



**Waterloo Region
District School Board**

REQUEST FOR TENDER

CHALMERS STREET P.S.

LIBRARY RENOVATION

PROJECT NO. 26-7855-RFT

ISSUE DATE: April 1, 2026

The Bidding System will receive ELECTRONIC SUBMISSIONS, no later than **2:00:00 p.m. local time, on April 23, 2026** (“Closing Date and Time”)

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, Subcontractors, Prequalified Rosters	19
00 21 15 – Scope of Work.....	21
00 31 34 – Subsurface Investigation Report	22
Appendix 00 31 34A – Soil Report	23
Appendix 00 41 13A – Asset and Warranty Card.....	24
00 56 13 – Definitions Stipulated Price	25
00 72 13 – Standard Terms and Condition.....	27
00 73 00 “The Supplementary Conditions”	64
DIVISION 01 - GENERAL REQUIREMENTS	122
01 14 00 – Work Restrictions	122
01 19 00 – Specifications and Documents	124
01 21 00 – Allowances.....	126
01 31 00 – Project Managing And Coordination.....	128
01 32 00 – Construction Progress Documentation	134
01 33 00 – Submittal Procedures.....	137
01 35 17 – Fire Safety Procedures	142
Appendix 013517-A Contractor Hot Work Permit	150
01 35 23 – Health And Safety.....	151
01 35 43 –Designated Substances	156
Appendix 01 35 43A Asbestos Audit Report	161
Appendix 01 35 34B– Lead Report.....	162
01 42 00 – References	163
01 45 00 – Quality Control	168
01 51 00 – Temporary Utilities	175
01 53 00 – Temporary Construction Facilities	180
01 54 00 – Materials and Equipment	186
01 61 00 – Product Requirements	189
01 70 00 – Examination and Preparation	194
01 73 30 – Execution and Cutting and Patching	197
01 74 00 – Cleaning and Waste Management	201
01 78 10 – Closeout Submittals and Requirements	205
01 78 40 – Maintenance Requirements	211
01 79 00 – Demonstration and Training	214

DIVISION 00 – BIDDING AND CONTRACT DOCUMENTS

DIVISION 02 – EXISTING CONDITIONS

02 41 00 Demolition

DIVISION 03 – CONCRETE

03 00 00 Not Applicable

DIVISION 04 – MASONRY

04 20 00 Unit Masonry

DIVISION 05 – METALS

05 12 00 Structural Steel

05 41 00 Structural Steel Framing

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

06 10 00 Rough Carpentry

06 20 00 Finish Carpentry

06 40 00 Architectural Wood Working

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

07 84 00 Firestopping

07 90 00 Joint Protection

DIVISION 08 – DOORS AND OPENINGS

08 11 13 Hollow Metal Doors & Frames

08 71 13 Power Door Operators

08 80 00 Glazing

DIVISION 09 – FINISHES

09 21 16 Gypsum Board Assemblies

09 30 00 Tiling

09 51 00 Acoustic Ceiling

09 68 00 Carpeting

09 84 13 Fixed Sound- Absorptive Panels

09 91 00 Painting

DIVISION 10 – SPECIALTIES

10 11 00 Visual Display Surfaces

10 20 00 Interior & Exterior Specialties

DIVISION 02 – EXISTING CONDITIONS

02 00 00 Not Applicable

DIVISION 11 – EQUIPMENT

11 00 00 Not Applicable

DIVISION 12 – FURNISHINGS

12 24 13.16 Manual Roller Window Shades

DIVISION 13 – SPECIAL CONSTRUCTION

13 00 00 Not Applicable

DIVISION 14 –CONVEYING EQUIPMENT

14 00 00 Name

DIVISION 21 – MECHANICAL

21 00 00 Not Applicable

DIVISION 22 – MECHANICAL- PLUMBING

22 05 00 Common Work Results for Plumbing
22 05 23 General Duty Valves for Plumbing Piping
22 05 53 Identification for Plumbing Piping and Equipment
22 07 00 Plumbing Insulation
22 11 16 Domestic Water Piping
22 13 00 Facility Sanitary Sewer
22 42 00 Commercial Plumbing Fixtures

DIVISION 23 – MECHANICAL- HVAC

23 05 00 Common Work Results for HVAC
23 05 93 Testing, Adjusting and Balancing for HVAC
23 07 00 HVAC Insulation
23 09 00 Instrumentation and Control for HVAC
23 21 13 Hydronic Piping
23 37 00 Air Outlets and Inlets
23 82 00 Convection Heating and Cooling Units

DIVISION 26 – ELECTRICAL

26 05 00 Common Work Results for Electrical
26 15 19 Low-Voltage Electrical Power Conductors and Cables
26 15 26 Grounding and Bonding for Electrical Systems
26 15 33 Raceway and Boxes for Electrical Systems
26 51 00 Interior Lighting

DIVISION 27 – COMMUNICATIONS

27 00 00 Name

DIVISION 28 – ELECTRICAL SAFETY AND SECURITY

28 05 00 Not Applicable

DIVISION 31 – EARTHWORK

31 00 00 Not Applicable

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 00 00 Not Applicable

DIVISION 33 – UTILITIES

33 00 00 Not Applicable

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

1.1 Designated Representative

To contact the Waterloo Region District School Board (“WRDSB” or the “Board”) or ask questions in relation to this Procurement, bidders must initiate communication electronically through the Bidding System. The WRDSB will not accept any communications by any other means, except as specifically stated in the Procurement. Bidders must not communicate in any manner with anyone other than the Designated Representative.

The Designated Representative for this procurement process is:

Procurement Lead: Ardith Inapan

Title: Buyer

Waterloo Region District School Board

Email: ardith_inapan@wrdsb.ca

1.2 Consultant

The WRDSB has hired the following consultant to assist in the preparation of this Procurement: BJC architects + associates

The Consultant and any subconsultants are not to respond to any questions or communicate with bidders and/or any interested parties from the bid issue date to the bid award notification. Reference: 1.5 Communication and Question Protocol.

The Consultant 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 WRDSB.

1.3 Blackout Period

A blackout 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 WRDSB, or any WRDSB consultants or employees, unless initiated by the Board’s Designated Representative, noted above.

1.4 Doing Business with the Waterloo Region District School Board

Waterloo region District School Board (WRDSB) serves approximately 65,000 students in 123 schools, as well as alternative and continuing education sites. WRDSB is committed to creating learning environments that support the achievement and well-being of all students through partnering with staff, parents, families, caregivers, and communities to promote success in learning and life.

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

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

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

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

1.5 Certificate of Recognition (COR) Certification (General Contractors)

- i. All bidders must possess and maintain a valid Certificate of Recognition (COR) issued by a recognized certifying partner at the time of bid submission.
- ii. Bidders shall provide proof of current COR Certification with their tender submission. Failure to provide acceptable documentation may render the bid non-compliant and subject to rejection.
- iii. The WRDSB reserves the right to verify the validity and status of COR Certification at any time during the procurement process and throughout the term of the contract.
- iv. If a bidder's COR Certification expires, is suspended, or is revoked during the contract period, the Board may, at its sole discretion, require immediate corrective action or terminate the contract without penalty

1.6 Communication and Question Protocol

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

The WRDSB will not be responsible for any verbal statements, instructions, 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 WRDSB shall not be bound by any verbal instruction or information provided by any WRDSB employee or consultant of the WRDSB. 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.

1.7 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 WRDSB at any time.

DESCRIPTION	DATE
Issue Date of Tender	Wednesday, April 1, 2026
Non-Mandatory Pre-Bid Site Examination	Date: Wednesday, April 8, 2026 Time: 03:30 pm local time School/Site: Chalmers Street Public School Address: 35 Chalmers Street S., Cambridge ON, N1R 5B4 Meeting Area: Main Foyer
Deadline for Questions	Monday, April 20, 2026
Closing Date and Time	Thursday, April 23, 2026 2:00:00 pm local time
Anticipated Contract Start / Work begins	Monday, June 1, 2026
Substantial Completion Date	Friday, August 28, 2026
Ready for Takeover	Friday, September 4, 2026
Deemed Complete Date	Friday, September 4, 2026

1.8 Site Pre-Bid Examination

Bidders are strongly encouraged to attend the non-mandatory pre-bid site meet and sign the attendance sheet. Date, time and location are provided above in the Anticipated Project Schedule. The WRDSB may not provide another opportunity to visit the site.

- i. Bidders shall attend site meetings at their own risk and hold the WRDSB harmless for any issues or damage arising out of their attendance at the site meeting.
- ii. The WRDSB 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

- iii. Absence from a non-mandatory site meeting will not disqualify any Bidder.
- iv. Bidders are solely responsible for making their own assessment of the site.
- v. 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.

1.9 Secondary Site Examinations

Bidders 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, phone number and email address 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 damage arising out of their attendance of the site meeting.

In the event the WRDSB holds a Mandatory Pre-Bid Site Examination meeting, Bidders not in attendance will not be provided an opportunity to a secondary site examination visit.

Bidders must adhere to all communication protocols, as described above in 1.5. 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.

1.10 Examination of Bid Documents and Work and Submitting Questions

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.

Submission of a Bid shall be considered conclusive evidence that the Bidder has satisfied itself as to the requirements of this Procurement.

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.

Bidders are strongly encouraged to ask clear and concise questions(s) or statements citing the relevant section of the Procurement Document. The Board cannot guarantee a response to questions received by the Board after the Deadline for Questions.

The WRDSB has endeavored to provide complete, correct information and estimates to enable Bidders to accurately assess and determine the scope and complexity of the Work prior to submitting a Bid.

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 Procurement document, unnecessary restrictions in the terms of reference, or should they be in doubt as to the meaning of any part of this document.

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

1.11 Electronic Bid Submission Only / Electronic Bidding System

The Bidder must complete and submit their bid through the Bidding System only. All components of the submission and supporting documents must be in English 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.

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&tenders e.g. plan taker contact information, categories, and agency etc.

All Bids shall be submitted through [bids&tenders](#) only. The onus is on the Bidder to ensure all requirements of this Procurement are submitted.

If a 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

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 Procurement. Only the plan takers will have access to download bid documents, receive addenda email notifications, download addenda, and submit their bid electronically through the Bidding System.

The onus is on the Bidder to ensure that the Bid is received in the Bidding System on or before 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 Bidding System receives the Bid, not when a Bidder submits a Bid.

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

All prices including provisional pricing, if requested, shall be submitted in the Schedule of Prices forms available through the Bidding System.

The Owner reserves the right to accept or reject any or all provisional bid prices submitted. Failure to submit provisional prices where required may result in the Bid being declared non-compliant.

Bids submitted by fax or paper copy, or any other format will not be accepted.

The Bidding System will not accept Bids after the Closing Time as determined by the Bidding System’s web clock.

The WRDSB hereby consents 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.

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

There will be no public opening for this Bid.

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 Procurement, they shall decide between them who is to be the Bidder, without any involvement of the WRDSB.

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 Procurement document, including WRDSB’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.

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.

1.12 Bid Prices

The amounts stipulated on the Schedule of Prices are intended to cover the cost of the complete Work as described in this Procurement Document.

All prices shall be in Canadian Funds, Free On Board (FOB) Destination, Freight Prepaid (WRDSB sites/locations).

Exclusive of the HST, or other similar taxes.

Unit pricing shall be exclusive of Harmonized Sales Tax (HST) but shall include all applicable costs including but not limited to overhead, material, labour, travel, fuel, fuel surcharge, equipment, disbursements, expenses, customs, charges, freight, shipping and handling costs, and all other charges of every kind attributable to the services, equipment or goods provided.

The person submitting the Bid on behalf of the Bidder must have authority to bind the Bidder.

Quantities may be estimated and subject to change, and therefore the WRDSB, at its discretion, may purchase more or less of the commodity based on the unit price bid.

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 subcontractors after the closing of the Bid must have prior written approval of the WRDSB's Project Representative.

All price(s) submitted shall be a reasonable price for each item as determined by the WRDSB 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 WRDSB adversely will be clarified and may be rejected.

Unit prices and/or optional pricing, if any will set the foundation for any approved increases or decreases in Work. The unit prices must remain fixed and firm for the term of the Contract, unless otherwise specified in this Procurement document.

Provisional or Optional Pricing may or may not be required for completion of the Work called for under the Contract. The WRDSB will decide necessity of these items and quantities thereon based on the unit prices(s) included in their Bid. If Provisional or Optional items are not purchased, or quantities are less than estimated, no adjustment or compensation will be awarded to the Bidder by the WRDSB. Optional pricing is not used for comparison of Bids for award purposes.

1.12.1 Bonding: for awards over \$200,000.00 unless otherwise instructed is required – Refer to Standard Terms and Conditions, Clause #4 Bonding Requirements.

1.13 References

1.13.1 References are NOT required. This Section does not apply to this Project

1.13.2 References must be for Work completed within the last five (5) years.

1.13.3 CLICK TO CHOOSE.

1.13.4 References for residential, domestic work or unrelated work are not defined as similar scope, size nor complexity and are not acceptable.

1.13.5 Bidders cannot use references that pertain to another Supplier or Contractors' work.

- 1.13.6 The WRDSB reserves the right to contact customers using any of the following but not limited to references form, reference letters, customers other than those provided by any Bidder, and CCDC-11 Contractor's Qualification Statement to verify information provided and assess overall client experience.
- 1.13.7 Bidders should ensure that their references are prepared to provide a response if contacted by the WRDSB. If the WRDSB is unable to obtain satisfactory references, or if the reference(s) do not respond after WRDSB's best efforts, or if the reference(s) choose not to comment, the reference(s) will be deemed unsatisfactory, and the WRDSB may ask the Bidder for additional references.
- 1.13.8 Unsatisfactory references may result in the Bidder's submission being rejected.
- 1.13.9 The WRDSB, in its sole discretion, may confirm the Bidder's experience and/or ability to provide the Services required after checking references, and the provision of the references by the Supplier is deemed to be consent to such confirmation/contact with the references.

1.14 Addenda

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

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

It is understood and acknowledged that while the Procurement 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 Procurement 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 WRDSB 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.

1.15 Edit and Withdrawal of Bid Submission

A Bidder who has submitted a bid may edit or withdraw its bid at any point up to the Closing Date and Time.

Any edits to a bid submission will cause the submission to automatically be withdrawn. The bid submission must be re-submitted to be accepted.

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.

1.16 Irrevocable Period

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

1.17 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).

1.18 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 Procurement Document.
- ii. Bids that are incomplete, conditional, qualified, or obscure.
- iii. Bids that are based upon an unreasonable period for completion of the Work.
- iv. Bids received from Bidders involved in Claims with either of the WRDSB or banned or on probation with the WRDSB.
- v. Bids received from any Bidder deemed to be unskilled or inexperienced 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.

1.19 Bid Review

- i. All Bids received on or before the Closing Time will be reviewed for compliance based on this Procurement document. Non-compliant Bids will be rejected. Bids not meeting any of the mandatory requirements included in this Procurement document will be disqualified. Bidders may be contacted to clarify their submissions.
- ii. Should there be any error in extensions, additions or computations, the WRDSB 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 WRDSB that they can comply with the requirements contained within this Procurement document and that they possess the necessary inventory, equipment, facilities, resources, and staff to perform the work specified in this Procurement document. Bidders may be required to submit evidence of above in a form acceptable to the WRDSB. Substitution of materials, equipment, or methods different from those outlined in the terms of reference will not be accepted unless provided for within this Procurement document or with the written approval of the WRDSB.
- iv. The WRDSB also reserves the right to examine Bidder's facilities, equipment and visit the subcontractors or subconsultants proposed and/or Bidder's existing and past clients. The award decision may be revised based on the above.
- v. The WRDSB will not be responsible for travel costs if travel is required. No additional charges will be accepted by the WRDSB for any cost incurred by the Bidder or any other party in participating in the Bid evaluations.
- vi. The WRDSB 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 WRDSB in its selection. The WRDSB reserves the right to consider all, or any information received from all available sources, whether internally or externally obtained. The WRDSB 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 WRDSB's own experiences with the respective Bidder(s) or any of the subcontractors and subconsultants proposed in their Bid.

1.20 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 WRDSB.

There shall be no obligation on the WRDSB because of seeking Bids or conducting the procurement process and the WRDSB reserves the right to pursue other Bidders, cancel the Procurement, issue a revised request, or to pursue any other course of action which would aid in meeting their needs.

If instructed, within **twenty-four (24) hours**, excluding hours occurring during a Saturday, Sunday, or a legal holiday, from the issuance date an intent to award from the WRDSB, 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, Subtrade Category and if applicable, related Divisions.

1.20.1 Within **seven (7) calendar days**, from the issuance date of an intent to award notice or requested by the WRDSB, the Bidder (the “Recommended Bidder”) shall provide the following mandatory requirements:

- i. Insurance certificate with coverage specified in the Procurement Document.
- ii. WSIB clearance certificate valid on the date of award or an exemption letter (if applicable and requested).
- iii. Non-Disclosure Agreement (NDA) duly signed by the authorized signatory (to be renewed annually). The WRDSB will provide this form.
- iv. Bonding Requirements, if applicable, as specified in the Procurement Document.
- v. An executed WRDSB issued Form of Agreement, if applicable, and duly signed by the authorized signatory.
- vi. Any other submittal specified in the Procurement Document or in the intent to award, as a requirement of award.
- vii. 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.

1.20.2 The documents listed below will be incorporated as deemed necessary by the WRDSB, 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:

- i. WRDSB approved change order(s) or Contract / Agreement / CCDC 2 - 2020 amendment(s)
- ii. Purchase Order(s), Contract(s) Agreement(s) / CCDC 2 -2020 executed with the Bidder including exhibits
- iii. Procurement document issued by the WRDSB, including addenda, if applicable
- iv. Bid submitted by the Bidder

1.21 Post- Closing/Pre-Award Meeting

The WRDSB may request a meeting with Bidders after the bid closing dates.

1.22 Award

Unless otherwise stated, the contract will be awarded to the lowest compliant bidder on the base bid, who meets the requirements, the scope of work outlined in this Procurement, and satisfactory references and experience. The WRDSB reserves the right to decrease quantities and/or the Scope of Work or not award this Project, due to insufficient budget.

1.23 Post-Award Meeting (Kick off Meeting)

A post-award meeting may be held consisting of the successful Contractor, and their key personnel assigned to the contract, the WRDSB's Project Manager/Lead and if applicable the 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.

1.24 Post Award

In addition to all the WRDSB'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 WRDSB 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.

1.25 Award Posting Notification

For procurements valued at \$121,200 or more, and in accordance with the Broader Public Sector Procurement Directive, once the WRDSB 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 WRDSB 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, Subcontractors, Prequalified Rosters

1.1 General Contractors

- 1.1.1 Only invited prequalified General Contractors, by award through a competitive prequalification process, 7430-RFPQ, may submit a bid for this opportunity.
- 1.1.2 Invitations are based on awarded Project Size Categories. Only approved GCs (on the Roster) may bid on the project size categories based on their award.
- 1.1.3 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 WRDSB and cannot be changed without prior written approval from the WRDSB.
- 1.1.4 Refer to COR Certification Requirements, Clause 1.5.

1.2 Subcontractors/Subconsultants

- 1.2.1 Refer to specifications for products and suppliers that will be required.
- 1.2.2 The subcontractor/subconsultant list is not required at time of bid submission.
- 1.2.3 The subcontractor/subconsultant list is mandatory after the bid closing date from the Recommended Bidder within twenty-four (24) hours of receiving a request or intent to award from the WRDSB.
- 1.2.4 In the event the WRDSB has a Prequalified Roster List for a Trade Category required for this project, the General Contractors will select from the list below in *3.0 WRDSB Prequalified Roster Lists*. General Contractor's subcontracting other than the companies listed below or identified by Addendum will have their Bid ruled informal.
- 1.2.5 The Bidder (the "Recommended Bidder") shall provide a list of subcontractor/subconsultant that it proposes to use for all Work described in this Procurement including the specification sections, as per the following:
 - i. 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.
 - ii. 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.
 - iii. The WRDSB reserves the right to reject any proposed subcontractor/subconsultant or supplier, based on the following but not limited to unsatisfactory past performance, suspended/removed from doing business with the WRDSB and/or outstanding/unresolved corrective action notice issued by the Owner to the subcontractor/subconsultant within the last three (3) years.

- iv. The WRDSB 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.
- v. The WRDSB reserves the right to examine Bidder's facilities, equipment and visit the subcontractor/subconsultant's proposed.
- vi. 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.
- vii. Where a bidder lists "own forces" in place of a subcontractor/subconsultant, the bidder shall conduct such item of the Work with its own forces.
- viii. Where "own forces" have been listed by a bidder, the WRDSB 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.

1.3 WRDSB Prequalified Roster Lists

The following subcontractors have been prequalified by the WRDSB through a competitive process. If the trade categories listed below are required for this Project, the General Contractor must select from the Prequalified Roster(s) below.

Example: Roofing Contractors

- Atlas Apex Roofing Inc
- Eileen Roofing Inc
- Flynn Canada Inc
- Lafleche Roofing (1992) Ltd
- Nedlaw Roofing Ltd
- Nortex Roofing Ltd
- Provincial Industrial Roofing & Sheet Metal Co. Ltd
- Semple Gooder Roofing Corp
- Trio Roofing Systems Inc.

END OF SECTION

00 21 15 – Scope of Work

Scope of work consists of removal of existing floor finishes, ceiling grid and acoustic ceiling tiles, all millwork (including fixed and moveable shelving units, existing circulation desk, cabinetry), demolition of existing raised platform, existing light fixtures and electrical posts throughout library.

New carpet and ceramic tile floor finishes will be installed along with new millwork bookshelves and cabinetry throughout main library area and new circulation desk. Previous raised platform area will be converted to a meeting room. There will also be replacement of existing hollow metal doors, and new metal doors in the library and meeting rooms.

There shall be a new acoustic tile ceiling with suspended acoustic panels and feature ceiling above circulation desk. New light fixtures will be installed throughout.

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: Not Applicable
 - .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 was 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:

- a. The WRDSB Project Asset & Warranty Card shall be filled out and completed for any project or work that calls for the replacement or new installation of any asset that has a warranty and requires ongoing preventative maintenance, as well any asset that is being removed.
- b. The information for the WRDSB Project Asset & Warranty Card shall be collected and coordinated by the General Contractor responsible for the overall project. The WRDSB Project Asset & Warranty Card shall be filled out and submitted to the Board electronically to FAC_maintenance@wrdsb.ca and carbon copy the project coordinator at the point in time where the project is deemed "Substantially Complete" or at the start of the Warranty Period for said asset. For any project without a General Contractor, the Contractor or Trade responsible for the installation and/or removal of the asset shall complete the WRDSB Project Asset & Warranty Card and submit it to the Board in the same manner as mentioned above.
- c. All items shall include the asset identifier, asset description, location, manufacturer, model, serial number, and warranty end date (refer to example at bottom of page).
- d. NO Warranty Period shall start without the written permission of the Board prior to the point of Substantial Completion of the project.
- e. The Contractor that is responsible for the coordination and completion of the WRDSB Project Asset & Warranty Card shall ensure that the contractor or trade responsible for the installation of the item understands that the contractor or trade is responsible for the preventative and general maintenance of that item for the minimum 2 year warranty period as noted on the WRDSB Project Asset & Warranty Card.
- f. All items installed under this contract that require ongoing preventative maintenance (PM) shall be included on the WRDSB Project Asset & Warranty Card. The following list contains examples to be included but not limited to;
- | | | |
|----------------------------------|-------------------------------|--------------------------------|
| Air Compressor | Chiller | Grease Trap |
| Air Handler- ERV, Heat Pump, RTU | Cooling Tower | Gym Equipment |
| AC Split -Indoor/Outdoor Unit | Elevator/Lift | Hoods- Kitchen/Fume |
| Automatic Doors | Eyewash Station-location only | Operable Partitions |
| Backflow Preventer | Fire Panel | Sprinkler System -area covered |
| Boiler | | Techn Equipment |
- g. All maintenance during the warranty period shall be the responsibility of the contractor. This shall include, but not be limited to: air handling unit filter changes (3x min per year), or as per manufacturers recommendations; servicing testable backflow preventors, including fees; and any and all required maintenance.

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 – WRDSB Standard Terms and Condition

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 WRDSB in writing. This includes, without limitations, terms in publications, website, sales invoice, delivery document as well as those commonly applied by the Bidder. WRDSB's acceptance of goods, equipment or service, acknowledgement thereon or paying invoices shall not imply acceptance of such terms, conditions, or provisions.

2. **Bankruptcy**

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

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

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

4. **Bonding Requirements**

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

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

i. **Bid Amount**

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

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

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

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

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

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

The bid deposit of the Bidder whose submission is accepted shall be forfeited by the Bidder should the Bidder fail to execute a Contract or provide the necessary documents as required within this Procurement 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 WRDSB.

For bid amounts where Bonding is not requested, the Awarded Bidder agrees to pay to the WRDSB 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 Procurement within seven (7) calendar days of written notification of the award of the contract.

iii. Performance and Labour & Materials Bonds

For bid amounts where bonding is required, inclusive of all taxes, the Supplier shall provide a digital Bid Performance and Labour and Materials Bond in an electronically verifiable and enforceable (e-Bond) format in the amount(s) of not less than 50% Performance Bond and a 50% Labour and Materials Bond of the total Contract Price made payable to the Waterloo Region District School Board 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 Supplier fails to provide a performance bond and/or labour and materials bond when requested, the WRDSB may declare the bid deposit forfeited, and the Bidder will be held responsible for any increased costs or damages incurred by the WRDSB. Any Bidder who fails to provide all required documents within the timelines provided or otherwise fails to enter into an agreement with the WRDSB upon notice of being the Supplier may be subject to future bidding constraints by the WRDSB.

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

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

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

5. Business Code of Conduct for Board Employees

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

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

6. Code of Conduct for Suppliers

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

- i. Courtesy and Respect: all Suppliers and their employees must conduct themselves in a manner that is lawful, courteous, respectful, businesslike, and free of bias to the WRDSB, its officer, employees, students, guests, or visitors.
- ii. Language and Behavior: Suppliers and their employees cannot engage in behavior that is rude, threatening, or offensive. Use of profane or insulting language is prohibited. Harassment of any type, including sexual harassment is strictly

- prohibited. Abusive, derogatory, obscene or improper language, gestures, remarks, whistling, cat calls or other disrespectful behavior cannot be tolerated. Rough housing, fighting, fisticuffs, physical threats, destruction of property, vandalism, littering, or physical abuse of anyone on WRDSB property are not permitted under any circumstance.
- iii. No Weapons, Alcohol, or Drugs: The use, possession, distribution, or sale of any weapon, alcohol, illegal drug, or controlled dangerous substance by any Supplier or Supplier's employee is prohibited. Offenders will be removed from WRDSB property and/or reported to the local Police Department.
 - iv. Smoking: Suppliers and their employees are not permitted to smoke on WRDSB property, in or near any buildings.
 - v. Fraternization: Suppliers and their employees may not fraternize or socialize with WRDSB students or employees.
 - vi. Appearance: Suppliers and their employees, where applicable, are required to wear appropriate Personal Protective Equipment (PPE), work wear, hard hats and safety footwear high-visibility clothing, 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. Identification: contracted suppliers and their employees are required to wear branded attire of the company they work for when on WRDSB property.
 - viii. Vehicles and Driving on WRDSB Property: Vehicles must clearly indicate the Supplier's company name, identifier number and telephone number. It must be readable from 8 meters (25 feet) away. Vehicles including movable Equipment/Machinery must not enter, leave or drive on WRDSB premises during nutritional breaks, before and after school hours, or anytime there are students or staff outside of the building.
 - ix. Reporting: The Supplier is required to report any matter involving a violation of these rules of conduct, any matter involving health or safety, including any altercations, to WRDSB Facilities staff.

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

7. Compliance with Laws, Acts and Regulations

Suppliers shall abide by all applicable municipal, provincial and federal laws, as well as WRDSB Policies. Some of the applicable laws are highlighted below for information purposes only. In case of any discrepancy between this Procurement 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. Accessibility for Ontarians with Disabilities Act (AODA)
- ii. Architect Act
- iii. Bill S-211 Fighting Against Forced Labour and Child Labour in Supply Chains Act
- iv. Broader Public Sector Accountability Act, 2010
- v. Building Ontario Businesses Initiative (BOBI) Act, 2022
- vi. Canada Revenue Agency (CRA) regulations
- vii. Confidentiality Acts (MFIPPA, PIPEDA etc.)
- viii. Construction Act
- ix. Education Act
- x. Occupational Health and Safety Act
 - a. Ontario Regulation 157/25, Section 27.1.

This regulation requires Constructors to have a defibrillator (AED) on construction projects with 20 or more regularly employed workers (effective January 1, 2026), and ensure a worker trained in CPR/AED operation is present at all times.
- xi. Supply Ontario: Supply Chain Management Act (Government, Broader Public Sector and Health Sector Entities), 2019, S.O. 2019, c. 15, Sched. 37
- xii. Trade Agreements (CETA/CFTA etc.)
- xiii. Workplace Safety and Insurance Act (WSIB)
- xiv. [WRDBS Procurement Services Policies website](#)
- xv. [WRDSB Policies and Procedures](#)

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

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

The Supplier(s) will be required to comply with all applicable federal, provincial laws as well as WRDSB 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 WRDSB, upon request, periodic reports and evidences confirming such compliance.

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

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

8. Confidential Information, MFIPPA, and PIPEDA

All information and documentation provided by the WRDSB or to the WRDSB in connection with this Procurement, before or after the issuance of this Procurement is the sole property of the WRDSB 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 WRDSB 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 WRDSB to advise or assist with the Bid process, including the evaluation of Bid submissions.

Bidders should be aware 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 WRDSB, the Bid prices submitted and agreed to under contract with the WRDSB can also be made available through a Freedom of Information request. Bidders will be notified regarding requests for any other information submitted in a Bid; information may be disclosed to a requester in whole or part unless otherwise considered exempt from disclosure under MFIPPA.

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

- i. it and all the Supplier's Subcontractors shall ensure the PIPEDA compliance of all PIPEDA Protected Information it collects directly from individuals or indirectly from the WRDSB, uses or discloses while performing their obligations under this Agreement; and,
- ii. without limitation, it shall ensure the PIPEDA compliance of all PIPEDA Protected Information it transfers or discloses to the WRDSB.

9. Confirmation to Proceed

No work shall commence until the WRDSB has issued a purchase order and/or contract, if applicable to the Supplier. Goods/Service or Work as described shall not commence

until all the required documents have been submitted to Procurement Services and the Form of Agreement and/or the CCDC 2 - 2020, if applicable, are executed by the Supplier and the WRDSB. For payment purposes, a Purchase Order shall be generated and issued to the Supplier. The Purchase Order number must appear on all invoices 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, subconsultants and suppliers also have no conflict with respect to other work and/or other clients.

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

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

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

It is of the essence of the Contract that the Owner shall not have direct or indirect liability to any Subcontractor or Supplier, and that the Owner relies on the maintenance of an arm's-length relationship between the Supplier and its Subcontractors and Sub-suppliers. Consistent with this fundamental term of the Contract, the Supplier 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 Supplier, where such claim is, in whole or in part, in respect of a disputed claim by the Subcontractor or Supplier against the Supplier, where the payment to the Subcontractor or Supplier by the Supplier is agreed to be conditional or contingent on the ability to recover those amounts or a portion thereof from the Owner, failing which the Supplier shall be saved harmless from all or a portion of those claims. The Supplier

acknowledges that any such agreement would undermine the required arm's-length relationship and constitute a conflict of interest. For greater certainty, the Supplier shall only be entitled to advance claims against the Owner for amounts pertaining to Subcontractor or Supplier claims where the Supplier has actually paid or unconditionally acknowledged liability for those claims or where those claims are the subject of litigation or binding arbitration between the Subcontractor or Supplier and the Supplier has been found liable for those claims.

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

11. Construction Act Guidelines

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

12. Criminal Background Checks and Collection of Personal Information

The WRDSB 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 WRDSB, the Supplier will provide to the WRDSB, 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 WRDSB-approved form for every employee of the Supplier who may come in direct contact with WRDSB staff and/or students on a regular basis at any WRDSB 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 WRDSB will determine in its sole discretion whether this is a requirement.

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

13. Damage Responsibility of Supplier

The Supplier, their agents and all workers and persons employed by them or under their control, shall use due care that no person or property is injured and that no rights are infringed in the prosecution of the work, and the Supplier shall be solely responsible for all damages by whomsoever claimable in respect of any injury to persons or to lands, buildings, structures, utilities, survey markers, fences, livestock, trees, crops, roads, ways, ditches, drains and in watercourses, whether natural or artificial, or property or whatever description and in respect of any infringement of any right, privilege or easement

whatever occasioned in the carrying on of the work or any part thereof, or by any neglect, misfeasance or nonfeasance on the Supplier's part or on the part of any of his agents, workers and persons employed by them or under their control shall bear the full cost thereof and shall at his own expense make such temporary provisions as may be necessary to ensure the avoidance of any such damage, injury or infringement.

The Supplier shall indemnify and save harmless the WRDSB 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 WRDSB Representative the Supplier has failed to rectify any damage, injury or infringement or has failed to adequately compensate any person for any damage, injury or infringement for which the Supplier is responsible under the Contract, the WRDSB, following notice in writing to the Supplier of his intention so to do, may withhold payment of any monies due to the Supplier under this or any other Contract until the Supplier has rectified such damage, injury or infringement or has paid adequate compensation for such damage, injury or infringement.

14. Damage Reporting

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

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

15. Debriefing Requests

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

16. Default

If the Supplier fails to properly, promptly, and fully carry out the Work required by these documents, the WRDSB reserves the right to notify the Supplier to discontinue all Work

under this Contract, to advertise for new Bids or carry out the Work in any way as the WRDSB may, in their sole discretion, deem best.

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

17. Delay Claims

The Supplier shall be responsible for all deliverables including lead times. The bidder shall include in their bid price any costs associated with an extended schedule beyond the stated substantial completion date due to delayed deliveries of items. Cost 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 WRDSB will not accept or consider any "delay claim" requests for delayed deliverables outlined in the tender documents.

18. Delivery and Transportation Charges

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

19. Designated Substances

The Occupational Health and Safety Act of Ontario (OHSA) allow 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 WRDSB retained consultants. Each facility was surveyed, and if applicable, an AAU Report is available, refer to attached, Appendix 01 35 34A. If these materials, including those deemed or suspected, will be disturbed, or will likely be disturbed, during building maintenance, renovations, construction, or demolition activities, they must be

handled and disposed of in accordance with the procedures prescribed by O. Reg. 278/05.

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

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

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

ii. Lead

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

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

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

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

for extra cost will be accepted for lead-containing paint or coatings in identified areas.

The classification of typical lead-containing construction tasks is based on presumed airborne concentrations obtained from the U.S. Occupational Safety and Health Administration (OSHA), the Ontario Ministry of Labour, and published research studies. The classification of Type 1, Type 2, or Type 3 operations are grouped based on the following concentrations of airborne lead

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

iii. Mercury

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

iv. Silica

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

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

v. Other Designated Substance

In addition to asbestos and/or lead, silica, and mercury are present in all WRDSB facilities. New construction, renovation, or alterations require compliance by the Supplier with the applicable legislation. Other designated substances (i.e., acrylonitrile, arsenic, benzene, coke oven emissions, isocyanates, ethyl oxide, and vinyl chloride) are not encountered in WRDSB facilities as significant constituents or in a form that would represent an exposure concern.

20. Dispute Resolution

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

21. Duty to Disclose Change of Control

If the Supplier undergoes a change in control, the Supplier shall immediately disclose such change in control to the Designated Representative and shall comply with any terms and conditions subsequently prescribed by the WRDSB resulting from the disclosure.

22. Electrical Safety Requirements

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

23. Emergency and Maintenance

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

For emergency and maintenance measures, the name, address, and telephone number of a responsible official of the contracting firm shall be given to the WRDSB'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 WRDSB in the event emergency or maintenance measures are required, although the emergency or requirement of maintenance may have been caused by the Supplier's negligence, Act of God, or any cause whatsoever.

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

24. Equivalents and Alternatives

24.1 Equivalents or Brands Names

24.1.1 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.

- 24.1.2 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 WRDSB in the form of an Addendum. It is the Bidder's responsibility to demonstrate that the item meets the specifications.
- 24.1.3 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. Upon receipt of a request, the WRDSB will respond by providing further instructions where you may submit documentation.
- 24.1.4 The response must include enough detail to determine equivalency by comparing the WRDSB's specifications to the equivalent product. It will not be the WRDSB's responsibility to make this comparison.
- 24.1.5 The WRDSB/ Consultant may, depending on the nature of the product request site visits within a reasonable distance (preferable within 100 km of the WRDSB) 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.
- 24.1.6 The WRDSB/Consultant will endeavor to complete a review and decide prior to the Closing Date, and, if required, the WRDSB 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 Procurement.
- 24.1.7 If the WRDSB is willing to consider the product with its differences, it will be communicated in the form of an Addendum prior to the Closing Date.
- 24.1.8 The cost of any testing requirements to establish acceptable equivalent or comparable products will be borne by the Bidder, unless otherwise stated by the WRDSB.

24.2 Alternatives and Substitutions

- 24.2.1 After Contract Award, the Contractor may submit an alternate material or piece of equipment to the Consultant and Owner for review. An Alternate will only be evaluated and considered acceptable if it meets the intent of the original design and specifications, and where there is a credit or no additional cost to the Owner. The Specification Sections contain pertinent performance criteria, quality, function and requirements for materials and methods to achieve work described.
- 24.2.2 Material or equipment of equal or better performance and quality may be offered in substitution for those specified. Requests for review of substitute items of material and equipment will not be accepted by the Consultant from anyone other than the Contractor. All requests for substitution must be accompanied by a detailed listing of the expected cost savings to the Owner.

24.2.3 Substitutions will not be considered when they are indicated or implied on Shop Drawings or product data submittals without a separate written request.

24.2.4 Requests for substitution shall include any request for changes from the Contractor that require significant design changes, redesign, or significant design reviews.

A request for substitution constitutes a representation that the Contractor:

- i. Has investigated the proposed product and determined that it meets or exceeds the quality level of the specified product.
- ii. Will provide the same warranty for the substitution as for the specified product.
- iii. Will coordinate the installation and amend other Work which may be required for the Work to be complete at the Contractor's expense and at no additional cost to the Owner.
- iv. Waives claims for additional costs or time extension which may subsequently become apparent.
- v. Will reimburse the Owner for review or redesign services.

24.2.5 Request for substitution to be made by written application to the Consultant and is to include sufficient data to enable the Consultant to assess the acceptability of requirements, including the following:

- i. All submittal information required for the specified equipment, including all deviations from the specified requirements and/or necessitated by the requested substitution.
- ii. Materials of construction, including material specifications and references.
- iii. Dimensional drawings, showing required access and clearances, including any changes to the work required to accommodate the proposed substitution.
- iv. Drawings and details showing changes if the offered substitution necessitates changes to or coordination with other portions of the Work. Perform these changes as part of the substitution of material or equipment at no additional cost.
- v. Certification that the proposed substitute will adequately perform the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified with the same or better warranty.
- vi. Information and performance characteristics for all system components and ancillary devices to be furnished as part of the proposed substitution.
- vii. Certification that acceptance of the proposed substitute will not prejudice achievement of Substantial Performance.
- viii. Itemization of all costs including any licenses fee or royalty that will result directly or indirectly from the acceptance of the proposed substitution.

- Include redesign and cost of claims of any other contract affected by the resulting change.
 - ix. Guaranteed credit or cost reduction offered if the proposed substitution is accepted and a waiver of claims for additional expenses which may subsequently become apparent.
 - x. Recommended maintenance requirements and availability of spare parts and service.
 - xi. Written confirmation from subcontractors and suppliers on cost, schedule, and technical requirements if requested by the Consultant.
- 24.2.6 Consultant will evaluate each proposed substitution. Consultant will be the sole judge of acceptability, and no substitute will be ordered, installed, or utilized without the Consultant's prior written acceptance by either a Change Order or a reviewed shop drawing. The burden of proof is on the Contractor.
- 24.2.7 Pay the Consultant's cost for evaluating the requested substitution even though the request may be denied, or for additional redesign work required because of any substitution. Costs will be charged on a time and expense basis and will be deducted from progress payments due to the Contractor.

25. Evidence of Quality

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

26. Force Majeure

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

Any cause, unknown at the effective date of the Contract and beyond either party's control, other than financial difficulties, bankruptcy or insolvency, which prevents the performance by a party, or both, of any of their respective obligations under the Contract and the event of Force Majeure did not arise from a party's default and could not be

avoided or mitigated by the exercise of reasonable effort or foresight. Force Majeure includes Labour Disputes; fire; unusual delay by common carriers or unavoidable casualties; delays in obtaining third-party licenses, permits, agreements, or approvals (excluding approvals of any 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 WRDSB 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.

27. Hold Back or Set Off

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

28. 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 because 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 WRDSB.
- 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.

28.2 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 WRDSB'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 WRDSB'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.

29. Incurred Costs

The WRDSB 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.

30. Indemnification

The Bidder will indemnify and save harmless and defend the WRDSB, and their respective elected officials, officers, employees, agents and their respective successors and assigns, from and against all actions claims and demands whatsoever which may be brought against or made upon any of the Indemnified Parties and against all losses, liability,

judgments, claims, costs, demands or expenses which the Indemnified Parties may sustain, suffer, or be put to resulting from or arising out of the Bidder's failure to exercise reasonable care, skill or diligence in the performance or rendering of any Work or service required hereunder to be performed or rendered by the Bidder, its agents, servants, employees or 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.

31. Inspection of Supplier's Work and Equipment.

- i. The WRDSB reserves the right to inspect and/or have demonstration of the products/equipment/services offered prior to award of this Procurement.
- ii. The WRDSB reserves the right to have all work, including maintenance and repair work reviewed by a third-party Contractor, Agency, or Consultant to confirm that work within this Contract is being completed satisfactorily.

32. Insurance Requirements

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

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

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

policy has been issued pursuant to a government-operated automobile insurance system, the Supplier shall provide the Owner with confirmation of automobile insurance coverage for all automobiles registered in the name of the Contractor.

- iii. **Contractor's Equipment Insurance:** If applicable/requested, 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 WRDSB and shall not allow subrogation claims by the Insurer against the WRDSB.
- iv. **All Risk Installation Floater:** If applicable/requested, 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 too, while stored at a temporary location, and awaiting installation at the work site.
- v. **Professional Liability Insurance (Errors and Omissions):** If applicable/requested, Contractors and/or Consultants shall ensure its professional consultants, architects, landscape architects, planners, engineers, including IT 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 Million per claim providing coverage for acts, errors and omissions arising from their professional services performed under this Agreement including but not limited to . design errors, project management mistakes, failure to perform etc. 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 WRDSB prior to the completion of the project and in accordance with the provisions stated above.
- vi. **Pollution Liability:** 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 conditions during construction. Coverage shall be in an amount of not less than \$5 Million per claim or per occurrence, or such greater amount as the WRDSB may from time to time require, naming the WRDSB 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. **Cyber Insurance:** If applicable/requested: In addition to the insurance required under the Agreement, the Contractor shall procure and maintain cyber and network

privacy insurance at its sole cost and expense with an aggregate limit of not less than \$1 million per occurrence.

The insurance policy shall include coverage for any and all liabilities, damages, claims, losses, costs, and expenses of any kind that may be incurred by or asserted resulting from or related to: (1) any act, error, omission, or negligence related to the Proponent's technology and/or professional services; (2) intellectual property infringement arising out of software and/or content; (3) breaches of security and/or data; (4) violation or infringement of any right to privacy, or any breach of federal, provincial or local security and/or privacy laws or regulations; and (5) theft, damage, destruction, or corruption of any WRDSB data or any employee, or student of WRDSB, including without limitation, unauthorized access, unauthorized use, identity theft, theft of personally identifiable information or confidential corporate information, the transmission of a computer virus or other type of malicious code.

Evidence of coverage must be provided to the WRDSB within 7 days of the Intent to Award. The policy must be kept in force by the Proponent during the term of this Agreement and for three (3) years (either as a policy in force or Extended Reporting Endorsement) after this Agreement is terminated or after completion of the Project provided for herein, whichever is later. Proof of insurance may be requested during the agreement term and for three (3) years after. If the policy is to be cancelled or non-renewed for any reason, a 90-day notice of said cancellation or non-renewal must be provided to the WRDSB. The WRDSB has the right to request that the Proponent purchase an Extended Reporting Endorsement at the Proponent's sole expense.

- viii. **Provisions:** Prior to the commencement of work, the Supplier shall forward a Certificate of Insurance evidencing this insurance with the executed Agreement. The Certificate shall state that coverage will not be suspended, voided, canceled, reduced in coverage or in limits except after thirty (30) days (ten (10) days if cancellation is due to non-payment of premium) prior written notice by certified mail to the WRDSB.

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 WRDSB and any other person insured under the policy and be primary insurance in response to claims. Any insurance or self-insurance maintained by the WRDSB 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 WRDSB under this Agreement.

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

ix. Third Party Claims Process:

- a. The WRDSB's claims process for Third Party claims is to refer the claimant directly to the Supplier and to leave the resolution of the claim with the Supplier. This applies regardless of whether it is an insured loss.
- b. As WRDSB has a responsibility to the taxpayers, we must ensure that claimants are dealt with in a fair and efficient manner. Claims reported to the Supplier, either directly by a third party or through the WRDSB shall be promptly investigated by the Supplier. The Supplier shall contact the third party claimant within 48 hours of receipt of notice of a claim. The Supplier shall initiate an investigation of the claim immediately upon notice, and advise the third party claimant in writing, with a copy to the WRDSB, of its position regarding the claim within 21 calendar days of the notice. The Supplier shall include in its response the reasons for its position.
- c. Should this position not resolve the claim and be accepted by the third party claimant, the Supplier shall immediately report the claim to its Insurer for further review. (Insurer for this purpose is defined as either the Claims Department of the Supplier's Insurance Company or the Claims Administrator at the Supplier's Insurance Broker.) The Supplier's Insurer upon receipt of this claim shall advise the third party claimant by letter, with a copy to the WRDSB, that it is now investigating the claim. When a final position on the claim has been determined, the Supplier's Insurer shall advise the third party claimant by letter, with a copy to the WRDSB. Failure to follow this procedure shall permit the WRDSB to investigate and resolve any such claims.
- d. Nothing herein shall limit the right of the WRDSB to investigate and resolve any such claims notwithstanding the response of the Supplier and/or its Insurer and to seek indemnification from the Supplier or to exercise any other rights under the Contract.
- e. The WRDSB may, without breaching this contract, retain from the funds owing to the Supplier an amount that, as between the WRDSB and the Supplier, is equal to the balance in the WRDSB's favour of all outstanding debts, claims or damages, whether related to this contract.

33. Invoicing and Payment Terms

- 33.1 Submit all invoices to finance-ap@wrdsb.ca for payment at the completion of the Work or after receipt of goods, unless otherwise stated. Not Applicable for Credit Card orders.
- 33.2 Fiscal Year End: All work scheduled within a single school year (Sept 1-Aug 31) must be completed and invoiced received by the WRDSB no later than August 31 of that same school year, unless budgets dictate that work must extend into the following school year and/or mutually agreed upon both parties.
- 33.3 New Account, in advance of invoicing, upon request, Suppliers will provide:

- i. necessary company information to set up a WRDSB account and
 - ii. banking information to receive payment by Electronic Funds Transfer (EFT).
- 33.4 Requests to change company information must be submitted in writing accompanied by a legal document/letter signed by a lawyer on the law firm's letterhead.
- 33.5 Invoices must contain the following information, where applicable, to be deemed complete:
 - i. Purchase Order Number
 - ii. Invoice Date
 - iii. Unique Invoice Number
 - iv. Supplier name and address
 - v. Quantity, Unit Price, Unit of Measure and Extended Price
 - vi. Description for each line item
 - vii. Date of Service Call, if applicable
 - viii. HST
 - ix. Payment Terms
 - x. Work Order Number, if applicable
 - xi. Name of WRDSB Project Lead, if known, and
- 33.6 Payment terms shall be net thirty days (30) days after receipt of invoice, unless otherwise agreed by the WRDSB in writing. 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 WRDSB. The WRDSB will not pay any interest, penalty, or late fee for delayed payments. The WRDSB preferred payment method is Credit Card or EFT, however alternate payment methods may be approved. Suppliers are required to invoice promptly, without delay. For Work that falls under the Construction Act, refer to 34 Construction Act – Proper Invoice.

34. Construction Act – Proper Invoice

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

- i. the Supplier's name, address, telephone number, and mailing address.
- ii. the date of the Proper Invoice and the period during which the services or materials for which payment is being made 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 WRDSB in the Contract.
 - viii. the invoice number and if applicable, the revision number.
 - ix. the Supplier's HST number.
 - x. invoices and time sheets from all subtrades whose work is included in the Proper Invoice, if required in the Contract.
 - xi. backup documentation to support any cash allowances and extra work claimed in the Proper Invoice.
 - xii. a schedule of values indicating:
 - a. for lump sum contracts, the percentage of work completed per division with each division further subdivided to show the percentage of work completed for each subtrade,
 - b. for unit price contracts, the tender quantity, unit of measure, previous quantity, current quantity, to-date quantity,
 - c. an updated list of change orders, showing the percentage of work completed under each change order, and
 - d. an updated cash allowance list, showing the percentage of work completed in respect of each cash allowance, if required by the Contract.
 - xiii. a Statutory Declaration where required by the Contract attesting to the truth of the statements made therein.

35. Interpretive Value of Headings

The headings in this Procurement document or subsequent Agreements are for convenience of reference only and in no manner modify, interpret, or construe the Procurement document or subsequent Agreements.

36. Licenses and Permits

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

37. Locates

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

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

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

38. Log Reports

If requested, the Supplier must submit a completed Log Report with invoices. The WRDSB may request more frequent log submissions if it is necessary.

39. Materials - Specifications

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

40. 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 WRDSB will not accept any additional charges or surcharges related to the supply of M.S.D.S.

41. Mathematical Errors (Unit Prices Prevail)

Should there be any error in extensions, additions or computations, the WRDSB 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.

42. No Branding

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

43. No Collusion

Bidders/Proponents 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/Proposal for the same Work and shall be fair in all respects and shall be without collusion or fraud.

44. No Lobbying

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

- i. any elected or appointed officer.
- ii. any staff of the WRDSB except the Designated Representative as identified in the Procurement Document; or
- iii. any other person connected in any way with the procurement.

45. 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 WRDSB owned properties. Furthermore, most WRDSB 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.

46. Non-Assignment

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

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

47. Non-Disclosure Agreement (NDA)

The WRDSB 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 WRDSB procedure AP4790. Prior to any sharing of WRDSB personal, sensitive, or confidential information, the Supplier will be subject to further privacy and security reviews as required. This agreement will be renewed on an annual basis.

48. 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 WRDSB 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 WRDSB agree as follows.

- i. Except as set out in paragraph (b) below, the Bidder hereby assigns and agrees to assign to the WRDSB 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 WRDSB a royalty-free, irrevocable, perpetual, world-wide, non-exclusive license to make, use, sell, modify, prepare derivative works, disclose, publish, sublicense, copy and communicate by electronic means such Retained Materials.

- iii. The Supplier agrees to always cooperate fully and will cause its Personnel to always cooperate fully, with respect to signing such documents and doing such acts and other things reasonably requested by the WRDSB to confirm the transfer of ownership rights in the Deliverables.

49. Patent, Copyright and Other Proprietary Rights

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

All reports submitted by the successful bidder, including the "Asbestos Audit Update Report" dated [Month/Day/Year], and any related documentation, shall become the exclusive property of the Board upon submission, including all associated intellectual property rights, except for any pre-existing intellectual property of the contractor unless otherwise agreed in writing.

The consultant shall ensure the accuracy and legal compliance of all submitted materials, which may be verified or audited by the Board.

The Board and its authorized agents may use, reproduce, and disclose the report as necessary to fulfill obligations under applicable legislation, including the Occupational Health and Safety Act, Ontario Regulation 278/05, and relevant privacy laws such as but not limited to Freedom of Information and Protection of Privacy Act (FIPPA), the Municipal Freedom of Information and Protection of Privacy Act (MFIPPA).

All information shall be treated as confidential and shall not be disclosed by the consultant to third parties without prior written consent from the Board representative, unless required by law.

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).

50. Performance

- i. Where the Supplier is in default in conducting any of its obligations under the contract, the WRDSB may issue a verbal warning outlining the deficiency in supply or other aspects of performance and requiring the Supplier to correct those deficiencies within such period as stated.

- ii. If the deficiency is not corrected within the time specified, or there is a further instance of deficient performance, the WRDSB may issue a written notice to the Supplier, identifying the deficiency in performance and setting a final date or period for its correction.
- iii. If corrective steps are not taken by the final date or within that time, the WRDSB may terminate the Contract and take corrective action.
- iv. Termination of any Contract can be immediate depending on the severity of the default.
- v. The Supplier shall have no right to perform the services contemplated under this agreement beyond the time when such services become unsatisfactory to the WRDSB; and in the event that Supplier shall be discharged before all the services contemplated hereunder have been completed, or the services are for any reason terminated, stopped or discontinued because of the inability of the Supplier to serve under this agreement they shall be paid only for that portion of the Work which shall have been satisfactorily completed at the time of termination.
- vi. Where deemed appropriate, a performance evaluation shall be completed by the WRDSB. The evaluation report shall be reviewed with Procurement Services, and a copy of the completed evaluation forwarded to the Supplier for their records. Dependent on the evaluation scoring, the WRDSB may request a corrective action plan and/or project size/value may be affected on future bid opportunities for your company.

51. Permits and Licenses

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

52. Proceedings Against the WRDSB

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 WRDSB and the Bidder. The WRDSB may reject any Bid in the event of potential, current, pending, or threatened litigation, arbitration, alternative dispute resolution, or disputes involving the WRDSB and the Bidder.

53. Protection of WRDSB Assets

The Supplier (the Supplier / Subcontractor) shall be informed of and protect all WRDSB assets including existing structures and vehicles, to the satisfaction of the WRDSB. Any damage shall be reported to the WRDSB and subsequently repaired and/or replaced by the Supplier, at their expense, to the satisfaction of the WRDSB. The Supplier shall not

cause any inconvenience to WRDSB operations, staff, public or users of the WRDSB facilities, within reason. Communication between the successful Supplier and the school (or WRDSB representative if school contact is not available) must be timely and effective to ensure all stakeholders are considered / aware of work to be completed.

54. Records, Inspection, Audits

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

55. Reserved Rights of the WRDSB

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

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

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

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

56. Responsibilities of the Supplier

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

The Supplier shall:

- i. perform the Contract in accordance with the specifications, terms and conditions under which it is awarded.
- ii. act in a professional manner always when dealing with WRDSB staff, with the public, and while working on site.
- iii. not, except with the consent of the WRDSB 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 WRDSB

- be used for, or in connection with, any advertising or promotional purpose of the Supplier.
- iv. treat information gained while working with the WRDSB confidentially and not use it for any other project and return it to the WRDSB 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).

57. 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 Procurement 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 the names of Subcontractors, subconsultants, 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 Procurement Document including any addenda.
- iv. In the event of discrepancies between the maps, drawings, reports, and the specifications regarding 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 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 conduct 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.

58. 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 WRDSB will not be responsible for damages or extra work caused or occasioned by the Supplier relying on this or any other information or records.

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

59. Site Inspection and Control

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

60. Site Investigation

Bidders shall not rely solely upon information furnished by the WRDSB 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.

61. 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 conducted by skilled workers acceptable to the WRDSB Representative, under the liability of the Supplier.

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

62. 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 Procurement Document.

63. Sustainable Purchasing

The procurement needs of the WRDSB 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 should include the consideration of environmentally tangible and intangible factors when determining the total life-cycle costs and environmental impact.

64. Termination

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

- i. The WRDSB may terminate the contract without further notice and exercise its rights to the Contract security provided by the Supplier.
- ii. The WRDSB may withhold any payment due to the Supplier hereunder until the Supplier has remedied its failure.
- iii. The WRDSB may engage the services of another Bidder to remedy the Supplier's failure and obtain reimbursement therefore from the Supplier. The said reimbursement may be obtained either through deduction from any amounts

owing to the Supplier hereunder, or through any other legal means available to the WRDSB; or

- iv. The WRDSB may assert any other remedy available to it in law or equity.

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

65. Termination for Convenience

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

66. Termination for Lack of Funding

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

67. Tools and Equipment

All equipment and methods used to fulfill 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 WRDSB 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 WRDSB entering into an agreement with the Supplier, or at any time during the contract, the WRDSB may, at its discretion, request an inspection of the equipment proposed for use.

It is the responsibility of the Supplier, in the event of a major mechanical equipment breakdown, to have available substitute equipment of similar capability. It shall be supplied and put into service to fulfill the requirements of this procurement. Failure to provide alternative equipment within expectations specified within this procurement may result in termination of the contract. It is the responsibility of the Supplier to ensure work continues and deadlines are met, despite any unforeseen interruption because of equipment failure.

It is the Supplier's responsibility to ensure that the equipment and the operator, are licensed in accordance with the Ministry of Transportation. The WRDSB may, at their

discretion, require the Supplier to provide proof that the equipment has passed a recent (within the last 12 months) government safety inspection and that the operators are suitably licensed prior to commencement of the contract. All vehicles, tools, equipment, and voltage rated gloves requiring dielectric testing shall have current certification and all applicable documentation.

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

68. Traffic/Pedestrian Safety

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

69. Traffic Control and Site use

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

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

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

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

The Supplier shall, at his own expense and to the satisfaction of the WRDSB, provide all vehicular traffic control equipment, signs, material, and labor required to perform the work in a safe manner in accordance with the "Occupational Health and Safety Act" and the "Ontario Traffic Manual" (Book 7). The Supplier shall assure that all required forms are completed and on-site for inspection. In the event a traffic control company is contracted for the purpose of signage, information regarding the Supplier must be included in the quotation and included with the bid price.

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

70. Usage Reports

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

71. Variation of Bid Prices

No variation in the Total Price, unit prices and/or optional 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.

72. Volume and Exclusivity

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

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

73. Waiver

No term or provision of the Procurement 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 WRDSB does not accept responsibility for any information or any errors or omissions which may be contained in the Procurement Document, or the data, materials or documents disclosed or as provided to the Bidders pursuant to the procurement. The WRDSB make no representation or warranty, either expressed or implied, in fact or in law with respect to the accuracy or completeness of the Procurement Document or such data, materials or documents and the WRDSB shall not be responsible for any actions, costs, losses or liability whatsoever arising from any Bidder's reliance or use of the Procurement Document or any other technical or historical data, materials or documents provided by the WRDSB. The Bidder is responsible for obtaining its own independent financial, legal, accounting, and technical advice with respect to any information included in the Procurement Document or in any data, materials, or documents provided or required by the WRDSB.

74. Warranty and Maintenance

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

75. Work Continuity

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

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

76. Work Requirements

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

77. Workplace Safety Insurance Board (WSIB) Certificate

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

Prior to a formal award and commencing the services covered by this Procurement, the recommended Bidder(s) make available to the WRDSB a copy of certificates of good standing with the Workplace Safety and Insurance Board ("WSIB Certificates") listing appropriate NAICS Code and Code Description stating that the Supplier/consultant and all of its subcontractors/consultants have complied with the requirements of the Workplace Safety and Insurance Act and in particular, that all requisite premiums under such Act have been paid. Where the Bidder is exempt from registration with the WSIB, the Bidder must provide evidence of such by way of written confirmation from WSIB.

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

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 28 day of August in the year 2026. .2 (if applicable) <i>Occupancy</i> by the 4 day of September in the year 2026, and .3 <i>Ready-for-Takeover</i> by the 4 day of September in the year 2026.”
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
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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>.”
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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:
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		.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
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		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>."
SC6.2		

DEFINITIONS

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

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

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

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

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

GENERAL CONDITIONS OF THE STIPULATED PRICE CONTRACT

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

PART 1 GENERAL PROVISIONS

GC 1.1 CONTRACT DOCUMENTS

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

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

GC 1.3 RIGHTS AND REMEDIES

SC6.1	1.3.2	In paragraph 1.3.2 <u>delete</u> the word "No" from the beginning of the paragraph and <u>replace</u> it with the words: "Except with respect to the requirements set out in paragraphs 6.4.1, 6.5.4, 6.6.1 and 8.3.2, no..."
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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>.
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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>
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		<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> ”.
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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
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		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."
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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>."
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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> .
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		3.9.3 The <i>Owner</i> shall have the right to enter or occupy the <i>Place of the Work</i> in whole or in part for the purpose of placing fittings and equipment, or for other use before <i>Substantial Performance of the Work</i>, if, in the opinion of the <i>Consultant</i>, such entry and occupation does not prevent or substantially interfere with the <i>Contractor</i> in the performance of the <i>Contract</i> within the <i>Contract Time</i>. Such entry or occupation shall neither be considered as acceptance of the <i>Work</i> or in any way relieves the <i>Contractor</i> from its responsibility to complete the <i>Contract</i>."
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***NEW* GC 3.10 CUTTING AND REMEDIAL WORK**

SC23.1	GC 3.10	Add new GC 3.10 – CUTTING AND REMEDIAL WORK as follows: "GC 3.10 CUTTING AND REMEDIAL WORK 3.10.1 The <i>Contractor</i> shall perform the cutting and remedial work required to make the affected parts of the <i>Work</i> come together properly. Such cutting and remedial work shall be performed by specialists familiar with the <i>Products</i> affected and shall be performed in a manner to neither damage nor endanger the <i>Work</i>. 3.10.2 The <i>Contractor</i> shall coordinate the <i>Work</i> to ensure all cutting and remedial work required is kept to a minimum. 3.10.3 Unless specifically stated otherwise in the <i>Specifications</i>, the <i>Contractor</i> shall do all cutting and making good necessary for the proper installation and performance of the <i>Work</i>. 3.10.4 To avoid unnecessary cutting, the <i>Contractor</i> shall lay out its work and advise the <i>Subcontractors</i>, when necessary, where to leave holes for installation of pipes and other work."
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***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.
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		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."
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***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."
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***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>.”
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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>.
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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
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		.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,
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		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."
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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;
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		.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
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		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..
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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
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		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.
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		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>."
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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."
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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>
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		<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)."
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PART 6 CHANGES IN THE WORK

GC 6.1 OWNER'S RIGHT TO MAKE CHANGES

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

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

GC 6.2 CHANGE ORDER

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

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

GC 6.3 CHANGE DIRECTIVE

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

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

GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

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

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

GC 6.5 DELAYS

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

	6.5.4	<u>Delete</u> paragraph 6.5.4 in its entirety and <u>replace</u> it with the following: “6.5.4 No extension or compensation shall be made for delay or impact on the <i>Work</i> unless notice in writing of a claim is given to the <i>Consultant</i> not later than ten (10) <i>Working Days</i> after the commencement of the delays or impact on the <i>Work</i>, provided however, that, in the case of a continuing cause of delay or impact on the <i>Work</i>, only one notice of claim shall be necessary.”
	6.5.6 to 6.5.8	<u>Add</u> new paragraphs 6.5.6, 6.5.7 and 6.5.8 as follows: “6.5.6 If the <i>Contractor</i> is delayed in the performance of the <i>Work</i> by an act or omission of the <i>Contractor</i> or anyone directly or indirectly employed or engaged by the <i>Contractor</i>, or by any cause within the <i>Contractor’s</i> control, then (i) firstly, at its expense, and to the extent possible, the <i>Contractor</i> shall accelerate the work and/or provide overtime work to recover time lost by a delay arising under this paragraph 6.5.6, and (ii) secondly, where it is not possible for the <i>Contractor</i> to recover the time lost by implementing acceleration measures and/or overtime work, the <i>Contract Time</i> may be extended for such reasonable time as the <i>Owner</i> may decide in consultation with the <i>Consultant</i> and the <i>Contractor</i>. The <i>Owner</i> shall be reimbursed by the <i>Contractor</i> for all reasonable costs incurred by the <i>Owner</i> as the result of such delay, including, but not limited to, <i>Owner’s</i> staff costs, the cost of all additional services required by the <i>Owner</i> from the <i>Consultant</i> or any sub-consultants, project managers, or others employed or engaged by the <i>Owner</i>, and in particular, the costs of the <i>Consultant’s</i> services during the period between the date of <i>Substantial Performance of the Work</i> stated in Article A-1 herein, as the same may be extended through the provision of these General Conditions, and any later or actual date of <i>Substantial Performance of the Work</i> achieved by the <i>Contractor</i>. 6.5.7 Without limiting the obligations of the <i>Contractor</i> described in GC 3.2 – CONSTRUCTION BY OWNER OR OTHER CONTRACTORS or GC 9.4 – CONSTRUCTION SAFETY, the <i>Owner</i> or <i>Consultant</i> may, by <i>Notice in Writing</i>, direct the <i>Contractor</i> to stop the <i>Work</i> where the <i>Owner</i> or <i>Consultant</i> determines that there is an imminent risk to the safety of persons or property at the <i>Place of the Work</i>. In the event that the <i>Contractor</i> receives such notice, it shall immediately stop the <i>Work</i> and secure the site. The <i>Contractor</i> shall not be entitled to an extension of the <i>Contract Time</i> or to an increase in the <i>Contract Price</i> unless the resulting delay, if any, would entitle the <i>Contractor</i> to an extension of the <i>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>."
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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>."
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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."
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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>:
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		.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
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		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>."
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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."."
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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:
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		"...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."
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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
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		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.
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		(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.
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		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>."
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***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.
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		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."
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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."
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GC 12.3 WARRANTY

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

		normal business hours of the <i>Contractor</i> , the <i>Owner</i> is authorized, notwithstanding GC 3.1, to carry out all necessary repairs or replacements at the <i>Contractor's</i> expense."
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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."
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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
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		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>."
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APPENDIX 1
to the Supplementary Conditions

Project-specific requirements for a "Proper Invoice"

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

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

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

END OF AMENDMENTS TO CCDC 2 - 2020

DIVISION 01 - GENERAL REQUIREMENTS

01 14 00 – Work Restrictions

1.0 GENERAL

1.1. SECTION INCLUDES

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

1.2. RELATED SECTIONS

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

1.3. EXISTING SERVICES

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

1.2. AFTER HOURS WORK

- .1 Schedule Work with school staff through the Board's contact so as to limit disruption to school operations. Include for any overtime, to ensure orderly and continuous progression of Work and operation of school.
- .2 Direct calls from Contractors to Board staff to adjust alarms and to arrange for access will not be accepted. All correspondence must be through the Project Manager.
- .3 Arrange 48 hours in advance with the Board to obtain an access card and adjust security alarms for after hours Work.
- .4 Bidders are cautioned that the Board will be compensated by the Contractor for false alarms. Any costs associated with each false alarm will be levied against the

Contractor for false fire alarm activation or security alarm activation. These costs may include, but are not limited to:

- .1 Fines or penalties imposed by the local Fire Services,
- .2 Fines or penalties imposed by the local Police Services,
- .3 Overtime costs borne by the Board.
- .5 Contractors are responsible for ensuring doors and windows are secured prior to leaving school.
- .6 Unless specifically stated otherwise school activities take precedence over Contractor's activities.

1.3. SPECIAL REQUIREMENTS

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

END OF SECTION

01 19 00 – Specifications and Documents

1.0 GENERAL

1.1. RELATED DOCUMENTS

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

1.2. WORDS AND TERMS

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

1.3. COMPLEMENTARY DOCUMENTS

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

1.4. PRECEDENCE OF DOCUMENTS

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

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

1.5. SPECIFICATION GRAMMAR

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

END OF SECTION

01 21 00 – Allowances

1.0 GENERAL

1.1. RELATED SECTIONS

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

1.2. GENERAL

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

1.3. CASH ALLOWANCES

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

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

1.4. ALLOWANCES SCHEDULE

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

1	Designated Substance Removal. (Additional removal not already identified in the ACM Summary report)	\$7,000.00
2	Independent Testing & Inspection	\$4,000.00
3	FF&E	\$60,000.00
4	Blinds	\$8,000.00
5	Door Hardware	\$20,000.00
6	Sound System	\$25,000.00
Total of All Allowances:		\$ 124, 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

Avoid hot work or seek an alternative method if possible.

A SEPARATE PERMIT IS REQUIRED FOR EACH AREA

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

Section A Indicate Precautions Taken

Section B Authorization Granted

(Maximum 7 days or until end of hot work whichever is sooner)

Section C	Contractor and Location Affected
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In Case of Emergency call: 911 - Then call: 519-570-0003 Ext. 4123

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

01 35 23 – Health And Safety

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 31 00 - Project Managing and Coordination.
- .2 Section 01 33 00 - Submittal Procedures.
- .3 Section 01 35 17 – Fire Safety Requirements
- .4 Section 01 35 43 –**Designated Substances**
- .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 **Designated Substances**

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 –Designated Substances

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 WRDSB retained consultants, 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 A Project Specific Designated Substance / Lead Report, as prepared by WRDSB retained consultants or Environmental Officer for this facility, is attached under Appendix 013543 B.
- .3 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.
- .4 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 working in buildings owned or operated by the Waterloo Region District School Board (hereinafter referred to as the Board). This protocol applies to Type 1, Type 2 and Type 3 Operations as identified in the most current

form of Ontario Regulation 278 as amended, and applies to both emergency and non-emergency work, whether directly retained by the Board or working as a subcontractor to a General Contractor retained by the Board.

- .2 Asbestos Abatement Contractors must maintain appropriate insurance coverage and WSIB certification and provide proof upon request.
- .3 Asbestos Abatement Contractors shall only use personnel certified by the Ontario College of Trades and must provide the Board with proof of asbestos certification (AAS and AAW) for all supervisors and all staff involved.
- .4 School Access: During regular school hours, all abatement contractors are to report to the school office upon arrival. They must sign in all personnel and identify to a person of authority, preferably the Principal, their purpose for being there as well as the area of work. After school hours, ensure card-in/card-out procedures are followed and building security is maintained. Contractor staff shall NOT prop doors open, and ensure that doors are locked.
- .5 Communication:
 - .1 Asbestos Abatement Contractor will contact the school's Principal and/or Vice Principal (phone numbers are available on the WRDSB website) to set up a firm date and time for the abatement (removal/repair). This communication shall allow at least 72 hours notice ahead of the proposed work unless it is emergency work.
 - .2 Confirmation of the date shall be via email to the following:
 - .1 Principal / Vice-principal
 - .2 Facility Manager
 - .3 Environmental Officers (environmental@wrdsb.ca)
 - .3 When working under a general contractor, also notify:
 - .1 Project manager for the General Contractor
 - .2 Architect/Consultant for the project
 - .3 The Board's Project Coordinator
 - .4 This communication shall indicate the date, the start time, the anticipated completion time (including any required air clearances and teardowns), the asbestos abatement type, and the areas of work within the school or building. It should also identify any mechanical equipment that is required to be disabled for the duration of the operations.
 - .5 For emergency work where requested by Area Supervisors, Facility Managers, On-Call Manager/Supervisor, or Environmental Officers, no notification to the school is required by the abatement contractor. Notification to the Principal

- or Vice-Principal will be managed by the Area Supervisor, Facility Manager, On-Call Manager/Supervisor, or Environmental Officers.
- .6 For **Type 2 Removals**, also notify: the Ministry of Labour, Immigration, Training and Skills Development (MLITSD) where required by Regulation.
 - .7 For Type 3 Removals, also notify: Manager of Health, Safety & Security, (healthandsafety@wrdsb.ca); and, the MLITSD where required by Regulation.
 - .8 Discussions related to the work, whether with media, school staff, or any others, is NOT permitted. Questions or enquiries shall be directed to the Board's Communication Officer (comms-team@wrdsb.ca) by the person(s) seeking information, where warranted.
- .6 Asbestos Removal Assessment
- .1 When working directly with the Board to undertake non-emergency abatement, the contractor is to assess the work on site and provide a cost estimate to the Environmental Officer. Some work will require discussion with the Facility Manager or Environmental Officer to determine if additional work should be done to completely remove all additional ACM material from the area or similar.
 - .2 When abatement is to be done under a General Contractor, the proposed work is to be quoted directly to the General Contractor. Additional abatement not already within the original scope of work or tender is to be quoted to the General Contractor for approval by the Project Coordinator or Architect.
- .7 Asbestos Operations
- .1 Asbestos operations shall be conducted according to Type, where each Type will require special timing and considerations as follows:
 - .2 **Type 1:** Any time behind a secured door or enclosure.
 - .3 **Type 2:** Any time when students and teaching staff are NOT present in the building, and behind a secured door or enclosure. During the school year, the work shall be performed outside of the regular program hours, Monday to Friday, anytime on weekends, when no regular programs are scheduled.
 - .4 The work shall be performed anytime during March Break, Winter Break, and Summer Break, when teaching staff are NOT present in the building.
 - .5 **Type 3:** Outside of school regular program hours, during unoccupied times, and behind a secured door or enclosure. During the school year, the work shall be performed outside of the regular program hours, Monday or Friday, anytime on weekends, provided all rentals are cancelled and card access is restricted for teaching staff entering the facility.

- .6 The work shall be performed anytime during March Break, Winter Break, and Summer Break, provided all rentals are cancelled and card access is restricted for teaching staff entering the facility
- .7 Facility Services personnel and Office staff may be present in the building due to training in Asbestos Awareness.
- .8 All Type 3 work must consider one (1) additional day in case the clearance sampling fail.
- .9 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 the potential for health and safety concerns by the staff, students, and school community. Where warranted, contact Area Supervisor, Facility Manager, On-Call Manager/Supervisor, or Environmental Officer to obtain further direction.
- .10 Before beginning any Type 1, Type 2, or Type 3 Operations, the work area must be secured, all doors locked, WHITE poly and caution tape used in open areas/corridors and "construction" warning signs added to all access points to keep school staff and students clear of all work areas.
- .11 If the work area is in use by Board staff, contact the Area Supervisor to assist in vacating the area. If unable, contact the Area Supervisor, Facility Manager, On-Call Manager/Supervisor, Environmental Officer, or Project Coordinator to reschedule the work.
- .12 Board preference is to use "construction" warning signs at all areas accessible to school staff and students. Behind those secured areas, a sufficient number of "asbestos" signs, posted in compliance with O. Reg. 278/05.
- .13 The Asbestos Abatement Contractor is responsible to disable the air handling unit/fan serving the work area (school wing, floor, or multiple floors if air handling unit/fan serve more than one floor) and prevent operation using Lock-out/Tag-out devices for each air handling unit/fan. Exercise caution during the heating season to ensure areas of the building are maintained above freezing and ensure equipment is turned back on after abatement/air clearance completed.
- .14 Asbestos Abatement Contractor's employees shall put on/take off PPE within the work area marked by construction signs. No employee shall leave the work area wearing PPE.
- .15 All dust and waste is to be cleaned up and removed at frequent/regular intervals as the work proceeds and immediately upon completion, but no later than the end of the work day. No waste bags or similar are to be left behind. No additional construction work shall be performed by an Asbestos Abatement Contractor.

1.5. SUBMITTALS

- .1 Once the abatement is completed, forward a Letter of Completion to the Environmental Officers (environmental@wrdsb.ca). This letter shall be received no

later than 72 hours after completion of each abatement area/phase and shall include any sample results. The letter must also clearly identify what specifically has been abated and where (Fixed Reference Numbers), so that this information can be attached to the current AAU Asbestos Audits for future updates.

- .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 (1) additional day to re-clean and re-sample before school is to resume operations. For those projects not under the direct supervision of an 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 (contact info sent with Work Request)
 - .2 Facility Manager (contact info sent with Work Request)
 - .3 Environmental Officers (environmental@wrdsb.ca)
 - .4 Manager of Mechanical, Electrical and Environmental Services (lou_lima@wrdsb.ca)
 - .5 Manager of Health, Safety & Security (healthandsafety@wrdsb.ca)
 - .6 Project team when working under a General Contractor

1.6. ACKNOWLEDGEMENT

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

END OF SECTION

Appendix 01 35 43A Asbestos Audit Report



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

Chalmers Public School

2023 Asbestos Audit Update Report

Project Location:

35 Chalmers Street South, Cambridge, ON

Prepared for:

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

Prepared by:

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

January 13, 2023

MTE File No.: C34532-941

For Tender Purposes



January 13, 2023

MTE File No.: C34532-941

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

RE: 2023 Asbestos Audit Update – Chalmers Street Public School
35 Chalmers Street South, Cambridge, Ontario

1.0 Introduction

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

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

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

2.0 Scope of Work

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

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

3.0 Methodology and Assessment Criteria

This inspection was conducted by visual and laboratory identification methods for the assessment of ACM and their corresponding location, use, condition, and friability. The areas outlined in Section 2.0 were inspected limited to building components, materials and service connections. Notwithstanding that reasonable attempts were made to identify all ACMs, the possibility of concealed material exists and may not become visible until substantial demolition has occurred and therefore are currently undocumented and did not include the following.

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

3.1 Condition of ACM

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

Monitor Annually

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

Abatement Action Required

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

4.0 Findings

An inspection of the building was conducted by MTE on January 6, 2023. The single-storey school was constructed in 1960 with additions in 1963, 1984, and 1999. The inspection did not include areas of post 1990 construction or renovation (where all building finishes have been removed and replaced), as applicable.

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

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

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

4.1 Analytical Results

During this inspection, no samples were collected.

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

4.2 Removed ACM

No ACM has been removed since the previous audit.

4.3 Discovery of Additional ACM

No additional ACM or suspect ACM was identified.

4.4 Damaged ACM

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

5.0 Recommendations

5.1 Remedial

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

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

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

5.2 Long Term Management

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

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

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

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

6.0 Limitations

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

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

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

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

All of which is respectfully submitted,

MTE Consultants Inc.



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Attach.

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Appendix A

Asbestos Management Database

For Tender Purposes

		School Name		Legend:				Notes:		
		Chalmers Street 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: 1960								
Addition(s): 1963, 1984, 1999										
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	Steel	-	Non ACM	-	-	-	-
	Original Building	Structure	Concrete	Concrete	-	Non ACM	-	-	-	-
	Original Building	Façade	Brick Veneer	Brick and Mortar	-	Non ACM	-	-	-	-
	Original Building	Windows	Interior Frames	Grey Sealant	NF	ACM	SL	S06abc	18-Mar-19	5% Chrysotile
	Original Building	Windows	Exterior Frames	Grey Silicon Sealant	-	Non ACM	-	-	-	-
	Original Building	Doors	Interior Frames	Yellow Sealant	NF	ACM	HM	S07	18-Mar-19	1% Chrysotile
	Original Building	Doors	Exterior Frames	Yellow Sealant	NF	ACM	SL	S07abc	18-Mar-19	1% Chrysotile
	Original Building	Mastic	Mastic	Floor Tile Mastic	-	Non ACM	SL	S02abc	18-Mar-19	ND
	Original Building	Exterior	Overhang	Transite Board	NF	Suspect ACM	VC	-	-	-
	Original Building	Exterior	Roofing	Paper/Felts/Mastics/Sealants (2016 Replacement)	-	Non ACM	-	-	-	-
	1963 Addition	Structure	Deck	Steel	-	Non ACM	-	-	-	-
	1963 Addition	Structure	Concrete	Concrete	-	Non ACM	-	-	-	-
	1963 Addition	Façade	Brick Veneer	Brick and Mortar	-	Non ACM	-	-	-	-
	1963 Addition	Windows	Interior Frames	Grey Sealant	NF	ACM	HM	S06	18-Mar-19	5% Chrysotile
	1963 Addition	Windows	Exterior Frames	Grey Silicon Sealant	-	Non ACM	-	-	-	-
	1963 Addition	Doors	Interior Frames	Yellow Sealant	NF	ACM	HM	S07	18-Mar-19	1% Chrysotile
	1963 Addition	Doors	Exterior Frames	Yellow Sealant	NF	ACM	HM	S07	18-Mar-19	1% Chrysotile
	1963 Addition	Mastic	Mastic	Floor Tile Mastic	-	Non ACM	SL	S03abc	18-Mar-19	ND
	1963 Addition	Exterior	Roofing	Paper/Felts/Mastics/Sealants (2016 Replacement)	-	Non ACM	-	-	-	-
	1984 Addition	Structure	Deck	Steel	-	Non ACM	-	-	-	-
	1984 Addition	Structure	Concrete	Concrete	-	Non ACM	-	-	-	-
	1984 Addition	Façade	Brick Veneer	Brick and Mortar	-	Non ACM	-	-	-	-
	1984 Addition	Windows	Interior Frames	Yellow Sealant	NF	ACM	SL	S09abc	18-Mar-19	0.5% Chrysotile
	1984 Addition	Windows	Exterior Frames	Yellow Sealant	NF	ACM	HM	S09	18-Mar-19	0.5% Chrysotile
	1984 Addition	Doors	Interior Frames	Yellow Sealant	-	Non ACM	SL	S05abc	18-Mar-19	ND
	1984 Addition	Doors	Exterior Frames	Brown Silicon Sealant	-	Non ACM	-	-	-	-
	1984 Addition	Doors	Exterior Frames	Grey Silicon Sealant	-	Non ACM	-	-	-	-
	1984 Addition	Mastic	Mastic	Floor Tile Mastic	-	Non ACM	SL	S04abc	18-Mar-19	ND
	1984 Addition	Exterior	Overhang	Texture Finish	-	Non ACM	SL	S11abc	7-Nov-08	ND
	1984 Addition	Exterior	Roofing	Paper/Felts/Mastics/Sealants (2016 Replacement)	-	Non ACM	-	-	-	-
Level 1										
101	Library	Floor	Carpet	-	-	Non ACM	-	-	-	-
101	Library	Floor	Vinyl Floor Tile 12"x 12"	Brown & Grey/White Dense Fleck	-	Non ACM	HM	S03abc	7-Nov-08	ND
101	Library	Wall	Concrete	-	-	Non ACM	-	-	-	-
101	Library	Wall	Drywall	-	-	Non ACM	HM	S05abc	7-Nov-08	ND
101	Library	Ceiling	Drywall	-	-	Non ACM	HM	S05abc	7-Nov-08	ND
101	Library	Ceiling	Ceiling Tile 2' x 2'	Star Fissure Random Pinhole	-	Non ACM	HM	S02abc	7-Nov-08	ND
101	Library	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND
102	Storage	Floor	Vinyl Floor Tile 12"x 12"	White with Grey Flecks	-	Non ACM	HM	S04abc	7-Nov-08	ND
102	Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-

		School Name		Legend:				Notes:		
		Chalmers Street 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: 1960								
Addition(s): 1963, 1984, 1999										
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
102	Storage	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND
102A	Storage	Floor	Concrete	-	-	Non ACM	-	-	-	-
102A	Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
102A	Storage	Deck	Concrete	-	-	Non ACM	-	-	-	-
102A	Storage	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.162.004	30-Nov-90	50-75% Chrysotile
102A	Storage	Ducting	Uninsulated	Uninsulated	-	Non ACM	-	-	-	-
103	Library Office	Floor	Vinyl Floor Tile 12"x 12"	Brown & Grey/White Dense Fleck	-	Non ACM	HM	S03abc	7-Nov-08	ND
103	Library Office	Wall	Concrete	-	-	Non ACM	-	-	-	-
103	Library Office	Ceiling	Ceiling Tile 2' x 2'	Star Fissure Random Pinhole	-	Non ACM	HM	S02abc	7-Nov-08	ND
104	Work Room	Floor	Vinyl Floor Tile 12"x 12"	Brown & Grey/White Dense Fleck	-	Non ACM	HM	S03abc	7-Nov-08	ND
104	Work Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
104	Work Room	Wall	Drywall	-	-	Non ACM	HM	S05abc	7-Nov-08	ND
104	Work Room	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole 2006	-	Non ACM	-	-	-	-
104	Work Room	Ceiling	Ceiling Tile 2' x 2'	Star Fissure Random Pinhole	-	Non ACM	HM	S02abc	7-Nov-08	ND
105	Work Room	Floor	Vinyl Floor Tile 12"x 12"	Brown & Grey/White Dense Fleck	-	Non ACM	HM	S03abc	7-Nov-08	ND
105	Work Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
105	Work Room	Wall	Drywall	-	-	Non ACM	HM	S05abc	7-Nov-08	ND
105	Work Room	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole 2006	-	Non ACM	-	-	-	-
105	Work Room	Ceiling	Ceiling Tile 2' x 2'	Star Fissure Random Pinhole	-	Non ACM	HM	S02abc	7-Nov-08	ND
106	Library	Floor	Carpet	-	-	Non ACM	-	-	-	-
106	Library	Floor	Vinyl Floor Tile 12"x 12"	Brown & Grey/White Dense Fleck	-	Non ACM	HM	S03abc	7-Nov-08	ND
106	Library	Wall	Concrete	-	-	Non ACM	-	-	-	-
106	Library	Wall	Drywall	-	-	Non ACM	HM	S05abc	7-Nov-08	ND
106	Library	Ceiling	Drywall	-	-	Non ACM	HM	S05abc	7-Nov-08	ND
106	Library	Ceiling	Ceiling Tile 2' x 2'	Star Fissure Random Pinhole	-	Non ACM	HM	S02abc	7-Nov-08	ND
106	Library	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND
107	Seminar	Floor	Vinyl Floor Tile 12"x 12"	Brown & Grey/White Dense Fleck	-	Non ACM	HM	S03abc	7-Nov-08	ND
107	Seminar	Wall	Concrete	-	-	Non ACM	-	-	-	-
107	Seminar	Wall	Drywall	-	-	Non ACM	HM	S05abc	7-Nov-08	ND
107	Seminar	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND
109	Boiler Room	Floor	Concrete	-	-	Non ACM	-	-	-	-
109	Boiler Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
109	Boiler Room	Deck	Concrete	-	-	Non ACM	-	-	-	-
109	Boiler Room	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.162.004	30-Nov-90	50-75% Chrysotile
109	Boiler Room	Piping	Pipe Insulation	Magblock	F	ACM	SL	1680.162.001	30-Nov-90	50-75% Chrysotile, 10-25% Amosite
109	Boiler Room	Ducting	Duct Expansion Joints	Duct Expansion Joints	NF	ACM	VC	-	-	-
112	Washroom	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
112	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
112	Washroom	Ceiling	Wood	-	-	Non ACM	-	-	-	-
112	Washroom	Ceiling	Ceiling Tile 2' x 4'	Medium Fissure Random Pinhole (2016)	-	Non ACM	-	-	-	-
113	Washroom	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
113	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
113	Washroom	Wall	Wood	-	-	Non ACM	-	-	-	-
113	Washroom	Ceiling	Ceiling Tile 2' x 4'	Medium Fissure Random Pinhole (2016)	-	Non ACM	-	-	-	-
115	Health Room	Floor	Terrazzo	-	-	Non ACM	-	-	-	-

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WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
115	Health Room	Wall	Drywall	Drywall Joint Compound (Post 2015)	-	Non ACM	-	-	-	-
115	Health Room	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (2018)	-	Non ACM	-	-	-	-
116	Washroom	Floor	Vinyl Floor Tile 12"x 12"	Brown & Grey/White Dense Fleck	-	Non ACM	HM	S03abc	7-Nov-08	ND
116	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
116	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
116	Washroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S05abc	7-Nov-08	ND
116	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole 2006	-	Non ACM	-	-	-	-
116A	Custodial	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
116A	Custodial	Wall	Concrete	-	-	Non ACM	-	-	-	-
116A	Custodial	Deck	Steel	-	-	Non ACM	-	-	-	-
116A	Custodial	Piping	Pipe Fitting	Fiberglass/PVC	-	Non ACM	-	-	-	-
117	Staff Room	Floor	Vinyl Floor Tile 12"x 12"	Brown & Grey/White Dense Fleck	-	Non ACM	HM	S03abc	7-Nov-08	ND
117	Staff Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
117	Staff Room	Wall	Drywall	No Drywall Joint Compound	-	Non ACM	-	-	-	-
117	Staff Room	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND
117	Staff Room	Ceiling	Ceiling Tile 2' x 4'	Medium Fissure Random Pinhole (2016)	-	Non ACM	-	-	-	-
117A	Kitchen	Floor	Vinyl Floor Tile 12"x 12"	Brown & Grey/White Dense Fleck	-	Non ACM	HM	S03abc	7-Nov-08	ND
117A	Kitchen	Wall	Concrete	-	-	Non ACM	-	-	-	-
117A	Kitchen	Wall	Drywall	No Drywall Joint Compound	-	Non ACM	-	-	-	-
117A	Kitchen	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND
117A	Kitchen	Ceiling	Ceiling Tile 2' x 4'	Medium Fissure Random Pinhole (2016)	-	Non ACM	-	-	-	-
118	Main Office	Floor	Carpet	-	-	Non ACM	-	-	-	-
118	Main Office	Floor	Wood Laminate	-	-	Non ACM	-	-	-	-
118	Main Office	Wall	Drywall	Drywall Joint Compound (Post 2015)	-	Non ACM	-	-	-	-
118	Main Office	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (2018)	-	Non ACM	-	-	-	-
120	Office	Floor	Wood Laminate	-	-	Non ACM	-	-	-	-
120	Office	Wall	Drywall	Drywall Joint Compound (Post 2015)	-	Non ACM	-	-	-	-
120	Office	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (2018)	-	Non ACM	-	-	-	-
120C	Washroom	Floor	Vinyl Floor Tile 12"x12"	Beige Dense Fleck	-	Non ACM	-	-	-	-
120C	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
120C	Washroom	Ceiling	Wood	-	-	Non ACM	-	-	-	-
120C	Washroom	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.162.004	30-Nov-90	50-75% Chrysotile
121	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Grey/Brown Dense Fleck	-	Non ACM	SL	S06abc	7-Nov-08	ND
121	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
121	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND
121	Classroom	Ceiling	Ceiling Tile 1' x 1'	Cellulose	-	Non ACM	-	-	-	-
121	Classroom	Ceiling	Wood	-	-	Non ACM	-	-	-	-
122	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Brown & Grey/White Dense Fleck	-	Non ACM	HM	S03abc	7-Nov-08	ND
122	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
122	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	SL	S01AB	18-Mar-19	ND
122	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND
122	Classroom	Ceiling	Ceiling Tile 1' x 1'	Cellulose	-	Non ACM	-	-	-	-
122	Classroom	Ceiling	Wood	-	-	Non ACM	-	-	-	-
123	Classroom	Floor	Vinyl Sheet Flooring	Faux Wood (Post 2015)	-	Non ACM	-	-	-	-
123	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-

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WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
123	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND
123	Classroom	Ceiling	Ceiling Tile 1' x 1'	Cellulose	-	Non ACM	-	-	-	-
123	Classroom	Deck	Wood	-	-	Non ACM	-	-	-	-
123A	Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
123A	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
123A	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
123A	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (2018)	-	Non ACM	-	-	-	-
124	Office	Floor	Wood Laminate	-	-	Non ACM	-	-	-	-
124	Office	Wall	Drywall	Drywall Joint Compound (Post 2015)	-	Non ACM	-	-	-	-
124	Office	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (2018)	-	Non ACM	-	-	-	-
125	Classroom	Floor	Vinyl Sheet Flooring	Faux Wood (Post 2015)	-	Non ACM	-	-	-	-
125	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
125	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	SL	S01CDE	18-Mar-19	ND
125	Classroom	Wall	Wood	-	-	Non ACM	-	-	-	-
125	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	34532-910-S01ABC	6-Feb-17	ND
125	Classroom	Ceiling	Ceiling Tile 1' x 1'	Cellulose	-	Non ACM	-	-	-	-
125	Classroom	Ceiling	Wood	-	-	Non ACM	-	-	-	-
125A	Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
125A	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
125A	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
125A	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (2018)	-	Non ACM	-	-	-	-
126	Classroom	Floor	Vinyl Sheet Flooring	Faux Wood (Post 2015)	-	Non ACM	-	-	-	-
126	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
126	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	SL	S01CDE	18-Mar-19	ND
126	Classroom	Wall	Wood	-	-	Non ACM	-	-	-	-
126	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	34532-910-S01ABC	6-Feb-17	ND
126	Classroom	Ceiling	Ceiling Tile 1' x 1'	Cellulose	-	Non ACM	-	-	-	-
126	Classroom	Ceiling	Wood	-	-	Non ACM	-	-	-	-
126A	Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
126A	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
126A	Washroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01	18-Mar-19	ND
126A	Washroom	Ceiling	Ceiling Tile 2' x 4'	Medium Fissure Random Pinhole (2016)	-	Non ACM	-	-	-	-
127	Classroom	Floor	Vinyl Sheet Flooring	Faux Wood (Post 2015)	-	Non ACM	-	-	-	-
127	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
127	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	SL	S01CDE	18-Mar-19	ND
127	Classroom	Wall	Wood	-	-	Non ACM	-	-	-	-
127	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	34532-910-S01ABC	6-Feb-17	ND
127	Classroom	Ceiling	Ceiling Tile 1' x 1'	Cellulose	-	Non ACM	-	-	-	-
127	Classroom	Ceiling	Wood	-	-	Non ACM	-	-	-	-
127A										
127A	Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
127A	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
127A	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
127A	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (2018)	-	Non ACM	-	-	-	-
128	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Grey/Brown Dense Fleck	-	Non ACM	HM	S06abc	7-Nov-08	ND

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WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type		
128	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-		
128	Classroom	Wall	Wood	-	-	Non ACM	-	-	-	-		
128	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND		
128	Classroom	Ceiling	Ceiling Tile 1' x 1'	Cellulose	-	Non ACM	-	-	-	-		
128	Classroom	Ceiling	Wood	-	-	Non ACM	-	-	-	-		
132	Seminar	Floor	Vinyl Floor Tile 12"x 12"	Grey/Brown Dense Fleck	-	Non ACM	HM	S06abc	7-Nov-08	ND		
132	Seminar	Wall	Concrete Block	-	-	Non ACM	-	-	-	-		
132	Seminar	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND		
133	Tuck Shop	Floor	Vinyl Floor Tile 12"x 12"	White with Grey Flecks	-	Non ACM	HM	S04abc	7-Nov-08	ND		
133	Tuck Shop	Wall	Concrete	-	-	Non ACM	-	-	-	-		
133	Tuck Shop	Ceiling	Ceiling Tile 2' x 4'	Star Fissure Random Pinhole	-	Non ACM	HM	S02abc	7-Nov-08	ND		
133	Tuck Shop	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND		
135	Changeroom	Floor	Vinyl Sheet Flooring	White with Grey Flecks	-	Non ACM	HM	S04abc	7-Nov-08	ND		
135	Changeroom	Wall	Concrete	-	-	Non ACM	-	-	-	-		
135	Changeroom	Ceiling	Ceiling Tile 2' x 4'	Star Fissure Random Pinhole	-	Non ACM	HM	S02abc	7-Nov-08	ND		
135	Changeroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND		
136	Changeroom	Floor	Vinyl Floor Tile 12"x 12"	White with Grey Flecks	-	Non ACM	HM	S04abc	7-Nov-08	ND		
136	Changeroom	Wall	Concrete	-	-	Non ACM	-	-	-	-		
136	Changeroom	Ceiling	Ceiling Tile 2' x 4'	Star Fissure Random Pinhole	-	Non ACM	HM	S02abc	7-Nov-08	ND		
136	Changeroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND		
139	Instructors Office	Floor	Vinyl Sheet Flooring	White with Grey Flecks	-	Non ACM	HM	S04abc	7-Nov-08	ND		
139	Instructors Office	Wall	Concrete	-	-	Non ACM	-	-	-	-		
139	Instructors Office	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND		
140	Washroom	Floor	Vinyl Floor Tile 12"x 12"	White with Grey Flecks	-	Non ACM	HM	S04abc	7-Nov-08	ND		
140	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-		
140	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND		
140	Washroom	Above Ceiling	Open Web Steel Joist	-	-	Non ACM	-	-	-	-		
141	Washroom	Floor	Vinyl Floor Tile 12"x 12"	White with Grey Flecks	-	Non ACM	HM	S04abc	7-Nov-08	ND		
141	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-		
141	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND		
141	Washroom	Above Ceiling	Open Web Steel Joist	-	-	Non ACM	-	-	-	-		
142	Instructors Washroom	Floor	Vinyl Floor Tile 12"x 12"	White with Grey Flecks	-	Non ACM	HM	S04abc	7-Nov-08	ND		
142	Instructors Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-		
142	Instructors Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-		
142	Instructors Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND		
143	Instructors Office	Floor	Vinyl Floor Tile 12"x 12"	White with Grey Flecks	-	Non ACM	HM	S04abc	7-Nov-08	ND		
143	Instructors Office	Wall	Concrete	-	-	Non ACM	-	-	-	-		
143	Instructors Office	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND		
144	Instructors Washroom	Floor	Vinyl Floor Tile 12"x 12"	White with Grey Flecks	-	Non ACM	HM	S04abc	7-Nov-08	ND		
144	Instructors Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-		
144	Instructors Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-		
144	Instructors Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND		
145	Washroom	Floor	Vinyl Floor Tile 12"x 12"	White with Grey Flecks	-	Non ACM	HM	S04abc	7-Nov-08	ND		
145	Washroom	Wall	Drywall	No Drywall Joint Compound	-	Non ACM	-	-	-	-		
145	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND		

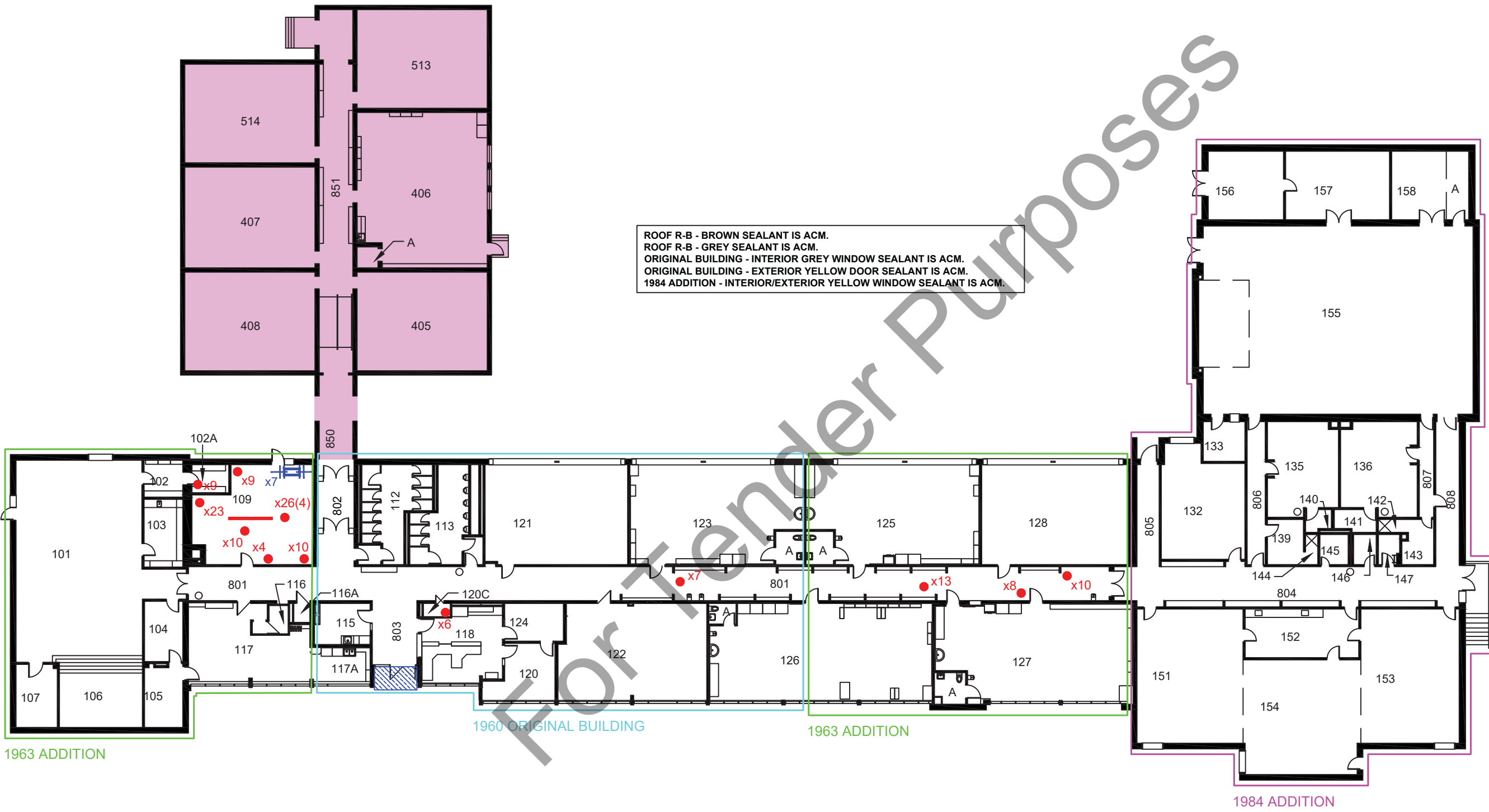
		School Name		Legend:				Notes:		
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		Date Built:						Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.		
		Original: 1960								
		Addition(s): 1963, 1984, 1999								
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
146	Washroom	Floor	Vinyl Sheet Flooring	Blue (Post 2015)	-	Non ACM	HM	S04abc	7-Nov-08	ND
146	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
146	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND
147	Custodial	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
147	Custodial	Wall	Concrete	-	-	Non ACM	-	-	-	-
147	Custodial	Deck	Steel	-	-	Non ACM	-	-	-	-
147	Custodial	Piping	Pipe Fitting	Fiberglass/PVC	-	Non ACM	-	-	-	-
151	Classroom	Floor	Vinyl Floor Tile 12"x 12"	White with Blue Fleck	-	Non ACM	SL	S08abc	7-Nov-08	ND
151	Classroom	Floor	Carpet	-	-	Non ACM	-	-	-	-
151	Classroom	Wall	Concrete Block	-	-	Non ACM	-	-	-	-
151	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND
152	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Grey/Brown Dense Fleck	-	Non ACM	HM	S06abc	7-Nov-08	ND
152	Classroom	Wall	Concrete Block	-	-	Non ACM	-	-	-	-
152	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND
153	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Grey/Brown Dense Fleck	-	Non ACM	HM	S06abc	7-Nov-08	ND
153	Classroom	Wall	Concrete Block	-	-	Non ACM	-	-	-	-
153	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND
154	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Grey/Brown Dense Fleck	-	Non ACM	HM	S08abc	-	-
154	Classroom	Floor	Carpet	-	-	Non ACM	-	-	-	-
154	Classroom	Wall	Concrete Block	-	-	Non ACM	-	-	-	-
154	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND
155	Gym	Floor	Vinyl Sheet Flooring	Faux Wood (Post 2015)	-	Non ACM	-	-	-	-
155	Gym	Wall	Concrete	-	-	Non ACM	-	-	-	-
155	Gym	Wall	Wood	-	-	Non ACM	-	-	-	-
155	Gym	Ceiling	Steel	-	-	Non ACM	-	-	-	-
156	Exterior Storage	Floor	Concrete	-	-	Non ACM	-	-	-	-
156	Exterior Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
156	Exterior Storage	Ceiling	Steel	-	-	Non ACM	-	-	-	-
157	Gym Storage	Floor	Vinyl Floor Tile 12"x 12"	White with Grey Flecks	-	Non ACM	HM	S04abc	7-Nov-08	ND
157	Gym Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
157	Gym Storage	Ceiling	Steel	-	-	Non ACM	-	-	-	-
158	Chair Storage	Floor	Vinyl Floor Tile 12"x 12"	White with Grey Flecks	-	Non ACM	HM	S04abc	7-Nov-08	ND
158	Chair Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
158	Chair Storage	Ceiling	Steel	-	-	Non ACM	-	-	-	-
158A	Chair Storage	Floor	Vinyl Floor Tile 12"x 12"	White with Grey Flecks	-	Non ACM	HM	S04abc	7-Nov-08	ND
158A	Chair Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
158A	Chair Storage	Ceiling	Steel	-	-	Non ACM	-	-	-	-
801	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
801	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
801	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	34532-910-S01ABC	6-Feb-17	ND
801	Corridor	Ceiling	Ceiling Tile 1'x1'	Medium and Large Pinhole White/Brown	-	Non ACM	SL	S12abc	13-Mar-12	ND
801	Corridor	Ceiling	Ceiling Tile 1'x1'	Brown Mastic	-	Non ACM	SL	S13abc	13-Mar-12	ND
801	Corridor	Ceiling	Ceiling Tile 1'x1'	Grey	-	Non ACM	SL	S01abc (2016)	9-Feb-16	ND
801	Corridor	Piping	Parging	At Wall intersections	-	Non ACM	SL	S10abc	7-Nov-08	ND
801	Corridor	Piping	Pipe Insulation	Parged Cement	F	ACM	SL	1680.162.004	30-Nov-90	50-75% Chrysotile

		School Name		Legend:				Notes:		
		Chalmers Street 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: 1960								
		Addition(s): 1963, 1984, 1999								
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
801	Corridor	Deck	Wood	-	-	Non ACM	-	-	-	-
802	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
802	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
802	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	34532-910-S01ABC	6-Feb-17	ND
803	Vestibule	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
803	Vestibule	Wall	Concrete	-	-	Non ACM	-	-	-	-
803	Vestibule	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
803	Vestibule	Wall	Brick	-	-	Non ACM	-	-	-	-
803	Vestibule	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (2018)	-	Non ACM	-	-	-	-
804	Corridor	Floor	Vinyl Sheet Flooring	Grey (Post 2000)	-	Non ACM	-	-	-	-
804	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
804	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (2006)	-	Non ACM	-	-	-	-
805	Corridor	Floor	Vinyl Sheet Flooring	Grey (Post 2000)	-	Non ACM	-	-	-	-
805	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
805	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (2006)	-	Non ACM	-	-	-	-
806	Corridor	Floor	Vinyl Sheet Flooring	White with Beige Fleck	-	Non ACM	HM	S06abc	7-Nov-08	ND
806	Corridor	Wall	Concrete Block	-	-	Non ACM	-	-	-	-
806	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	34532-910-S01ABC	6-Feb-17	ND
807	Corridor	Floor	Vinyl Sheet Flooring	Grey (Post 2000)	-	Non ACM	-	-	-	-
807	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
807	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (2006)	-	Non ACM	-	-	-	-
808	Corridor	Floor	Vinyl Sheet Flooring	Grey (Post 2000)	-	Non ACM	-	-	-	-
808	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
808	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (2006)	-	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:

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

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

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

- Legend**
- 13 Fixed Reference Number
 - No Access
 - Post 1990 Construction

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



Ph. (519) 743-6500 www.mte85.com

CLIENT

WATERLOO REGION DISTRICT SCHOOL BOARD

PROJECT

2019 ASBESTOS AUDIT UPDATE

DRAWING

CHALMERS STREET PUBLIC SCHOOL

LEVEL ONE

Project Manager	A. Dennett	Date	March 2019
Design By	WRDSB	Project No.	34532-917
Drawn By	P. Semeniuk	Drawing No.	1.0
Scale	N.T.S.		

Appendix C

Tables

For Tender Purposes

TABLE 3: BULK ASBESTOS SAMPLING SUMMARY					
Sample Number	Location	Material Description	Asbestos Content (%)	Fibre Type	Is Material ACM
2008 - Asbestos Audit Update					
S01A	1021	2'x2' Ceiling Tile - Short Fissure Random Pinhole	ND	-	No
S01B	1021	2'x2' Ceiling Tile - Short Fissure Random Pinhole	ND	-	No
S01C	1021	2'x2' Ceiling Tile - Short Fissure Random Pinhole	ND	-	No
S02A	1021	2'x2' Ceiling Tile - Star Fissure	ND	-	No
S02B	1021	2'x2' Ceiling Tile - Star Fissure	ND	-	No
S02C	1021	2'x2' Ceiling Tile - Star Fissure	ND	-	No
S03A	1001	12"x12" Floor Tile - Brown, Grey & White Dense Fleck	ND	-	No
S03B	1001	12"x12" Floor Tile - Brown, Grey & White Dense Fleck	ND	-	No
S03C	1001	12"x12" Floor Tile - Brown, Grey & White Dense Fleck	ND	-	No
S04A	1006	12"x12" Floor Tile - White & Grey Fleck	ND	-	No
S04B	1006	12"x12" Floor Tile - White & Grey Fleck	ND	-	No
S04C	1006	12"x12" Floor Tile - White & Grey Fleck	ND	-	No
S05A	1010	Drywall Joint Compound	ND	-	No
S05B	1010	Drywall Joint Compound	ND	-	No
S05C	1010	Drywall Joint Compound	ND	-	No
S05D	1024	Drywall Joint Compound	ND	-	No
S05E	1024	Drywall Joint Compound	ND	-	No
S06A	1016	12"x12" Floor Tile - Grey & Brown Dense Fleck	ND	-	No
S06B	1016	12"x12" Floor Tile - Grey & Brown Dense Fleck	ND	-	No
S06C	1016	12"x12" Floor Tile - Grey & Brown Dense Fleck	ND	-	No
S07A	1024	12"x12" Floor Tile - Grey & White Dense Fleck	ND	-	No
S07B	1024	12"x12" Floor Tile - Grey & White Dense Fleck	ND	-	No
S07C	1024	12"x12" Floor Tile - Grey & White Dense Fleck	ND	-	No
S08A	1030	12"x12" Floor Tile - White & Blue Fleck	ND	-	No
S08B	1030	12"x12" Floor Tile - White & Blue Fleck	ND	-	No
S08C	1030	12"x12" Floor Tile - White & Blue Fleck	ND	-	No
S09A	1035	12"x12" Floor Tile - Beige & White Dense Fleck	ND	-	No
S09B	1035	12"x12" Floor Tile - Beige & White Dense Fleck	ND	-	No
S09C	1035	12"x12" Floor Tile - Beige & White Dense Fleck	ND	-	No
S10A	1021	Wall Parging At Pipe/Upper Wall Intersection	ND	-	No
S10B	1021	Wall Parging At Pipe/Upper Wall Intersection	ND	-	No
S10C	1021	Wall Parging At Pipe/Upper Wall Intersection	ND	-	No
S11A	Main	Exterior Plaster Finish	ND	-	No
S11B	Main	Exterior Plaster Finish	ND	-	No
S11C	Main	Exterior Plaster Finish	ND	-	No
2012 - Asbestos Audit Update					
S12A	1021	1'x1' Acoustic Tile - Medium and Large Pinhole (White/Brown)	ND	-	No
S12B	1021	1'x1' Acoustic Tile - Medium and Large Pinhole (White/Brown)	ND	-	No
S12C	1021	1'x1' Acoustic Tile - Medium and Large Pinhole (White/Brown)	ND	-	No
S13A	1021	1'x1' Acoustic Tile - Brown Mastic	ND	-	No
S13B	1021	1'x1' Acoustic Tile - Brown Mastic	ND	-	No
S13C	1021	1'x1' Acoustic Tile - Brown Mastic	ND	-	No
S14A	Exterior	Window Caulking	4.4	Chrysotile	Yes
S14B	Exterior	Window Caulking	NA	Chrysotile	Yes
S14C	Exterior	Window Caulking	NA	Chrysotile	Yes
2016 - Asbestos Audit Update					
S01A	1021	1'x1' Acoustic Tile - Grey	ND	-	No
S01B	1021	1'x1' Acoustic Tile - Grey	ND	-	No
S01C	1021	1'x1' Acoustic Tile - Grey	ND	-	No
2016 – Roof Replacement Project					
S01A – Roof R-A	Roof	Sealant - Grey/White	ND	-	No
S01B – Roof R-A	Roof	Sealant - Grey/White	ND	-	No
S01C – Roof R-A	Roof	Sealant - Grey/White	ND	-	No
S02A – Roof R-A	Roof	Sealant - Black	ND	-	No
S02B – Roof R-A	Roof	Sealant - Black	ND	-	No
S02C – Roof R-A	Roof	Sealant - Black	ND	-	No
S03A – Roof R-A	Roof	Type 1 – Roof Membrane - Tar	ND	-	No
S03B – Roof R-A	Roof	Type 1 – Roof Membrane - Tar	ND	-	No
S03C – Roof R-A	Roof	Type 1 – Roof Membrane - Tar	ND	-	No
S03A – Roof R-A	Roof	Type 1 – Roof Membrane - Paper	ND	-	No
S03B – Roof R-A	Roof	Type 1 – Roof Membrane - Paper	ND	-	No
S03C – Roof R-A	Roof	Type 1 – Roof Membrane - Paper	ND	-	No
S03A – Roof R-A	Roof	Type 1 – Roof Membrane - Insulation	ND	-	No
S03B – Roof R-A	Roof	Type 1 – Roof Membrane - Insulation	ND	-	No

Table 3 - Sample Summary Table

TABLE 3: BULK ASBESTOS SAMPLING SUMMARY

Sample Number	Location	Material Description	Asbestos Content (%)	Fibre Type	Is Material ACM
S03C – Roof R-A	Roof	Type 1 – Roof Membrane - Insulation	ND	-	No
S04A – Roof R-B	Roof	Type 2 – Roof Membrane - Tar	<MDL	Chrysotile	No
S04B – Roof R-B	Roof	Type 2 – Roof Membrane - Tar	<MDL	Chrysotile	No
S04C – Roof R-B	Roof	Type 2 – Roof Membrane - Tar	<MDL	Chrysotile	No
S04A – Roof R-B	Roof	Type 2 – Roof Membrane - Paper	ND	-	No
S04B – Roof R-B	Roof	Type 2 – Roof Membrane - Paper	ND	-	No
S04C – Roof R-B	Roof	Type 2 – Roof Membrane - Paper	ND	-	No
S04A – Roof R-B	Roof	Type 2 – Roof Membrane - Insulation	ND	-	No
S04B – Roof R-B	Roof	Type 2 – Roof Membrane - Insulation	ND	-	No
S04C – Roof R-B	Roof	Type 2 – Roof Membrane - Insulation	ND	-	No
S05A – Roof R-B	Roof	Sealants - Beige	ND	-	No
S05B – Roof R-B	Roof	Sealants - Beige	ND	-	No
S05C – Roof R-B	Roof	Sealants - Beige	ND	-	No
S05A – Roof R-B	Roof	Sealants - Brown	0.52	Chrysotile	Yes
S05B – Roof R-B	Roof	Sealants - Brown	NA	Chrysotile	Yes
S05C – Roof R-B	Roof	Sealants - Brown	NA	Chrysotile	Yes
S05A – Roof R-B	Roof	Sealants - Grey	0.5	Chrysotile	Yes
S05B – Roof R-B	Roof	Sealants - Grey	NA	Chrysotile	Yes
S05C – Roof R-B	Roof	Sealants - Grey	NA	Chrysotile	Yes
S05A – Roof R-B	Roof	Sealants - Black	ND	-	No
S05B – Roof R-B	Roof	Sealants - Black	ND	-	No
S05C – Roof R-B	Roof	Sealants - Black	ND	-	No
2017 – Additional Sampling					
S01A	Gymnasium	Black Mastic	ND	-	No
S01B	Gymnasium	Black Mastic	ND	-	No
S01C	Gymnasium	Black Mastic	ND	-	No
2019 - Asbestos Audit Update					
S01A	1018	Drywall Joint Compound - 1960	ND	-	No
S01B	1018	Drywall Joint Compound - 1960	ND	-	No
S01C	1024	Drywall Joint Compound - 1960	ND	-	No
S01D	1024	Drywall Joint Compound - 1960	ND	-	No
S01E	1024	Drywall Joint Compound - 1960	ND	-	No
S02A	1018	Floor Tile Black Mastic - 1960	ND	-	No
S02B	1018	Floor Tile Black Mastic - 1960	ND	-	No
S02C	1016	Floor Tile Black Mastic - 1960	ND	-	No
S03A	1028	Floor Tile Black Mastic - 1963	ND	-	No
S03B	1028	Floor Tile Black Mastic - 1963	ND	-	No
S03C	1028	Floor Tile Black Mastic - 1963	ND	-	No
S04A	1030	Floor Tile Black Mastic - 1984	ND	-	No
S04B	1031	Floor Tile Black Mastic - 1984	ND	-	No
S04C	1033	Floor Tile Black Mastic - 1984	ND	-	No
S05A	1021	Interior Door Yellow Sealant - 1984	ND	-	No
S05B	1021	Interior Door Yellow Sealant - 1984	ND	-	No
S05C	1021	Interior Door Yellow Sealant - 1984	ND	-	No
S06A	1059	Interior Window Grey Sealant - 1960	5	Chrysotile	Yes
S06B	1059	Interior Window Grey Sealant - 1960	NA	Chrysotile	Yes
S06C	1059	Interior Window Grey Sealant - 1960	NA	Chrysotile	Yes
S07A	1021 (Ext)	Exterior Door Yellow Sealant - 1960	1	Chrysotile	Yes
S07B	1021 (Ext)	Exterior Door Yellow Sealant - 1960	NA	Chrysotile	Yes
S07C	1021 (Ext)	Exterior Door Yellow Sealant - 1960	NA	Chrysotile	Yes
S08A	1021	Interior Door Yellow Sealant - 1960	ND	-	No
S08B	1021	Interior Door Yellow Sealant - 1960	ND	-	No
S08C	1021	Interior Door Yellow Sealant - 1960	ND	-	No
S09A	1033	Interior Window Yellow Sealant - 1984	0.5	Chrysotile	Yes
S09B	1033	Interior Window Yellow Sealant - 1984	NA	Chrysotile	Yes
S09C	1033	Interior Window Yellow Sealant - 1984	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

Appendix 01 35 34B– Lead Report



January 28, 2026

**RE: Paint and Coatings bulk Sampling – Letter of Findings
Chalmers Public School, 25 Chalmers Street South, Cambridge
Project-Specific Work Area – Fixed Reference Nos. 101, 102, 103, 104, 105, 106, and 107**

1. INTRODUCTION

Paint and coatings samples were collected for lead content analysis within Chalmers Public School, specifically, Fixed Reference Nos. 101, 102, 103, 104, 105, 106, and 107. The samples were collected from surfaces within the project-specific location and submitted to ALS Canada Ltd. for the determination of lead content.

The extent of our paint sample collection and assessment area is outlined on the floor plans attached in Appendix A.

2. METHODOLOGY

An assessment for lead in paint was conducted by retrieving paint chip samples from representative surfaces within the area assessed that were deemed to have a potential to be disturbed as part of the planned renovation activities. The condition of painted surfaces from which samples were taken were also visually assessed for signs of deterioration such as cracking, chipping, flaking, bubbling and deterioration due to friction. Based on the degree and extent of deterioration, the conditions of these surfaces were assessed as good, fair, or poor.

The number of paint chip samples retrieved for analysis was based on surface colours observed. Samples were not retrieved from paint finishes with limited application. All paint chip samples were retrieved by scraping the paint down to the base material substrate to ensure collection of all layers of paint. Additional 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 ALS Canada Ltd. for the determination of lead content. Analysis was conducted by the laboratory following the EPA Method 6010. Result of analysis was reported by the laboratory in micrograms per gram ($\mu\text{g/g}$).

3. RESULTS

Results of analysis for the determination of lead content are summarized in Table 1, below. The Laboratory Certificate of Analysis is included as Appendix B.

TABLE 1: Summary of Lead-in-Paint Analytical Results

Sample No.	Location	Surface	Paint Colour	Condition	Lead Conc. ($\mu\text{g/g}$)	EACC Classification
Sa101	FR#101	Walls	Off-white	Good	<5.0	'De Minimis' Level of Lead

4. CONCLUSIONS

'De Minimis' Level of Lead in Paint

The off-white paint on wall surfaces within Fixed Reference No. 101, which is also representative of the wall surfaces throughout Fixed Reference Nos. 102, 103, 104, 105, 106, and 107, was determined to contain lead concentrations below 1,000 µg/g by weight. In accordance with the October 2014 Environmental Abatement Council of Canada (EACC) publication, *Lead Guideline for Construction, Renovation, Maintenance or Repair* (hereinafter referred to as the *EACC Lead Guideline*), this level is considered *de minimis*.

Provided these materials are disturbed in a non-aggressive manner and the work is performed using normal dust control procedures, the worker protection from the inhalation of lead is not required. General health and safety precautions must still be implemented, such as prohibiting eating, drinking, smoking, and chewing in the work area, implementing dust suppression techniques and providing washing facilities for workers to wash hands and face.

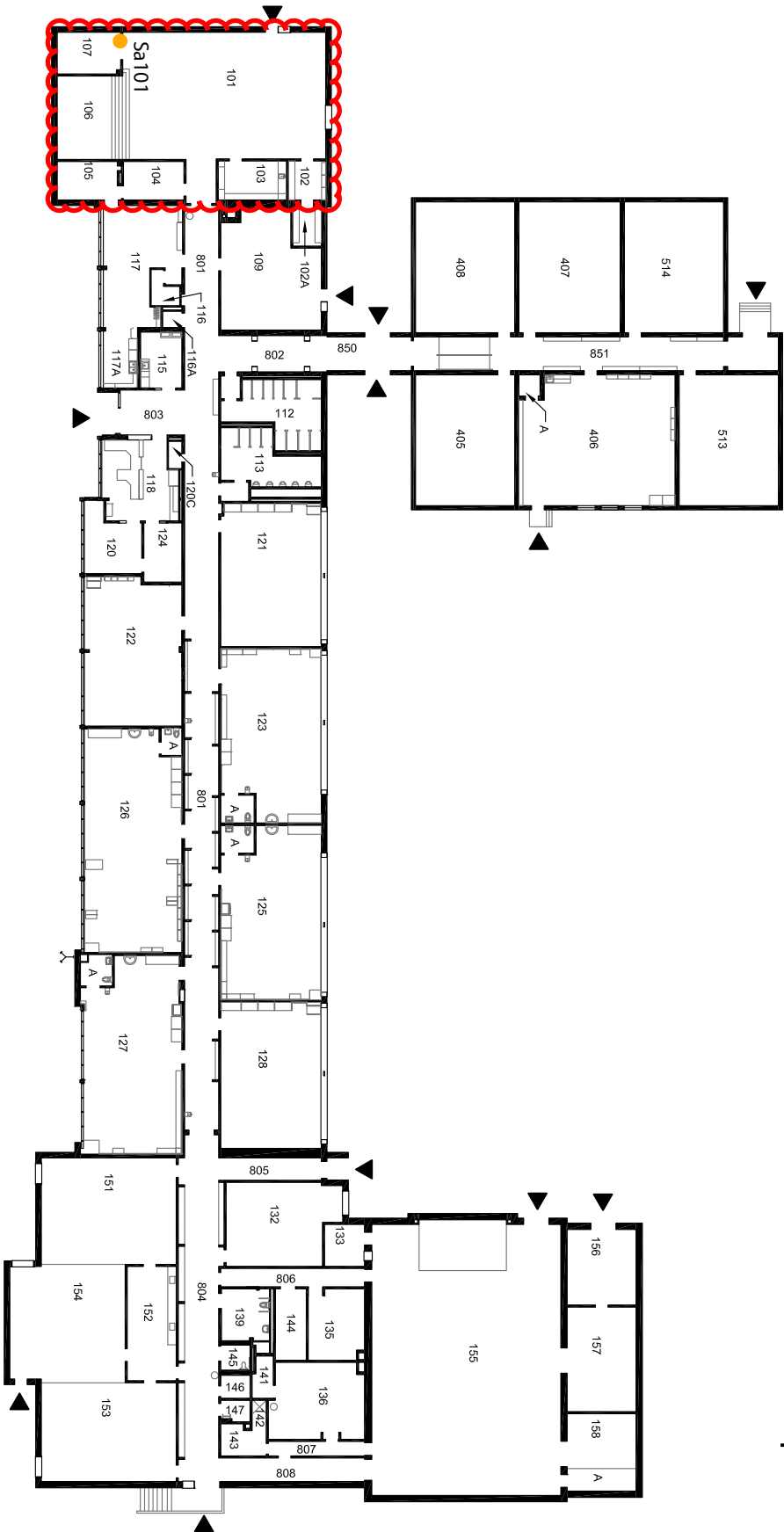
Prepared by:

Jeff Cull
Environmental Officer
jeff_cull@wrdsb.ca

Appendix A

Extent of Assessment Area & Paint Sample Locations

FIXED REFERENCE ROOM NUMBERS



Assessment Area

Sample Location



WATERLOO REGION DISTRICT SCHOOL BOARD			
PROJECT: CHALMERS STREET PUBLIC SCHOOL - GALT			
TITLE: FLOOR PLAN - FIXED REFERENCE ROOM NUMBERS			
Date:	JULY 2022	Drawn by:	ADO
Prev Rev:	APR 2021 ADO	Scale:	1" = 40'-0"
		Appr.:	.
		Dwg.No:	2 OF 2

Appendix B
Laboratory Certificate of Analysis

CERTIFICATE OF ANALYSIS

Work Order	: WT2601176	Laboratory	: ALS Environmental - Waterloo
Client	: Waterloo Region District School Board	Account Manager	: Karanpartap Singh
Contact	: Jeff Cull	Address	: 60 Northland Road, Unit 1
Address	: 51 Ardelt Avenue Kitchener Ontario Canada N2C 2E1		: Waterloo ON Canada N2V 2B8
Telephone	: 519 502 8343	E-mail	: karanpartap.singh@alsglobal.com
Project	: CHALMERS PS-RENO 2026	Telephone	: 19055076910
PO	: ----	Date Samples Received	: 19-Jan-2026 14:45
C-O-C number	: ----	Date Analysis Commenced	: 20-Jan-2026
Sampler	: Jeff Cull	Issue Date	: 20-Jan-2026 16:13
Site	: ----		
Quote number	: Non - Regulated Standing SOA		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Walt Kippenhuck	Supervisor - Inorganic	Metals, Waterloo, Ontario



General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key: CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
LOR: Limit of Reporting (detection limit).

Unit	Description
mg/kg	milligrams per kilogram

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Workorder Comments

<1 or Not Detected with LOR of 1 equals Zero (0).



Analytical Results

Sub-Matrix: Paint Chips
(Matrix: Soil/Solid)

Client sample ID					SA101-FR#101 / OFF-WHITE	----	----	----	----
Client sampling date / time					16-Jan-2026 12:00	----	----	----	----
Analyte	CAS Number	Method/Lab	LOR	Unit	WT2601176-001	----	----	----	----
					Result	----	----	----	----
Metals									
Lead	7439-92-1	E494.Pb/WT	5.0	mg/kg	<5.0	----	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: WT2601176	Page	: 1 of 5
Client	: Waterloo Region District School Board	Laboratory	: ALS Environmental - Waterloo
Contact	: Jeff Cull	Account Manager	: Karanpartap Singh
Address	: 51 Ardelt Avenue Kitchener ON Canada N2C 2E1	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 502 8343	Telephone	: 19055076910
Project	: CHALMERS PS-RENO 2026	Date Samples Received	: 19-Jan-2026 14:45
PO	: ----	Issue Date	: 20-Jan-2026 16:12
C-O-C number	: ----		
Sampler	: Jeff Cull		
Site	: ----		
Quote number	: Non - Regulated Standing SOA		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.



Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group : Analytical Method			Method	Sampling Date	Extraction / Preparation			Analysis				
Container / Client Sample ID(s)		Preparation Date			Holding Times		Eval	Analysis Date	Holding Times		Eval	
					Rec	Actual			Rec	Actual		
Metals : Lead in Paint by CRC ICPMS												
Glass soil jar/Teflon lined cap SA101-FR#101 / OFF-WHITE			E494.Pb	16-Jan-2026	20-Jan-2026	180 days	4 days	✓	20-Jan-2026	180 days	4 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).



Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Duplicates (DUP)							
Lead in Paint by CRC ICPMS	E494.Pb	2422921	1	6	16.6	5.0	✔
Laboratory Control Samples (LCS)							
Lead in Paint by CRC ICPMS	E494.Pb	2422921	2	6	33.3	10.0	✔
Method Blanks (MB)							
Lead in Paint by CRC ICPMS	E494.Pb	2422921	1	6	16.6	5.0	✔



Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Lead in Paint by CRC ICPMS	E494.Pb ALS Environmental - Waterloo	Soil/Solid	EPA 200.2/6020B (mod)	This analysis is carried out using procedures adapted from EPA Method 200.2. The sample is manually homogenized and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids. Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020B).
<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Digestion for Metals and Mercury in Paint Chips	EP494 ALS Environmental - Waterloo	Soil/Solid	EPA 200.2 (mod)	This analysis is carried out using procedures adapted from EPA Method 200.2. The sample is manually homogenized and a representative subsample of the dry material is weighed. The sample is then digested at 95 degrees Celsius for 2 hours by block digester using concentrated nitric and hydrochloric acids.



QUALITY CONTROL REPORT

Work Order : WT2601176

Client : Waterloo Region District School Board
Contact : Jeff Cull
Address : 51 Ardelt Avenue
Kitchener ON Canada N2C 2E1
Telephone : 519 502 8343
Project : CHALMERS PS-RENO 2026
PO : ----
C-O-C number : ----
Sampler : Jeff Cull
Site : ----
Quote number : Non - Regulated Standing SOA
No. of samples received : 1
No. of samples analysed : 1

Laboratory : ALS Environmental - Waterloo
Account Manager : Karanpartap Singh
Address : 60 Northland Road, Unit 1
Waterloo ON Canada N2V 2B8
Telephone : 19055076910
Date Samples Received : 19-Jan-2026 14:45
Date Analysis Commenced : 20-Jan-2026
Issue Date : 20-Jan-2026 16:13

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- @ReferenceMaterial!
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	Position	Laboratory Department
Walt Kippenhuck	Supervisor - Inorganic	Waterloo Metals, Waterloo, Ontario



General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key:

- Anonymous=Refers to samples which are not part of this work order, but which formed part of the QC process lot.
- CAS Number=Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
- DQO=Data Quality Objective.
- LOR=Limit of Reporting (detection limit).
- RPD=Relative Percent Difference
- # =Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.



Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: Paint Chips

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Metals(QC Lot: 2422921)											
WT2601176-001	SA101-FR#101 / OFF-	Lead	7439-92-1	E494.Pb	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	---

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: Soil/Solid

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals(QC Lot: 2422921)						
Lead	7439-92-1	E494.Pb	5	mg/kg	<5.0	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: Soil

Analyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier
Metals(QC Lot: 2422921)									
Lead	7439-92-1	E494.Pb	5	mg/kg	50 mg/kg	117	70.0	130	----



Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).



Sub-Matrix: Soil

Sub-Matrix: Soil					Reference Material (RM) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Target Concentration	Original Result	LCS	Low	High	Qualifier
Metals(QC Lot: 2422921)										
QC-2422921-001		Lead	7439-92-1	E494.Pb	919 mg/kg	919 mg/kg		70.0	130	----



Telephone : +1 519 886 6910

[illegible]

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges that:

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW-COC form.

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01 42 00 – References

1.0 GENERAL

1.1. SECTION INCLUDES

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

1.2. RELATED SECTIONS

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

1.3. REFERENCES

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

1.4. STANDARDS

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

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

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

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

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

END OF SECTION

01 45 00 – Quality Control

1.0 GENERAL

1.1. RELATED SECTIONS

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

1.2. REFERENCES

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

1.3. INSPECTION BY AUTHORITY

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

1.4. REVIEW BY CONSULTANT

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

1.5. INDEPENDENT INSPECTION AGENCIES

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

1.6. ACCESS TO WORK

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

1.7. CONTRACTOR RESPONSIBILITIES

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

1.8. DUTIES & AUTHORITY OF TESTING AGENCY

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

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

1.9. REJECTED WORK

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

1.10. TESTING OF EXCAVATION & BACKFILL

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

1.11. CONCRETE STRENGTH TESTS

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

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

1.12. INSPECTION OF STRUCTURAL STEEL

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

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

1.13. INSPECTION OF METAL DECK

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

1.14. INSPECTION AND TESTING OF PAVING

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

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

1.15. BUILDING THERMOGRAPHIC SCAN

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

1.16. TESTS AND MIX DESIGNS

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

1.17. MOCK-UP

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

- .2 Prepare mock-ups for Consultants review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
- .3 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .4 If requested, Consultant will assist in preparing a schedule fixing dates for preparation.
- .5 Remove mock-up at conclusion of Work or when acceptable to the Consultant. Repair any damage and clean-up at place of mock-up.
- .6 Approved mock-up may remain as part of Work.

1.18. EQUIPMENT AND SYSTEMS

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

END OF SECTION

01 51 00 – Temporary Utilities

1.0 GENERAL

1.1. RELATED SECTIONS

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

1.2. INSTALLATION AND REMOVAL

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

1.3. DEWATERING

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

1.4. WATER SUPPLY

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

1.5. TEMPORARY HEATING AND VENTILATION

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

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

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

1.6. TEMPORARY POWER AND LIGHT

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

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

1.7. TEMPORARY COMMUNICATION FACILITIES

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

END OF SECTION

01 53 00 – Temporary Construction Facilities

1.0 GENERAL

1.1. RELATED SECTIONS

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

1.2. INSTALLATION AND REMOVAL

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

1.3. PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

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

1.4. PROTECTION OF SURROUNDING WORK

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

1.5. ROOF AND STRUCTURE PROTECTION

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

1.6. WORK SITE ENCLOSURE & SAFETY BARRIERS

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

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

1.7. TREE PROTECTION

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

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

1.8. GUARD RAILS AND BARRIERS

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

1.9. WEATHER ENCLOSURES

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

1.10. DUST TIGHT BARRIERS

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

1.11. SCAFFOLDING

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

1.12. SHORING, BRACING, PILING

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

1.13. HOISTING

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

1.14. OVERHEAD LIFTING

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

1.15. ELEVATORS/LIFTS

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

1.16. USE OF THE WORK

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

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

1.17. CONSTRUCTION PARKING

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

1.18. ACCESS TO SITE

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

1.19. SECURITY

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

1.20. OFFICES

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

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

1.21. EQUIPMENT, TOOL AND MATERIALS STORAGE

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

1.22. SANITARY FACILITIES

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

END OF SECTION

01 54 00 – Materials and Equipment

1.0 GENERAL

1.1. RELATED SECTIONS

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

1.2. PRODUCT AND MATERIAL QUALITY

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

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

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

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

1.4. WORKMANSHIP

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

1.5. MANUFACTURER'S INSTRUCTIONS

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

1.6. TOOLS OF THE TRADE

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

1.7. EXISTING EQUIPMENT

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

END OF SECTION

01 61 00 – Product Requirements

1.0 GENERAL

1.1. RELATED SECTIONS

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

1.2. TERMINOLOGY

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

1.3. PRODUCT QUALITY

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

1.4. AVAILABILITY

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

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

1.5. STORAGE AND PROTECTION

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

1.6. TRANSPORTATION AND HANDLING

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

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

1.7. EXISTING UTILITIES

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

1.8. MANUFACTURER'S WRITTEN INSTRUCTIONS

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

1.9. QUALITY OF WORK

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

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

1.10. COORDINATION

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

1.11. CONCEALMENT

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

1.12. REMEDIAL WORK

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

1.13. LOCATION OF FIXTURES

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

1.14. FASTENINGS - EQUIPMENT

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

1.15. PROTECTION OF WORK IN PROGRESS

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

END OF SECTION

01 70 00 – Examination and Preparation

1.0 GENERAL

1.1. RELATED SECTIONS

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

1.2. REFERENCES

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

1.3. SUBMITTALS

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

1.4. QUALIFICATIONS OF SURVEYOR

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

1.5. SURVEY REFERENCE POINTS

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

1.6. SURVEY REQUIREMENTS

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

- .6 Establish foundation and floor elevations.
- .7 Establish lines and levels for mechanical and electrical work.

1.7. SUBSURFACE CONDITIONS

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

1.8. EXAMINATION

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

1.9. PREPARATION

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

1.10. EXISTING SERVICES

- .1 Before commencing work, establish location and extent of service lines in the area of Work and notify the Consultant of findings.

- .2 Remove abandoned service lines running through existing and new structures. Cap or seal lines at cut-off points as directed by the Consultant.

1.11. LOCATION OF EQUIPMENT AND FIXTURES

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

1.12. SURVEY RECORD

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

END OF SECTION

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

DIVISION 02 - EXISTING CONDITIONS

PART 1 - GENERAL

1.0 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Special Project procedures Section 01 35 13
- .2 Health, Safety and Emergency Procedures Section 01 35 29
- .3 Temporary Facilities & Controls Section 01 50 00
- .4 Facility Performance Requirements Section 01 81 00

1.2 WORK INCLUDED

- .1 All Work of this Section shall be done in strict accordance with Section 01 35 13 of the Specification, as shown on the Architectural Drawings and as noted in the Demolition Structural Assessment.
- .2 This Section includes the demolition, removal and disposal of components of the existing building. Include all labour, equipment and material required for a complete work.

1.3 QUALIFICATIONS

- .1 Work under this Section shall be performed by a Contractor specializing in this type of work. Furnish evidence of qualifications upon request of the Architect.
- .2 Use only skilled tradesman for Work under this Section.

1.4 MATERIALS FROM DEMOLITION

- .1 The owner will have first right of refusal for all materials and equipment scheduled for demolition or removal from the building and site.
- .2 All materials resulting from demolition work will become the property of the Contractor, with the exception of those materials shown on the Drawings to be relocated, removed, re-used or turned over to the Owner.

1.5 SUBMITTALS

- .1 Prior to the commencement of Work, submit a schedule and a summary of the methods of demolition and type of equipment intended to be used.

1.5 SUBMITTALS (CONT'D)

- .2 Submit detailed shop drawings of all shoring, underpinning and scaffolding to be used in the demolition and removal of beams, lintels, columns and masonry walls.
- .3 Submit in accordance to Section 01 33 00.

1.7 PROTECTION

- .1 Provide, erect and maintain required hoarding, barriers, fencing, sidewalk sheds, catch platforms, lights and other protection around Site before commencing Work. Maintain such areas free of snow, ice, mud, water and debris. Lighting levels shall be equal to that prior to erection.
- .2 Protect existing areas against damage, dust, odours and noise which might occur from falling debris due to the demolition process or other cause. Do not interfere with use of existing areas and maintain free, safe passage to and from same.
- .3 Provide flagmen where necessary or appropriate to provide effective and safe access to Site to vehicular traffic and protection to pedestrian traffic.
- .4 Protect adjacent structures and property against damage which might occur from falling debris or other causes. Repair or replace damage caused from Work of this Section to acceptance of Consultant.
- .5 Do not interfere with use of adjacent structures and Work areas. Maintain free, safe passage to and from adjacent structures and Work areas.
- .6 If movement or settlement occurs, install additional bracing and shoring as necessary and make good damage to acceptance of Consultant.
- .7 Hang tarpaulins where debris and other materials are lowered. Build in around openings with wood and plywood at locations used for removal of debris and materials.
- .8 Prevent debris from blocking surface drainage system, elevators, mechanical, and electrical systems which are required to remain in operation.
- .9 Pay particular attention to prevention of fire and elimination of fire hazards which would endanger Work or adjacent structures and premises.
- .10 Supply, install and maintain legal and necessary barricades, guards, railings, lights, warning signs, security personnel and other safety measures, and fully protect persons and property.
- .11 Precautions shall be taken to prevent movement of existing areas, settlement or damage of adjacent structures, services, walks and pavement. This Contractor shall be responsible for safety and support of existing areas and be liable for any movement, any damage or injury caused thereby, or resulting therefrom.

1.7 **PROTECTION (CONT'D)**

- .12 If at any time, during the course of Demolition Work, the safety of the existing areas appear to be endangered, cease operations and notify the Consultant; and do not proceed with Demolition Work until permission has been granted to do so.
- .13 If movement is caused by negligence or default of the Contractor, he shall be completely responsible to rectify the situation, at no extra cost to the Owner.
- .14 Provide special protection for sensitive finishes being retained, removed and re-installed.
- .15 Do not temporarily fasten hoarding or dust closures to the finished floor, ceiling and /or wall finishes.

PART 2 - PRODUCTS

- 2.1 Not Applicable.

PART 3 - EXECUTION

3.1 **PREPARATION**

- .1 All Bidders shall visit the Site and thoroughly examine existing conditions in order to familiarize themselves with the extent of demolition and removal work required to properly execute this portion of the Contract.
- .2 Disconnect electrical and telephone service lines entering areas to be demolished as per rules and regulations of authorities having jurisdiction. Post warning signs on electrical lines and equipment which must remain energized to serve other areas during demolition.
- .3 Disconnect and cap mechanical services in accordance with requirements of local authority having jurisdiction.
 - .1 Natural gas supply lines to be removed by gas company.
 - .2 Remove sewer and water lines and cap to prevent leakage.
 - .3 Remove and cap or dispose other existing underground services.
- .4 Do not disrupt active or energized utilities traversing premises.
- .5 Refer to Mechanical & Electrical drawings and specifications.

3.2 **DEMOLITION**

- .1 Do not start demolition without the approval of the Architect.

3.2 DEMOLITION (CONT'D)

- .2 Do not operate heavy equipment such as front end loader on the floor slab without the approval of the Architect.
- .3 The use of explosives will not be permitted.
- .4 In addition to following the requirements of the Ontario Building Code, carry out demolition in accordance with the requirements of local and Municipal Authorities and the Canadian Construction Safety Code.
- .5 Furnish all labour, materials, tools, plant, scaffolding, chutes and services required or incidental to the completion to the full extent of the Work and to the full intent of the Drawings and Specifications, for the execution of all demolition and protection work specified herein.
- .6 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces and replace same as work progresses.
- .7 At end of each day's work, leave work in safe condition so that no part is in danger of toppling or falling. Protect interiors of parts not to be demolished from exterior elements at all times.
- .8 Demolish in a manner to minimize dusting. Keep dusty materials wetted.
- .9 Demolish masonry and concrete walls in small sections. Carefully remove and lower structural framing and other heavy or large objects.
- .10 Selling or burning materials on Site is not permitted.
- .11 Remove contaminated or dangerous materials from site and dispose of in safe manner to minimize danger at site or at any time during disposal.
- .12 Removal of floor covering material includes adhesives, mortars and grout. Slab to be left ready for installation of new flooring. Grind floor smooth to remove as required. Remove floor covering where new finishes are called for.
- .13 Employ rodent and vermin exterminators to comply with health regulations.
- .14 Perform demolition with extreme care. Confine effects of demolition to those parts which are to be demolished.
- .15 Perform Work and prevent inconvenience to persons outside those parts which are to be demolished.
- .16 Carry out demolition in accordance with the requirements of CSA S350-M.
- .17 Demolish parts of structure to permit remedial Work as indicated on drawings.

3.2 **DEMOLITION (CONT'D)**

- .18 Do not overload floor or wall with accumulations of material or debris or by other loads.
- .19 At end of day's Work, leave Work in safe condition with no part in danger of toppling or falling.

3.3 **REMOVALS**

- .1 Carefully remove, store and protect all equipment and materials which are to be salvaged, relocated and re-used from the building using qualified tradesmen.

3.4 **CLEANUP AND DISPOSAL**

- .1 Clean up the work areas daily to the satisfaction of the Architect.
- .2 Dispose of concrete, steel masonry and debris and other unsalvageable materials off site except where noted otherwise.
- .3 Clear the entire site of all debris at completion of this Contract.

END OF SECTION

DIVISION 04 - MASONRY

PART 1 – GENERAL

1.0 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.2 REFERENCE STANDARDS

- .1 ASTM A123/A123M, Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 ASTM A580/A580M, Stainless Steel Wire.
- .3 ASTM A653/A653M, Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
- .4 ASTM D2240, Test Method for Rubber Property Durometer Hardness.
- .5 CAN/CSA A179, Mortar and Grout for Unit Masonry.
- .6 CAN/CSA A370, Connectors for Masonry.
- .7 CAN/CSA A371, Masonry Construction for Buildings.
- .8 CAN/CSA A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .9 CAN/CSA G30.3-M, Cold-Drawn Steel Wire for Concrete Reinforcement.
- .10 CAN/CSA G40.18-M, Billet-Steel Bars for Concrete Reinforcement.
- .11 CAN/CSA G40.20-04/G40.21, General Requirements for Rolled or Welded Structural Steel/Structural Quality Steel.
- .12 CAN/CSA S304.1, Design of Masonry Structures.
- .13 CAN/CSA-A165 SERIES-04 - CSA Standards on Concrete Masonry Units
- .14 CAN/CSA-A82-14 - Fired masonry brick made from clay or shale

1.3 RELATED WORK SPECIFIED ELSEWHERE

- .1 Installations of Hollow Metal Door and Window Frames.

Section 06 10 00

1.3 **RELATED WORK SPECIFIED ELSEWHERE (CONT'D)**

- | | | |
|----|---|------------------|
| .2 | Sealing of Control and Expansion Joints | Section 07 90 00 |
| .3 | Supply Only of Hollow Metal Door and Window Frames. | Section 08 11 13 |

1.4 **SUPERVISION**

- .1 Work of this Section shall be executed under the continuous supervision and direction of a competent foreman for each class of work.
- .2 One thoroughly experienced, reliable and competent man shall be in charge of mortar mixing.

1.5 **SHOP DRAWINGS**

- .1 Consult the approved Shop Drawings to determine the exact location of items to be built into masonry.

1.6 **SAMPLES & SUBMISSIONS**

- .1 Submit for approval clearly labelled samples of masonry units, reinforcement and accessories to be used in the work. Submit for approval of samples of alternative materials if requested by the Architect.
- .2 All submittals to be in accordance to section 01 33 00.
- .3 Approved sample panel shall establish standard for acceptance or rejection of actual work.
- .4 Submit laboratory test reports certifying compliance of masonry units and mortar ingredients with specifications requirements.

1.7 **JOB MOCK-UP**

- .1 Construct mock-up panel where directed by Architect.
- .2 Construct mock-up panel of exterior masonry wall construction 4'-0" x 6'-0" min. in size, showing masonry colours, textures, pilasters, recesses, panelling, use of reinforcement, ties, through wall flashing, weep holes, ventilators, jointing, coursing, mortar, sills and workmanship.
- .3 Clean one half of mock-up wall in accordance with cleaning requirements here-in and leave remainder for comparison.
- .4 Receive acceptance of Mock-Up by Architect before proceeding with masonry installation.
- .5 Mock-up may remain as part of the work if acceptable to the Architect.

1.7 **JOB MOCK-UP(CONT'D)**

- .6 The approved mock-up panel shall establish the standard for acceptance or rejection of actual work.

1.8 **DEFECTS DEFINED**

- .1 In addition to non-compliance with specified requirements or other contract requirements, the following will be considered defect:
 - .1 Shrinkage in individual units and erected panels.
 - .2 Spalling.
 - .3 Poor colour or texture blending of units.
 - .4 Surface deterioration dusting.
 - .5 Discolouration, crumbling and similar deterioration of mortar.
 - .6 Failure of built in items to remain anchored.
 - .7 Excessive cracking of mortar joints on brick faces.
 - .8 Over cuts at service entries, boxes, etc..

1.9 **PRODUCT DELIVERY, STORAGE AND HANDLING**

- .1 Store cementitious material in accordance with CAN3.A5. Store aggregates in accordance with CAN A.23. Stack masonry units to avoid chipping. Manufacturers seals and labels shall be intact.
- .2 Protect concrete block from rain and inclement weather to ensure that blocks are dry when delivered to site, while stored on site and when used.

1.10 **FIRE SAFETY FEATURES**

- .1 Masonry units used in partitions designed to provide fire separation shall be of material specified and in the case of hollow units shall have the percentage of solid material necessary to provide the rating called for and or required by authorities having jurisdiction.
- .2 Concrete block and similar hollow units shall be identified as to percentage of solid material and tested for fire separation value in each thickness. Delivery slips shall state tested status of the units and the skids shall be marked to facilitate identification of the units at Site.

1.11 **WARRANTY/GUARANTEE**

- .1 Provide guarantee for 2-year period. Warranty to cover both labour and materials. Warranty shall start from the date of substantial performance.

PART 2 - PRODUCTS

2.1 **MATERIALS (MASONRY UNITS)**

.1 **Concrete Block:**

- .1 Standard concrete masonry units Type 1: to CAN/CSA-A165 Series (CAN/CSA-A165.1).
 - .1 Classification: H/15/A/M. (Unless noted otherwise on Structural Dwgs. & Spec.)
 - .2 Size: metric modular
 - .3 Curing: Autoclaving to CAN/CSA-A165 Series-M85 (CAN/CSA-A165.4) or bubble cure system, TCG Material Ltd or Boehmers.
 - .4 Use header and other special shape blocks for backups to blockwork forming piers, reveals, control and expansion joints and the like.
- .2 H/15/A/M, filled solid for top two courses of load bearing walls, for all locations where structural members bear on concrete block, and where shown on Drawings.
- .3 Strength of load bearing masonry units shall be: 7.5 MPa minimum for hollow units; 12.5 MPa minimum for 75% solid units based on gross area.
- .4 Provide special shapes and sizes as shown or specified such as halves, jambs, lintels, solids, corners, bullnoses and double bullnoses, semi-solids, 90 & 45 degree corner return units and the like as shown.
- .5 Where concrete block walls are required to act as fire separations or barriers, they shall conform to Ontario Building Code with respect to equivalent thickness and type of concrete.

Concrete Masonry Units – Light Weight:

- .1 CMU LWT, using L² 20S slag aggregate width as shown on drawings to provide noted fire ratings.
- .6 Exposed block shall be uniform in colour, shade and texture, and made by one manufacturer.

2.1 **MATERIALS (MASONRY UNITS) (CONT'D)**

- .7 Acoustic Concrete Masonry Units: size as indicated on the drawings, dual slotted with fibrous sound dampening filler, Acousta Wall by Day & Campbell Ltd., or SoundBlox by Brampton Brick.

2.2 **MASONRY REINFORCEMENT FOR NON-CAVITY WALLS**

- .1 Approved manufacturer:
 - .1 DW 100 by Dur-O-Wal Ltd., (Hohman & Bernard)
 - .2 Ladur by Dur-O-Wal Ltd., (Hohman & Bernard)
 - .3 Blok-Lok or Blok-Truss by Blok-Lok Ltd.
- .2 3.8 mm diameter (No. 9 Steel ga) deformed wire for single block wythes, 4.8 mm diameter (3/16") for two or more wythes; mill galvanized for interior wall locations; for exterior wall locations, hot dipped galvanized after fabrication, ASTM A153, Class B-2, minimum of 457 g/m² (1.5 oz/sf) zinc coating; sized 50 mm (2") narrower than wall or partition.
- .3 Provide shop fabricated corners and intersections where required hot dipped galvanized for exterior walls and mill galvanized for interior walls. In curved configuration provide shop fabricated reinforcement fully galvanized as specified herein.

2.3 **ANCHORAGE AND REINFORCEMENT**

- .1 Steel Wire: CAN/CSA G30.3.
- .2 Steel Sections and Plates: CAN/CSA G40.20/G40.21, Grade 350W.
- .3 Stainless Steel Wire: ASTM A580, Type 304 or 316.
- .4 Strap anchors 60mm thick, 38mm wide steel plate with 50 mm long Z shaped bends, H.D.G, lengths to suit applications, equal to BLT-112 by Blok-Lok.
- .5 Seismic clip: 14x25mm C shaped clip with 11mm inside width and 5 mm opening fabricated 1-37mm thick stainless steel, Type 304 equal to Lateral Tie Clip by Fero to be used with Fero V-tie in seismic zones. Refer to structural drawings.
- .6 Conform to Ontario Building Code.

2.4 **MORTAR AND GROUT**

- .1 Cementitious Material: CAN/CSA A179.
- .2 Portland Cement: CAN/CSA A3001, Type GU, grey colour.

2.4 **MORTAR AND GROUT (CONT'D)**

- .3 Mortar Aggregate: CAN/CSA A179, fine aggregate.
- .4 Grout Aggregate: CAN/CSA-A179, fine aggregate.
- .5 Hydrated Lime: ASTM C207-79; Type "N".
- .6 Aggregate: CAN/CSA A82.56, except that the maximum allowable percentage passing 600 um (No. 30) sieve shall be 80% and maximum passing 300 um (No. 50) sieve shall be 50%.
- .7 Mortar Colouring Compounds: Pure, synthetic, inorganic pigments manufactured by Northern Pigment Company in proportions recommended by manufacturer, but not exceeding 10% of weight of cementitious material.
- .8 Proprietary Mortar Mixes (in lieu of above) St. Lawrence Cement Company, Canada Cement, St. Marys Cement or Lake Ontario Cement Ltd.; conforming to mix requirements specified.
- .9 Ready Mixed Lime Mortar: Redi-Mix Mortar Ltd.
- .10 Water: Clean and potable. Exempt of ice, oils, acid, alkalis, organic material, sediments or other harmful matter.
- .11 Colour: Refer to colour schedule on Drawings.

2.5 **JOINT FILLER**

- .1 Compressible Joint Filler - Rodof foam per type by Sternson Ltd.
- .2 Pre-moulded Joint Filler: For Fire Rated walls "Fire-Bloc" mineral fibre, as distributed by M.W. McGill & Associates Ltd., or other approved U.L.C. labelled materials.

2.6 **WATER PROOFING ADMIXTURES**

- .1 Add integral water proofing to mortar at exposed areas (except Mortar Mortars) acceptable types: Sterad 300 by Sternsons Ltd., or Rheo-mix 235 by Master Builders unless otherwise noted. Dry-Block by WR Grace.

2.7 **MORTAR MIXES**

- .1 Mortar for Above Grade:
 - .1 Load bearing Walls: CAN/CSA A179, Type S using the Proportion specifications.
 - .2 Non-Load bearing Walls: CAN/CSA A179, Type N using Proportion specifications

2.7 **MORTAR MIXES**

- .2 Stain Resistant Pointing Mortar: CAN/CSA-A179, non-staining masonry cement for cementitious portion of specified mortar type.
- .3 For all load bearing concrete block wall masonry units in exterior cavity walls, interior bearing walls and partitions. Use Type 'S' cement mortar having a 28 day strength min 8.5 MPa and max 120 MPa.

2.8 **MORTAR MIXING**

- .1 Mixing: Prepare and mix mortar materials under strict supervision, in an onsite batching plant. Use and mix proprietary mortar in strict accordance with manufacturer's instructions to produce the following mortar types, CAN/CSA A179-M1976. Do not use re-tempered mortars.
- .2 For Bedding Steel Bearing Plates, Lintels, for Laying Bearing Courses Under Concentrated Loads and for Laying Masonry Below Grade: Use Type 'M' cement mortar, having a compressive strength of 17.5 MPa (2,500 psi) minimum.
- .3 Except as provided in 2.2.2 for Laying; Brick or Brick Facing only of double wythe walls whether backup is load bearing or otherwise: Use Type "N" masonry mortar, having a compressive strength of 5.0 MPa (750 psi) minimum.
Or proprietary or ready-mixed type "N" masonry mortar mixes specified, mixed in accordance with manufacturer's instructions.
- *.4 Use same manufacturer's product for the entire project to ensure uniformity of mix and coloration.

2.9 **NON-SHRINK GROUT**

- .1 "Masterflow 713" manufacturer by Master Builders Ltd. Or "M-Bed Standard" manufactured by Sika Canada Inc or 'CPD Non-Shrink Grout' by CPD Construction Products.

2.9 **PACKING INSULATION**

- .1 Loose glass fibre insulation, 16kg/m² (1lb/c.f.) density or mineral wool.

PART 3 - EXECUTION

3.1 **INSTALLATION**

- .1 General Workmanship
 - .1 Confirm required size of masonry openings for all doors, windows and equipment with supplier or manufacturer prior to installation of masonry units.

3.1 **INSTALLATION (CONT'D)**

- .2 Install Brick, Architectural Stone and architectural trim products in accordance with manufacturer's installation instructions.
- .3 Architect is to be notified 36 hours in advance of laying first course of masonry to review installation of flashing, weep-vents, control joints and block positioning on wall. Failure to do so will result in removal for inspection.
- .4 Employ properly qualified masons for laying up masonry units.
- .5 Distribute exposed masonry units of varying colours, tones and textures evenly over wall surface to avoid patches and streaks and to produce a pleasing appearance.
- .6 Gaining to meet spandrels, etc., leaving courses uneven or with visibly thicker mortar joints is not acceptable. Any such work must be removed and rebuilt to approval of Architect.
- .7 Construct masonry evenly in maximum lifts of 5'-0" (1500mm) per working day. Rake back ends of unfinished walls; do not tooth and bond new masonry.
- .8 Maintain dimensions, lines and levels.
- .9 Keep exposed faces free from stains, chips and cracks. Keep tolerance in plane 3 mm (1/8") in 2,400 mm (8'-0"). Do not use chipped, cracked or deformed units in exposed work.
- .10 Buttering corners of units, throwing mortar droppings in joints, deep or excessive furrowing of bed joints will not be permitted. Do not shift or tap units after mortar has taken initial set. Where adjustment must be made after mortar has started to set, remove mortar and replace with fresh supply.
- .11 When mortar is "thumb-print" hard, tool joints slightly concave for exposed work, elsewhere, strike joints flush. Use sufficient force to press mortar tight against masonry units on both sides of joints. Remove excess material or burrs left after jointing. Use trowel or rub with burlap bag.
- .12 Lay all joints approximately 10 mm (3/8") thick unless otherwise specified or otherwise shown on Drawings. All joints shall be full of mortar except where specifically designated to be left open.
- .13 Build in all door frames, window frames, wood louvres, anchor bolts, sleeves, inserts, loose steel, etc.
- .14 Complete all door and windowsills, quoins, soldier courses, dovetail designs as per plans.

3.1 **INSTALLATION (CONT'D)**

- .15 All outside 45-degree brick walls are to be completed with mitered corners.
- .16 "Load bearing" means supporting a load other than itself and any unit masonry wall which supports floor loads, roof loads, landing loads, staircase loads, or any other such loads whether directly or indirectly, or which is shown on Drawings as load bearing or which is shown on Structural Drawings, shall be considered to be a load bearing wall. Brick or stone veneer, whether cavity or otherwise, is not load bearing.
- .17 "Exposed" means unpainted, painted and special plastic coated block that are exposed to view in completed work.
- .18 Partition means a non load bearing interior wall.
- .19 Construct masonry evenly in maximum lifts of 5' – 0" (1500 mm) per working day. Rake back ends of un-finished walls; do not tooth and bond new masonry.
- .20 Chases must be built – not cut.
- .21 Build-in hollow metal door frames previously set in place by Section 06 20 00 by building in lugs and fill voids with mortar. Refer to Section 08 10 00 for number of lugs per jamb. Keep frames free of mortar stains until planned.
- .22 Use bullnose and double bullnose block at all external corners where block is left exposed including all door and window jambs.

.2 **Cold Weather Requirements**

- .1 When laying masonry in ambient temperature below 4 degrees C, (40 degrees F), use heat and maintain temperature of masonry materials and protect completed work from freezing to Satisfaction of Architect. Heat and maintain temperature of masonry materials to at least 4 degrees C (40 degrees F) on both sides of masonry for a period of at least 72 hours.
- .2 Do not use scorched sand. Do not use salts, admixtures or anti-freezes. Use approved smokeless heaters.
- .3 In general conform to "Recommended and Guide Specifications for cold weather masonry construction" by O.M.C.A.

.3 **Hot Weather Requirements**

- .1 Protect freshly laid masonry from drying too rapidly by means of waterproof, non-staining coverings.

3.1 **INSTALLATION (CONT'D)**

- .2 When the ambient air temperature exceeds 38°C, or 33°C with a wind velocity greater than 8 mph, execute the following:
 - .1 Store masonry units out of direct sunlight.
 - .2 Do not spread mortar beds more than 4' - 0" ahead of masonry.
 - .3 Set masonry units within one (1) minute of spreading mortar.
- .4 Blockwork:
 - .1 Lay block to align plumb over each other with thick ends of webs up. Leave no cells open in exposed work. Reinforce all blockwork as hereinafter specified.
 - .2 Minimize cutting block. Cut exposed block with power driven abrasive cutting disc or diamond cutting wheel where cutting is required and for flush mounted electrical outlets, grilles, pipes, conduit, leaving 3 mm (1/8") maximum clearance.
 - .3 Do not wet concrete masonry before or during laying in wall.
 - .4 Locate corners accurately with bullnose blocks.
 - .5 Use full bed of mortar for first course. For remaining courses bed face shells and cross and end webs and vertical end joints fully in mortar. Compress end joint mortar.
 - .6 Stagger end joints in every course. Align joints plumb over each other in every other course.
 - .7 Do not break bond of corridor walls or other walls of exposed units where partitions intersect and if bonding will show through on exposed face of walls. Bond these partitions to walls that intersect with prefabricated intersection masonry reinforcement in each course.
- .5 Bullnose Concrete Masonry Units
 - .1 For interior applications provide bullnose concrete masonry unit at exposed corners, window jambs and sills, door jambs and where noted on drawings.
 - .2 Provide square base block in areas of ceramic tile installation for cove base and fitted corners. Contractor to grind exposed upper portion of block corner to match upper courses of bullnose blocks.
 - .3 Provide a square edged block at ceiling level to accommodate a square fitted corner in the ceiling grid.

3.1 **INSTALLATION (CONT'D)**

.6 Partitions:

- .1 Carry the following partitions up through ceiling to structure above, unless shown or specified otherwise: corridor partitions, demising partitions, partitions in areas without suspended ceilings and other partitions so shown on Drawings. Terminate such partitions 19 mm (3/4") below structure and fill space between top of masonry and structure with compressed packing insulation.
- .2 Co-ordinate bracing to provide lateral support for tops of partitions required to extend to within 19 mm (3/4") of underside of structure where they occur under steel joists and beams, slabs and other structural elements with section 05 51 00, Metal Fabrication.
- .3 Where walls and partitions are pierced by structural members, ducts, pipes, fill voids with mortar to within 19 mm (3/4") of such items flush with wall finish.
- .4 Fill spaces between partitions and structure, ducts and pipes with compressed packing insulation completely from one side of wall to other.
- .5 Secure large precast units in place with stainless steel pins set in drilled holes within precast cap. Bent stainless steel anchor plates to be anchored to wall framing.

.7 Load Bearing Walls:

- .1 Wedge and grout load bearing walls to underside of structure.

.8 Protection

- .1 Protect laid masonry from damage by weather. At end of each day or shutdown period, cover exposed tops of masonry with canvas or strong waterproof membrane securely clamped down and overhanging on each side of wall at least 600 mm (2'-0"). Use wire spring clamps which extend 200 mm (8") down each side of wall, spaced 2,400 mm (8'-0") maximum or other approved method.
- .2 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.
- .3 Subcontractor is responsible to protect glass, sliding patio doors and other building components (including concrete terraces) from mortar droppings, and will supply poly for same.
- .4 Protect and leave broom-clean all surfaces, where masonry work carried out over or above.
- .5 Wind bracing of all masonry walls during construction until the structure provides sufficient lateral support is a mandatory requirement.

3.1 **INSTALLATION (CONT'D)**

- .6 Comply with the Occupational Health & Safety Act & Regulations For Construction Project.
- .9 Reinforcement, Reinforcing Ties and Stud Shear Connectors
 - .1 Install anchors and ties in accordance with CAN/CSA A370 and CAN/CSA A371.
 - .2 Space wall ties in accordance with CAN/CSA A370. Increase wall ties where recommended by masonry unit manufacturer.
 - .3 Reinforce all masonry walls with continuous masonry wall reinforcement in every second block or every 6th brick course. Reinforcing shall be continuous.
 - .4 Adjustable masonry reinforcement not permitted to correct poorly laid masonry. Bending of masonry reinforcement or ties not permitted.
 - .5 At openings provide extra masonry/cavity wall reinforcement, so that first and second courses above and below openings are reinforced. Extend extra reinforcement 600 mm (2'-0") beyond opening in each direction.
 - .6 Do not bridge expansion or control joints.
 - .7 Lap reinforcement 6" (150 mm) minimum.
 - .8 Where steel columns occur in masonry walls embed steel bar anchors fully with mortar, including bent ends.
 - .9 In areas where exterior signage is indicated on the drawings, spacing of masonry ties are to be increased to 16" o.c.
 - .10 Install Stud Shear connectors for brick veneer masonry in strict compliance with the manufacturer's instructions and the General notes on the Structural Drawings.
 - .11 Refer to the General Notes on the Structural Drawings that are applicable to and govern the work of this section, notwithstanding whatever may be specified herein to the contrary.
 - .12 Masonry Reinforcement for Earthquake: CAN/CSA 3-S304-M, refer to notes on Structural Engineers drawings.
- .10 Built-ins
 - .1 Confirm all built in items are available before proceeding.

3.1 **INSTALLATION (CONT'D)**

.2 Build in items occurring in masonry provided by other Sections including: steel door frames; anchor bolts; sleeves; inserts; loose steel lintels; shelf angles; access panels; masonry flashings not in direct connection with roofing and other such items. Build in items to present a neat, rigid, true and plumb installation. Leave wall openings required for ducts, grilles, pipes and other items.

.3 Brace/plumb/square all built ins and maintain same until rigidly set.

.4 Fill voids between masonry and metal frames with masonry mortar or insulation, as shown.

.11 **Lintels**

.1 Bridge openings not exceeding 1'-6" in width with 1/4" mild galvanized steel plate lintels bearing 100 mm on each side of opening. Width of plate shall be wall thickness less 1".

.2 Set loose lintels for bridging openings in masonry.

.3 Bearing surface for lintels shall be full width of wall or partition extending 8" (200 mm) each side of opening for openings up to 5'-0" (1500 mm) in width with 1/2" (13 mm) increments each side for each additional 1'-0" (300 mm) of span or part thereof.

.12 **Lateral Supports**

.1 Lateral Supports - Where non load bearing unit masonry partitions meet structural elements at top of partitions, provide lateral supports as required by National Building Code. In areas where ceilings are scheduled, use (6") 150 mm lengths of steel angle located each side of partition at 1200 mm and staggered. Where no ceilings are scheduled, use continuous length of steel angle on each side of partition. Use angle of sufficient size to accommodate where required due to fire rated walls.

.13 **Control Joints for masonry**

.1 Provide continuous vertical control joints at the following locations and maximum at every 20'-0" on centre for clay masonry and 25' - 0" o.c. for concrete masonry.

.1 Interior and exterior of masonry panels.

.2 In line with the end of all lintels over doors, windows and other openings.

.3 Changes in wall directions.

.4 Changes in building height.

3.1 **INSTALLATION (CONT'D)**

- .5 Major changes in wall thickness.
- .6 Abutting of new structure to existing structure.
- .7 4'-0" from exterior corners. (one side)
- .8 At movement joints in foundations, floors and roof.
- .2 Control joints are to extend full height of the wall **and be mortar free.**
- .3 All locations to be reviewed on site with the Architect and the Project Manager prior to placement.
- .4 Install control joints as detailed on the drawings.
- .14 Scaffolding:
 - .1 Supply, erect and dismantle scaffolding that may be required.
 - .2 Scaffolding must meet Ministry of Labour standards.
- .15 Repointing or Tuckpointing:
 - .1 Repoint defective joints as follows: cut back joints ½", taking care not to damage units. Remove dust and loose materials by brushing or by water jet. If water jet is used, allow excess water to drain before repointing. Repoint with same mix as original. Pack mortar tightly in these layers, and tool joints or strike flush as required.
- .16 Fire Separations:
 - .1 Construct fire separation wall tightly to adjacent construction without voids or openings.
 - .2 Do not reduce the thickness of masonry fire separations to less than the thickness indicated for the required fire separation.
 - .3 Refer to Mechanical and Electrical drawings for location of fire dampers and service penetrations requiring fire stopping.

3.2 **CLEANING**

- .1 Power spray washing of masonry is **not allowed.**

3.2 **CLEANING (CONT'D)**

- .2 Obtain and follow masonry manufacturer's written instructions for cleaning. Test sample area, 10 square metres (100 sq ft), to judge effectiveness of cleaning procedures and obtain Architect's approval.
- .3 Keep wall clean and free of mortar stains during laying. Allow mortar droppings which adhere to wall to dry out but not to set. Then rub with small piece of masonry followed by brushing to remove all traces. On completion of masonry, after mortar is thoroughly set and cured, clean masonry thoroughly.
- .4 Remove all mortar fins, stains, discolouration and efflorescence to satisfaction of Architect.
- .5 Protect windows, trim and metal from cleaning agents.
- .6 Remove mortar with wood paddles and scrapers before wetting. Saturate masonry with clean water and flush off loose mortar and dirt. Clean brickwork using water, scrubbing brushes and wood paddles only.
- .7 Clean masonry to be left exposed, using procedures as outlined herein and, where this is inadequate, try following recommendations outlined in Technical Notes on Brick and Tile No. 20, revised May 1964, published by the Canadian-Structural Clay Association. Should these methods prove inadequate consult masonry manufacturer before undertaking unusual cleaning procedures and obtain Architect's prior consent.
- .8 Repoint all defective joints.
- .9 Masonry work to be cleaned at the end of each working day and immediately after removal of scaffolding.

END OF SECTION

DIVISION 05 - METALS

PART 1 – GENERAL

1.1 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.2 WORK SUPPLIED BY THIS SECTION AND PERFORMED BY OTHERS

- .1 To install loose bearings, bearing plates, anchors and loose lintels Section 04 20 00

1.3 QUALITY ASSURANCE

- .1 Undertake welding and/or welding inspection only by welders fully approved to one or more of the following codes and reference standards where applicable:
 - .1 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
 - .2 CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Steel Members used in Buildings. CAN/CSA W178.2, Qualification Code for Welding Inspection Organizations.
- .2 Reference Standards:
 - .1 Perform work of this Section in conformance with the specified requirements of:
 - .1 CISC/CPMA Standard 1.73a, A Quick-drying One-Coat Paint for use on Structural Steel.
 - .2 CISC/CPMA Standard 2.75, A Quick-drying Primer for Use on Structural Steel.
 - .3 CAN/CSA. S16.1; Steel Structures for Building - Limit States Design.
 - .4 CAN/CSA S136, Design of Light Gauge Steel Structural Members.
- .3 Tolerances:

In addition to tolerances in CAN/CSA S16.1, erect shelf angles and ash angles attached to steel frame within a tolerance of 1/8" plus or minus, with abutting ends of members at the same level.
- .4 Random Splicing:

Obtain from Consultant location of critical sections of non-simple spanning members within which randomly located butt welded splices are to be ultrasonically tested.

1.4 **INSPECTION AND TESTING**

- .1 Inspection and testing of materials and shop fabricating of Work of this Section, and for field quality control specified elsewhere in this Section, will be performed by an Inspection and Testing Company appointed by the Consultant.
- .2 The Inspection and Testing Company, and Welding Inspectors and Supervisors shall meet qualification requirements of CAN/CSA W178.2 and shall be certified by the Canadian Welding Bureau in Category (a), Buildings.
- .3 Provide free access for Inspectors to all places work is being performed.
- .4 Mill Inspection:
Inspection shall ensure that materials conform to specified requirements. Mill test reports, properly correlated to the materials, will be accepted in lieu of physical tests.
- .5 Shop inspection shall ensure that structural steel is fabricated in accordance with the shop drawings, and the specified fabrication and welding procedure.

1.5 **SUBMITTALS**

- .1 Submit shop and erection drawings in accordance with Section 01 33 00 and the Reference Standards. Modified reproduction of the structural design drawings are not acceptable erection drawings. **Shop drawings are to be submitted two weeks after award of tender.**
- .2 Submit typical details of connections and any special connections for review before preparation of shop drawings.
- .3 Check shop drawings before submitting them for review. Indicate checker's initials on each shop drawing.
- .4 Allow reasonable time for review of shop drawings.
- .5 Assume responsibility for the accuracy of work. Review of submitted shop drawings is to ensure only that the Contract Documents are being correctly interpreted.
- .6 Show on shop drawings: Size, spacing and the location of structural steel members; connections, attachments, reinforcing and anchorage; necessary plans, elevations and details; size and type of fasteners; Welded connections designated by welding symbols in compliance with Canadian Welding Bureau, W059 Welding Symbols, and indicating clearly net weld lengths.
- .7 Roof structure is to be sloped to provide positive drainage to roof drains. Refer to Architectural Roof Plan and Structural Framing Plans for elevations of steel at the roof perimeter, scuppers and drain locations.
- .8 Clearly indicate joist spacing, bearing and anchorage details, framed openings accessories, schedule of materials, depth and loadings.

1.5 **SUBMITTALS (CONT'D)**

- .9 Submit Joist and Beam design calculation sheets.
- .1 Include for additional loading from interior loading of bulkheads, hanging of half walls, sliding screens, curtains, signage, removable partitions, and the like. Coordinate with interior layout and Reflected Ceiling Plan.
- .10 Each drawing submitted shall bear the signature and stamp of qualified professional engineer registered in the Province of the place of the Work.
- .11 Where tying into existing structure, site verify all dimensions and sizes of components, grids and elevations to ensure design intent.

1.6 **INSPECTION REPORTS**

- .1 Submit to the Architect the procedure which shall be followed to ensure compliance with the shop and erection drawings and the Specification. Include details of any random sampling procedure, general instructions given to inspectors and special instructions pertaining to aspects peculiar to this Project. Submission of this procedure shall not relieve the Inspection and Testing Company of its responsibility to ensure that the completed structural steel work complies with the above requirements.
- .2 Submit Inspection Reports as follows:
 - To Architect: 2 Copies
 - To Structural Engineer: 1 Copy
 - To Contractor: 1 Copy
 - To Owner: 1 Copy
- .3 Sign report by the inspector who performs the inspection, and describe progress of work, the deficiencies found, and the actions taken to correct them.

1.7 **PRODUCT HANDLING**

- .1 Deliver products that are only supplied under work of this Section to those who are responsible for their installation, to the place they direct and to meet construction schedule.
- .2 Handle and store structural steel in such a manner that no damage, including corrosion, is caused to the stored or erected work, or to other property.
- .3 Protect architecturally exposed steel during fabrication handling, storage and erection to prevent damage to surfaces exposed to view by marking, bending, denting, or soiling by grease, oil, weld flux or other foreign materials.

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL

- .1 Structural steel: Rolled shapes, hollow structural sections, plates and rods: new steel, in compliance with CSA and/or ASTM Standards indicated on Structural Drawings.
- .2 Fasteners: High Strength Bolts: To meet specified requirements of ASTM A325, Specification for High Strength Bolts for Structural Steel Joists, including Suitable Nuts and Plain Hardened Washers.
- .3 Machine Bolts: To meet specified requirements of ASTM A307, Specification for Low Carbon Steel, Externally and Internally Threaded Standard Fasteners, for Grade A.
- .4 Anchor Bolts: To meet specified requirements of CAN/CSA G40.21, Specification for Low Carbon Steel, Externally and Internally Threaded Standard Fasteners, Section 1C.
- .5 Welding Electrodes: To meet specified requirements of CAN/CSA W48.1, Mild Steel Covered Arc-Welding Electrodes.
- .6 Shop Coat Paint: To meet specified requirements of CISC/CPMA Standard 1.73A.
- .7 Prime Paint: To meet specified requirements of CISC/CPMA Standard 2.75, A quick drying Primer for Use of Structural Steel.
- .8 Zinc Rich Paint: To meet specified requirements of CGSB Specification 1-GP-181-a, Coating, Zinc Rich, Organic, Ready Mix.
- .9 Galvanizing: Do all "Hot Dipped Galvanizing" after welding in accordance with requirements of CSA G164.

2.2 FABRICATION - STRUCTURAL STEEL

- .1 Fabricate Structural Steel and work of this Section as indicated in compliance with CAN/CSA-S16.1, the approved shop drawings and as specified following:
 - .1 Connections:
 - .1 Make bolted or welded connections.
 - .2 Use high strength bolts, except that machine bolts may be used for connections of roof purlins, bridging, secondary bracing, girts and trimmer beams not connecting to columns unless otherwise noted on drawings.
 - .3 Use friction type high strength bolts for the connections of bracing members resisting the effects of applied lateral loads. Provide tension adjustment at flat bar and rod type lateral bracing.

2.2 **FABRICATION - STRUCTURAL STEEL (CONT'D)**

- .4 Do not permit connections to encroach on the clearance lines required for the installation of work on other Sections.
- .5 Provide steel studs fuse welded through steel deck to beams as required on Drawings.
- .2 Beam Connections:
 - .1 Provide beam connections adequate to resist the reactions produced by the framing or load conditions.
 - .2 Provide beam to column connections that apply vertical reaction with negligible eccentricity at the connecting face of the column, such as single or double angle beam web connections, end plate connections or unstiffened seats, unless otherwise shown on Drawings. Submit for review, in advance of the preparation of shop drawings, connections which do not meet these requirements.
 - .3 Provide connections complying with the requirements that the length of beam web angles shall not be less than half the depth of the beam and single angles shall not be used for beams deeper than 600 mm.
 - .4 Provide direct connections to flanges of spandrel beams to restrain twisting.
 - .5 Do not use fish plate or shear plate connections.
- .3 Holes:
 - .1 Punch holes 7/16" to 1-1/8" in dia. as required for attaching the work of other Sections to Structural steel members. Locate holes so that no appreciable reduction of the strength of members is caused.
 - .2 Provide holes for pipes and ducts, and reinforce openings as indicated on Drawings and as required to run services overhead and in exterior/interior walls. Cutting of holes in structural members in the field will no be permitted except with written approval of the Consultant.
 - .3 Provide effective 1/4" drainage holes to prevent the accumulation of water in tubular members at low spots.
 - .5 All open ends of hollow structural sections are to be capped with 6 mm plate, full welded and ground smooth.
- .4 Lintels:
 - .1 Provide 8" bearing for angle lintels, and bolt or weld together upstanding legs.

2.2 **FABRICATION - STRUCTURAL STEEL (CONT'D)**

.2 **All exterior lintels to be hot dipped galvanized.**

.5 Painting:

- .1 Paint steel in the shop under cover. Keep painted members under cover until the paint has dried.
- .2 Clean and prepare surfaces, as appropriate for paint specified, in accordance with: CISC/CPMA Standard 1-73a.
- .3 Clean steel in compliance with SSPC-SP6-63, Steel Structures Blast Cleaning, where zinc rich paint is shop applied.
- .4 Where paint is applied adjacent to welded joints, remove it to bare metal for a distance of at least 2" beyond sides of joints.
- .5 Do not paint:
 - .1 surfaces and edges to be field welded.
 - .2 contact surfaces of friction type connections assembled by high strength bolts.
 - .3 surface encased in or in contact with concrete, including top flanges of beams supporting cast-in-place slabs.
 - .4 surfaces to be spray fireproofed.
- .6 Give steel surfaces exposed on the exterior of the building one coat of zinc rich paint applied to a minimum dry film thickness averaging 4 mils but not less than 3 mils.
- .7 Give steel surfaces that are specified to receive a top coating one coat of prime paint. Colour to be grey.
- .8 Give steel surfaces that do not receive top coating or zinc rich paint one coat of shop coat paint.

PART 3 - EXECUTION

3.1 **INSTALLATION - STRUCTURAL STEEL**

- .1 Verify, before delivery of structural steel, that work of other Sections on which work of this Section is dependent is correctly installed and located.

3.1 **INSTALLATION - STRUCTURAL STEEL (CONT'D)**

- .2 Supply anchor bolts, base and bearing plates and other members to be built-in under work of other Sections as the work progresses. Co-operate with installers of this work and provide instructions for its selling.
- .3 Comply with CAN/CSA-S16.1 & By-Laws of the Municipality in erection of work of this Section.
- .4 Make adequate provision for horizontal and vertical erection loads and for sufficient temporary bracing to keep structural frame plumb and in true alignment until the completion of erection, and the installation of masonry, concrete work, and floor and roof decks which provide the necessary permanent bracing.
- .5 Provide temporary steel members as may be required for erection purposes and remove them when no longer required,
- .6 Bearing and Column Base Plates:
 - .1 Install bearing plates and standard wall anchors for beams bearing on masonry or concrete.
 - .2 Set loose beam bearing plates and column base plates, at proper elevation, true and level, with steel shims, ready for grouting as specified under work of other Sections.
- .7 Perform field inspection by Inspection and Testing Company to meet requirements specified under Source Quality Control of this Section, and to include:
 - .1 Inspection of erection and fit-up, including placing, plumbing, levelling and temporary bracing.
 - .2 Inspection of bolted connections.
 - .3 Inspection of welded joints.
 - .4 General inspection of field cutting and alterations.
 - .5 General inspection of shop coating touch-up.
- .8 Clean welds with wire brushes and wash down with clean water to ensure no residue from electrodes is present.
- .9 After erection, give one coat of prime paint or zinc rich paint as applicable and specified for shop coat to field bolts, field connections, burnt areas, and abrasions or damage to shop coats.
- .10 Obtain written permission of Consultant prior to field altering or cutting of structural members.

END OF SECTION

DIVISION 05 - METALS

PART 1 – GENERAL

1.0 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.1 REFERENCES

- .1 CISC, Cold-Formed Steel Design Manual.
- .2 ANSI/AWS D1.3, Structural Welding Code – Sheet Steel.
- .3 ASTM A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .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 C754, Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.
- .6 ASTM C955, Load bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
- .7 ASTM C1002, Steel Self-Piercing, Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .8 ASTM C1278/C1278M, Standard Specification for Fiber-Reinforced Gypsum Panel.
- .9 CAN/CSA-S16, Limit States Design of Steel Structures.
- .10 CAN/CSA-S136, North American Specification for the Design of Cold-Formed Steel Structural Members.
- .11 CAN/CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
- .12 CAN/CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
- .13 CAN/CSA W59, Welded Steel Construction (Metal Arc Welding).
- .14 CSSBI (Canadian Sheet Steel Building Institute), Lightweight Steel Framing Design.

1.2 SYSTEM DESCRIPTION

- .1 Design metal framing to withstand live, dead, lateral, wind, seismic, handling, transportation, and erection loads, imposed and other loads.
- .2 Size components to withstand design loads cited by CSSBI.
- .3 Maximum Allowable Deflection Under Loads: 1:360 of span.
- .4 Wall Assembly:
 - .1 Design to CSSBI 51, applicable code and CAN/CSA S136.
 - .2 Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
 - .3 Design to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

1.3 SUBMITTALS

- .1 Section 01 30 00: Submission procedures.
- .2 Shop Drawings:
 - .1 Indicate component details, framed openings, bearing, anchorage, loading, construction bracing, welds, type and location of fasteners, and accessories or items required of related Work.
 - .2 Indicate stud and runner layout.
 - .3 Describe method for securing studs to tracks and for framing connections.
 - .4 Provide calculations for loadings and stresses of specially fabricated framing, under the Professional Structural Engineer's seal.
- .3 Product Data: Provide data on standard framing members; describe materials and finish, Product criteria, and limitations.
- .4 Manufacturer's / Installer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

- .1 Calculate structural properties of framing members in accordance with CAN/CSA W47.1, CSA W55.3, CSA W59 requirements.
- .2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten (10) years documented experience.
- .3 Installer Qualifications: Company specializing in performing the Work of this section with minimum three (3) years documented experience and approved by manufacturer.
- .4 Design structural elements under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the Province of the Work.
- .5 Form, fabricate, install, and connect components in accordance with ML/SFA 540 – Lightweight Steel Framing Systems Manual.

1.6 COORDINATION

- .1 Coordinate the placement of components within the stud framing assembly.

PART 2 – PRODUCTS

2.1 FRAMING MATERIALS

- .1 Framing Materials: Cold-rolled steel conforming to CAN/CSA S136, with metallic coating to ASTM A653/A653M, minimum coating thickness Z180 (G60).
 - .1 Studs: ASTM C955, formed to channel shape, punched web, knurled faces; depth and spacing as indicated; gauge to be engineered by this Section.
 - .2 Track: Formed steel; channel shaped; same width and gauge as studs, tight fit. Provide a bottom track with oversized flanges to accommodate an after installation of a cementitious slab topping of a min. depth of 1".

2.2 GYPSUM SHEATHING

- .1 Water-Resistant Exterior Fibre-Reinforced Gypsum Board/Sheathing: to ASTM C1278M, thickness as indicated, maximum available length in place; ends square cut, edges square; CGC Fiberock Aqua-Tough Sheathing, CertainTeed Gypsum Canada GlasRoc Sheathing.
 - .1 Acceptable Alternate; Glass-mat Sheathing: CGC Securock, GP DensGlass.
 - .2 Fasteners: ASTM C1002, Type S12 screws, wafer-head design, with strip-out-prevention ribs and self-drilling points; screw heads minimum 10 mm diameter; coated for corrosion resistance.

2.3 ACCESSORIES

- .1 Bracing, Furring, Bridging: Formed sheet steel, thickness determined by performance requirements specified.
- .2 Plates, Gussets, Clips: Formed sheet steel, thickness determined by performance requirements specified.
- .3 Welding Materials: CAN/CSA W59.
- .4 Shop and Touch-Up Primer: SPCC 15, Type 1, red oxide.
- .5 Touch-Up Primer for Galvanized Surfaces: SPCC 20 Type I Inorganic, zinc rich.
- .6 Compressible Foam Gasket: sill plate gasket; polyethylene foam, minimum thickness 6 mm x full width of sill plate.

2.4 FASTENERS

- .1 Bolts, Nuts and Washers: ASTM A307 or ASTM A325, hot-dip galvanized to minimum requirements of CSSBI.
- .2 Self-drilling, Self-tapping Screws, Bolts, Nuts, and Washers: Steel, hot dip galvanized to ASTM A123 380 g/sq m. Use low profile screws to aid in the application of wall sheathing.
- .3 Anchorage Devices: Drilled expansion bolts, screws with sleeves.

2.5 FABRICATION

- .1 Fabricate assemblies of formed sections of sizes and profiles required.
- .2 Provide cut-outs centered in webs of members to accommodate services and through-the knockout style bridging.
- .3 Fit, reinforce, and brace framing members to suit design requirements.
- .4 Fit and assemble in largest practical sections for delivery to Site, ready for installation.
- .5 Do welding to CAN/CSA S136, CAN/CSA W59 and AWS D1.3, as applicable.

PART 3 – EXECUTION

3.1 EXAMINATION

- .1 Verify that substrate surfaces and building framing components are ready to receive Work.
- .2 Verify that rough-in utilities are in proper location.

3.2 ERECTION OF STUD WORK

- .1 All required layout and survey during installation is to be completed under this Section by this Sub-trade.
- .2 Install components in accordance with manufacturer's written instructions.
- .3 Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners or by welding at maximum 600 mm on centre.
- .4 Coordinate installation of floor track with placement of foam gasket with concrete floor.
- .5 Place studs at spacing indicated: not more than 50 mm from abutting walls and at each side of openings. Connect studs to tracks using fastener or welding method.
- .6 Construct corners using minimum three studs. Double stud wall openings, door jambs, and window jambs.
- .7 Erect load bearing studs one-piece full length. Splicing of studs is not permitted.
- .8 Erect load bearing studs, brace, and reinforce to develop full strength, to achieve design requirements.
- .9 Erect framing to support soffit and parapet finishes as indicated.
- .10 Coordinate placement of insulation in multiple stud spaces after erection.
- .11 Install intermediate studs above and below openings to align with wall stud spacing.
- .12 Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
- .13 Attach horizontal studs to vertical studs for attachment of fixtures anchored to walls.
- .14 Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.
- .15 Touch-up field welds and damaged galvanized surfaces with primer.
- .16 Erection Tolerances:
 - .1 Maximum variation from True Position: 5mm.
 - .2 Maximum Variation of any Member from Plane: 5mm.

3.3 **SHEATHING INSTALLATION**

- .1 Install components in accordance with ASTM C754 and manufacturer's written instructions.
- .2 To be installed in the wall cavity, exterior facia, parapet and soffit locations. Install gold side out in maximum lengths possible.
- .3 Coordinate location of openings and through-wall components with other Work.
- .4 Erect gypsum sheathing, with edges butted tight and ends occurring over firm bearing.
- .5 Use screws when fastening gypsum board to furring or framing. Do not countersink fasteners or over drive. Spacing and type of fastener as per manufacturers recommendations.
- .6 Treat cut edges and holes in sheathing with sealant.
- .7 Place sealable exterior control joints consistent with lines of building spaces to maximum spacing of 10 m or as indicated on drawings. Form joint with back to back casing beads spaced apart to form a flexible sealant joint.
- .8 Maximum Variation of Gypsum Sheathing Surface from True Flatness: 6 mm in 3 m in any direction.
- .9 Where exterior walls note a required fire rating use **Fireguard 5/8"**.

END OF SECTION

DIVISION 06 - WOOD, PLASTICS AND COMPOSITES

PART 1 - GENERAL

1.0 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.1 INSTRUCTIONS

- .1 This Contractor shall report in writing to the General Contractor any defects of surfaces or work prepared by other trades which affect the quality or dimensions of this Contractor's work. Commencement of this Contractor's work shall imply complete acceptance of all work by other trades.

1.2 INTENT

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

1.3 RELATED WORK SPECIFIED ELSEWHERE

- .1 Supply and installation of Millwork and Casework including Millwork Hardware Section 06 20 00
- .2 Supply of Hollow Metal Frames Section 08 11 13
- .3 Supply of Finished Hardware Section 08 71 00
- .4 Painting Section 09 91 00

1.5 WORK INCLUDED

- .1 This Contractor shall supply and install all of the rough carpentry items indicated on the working drawings or specified herein, including but not limited to the following:
 - .1 Wood nailers and blocking, including supports for all washroom accessories, upper and lower millwork cabinets, vanities and wall mounted shelving.
 - .2 Wood curbs, caps and blocking for roofing and Mechanical & Electrical equipment.
 - .3 Plywood wall covering. Fire retardant in Non-Combustible Construction. (if Required)
 - .4 Hardware for anchoring rough carpentry to masonry, concrete, steel, etc.

1.5 **WORK INCLUDED (CONT'D)**

- .5 Supply and install continuous 3/4" pressure treated Plywood secured to wood blocking for attachment of windows, doors, exterior light fixtures and signage.
- .6 Safety railings and barricades around floor openings and edges are to be structurally sound, secured and maintained during construction.
- .7 Temporary stairs & railings

1.6 **BY-LAWS & CODES**

- .1 The design, fabrication and erection shall conform to the requirements of the Ontario Building Code and any other applicable local building by-law.

1.7 **REFERENCES**

- .1 This Specification makes reference to the following publications and where such reference is made, it shall be to the latest edition of such publications as listed below.
 - .1 CANPLY (Canadian Plywood Association) - Canadian Plywood Handbook.
 - .2 CAN/CGSB 51.34, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.
 - .3 CSA B111, Wire Nails, Spikes and Staples.
 - .4 CAN/CSA O80 Series M, Wood Preservation.
 - .5 CSA O141, Softwood Lumber.
 - .6 CSA O151, Canadian Softwood Plywood.
 - .7 National Lumber Grades Authority (NLGA) - Standard Grading Rules for Canadian Lumber.
 - .8 CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .9 C.S.A. Standard.
 - 10 CAN/CSA 3-086. Engineering Design in Wood (Working Stress Design).
 - .11 National Hardwood Lumber Association Standards.
 - .12 Architectural Woodwork Manufacturers Association of Canada Standards.
 - .13 CSA 0121. Douglas Fir Plywood.

1.8 HANDLING AND STORAGE OF MATERIAL

- .1 This Contractor shall store all materials under waterproof cover both in transit and on the site in such a manner as to cause no damage to other materials, to any existing building or property or to the new structure.
- .2 This Contractor to co-ordinate delivery schedule of material with the suppliers.

1.9 REJECTIONS

- .1 Defective materials or workmanship whenever found, at any time prior to final acceptance of the work, shall be rejected. Inspection will not relieve this Subcontractor of responsibility but is a precaution against oversight or errors. Defective materials shall be removed and replaced by this Subcontractor at his own expense, and he shall be responsible for the cost of the work of other trades affected by this replacement.

1.10 CLEAN-UP

- .1 Upon completion of the work of this Section, all surplus material and debris caused by the work of this Trade shall be removed from the site to the satisfaction of the Consultant.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 All lumber for rough carpentry shall be well seasoned stock, free from shakes, splits, dry rot, mildew or other defects which would impair its strength or durability.
- .2 All lumber must be straight, sawn square and true, dressed four sides, properly sized and shaped to correct dimensions from nominal sizes indicated or specified. Kiln dried.
- .3 Lumber grade and moisture content: comply with the official grading rules of Canadian Lumberman's Association (CLA) for the particular lumber and grade, and structurally complying with the latest requirements of the Ontario Building Code. Comply with CSA Standard 0141 Softwood Lumber. Grade mark all lumber. For framing lumber: no. 1 or No. 2 Spruce.
- .4 All wood materials: well seasoned CLA. Moisture content limit: S-GRN: Unseasoned; S-Dry: Maximum 19% moisture content: KD; Maximum 15% moisture.
- .5 Blocking, cant strips, grounds, nailing strips: NLGA No. 2 Ontario White Pine, No. 2 Red Pine, all complying with the grading rules of the NLGA, or Construction, Douglas Fir dense complying with COFI standard grading and dressing rules.
- .6 Softwood Plywood Spruce: to meet specified requirements of CSA Standard 0151. For exterior sheathing use un-sanded exterior grade. For sub flooring use T.& G. un-sanded select sheathing.

2.1 MATERIALS (CONT'D)

- .7 Douglas Fir plywood: comply with CSA Standard 0121. COFI Exterior. Western softwood plywood - comply with CSA Standard 0151. COFI Waterproof glue WSF. Exposed two sides shall be Grade G2S and exposed on one side shall be Grade G.1.S. Consider fitment doors exposed on both sides.
- .8 Wood Preservative: solignum manufactured by Sturgeons, Ltd., Pentox manufactured by Osmose Wood Preserving Co. of Canada Ltd., Rez Sanding Sealer manufactured by Monsato Co. Ltd. or other approved manufacturer. For painted surfaces use clear type and for concealed surfaces use green tinted type.
Note: The following are not to be used in roof areas or in contact with roof membrane.
 - .1 Creosote.
 - .2 Pentachlorophenol.
 - .3 Copper Naphthenate.
 - .4 Copper & Quinolinalate.
- .9 Rough Hardware: nails (common and spiral), staples, spikes, screws, bolts, lag screws, anchors, special fastening devices and supports as required for the erection of all carpentry items. CSA B111. Cadmium plated or galvanized when used on exterior.
- .10 Adhesives: CSA 0112.

2.2 FINISHES

- .1 Galvanizing: To CAN/CSA-G164, for galvanized fasteners for exterior work.

2.3 FIRE RETARDANT TREATMENT

- .1 Fire retardant treatment of lumber and plywood: 'Dricon' fire retardant treatment by J. A. Biewer or approved alternate, conforming to CAN/CSA-O80.20 and CAN/CSA-O80.27 respectively, to provide a flame spread rating of 25 or less in accordance with CAN/ULC-S102.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Prior to fabrication, check all dimensions relating to this Section of Work. Report any discrepancies to the Architect.
- .2 Prior to site erection, examine all site conditions relating to this Section of Work to ensure that they are acceptable for installation. Report any discrepancies to the Architect.

3.2 **ERECTION**

- .1 This Contractor shall ensure that all structural timbers and connections will sustain any erection loadings that may occur with an adequate safety factor.
- .2 All timber members shall fit together properly, without trimming, cutting or any other unauthorized modifications. Report any discrepancies to the Architect.

3.3 **TREATED WOOD**

- .1 All wood nailers, blocking, cant strips, wood sills, etc. in contact with concrete or masonry, in roof areas and areas of high humidity or moisture shall be pressure treated to ensure full protection against rot and decay.
- .2 When treated lumber is cut or sawn for fabrication or drilled and countersunk for bolts etc., the new surfaces of the timber thus exposed shall be treated with two coats of the preservative.

3.4 **WOOD CURBS**

- .1 All necessary wood curbs and blocking for roof ventilators, Electrical and Mechanical equipment shall be supplied and installed level on the roof by this Contractor.

3.5 **INSTALLATION - ROUGH CARPENTRY**

- .1 Blocking and Grounds:
 - .1 Fasten wood nailers, blocking, bucks, cants, sills ground curbs, copings and strapping solidly to supporting materials in true planes so that they will remain straight and not be loosened by work of other Contractors or Subcontractors.
 - .2 Include blocking around each door & window and at window heads for blinds and all other such items.
 - .3 Refer to plans and details for locations and securement requirements.
- .2 Framing
 - .1 Do all wood framing in accordance with the Ontario Building Code 2012 and to CAN 3-086-M84 as applicable.
 - .2 Refer to all plans and details for locations and heights of framing, partitions, enclosures, blocking and grounds, sheathing, etc.
- .3 Wood Furring and Blocking
 - .1 Provide all miscellaneous wood furring, caps, blocking, strapping, nailing strips where required, and as indicated on drawings.

3.5 **INSTALLATION - ROUGH CARPENTRY (CONT'D)**

- .2 Coordinate with the applicable other trades and provide wood and/or plywood back-up within wood framing by this Section and metal stud framing specified in Sections 05 41 00 (Steel Metal Framing) and 09 21 16 (Gypsum Board Assemblies) as required to provide proper support for wall-mounted items. Coordinate locations of grab bars in washrooms with Division 15 to avoid interference with plumbing.
 - .3 Apply strapping where required to provide backing for finishes to follow. Securely nail, staple or shoot straps in place uniformly spaced, all shimmed and straightened to flat planes. Strapping to be minimum 38 x 64 by 400 mm o.c. unless noted otherwise.
 - .4 Align and plumb faces of furring and blocking to tolerance of 1:600.
 - .5 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
 - .6 Install wood cants, caps, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.
 - .7 Nailers shall be of treated spruce, sizes as indicated and as required, to be continuous unless otherwise noted.
 - .8 Install sleepers as indicated.
 - .9 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation for roof scupper.
 - .10 Provide additional items as required for strength and against movement and deflection, such as blockings, infill pieces, fasteners, furring, shims, grounds, bucks, dowels, bolts and washers, firestops and other hardware, whether indicated or not, and as required by building code.
 - .11 For all services, piping, ductwork and other items projecting or becoming visible through finished surfaces of walls, columns, ceilings, as required to provide planes of finished surfaces on desired lines and/or elevations. Furring minimum 38 x 38 spaced at 400 mm O.C., unless otherwise required.
- .4 Wall Sheathing:
- .1 Panels shall be installed vertically with their edges supported over studs and ends supported over plates or wood blocking.
 - .2 Nailing shall be minimum 50 mm galvanized, ring or spiral thread and shall be well set into panels.

3.5 **INSTALLATION - ROUGH CARPENTRY (CONT'D)**

- .3 If nailing is done with pneumatic nailing gun, special attention must be given to assure nails are well set into panels.
- .4 Space nails at 300 mm O.C. in field and 150 mm O.C. along perimeters.

3.6 **ELECTRICAL AND TELEPHONE BACKBOARDS**

- .1 Supply and install 3/4" (19 mm) thick backboards of Douglas Fir Plywood, fire treated solid/25 grade; sanded both faces; in electrical and telephone rooms for extent noted on Drawings. Paint finish.
- .2 Fasten to wall by fasteners and at spacing suitable for type of walls to provide secure, sturdy installation capable of carrying normal equipment load without damaging wall or working loose.

3.7 **INSTALLATION - STEEL FRAMES**

- .1 Set frames plumb and square in their exact location. Firmly block and brace to prevent shifting. Shim up where required to ensure proper alignment and dimensions from finished floor to head of frame. Install temporary wood spreaders at mid-height.
- .2 Anchor frames securely (to studs) using minimum 3 anchors/jamb for jambs up to 6'-10" and a minimum of 4 anchors per jamb for jambs over 6'-10" high in masonry infill with grout. In interior partitions infill with acoustic/fire rated batt insulation to match partition construction. Spray foam infill for exterior wall installations.

END OF SECTION

DIVISION 06 - WOOD, PLASTICS AND COMPOSITES

PART 1 - GENERAL

1.0 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.1 DESCRIPTION

- .1 Work included:

To complete all carpentry required as shown or specified and which is not specifically called for in "work included" portions of other specifications divisions.
- .2 Work installed but furnished by other sections:
 - .1 Finish hardware (Doors) Section 08 71 00
- .3 Related work specified in other sections:
 - .1 Back Priming & Finish Painting Section 09 91 00

1.2 REFERENCES

- .1 Architectural Woodwork Manufacturers Association of Canada (AWMAC).
- .2 CAN/CSA B111, Wire Nails, Spikes and Staples.
- .3 CAN/CSA O115, Hardwood and Decorative Plywood.
- .4 CAN/CSA O151-M, Canadian Softwood Plywood.
- .5 CAN/CSA O153-M, Poplar Plywood.
- .6 CAN/CSA O141, Softwood Lumber.
- .7 CAN/CSA O153, Canadian Softwood Plywood.
- .8 National Lumber Grades Authority (NLGA), Standard Grading Rules for Canadian Lumber.

1.3 QUALITY ASSURANCE

- .1 Requirements of regulatory agencies:
 - .1 Mark each piece of wood that is pressure treated to meet fire retardant requirements of jurisdictional authorities, or underwriters, or both, with ULC Fire Hazard Classification label.
- .2 Reference standards:
 - .1 Conform to CAN/CSA Standard 0141 for dressed dimensions of wood members.
 - .2 Fabricate the listed Work to Custom Quality Standard of: AWMAC Specification, Quality Standards of the Architectural Woodwork Manufacturers Association of Canada.

1.4 QUALIFICATION

- .1 Contractor to have 5 years of experience in the Work of this Section.
- *.2 Subcontractor to submit a list of 5 previous jobs where he has performed similar work in scale and scope for review by the Consultant and Owner, and to be representative of his workmanship.
- *.3 Sub-contractor to provide documentation that he has required manpower for the scale of this job, to meet the construction schedule.

1.5 SUBMITTALS

- .1 Samples:
 - .1 Submit 1-12"x12" sample of each specified finish wood species, and in each cut. As per Section 01 33 00 "Submittals Procedures".
- .2 Shop Drawings:
 - .1 Submit shop drawings for manufactured items to Section 01 33 00 "Submittals Procedures".

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Environmental Requirements:
 - .1 Ensure that relative humidity in areas where Work is stored and installed does not exceed 55%.

1.6 **PRODUCT DELIVERY, STORAGE AND HANDLING (CONT'D)**

.2 Protection:

- .1 Ensure that Work of this Section is protected from damaged and deterioration during installation, and otherwise until Project completion.
- .2 Take particular care that wood made fire retardant by pressure treatment is exposed to no dampness.

1.7 **WARRANTY**

- .1 Warrant work of this Section against de-lamination of plastic laminate work and warpage of millwork for a period of 2 years from date Work is certified as substantially performed in accordance with General Conditions of the Contract and as amended by Supplementary General conditions. Promptly make good defects and deficiencies which become apparent within warranty period including making good any work damaged by this work, satisfactory to the architect and at no expense to Owner.

PART 2 - PRODUCTS

2.1 **MATERIALS**

.1 General:

- .1 Include in Work of Section rough hardware required for its execution.
- .2 Moisture content of wood at time of installation shall be for interior locations at an average of 7%, with a permitted range of individual pieces of 5% to 9%, and for exterior locations at an average of 12%, with a permitted range in individual pieces of 10% to 15%.
- .3 Use only adhesives and fastenings that develop sufficient strength for intended use, are non-staining, and are unaffected by the environment to which exposed.

.2 Wood:

- .1 Grade mark softwood and hardwood lumber by the appropriate association under authority of the National Lumber Grades Authority. Where not exposed to view, use wood of grades suitable for fabrication, utility and structural needs.
- .2 Where exposed to view, use wood to meet requirements of AWMAC Quality Grade Standard.
- .3 Wood framing: No. 1 Eastern Spruce
Wood blocking: No. 2 Eastern Spruce

2.1 MATERIALS (CONT'D)

- .4 Hardwood lumber: to National Hardwood Lumber Association (NHLA) requirements, birch species, AWMAC custom-grade.
- .3 Plywood:
 - .1 Douglas Fir: to meet specified requirements to CAN/CSA Standard 0121, Sanded Grade, Good Two Sides where both sides are exposed to view, and Good one Side where only one side is exposed to view. Fire Rated as noted on Drawings
 - .2 Softwood: to meet specified requirements of CAN/CSA Standard 0151, Sanded Grade Solid Two Sides where both sides are exposed to view, and Good One Side where only one side is exposed to view.
- .4 Miscellaneous Hardware
 - .1 Standard of quality to be for heavy duty use to suit use and finish to match Hardware as listed and described on drawings. Unless specified otherwise, provide cabinet hardware to ANSI/BHMA A156.9, Grade 1 but not limited to the following.
- .5 Fire Retardant Treatment
 - .1 Pressure treat lumber in accordance with CSA Specification 080 and plywood with 080.27, or to ULC Spec.; to ensure a flame spread rating of less than 25 when tested in accordance with ASTM Standard E84-77.
- .5 Wood Preservative
 - .1 Clear pentachlorophenol, to meet specified requirements of Standard 080.
- .6 Hollow wall anchors
 - .1 Star Wall grip; Rawplug Rawlys; or Red Head WA series.
- .7 Provide all rough or builders hardware such as nails, spikes, ground, bolts, iron works, washers, anchors, etc., herein specified or as may be required for proper completion of the work.
- .8 Fastenings for exterior use to have a rust-inhibitive coating; screws for securing of galvanized anchors, etc., to be galvanized.
- .9 Fieldwood Preservatives: Pentox green as manufactured by Osmose Wood Preserving Co. of Canada, to CSA 080 and supplements.
- .10 Pressure Treated Lumber: to NLGA and CSA O141, softwood SPF species, Grade 2. Dimension sizes indicated:

2.1 MATERIALS (CONT'D)

- .1 Pressure Treatment: to CAN/CSA O80 preservative with 0.25 percent retention.
- .11 Dimensional Lumber: To Section 06 10 00; sanded to remove grade marks, selected for knot-free appearance.
- .12 Cedar Lumber: Western Red Cedar species, to AWMAC QSI Premium grade and NLGA Grade Select-Tight-Knot (STK) or better.

2.2 FABRICATION

.1 GENERAL WORKMANSHIP

- .1 Fabricate and install work in accordance with Architectural Woodwork Manufacturers Association of Canada Custom Grade Standards by skilled craftsmen of companies specializing in work specified and to requirements of other trades. Each item shall be as shown on Drawings and as detailed on shop drawings.
- .2 Assemble work in shop and deliver to Work ready for installation, as far as practicable. Leave ample allowance for fitting and scribing on job.
- .3 Take care to prevent opening up of glue lines in finished work.
- .4 Design construction methods for expansion and contraction of material.
- .5 Conceal joints and connections wherever possible. Locate prominent joints where directed by Architect. Intermediate joints between supports not permitted.
- .6 Joints made on the job shall be equal in quality & workmanship to joints made in shop.
- .7 Be responsible for methods of construction and for ensuring that materials are rigidly and securely attached and will not be loosened by work of other trades.
- .8 Take field dimensions and fabricate work to suit field dimensions.
- .9 Fasten wood nailers, blocking, framing and strapping solidly to adjacent materials in true planes.
- .10 Do not permit delivery of this work to Site until area is sufficiently dry so that woodwork will not be damaged by excessive changes in moisture content.
- .11 Check access clearance at Site before assembling large units or components in factory for shipment to work.
- .12 Provide all blocking coming in direct contact with millwork in accordance with applicable provision set forth herein.

2.2 FABRICATION (CONT'D)

- .13 Glues shall be waterproof and of a type suitable for work to be joined. All glue residue is to be removed from cabinetry, countertops and surrounding area, and all stickers removed by installer.
- .14 Moisture content of interior woodwork shall be not less than 4% nor more than 8%.
- .15 Comply with glue manufacturer's recommendations for lumber moisture content, glue shelf life, pot life, working life, mixing, spreading assembly time, time under pressure and ambient temperature.
- .16 Subcontractor to site measure after plumbing, electrical, HVAC and carpentry rough ins are complete allowing for drywall finish as necessary. At the time of measuring, identify any discrepancies between the approved layouts, work orders and the actual on-site dimensions, and review the differences and proposed final layouts with Contractor on site prior to releasing for production.
- .17 All holes required in cabinetry for plumbing to be drilled, not cut.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Before commencing installation, ensure that grounds, strapping, and other constructions and surfaces to which Work is installed are satisfactory for fitting and adequate for securing of Work.

3.2 INSTALLATION

- .1 Take site measurements of construction to which Work of this Section must conform, and through which access must be made, before Work is delivered to site, to ensure that adaptation is not required which would result in construction delay.
- .2 General:
 - .1 Supply and install all other carpentry shown on Drawings or as required for completion of work. Co-operate with other trades in installing items supplied by other Sections, cut openings in woodwork when so required and make good disturbed surfaces.
 - .2 Back-prime exterior and interior woodwork immediately after delivery to site under Work of Section 09 91 00. Ensure that cut ends are primed. Scrape or sand smooth surfaces under Work of this Section. Notify those who are responsible for back-priming in sufficient time to enable them to schedule their Work.
 - .3 Install Work plumb, level and straight, and fasten it securely to backing to support itself and anticipated superimposed loads.

3.2 INSTALLATION (CONT'D)

- .4 Build Work into construction as indicated on Drawings or specified in other Sections of this Specification, or both.
- .3 Trim:
 - .1 Install in single lengths except where material limitation makes impossible. Stagger joints where they occur and locate over solid backing for fastening.
 - .2 Cut returns of stool and apron ends to match face profile.
- .4 Cutting and Fitting:
 - .1 Cut mouldings with sharp true profiles.
 - .2 Cope trim and mouldings at interior corners and at returns.
 - .3 Mitre trim and mouldings at exterior corners. Glue and lock shop mitres that are over 4" from heel to point.
 - .4 Scribe and joint Work accurately together, and to other work, to fit tightly and with flat smooth surfaces. Install trim or filler panels to close gaps.
- .5 Fastening:
 - .1 Fasten work with nails generally but use screws or special fasteners at critical joints where strain, usage and excessive shrinkage is anticipated, and where specified quality grade standards require.
 - .2 Blink nail unless impossible. Set finishing nails below finished surfaces to receive putty.
 - .3 Properly countersink (set) all fastener heads. No staples to be used. Fill, sand and clean all joints, nail heads, cracks and blemishes of completed trim work so as to make ready to accept paint.
- .6 Installation of Washroom Accessories:
 - .1 Install all washroom accessories supplied under work of Section 10 28 00 and supplied by Owner.
- .7 Installation of Doors:
 - .1 Install wood doors supplied under Work of Section 08 14 00 after finishing of walls.
 - .2 Fit wood doors with 24 mm (3/32") clearance at jambs and heads and 3/8" over finished flooring.

3.2 **INSTALLATION (CONT'D)**

- .3 Trim hinge side of wood doors to fit, and bevel latch edges as required.
- .4 Ensure that top and bottom edges of wood doors are primed under Work of Section 09 91 00 after they are cut to fit.
- .5 Install grilles in wood doors, supplied as specified in other Sections.
- .6 Undercut non fire rated wood doors where indicated on Door Schedule.
- .8 Installation of Finishing Hardware:
 - .1 Accept delivery of all finishing hardware, and be responsible for safe storage, issuing and ultimate installation under this or other Sections.
 - .2 Make cuts in wood doors neatly.
 - .3 Accurately located and adjust hardware to meet manufacturer's instructions. Use special tools and jigs as recommended.
 - .4 Install hardware in wood doors at same locations as for hollow metalwork installed in Project.
 - .5 Locate top hinges with top 5" below door top, bottom hinges with bottom 10" from floor, and intermediate hinges equidistant between top and bottom hinges.
 - .6 Locate door stops to contact doors 3" from latch edge.
 - .7 Install hardware and trim square and plumb to doors.
 - .8 Replace missing hardware to ensure specified installation at time of building completion.
 - .9 Safeguard keys to keep them out of unauthorized hands, tag them with opening number, and deliver them to person designated by Architect at building completion.
- .9 Finishing:
 - .1 Sand wood surfaces after installation to leave surfaces in true planes and free of machine or tool marks, ready for application of finishes.
- .10 Wood Preservatives:
 - .1 Wood installed at exterior of building and which is specified for painting to receive a soaking coat of wood preservative on all surfaces. Give freshly cut ends two additional soaking coats.

3.2 INSTALLATION (CONT'D)

- .2 Apply to all wood members in contact with masonry.

3.3 ADJUSTMENT AND CLEANING

- .1 Adjust hinged doors to swing freely and easily, to remain stationary at any point of swing, to close evenly and tightly against stops without binding, and to latch positively when doors are closed with moderate force. Adjust sliding doors to operate smoothly without binding, and to close evenly and tightly against jambs.
- .2 Adjust hardware so that latches and locks operate smoothly and without binding, and closers act positively with the least possible resistance in use. Lubricate hardware if required by supplier's instructions.
- .3 Clean hardware after installation in accordance with supplier's instructions.
- .4 Sand and clean woodwork to leave free from finish defects in any exposed part.

END OF SECTION

DIVISION 6 – WOOD, PLASTICS AND COMPOSITES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.
- .2 Refer to Vendor of Record for pre-selected subcontractors that are acceptable woodworking companies for the fabrication, supply and installation of all millwork.
- .3 General Contractors who identify subcontractors on their tender form other than those listed above or approved by addendum prior to tender closing may have their bid ruled informal.

1.2 RELATED SECTIONS

- | | | |
|----|--------------------------|------------------|
| .1 | Rough Carpentry: | Section 06 10 00 |
| .2 | Supply of Door Hardware: | Section 08 71 00 |
| .3 | Painting | Section 09 91 00 |

1.3 SECTION INCLUDES

- .1 Provide all millwork, casework and decorative panels as shown on the drawings, including but not limited to the following:
 - .1 Circulation Desk, Picture Book Units
 - .2 Short & Tall Bookshelves, Book Carts, Whiteboard Cabinet

1.4 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.2- 1986 , Medium Density Fiberboard for Interior Use.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM E 1333- 90, Standard Test Method for Determining Formaldehyde Levels From Wood Products Under Defined Test Conditions Using a Large Chamber.
- .3 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
 - .1 AWMAC Quality Standards for Architectural Woodwork 1984.

1.4 **REFERENCES (CONT'D)**

- .4 Canadian Standards Association (CSA)
 - .1 CAN3-A172-M79, High Pressure Paper Base, Decorative Laminates.
 - .2 CSA B111- 1974 , Wire Nails, Spikes and Staples.
 - .3 CSA O115- M1982 , Hardwood and Decorative Plywood.
 - .4 CSA O121- M1978 , Douglas Fir Plywood.
 - .5 CAN/CSA O141- 91, Softwood Lumber.
 - .6 CSA O151- M1978, Canadian Softwood Plywood.
 - .7 CSA O153- M1980, Poplar Plywood.
 - .8 CAN3-O188.1- M78, Interior Mat-Formed Wood Particleboard.
 - .9 CAN/CGSB-11.3- M87, Hardboard.
- .5 National Hardwood Lumber Association (NHLA)
 - .1 Rules for the Measurement and Inspection of Hardwood and Cypress January 1996.
- .6 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 1991.

1.5 **QUALITY ASSURANCE AND REFERENCE STANDARD**

- .1 Fabricate millwork by a manufacturer that is a recognized millwork supplier, well experienced in the manufacturing techniques of a millwork shop.
- .2 Employ fully trained mechanics that are regularly employed in this field.
- .3 Produce the work according to millwork standards of the Architectural Woodwork Manufacturer's Association of Canada (AWMAC) 1991.
- .4 CSA 0112.5-M1977 Urea Resin Adhesives for Wood.
- .5 CAN3-01881-M78 Interior Mat-Formed Wood Particle Board.

1.6 **SUBMITTALS**

- .1 **Shop Drawings**
 - .1 Submit five (5) copies of all shop drawings for the Consultant's review, as per Section 01 33 00. Shop drawings are required for all millwork items.

1.6 **SUBMITTALS (CONT'D)**

- .2 This review is for the sole purpose of ascertaining conformance with the general sign concept. This review shall not mean that the reviewer approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of his responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all 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 trades.
- .3 Do not commence work until reviewed drawings have been returned.
- .4 Indicate details of construction, profiles, jointing, fastening and other related details.
 - .1 Scale: profiles full size, details 1/2 full size.
 - .2 Indicate all materials, thicknesses, finishes and hardware.
- .5 Indicate locations of all service outlets in casework, typical and special installation conditions, and all connections, attachments, anchorage and location of exposed fastenings.

1.7 **SAMPLES AND MOCKUP**

- .1 Submit samples in accordance with Section 01300 - Submittals.
- .2 Submit duplicate colour samples of laminated plastic for colour selection.
- .3 Submit duplicate samples of laminated plastic joints, edging, cutouts and postformed profiles.
- .4 **Submit mockup of one unit complete with hardware, countertop for Consultant review prior to manufacturing.**

1.8 **REJECTIONS**

- .1 Defective materials or poor quality of work, whenever found at any time prior to final acceptance of the work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility but is a precaution against oversight and error.
- .2 Remove and replace defective materials and make good work of other trades affected by this replacement, at no additional cost to the Owner.

1.9 **EXAMINATION**

- .1 Report to the consultant, in writing, all defects of surfaces or work prepared by other trades and or unsatisfactory site conditions.

1.9 EXAMINATION (CONT'D)

- .2 Thoroughly examine all surfaces scheduled to receive Architectural Woodwork to see that they are secure, rigid, true and not liable to impair performance or appearance.
- .3 Commencement of work implies total acceptance of surface and site conditions.
- .4 Prior to fabrication, site measure existing conditions and verify any field measurements necessary to ensure a perfect fit.

1.10 DELIVERY, STORAGE, AND HANDLING

- .1 Protect millwork against dampness and damage during and after delivery.
- .2 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.

1.11 JOB CONDITIONS

- .1 Co-operate in coordinating work of related trades in order that the work may proceed in an orderly and effective manner.

1.12 CLEAN UP

- .1 Promptly, as the work proceeds and upon completion, clean-up and remove from the premises all rubbish and surplus materials resulting from the foregoing work.

1.13 PLANT AND EQUIPMENT

- .1 Edge banding of panels will be machine produced so that in a single pass, each edge will receive hot melt adhesive and the PVC edge banding compressed in place, and all edges and ends will be machine trimmed and rounded over to match details shown on drawings.

1.14 INTENT

- .1 The intent of this Section is that casework shall be manufactured and finished at the plant, delivered to the Site and immediately installed by this Section including provision of necessary strapping, backings, bearers, rough hardware and finish hardware and miscellaneous support metals and stainless steel metal components. Touch up finish immediately prior to completion of the work and leave in perfect condition.

1.15 CO-OPERATION

- .1 Water, drainage and air piping, faucets, hose cocks, retort rod and bases, traps, ventilation ducts, sinks, electric receptacles and wiring are supplied and installed by the Mechanical and Electrical Sections at all rooms. Co-ordinate the work with these trades and make provision in the construction of the fitments to accommodate this work. Methods of construction shall be such as to permit mechanical and electrical work being concealed in the fitments, cut and frame accordingly, provide removal access panels in the units or provide proper access for installation and repairs.
- .2 Cabinet hardware, pilaster strips, locks, finishing hardware will be supplied by this section.
- .3 Woodwork, not shop primed, will be primed and back painted as per painting section immediately upon delivery to the site. Care shall be taken that all surfaces cut after priming are brush coated with an approved primer before installation.

1.16 WARRANTY

- .1 Warranty workmanship against manufacturing defects, including warpage or delamination, for a period of five (5) years from date of acceptance of the completed installation. Make good or replace work showing defects in this period, as requested, at no expense to the Owner. Warranty shall be from date of Substantial Performance.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Softwood lumber: unless specified otherwise, S4S, moisture content 7% or less in accordance with following standards:
 - .1 CAN/CSA O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .3 AWMAC premium grade, moisture content as specified.
- .2 Machine stress-rated lumber is acceptable for all purposes.
- .3 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .4 Hardwood plywood: to CSA O115.
- .5 Poplar plywood (PP): to CSA O153, standard construction.
- .6 Interior mat-formed wood particleboard: to CAN3-0188.1.
- .7 Medium density fibreboard (MDF): to ANSI A208.2, density 769 kg/m3.

2.1 MATERIALS (CONT'D)

- .8 Plastic laminate:
 - .1 Laminated plastic for flatwork: to CAN3-A172, Grade GP, S, 1.6 mm thick; based on solid, woodgrain or printed pattern, colour range with matt finish or 19mm acid resistant plastic laminate counter tops and back splash.
 - .2 Laminated plastic for postforming work: to CAN3-A172, Grade PF, Type S, 0.8 mm thick, based on solid, woodgrain or printed pattern, colour range with matt finish.
 - .3 Laminated plastic backing sheet: Grade BK, Type S not less than 0.5 mm thick or same thickness and colour as face laminate.
 - .4 Plywood core: to CSA O121 solid two sides, Grade G1S, 19 mm thick.
 - .5 Particleboard core: to CAN3-O188.1, Grade R, sanded faces, of thickness indicated.
 - .6 Laminated plastic adhesive: urea resin adhesive to CSA O112.5, contact adhesive to CAN/CGSB-71.20, resorcinol resin adhesive to CSA O112.7, polyvinyl adhesive to CSA O112.4 or two component epoxy thermosetting adhesive.
- .9 Melamine overlaid panelboards:
 - .1 Melamine overlay, heat and pressure laminated with phenolic resin to thickness indicated particleboard core.
 - .2 Overlay bonded to both faces where exposed two sides, and when panel material require surface on one side only, reverse side to be overlaid with a plain (buff) balancing sheet.
 - .3 Furniture finish: colour selected by Consultant.
 - .4 Edge finishing: 3 mm thick PVC, adhered by hot melt adhesive, exposed edges rounded over min 3 mm radius by machine cutters, machine applied solid colour selected by Consultant.
 - .5 Acceptable Material: Melamines by Flakeboard, Uniboard colour to be selected from either the standards or solids series, and will be selected by Consultants discretion, Colour: Hardrock Maple WM791 by Flakeboard or equal.
- .10 Hardwood plywood: to CSA 0115 rotary cut face veneer, oak or birch species as noted on drawings, type 1 bond, particle board core, G2S grade. Select veneers to provide random match.
- .11 Nails and staples: to CSA B111.

2.1 **MATERIALS (CONT'D)**

- .12 Wood screws: to CSA B35.4, and specifically designed for use in matt-formed particle board.
- .13 Adhesives: to CSA 0112 Series-M.
 - .1 Use water resistant white carpenters glue for general millwork and casework.
 - .2 Use hot-melt adhesive for edge banding.
- .14 Splines: wood or metal.
- .15 Sealant: to CAN2-19.13-M87, type one component silicone, gun grade, clear colour.
- .16 All colours and finishes to be as per Colour & Finish Schedule elsewhere in the Contract Documents.
- .17 Edging Material
 - .1 Rigid PVC with a measured degree of hardness of "95 shore D" and thickness of "3 mm (+0.15 mm, -0.2 mm)" with the primer side having a concave measuring 0.10 to 0.25 mm.
 - .2 Edging Adhesive: Ethylene vinylacetate thermalset adhesive with a temperature resistance of not less than 100 degrees C; a processing range of 190 degrees – 200 degrees C and natural in colour.
 - .3 Edging is to be applied using only equipment designed for the application of thick PVC in strict accordance with the specifications of both the thick PVC and hot-melt adhesive manufacturers. All edges and all corners of this 3 mm thick edge banding are to be machined to a 3 mm radius for all cabinet parts.
 - .4 Care should be taken during application to achieve the thinnest glueline consistent with a good bond without causing skips or unspread areas.

2.2 **HARDWARE (SUPPLIED BY ARCHITECTURAL WOODWORK MANUFACTURER)**

- .1 Hardware supplied and installed by Architectural Woodwork Manufacturer to be designed to work in "System 32" modular construction and hardware preparation.
- .2 The cabinet work manufacturer shall furnish and install cabinet hardware. Finish of hardware shall be used US26D or US28 depending on base material. Hardware shall be manufactured as follows or approved equal:
- .3 Use one manufacturer's product for all similar items.
- .4 **Pulls** – door and drawer, Canadian Building Hardware CBH 255 x C26D complete with tamper proof screws.

2.2 **HARDWARE (SUPPLIED BY ARCHITECTURAL WOODWORK MANUFACTURER)
(CONT'D)**

- .5 **Hinges** Hinges: 110° opening, fully concealed, self-closing, soft closing. Blumotion or approved equal.
- .6 **Door bumper** – Richelieu #AMP5312-11
- .7 **Cabinet Locks:** To CAN/CGSB-69.27, cylinder lock recessed in door or drawer front, dead bolt type lock, complete with matching strikes as required.
 - .1 Door locks: National C8703.
 - .2 Drawer locks: National C8704.
- .8 **Closet Door Lock Sets:** Supplied by Section 08710 – Door Hardware.
- .9 **Pilasters:** “U” shaped for recessed installation steel with zinc plating – Knappe and Vogt KV-255.
- .10 **Shelf Brackets:** Clip-in steel brackets – Finish to match pilasters. Knappe and Vogt KV-256.
- .11 **Drawer Slides** – Ball bearing, full extension, soft closing, length to suit.
 - .1 Drawers 600mm maximum width: Knappe and Vogt, KV-8400.
 - .2 Drawers over 600mm in width: Knappe and Vogt, KV-8505.
- .12 **Elbow catch** – Richelieu #5540180 nickel
- .13 **Coat Hooks** - to be by Hafele Canada, polished aluminium 53mm, triple hook, 846.52.808 underneath cubbies.
- .14 **Latches** - Elbow catch, Dayvan No. DY5545. Or Richelieu Heavy Duty No. SS40180 nickel finish.
- .15 **Flush Bolts:** Taymor No. 37-3035.

2.3 **MELAMINE MANUFACTURED UNITS**

- .1 **CASEWORK:**
 - .1 All millwork to be Hard Rock Maple only.
 - .2 Fabricate caseworks to AWMAC premium quality grade.
 - .3 Furring, blocking, nailing strips, grounds and rough bucks and sleepers.
 - .1 S2S is acceptable for concealed use.
 - .2 Board sizes: "Standard" or better grade.
 - .3 Dimension sizes: "Standard" light framing or better grade.

2.3 **MELAMINE MANUFACTURED UNITS (CONT'D)**

- .4 Framing Birch or Maple species, NHLA custom grade.
- .5 Case bodies (ends, divisions and bottoms).
 - .1 Melamine Panel Board.
 - .1 Thickness: 19 mm.
 - .2 Face colour: selected by Consultant from solid colour range.
 - .3 Back colour: selected by Consultant from solid colour range.
 - .4 Core: Particle board.
 - .5 Bond type II.
 - .2 Edge banding: 3 mm thick PVC min 3 mm radius in colour to be selected by Consultant.
- .6 Back
 - .1 Melamine Panel Board
 - .1 Thickness: 16 mm.
 - .2 Face colour: selected by Consultant from solid colour range.
 - .3 Back colour: selected by Consultant from solid colour range.
 - .4 Core: particle board.
 - .5 Bond type II.
- .7 Shelving
 - .1 Melamine Panel Board
 - .1 Thickness: 19 mm.
 - .2 Face colour: selected by Consultant from solid colour range.
 - .3 Back colour: selected by Consultant from solid colour range.
 - .4 Core: Plywood.
 - .5 Bond type II.
 - .2 Edge banding: 3 mm thick PVC in colour to be selected by Consultant.

.2 **CASEWORK DOORS:**

- .1 Fabricate doors to AWMAC premium grade supplemented as follows:
- .2 Melamine Panel Board
 - .1 Thickness: 19 mm.
 - .2 Face colour: selected by Consultant from solid colour range.
 - .3 Back colour: selected by Consultant from solid colour range.
 - .4 Core: Particle board.
 - .5 Bond type II.

2.3 MELAMINE MANUFACTURED UNITS (CONT'D)

- .3 Edge banding: 3 mm thick PVC min 3 mm radius in colour to be selected by Consultant adhered with hot melt adhesive.
- .4 Hinges: use 2 hinges for doors up to 800 mm high, and 5 hinges for doors up to 2000 mm high.
- .5 Pulls: use 1 pull per door.

2.4 MATERIALS – PLASTIC LAMINATE

- .1 Laminated plastic for flatwork: to CAN3-A172, Grade GP, S, 1.6 mm thick; based on solid, woodgrain or printed pattern, colour range with matt finish.
- .2 Laminated plastic for postforming work: to CAN3-A172, Grade PF, Type S, 0.8mm thick, based on solid, woodgrain or printed pattern, colour range with matt finish.
- .3 Laminated plastic backing sheet: Grade BK, Type S not less than 0.5 mm thick or same thickness and colour as face laminate.
- .4 Plywood core: to CSA O121 solid two sides, Grade G1S, 19 mm thick.
- .5 Particleboard core: to CAN3-O188.1, Grade R, sanded faces, of thickness indicated.
- .6 Laminated plastic adhesive: urea resin adhesive to CSA O112.5, contact adhesive to CAN/CGSB-71.20, resorcinol resin adhesive to CSA O112.7, polyvinyl adhesive to CSA O112.4 or two component epoxy thermosetting adhesive.
- .7 Sealer: water resistant sealer or glue acceptable to laminate manufacturer.
- .8 Sealants: to Section 07900 Sealants.
- .9 Draw bolts and splines: as recommended by fabricator.

2.5 FABRICATION - WOODWORK

- .1 Fitments shall be machined, assembled in mill where possible and delivered to job in units. Construct in accordance with details using first class cabinet construction with joints dowelled, glued and properly fastened. Machine all surfaces of finished woodwork to an even smooth surface; fit all joints and miters accurately. Frame materials with tight joints held in place. Conceal joints and connections where possible. Joints made on site shall be equal in quality of work to joints made in the shop.
- .2 Check job dimensions and conditions and notify the Consultant in writing of unacceptable conditions. Design construction methods for expansion. Do not proceed until remedial instructions are received.

2.5 **FABRICATION – WOODWORK (CONT'D)**

- .3 Deliver work to the job ready for installation. Leave ample allowance for fitting and scribing on the job. Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings. Design units to fit together if site assembly is required.
- .4 Fabricate work square and to the required lines. Recess and conceal fasteners and anchor heads. Fill with matching wood plugs.
- .5 Comply with glue manufacturer's recommendations for lumber moisture content, glue life, pot life, working life, mixing spreading, assembly time, time under pressure and ambient temperature.
- .6 The interior of counters, cupboards, shelving units, desks, shall be considered "exposed".
- .7 Interior fitments shall be complete in every respect with special fittings required and hardware.
- .8 Make all necessary cut-outs in the furniture for sinks, gas cocks, appliances, and electrical switch and outlet boxes and pre-drill all mounting holes for faucets, fittings and outlet boxes. Refer to electrical and mechanical drawings and specifications.
- .9 Provide and install pipe covers, scribing pieces, top, bottom and/or closures and filler panels where necessary, including wherever units require furring out or blocking to existing conduits, pipes, etc.
- .10 Service cover panels to be provided at all kneehole drawer units, kneehole front rails and knee drawer table assemblies. End closing panels to be provided at all exposed ends of service strips and island/peninsula assemblies. Front filler panels to be provided where called for on Drawings and as required by field conditions.
- .11 Telephone and electrical receptacles and wiring are specified under Electrical Division. Co-ordinate work of this trade, make provision to accommodate this work and cut tops for and provide wood bearers for support.
- .12 Co-operate with others engaged in work on the building to the end that proper unit of action will assure the orderly progress of the work. Do necessary boxing and protecting of sills, jambs and the like. Construct scaffold, ramps, and other temporary staging necessary.
- .13 The plywood used in interior fitments throughout regardless of whether for paint or stain finish, shall have exposed edges with solid strips ¼" (6mm) wide, unless noted otherwise by full thickness of plywood. No exposed edges of plywood will be permitted. Strips shall be glued and accurately fixed at edges. Adjustable shelves shall have strips applied to front edge. Exposed framing members and trim shall be solid birch.
- .14 When cutting holes in plastic laminate work, corners shall be rounded and filed smooth.
- .15 Protection erected by this trade shall be removed, damage to this work and adjoining work due to the lack or failure of such protection, made good and debris, surplus materials, plant and equipment removed and premises and the whole left clean and tidy the Architect's satisfaction.

2.5 FABRICATION – WOODWORK (CONT'D)

.16 Sills:

- .1 Round edges of countertops and splash backs to 4mm radius.
- .2 Cut countertops for sinks and provide bearers. Provide backsplash at back of sink for entire length of the unit and at return ends where walls or other vertical surface occur with 600mm of sink or other wet location.
- .3 Provide removable plywood access panels, screwed in place, where necessary for access to concealed wiring.
- .4 Fit trim and scribe moulds to fitments as shown and as required to hide voids at walls, partitions and ceilings.
- .5 Provide cut-outs for inserts, outlets, grilles appliances, etc occurring in fitments.
- .6 Bottom of units blocked up to form a 4" (100mm) high x 3" (75mm) deep toe space and fabricated from 19mm waterproof veneer core plywood of fir or spruce.
- .7 Fit fillers between fitments, of same material as fitments, where necessary to fill voids between fitments and walls.
- .8 Provide cutouts and access panels where required for Division 15 and piping that run exposed above counters and upper shelves.
- .9 Provide extended top, bottom, and exposed gables where furring out of upper cupboards is required due to pipes, conduits, and the like behind to provide a flush face at walls.
- .17 Set nails and countersink screws, apply plain wood filler to indentations, sand smooth and leave ready to receive finish.
- .18 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.
- .19 Shelving to cabinetwork to be adjustable unless otherwise noted.
- .20 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.
- .21 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.

2.6 FABRICATION- PLASTIC LAMINATE

- .1 Comply with CAN3-A172, Appendix 'A'.

2.6 **FABRICATION- PLASTIC LAMINATE (CONT'D)**

- .2 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.
- .3 Ensure adjacent parts of continuous laminate work match in colour and pattern.
- .4 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 3000 mm. Keep joints 600 mm from sink cutouts.
- .5 Form shaped profiles and bends as indicated, using postforming grade laminate to laminate manufacturer's instructions.
- .6 Form counter tops as follows:
 - .1 Counter tops general: "D" profile, **(Sienna) by Form-A-Top.**
 - .2 See details shown on drawings.
- .7 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.
- .8 Apply laminate backing sheet to reverse side of core of plastic laminate work.

2.7 **FINISHING**

- .1 Keying: Cabinet locks keyed alike by room and master keyed. Provide keys in duplicate for every lock in this contract. Provide three master keys for all cupboards, drawers and locks.

PART 3 - EXECUTION

3.1 **INSTALLATION - ARCHITECTURAL WOODWORK**

- .1 Do architectural woodwork to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.
- .2 Install prefinished millwork at locations shown on drawings. Position accurately, level, plumb straight.
- .3 Fasten and anchor millwork securely. Provide heavy duty fixture attachments for wall mounted cabinets.
- .4 Use draw bolts in countertop joints.
- .5 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.

3.1 INSTALLATION - ARCHITECTURAL WOODWORK (CONT'D)

- .6 At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant.
- .7 Apply bituminous coating over wood framing members in contact with masonry or cementitious construction.
- .8 Fit hardware accurately and securely in accordance with manufacturer's directions.

3.2 INSTALLATION – PLASTIC LAMINATE

- .1 Install work plumb, true and square, neatly scribed to adjoining surfaces.
- .2 Make allowances around perimeter where fixed objects pass through or project into laminated plastic work to permit normal movement without restriction.

3.2 INSTALLATION – PLASTIC LAMINATE

- .3 Use draw bolts and splines in countertop joints. Maximum spacing 450 mm oc, 75 mm from edge. Make flush hairline joints.
- .4 Provide cutouts for inserts, grilles, appliances, outlet boxes and other penetrations. Round internal corners, chamfer edges and seal exposed core.
- .5 At junction of laminated plastic counter back splash and adjacent wall finish, apply small bead of sealant.
- .6 Site apply laminated plastic to units as indicated. Adhere laminated plastic over entire surface. Make corners with hairline joints. Use full sized laminate sheets. Make joints only where indicated and approved. Slightly bevel arises.
- .7 For site application, offset joints in plastic laminate facing from joints in core.

3.3 CLEANING

- .1 Clean millwork and cabinet work inside cupboards and drawers and outside surfaces.

3.4 PROTECTION

- .1 Cover finished laminated plastic veneered surfaces with heavy kraft paper or put in cartons during shipment. Protect installed laminated surfaces by approved means. Do not remove until immediately before final inspection.
- .2 Protect millwork and cabinet work from damage until final inspection.

END OF SECTION

DIVISION 07 - THERMAL & MOISTURE PROTECTION

PART 1 – GENERAL

1.0 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.1 SUMMARY OF WORK

- .1 Work Included: The work of this Section includes the provision of all labour, materials, equipment and services required to install firestopping and smoke seal materials, as indicated on the drawings, as specified herein and as required for a complete project.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- .1 Rough Carpentry. Section 06 10 00
- .2 Gypsum Board Assemblies. Section 09 21 16
- .3 Fire stopping and smoke seals within mechanical assemblies (i.e inside ducts, dampers) and electrical assemblies (i.e. inside cable trays) Division 21 to 28 respectively.

1.3 REFERENCE STANDARDS

- .1 Underwriters' Laboratories Canada (ULC):
 - .1 CAN/ULC-S115-11, Standard Method of Fire Tests of Firestop Systems.

1.4 REGULATORY REQUIREMENTS

- .1 The work of this Section shall conform to the requirements of the applicable building code, to ULC design requirements for each assembly and to all other applicable codes and regulations, to the satisfaction of the authorities having jurisdiction.

1.5 SUBMITTALS

- .1 General: Submit each item in this Article according to the Conditions of the Contract and the applicable Division 01 Specification Sections.
- .2 Test Reports: Submit test reports certifying that materials have been tested and approved as part of a firestop system by Underwriters Laboratories of Canada (ULC) or Underwriters Laboratories (UL) or Factory Mutual (FM).

1.5 **SUBMITTALS (CONT'D)**

.3 Product Data:

- .1 Include installation instructions for each material.
- .2 Include manufacturer's material safety data sheets for the safe handling of the specified materials and products, in accordance with Workplace Hazardous Materials Information Service (WHMIS) requirements.

16 **DELIVERY, STORAGE & HANDLING**

- .1 Deliver products in original unopened packaging with legible manufacturer's identification.
- .2 Store materials in strict accordance with the manufacturer's recommendations, off the ground, under cover and away from moisture.

1.7 **ENVIRONMENTAL REQUIREMENTS**

- .1 Maintain minimum ambient temperature above 15°C. for 24 hours before, during, and 72 hours after application.
- .2 Maintain relative humidity within manufacturer's recommended limits to allow proper drying.
- .3 Maintain adequate ventilation in areas of application during and for 24 hours after completion.

PART 2- PRODUCTS

2.1 **MANUFACTURERS**

- .1 Acceptable Manufacturers:
 - .1 3M Company Canada
 - .2 AD Fire Protection
 - .3 Hilti Canada
 - .4 Tremco

2.2 **MATERIALS**

- .1 Use products by only one manufacturer throughout Work of this Section.

2.2 MATERIALS (CONT'D)

- .2 Fire stopping and smoke seal systems: in accordance with CAN/ULC-S115, asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of CAN/ULC-S115 and not to exceed opening sizes for which they are intended.
- .3 Service penetration assemblies: certified by ULC in accordance with CAN/ULC-S115 and listed in ULC Guide No. 40 U19.
- .4 Service penetration firestop components: certified by ULC in accordance with CAN/ULC-S115 and listed in ULC Guide No. 40 U19.13 and ULC Guide No. 40 U19.15 under the Label Service of ULC.
- .5 Firestop Sealant: non-slump, one-part silicone type; capable of stopping travel of heat and ignition of combustible materials.
- .6 Firestop Insulation: Mineral/ceramic fibre type to ULC Guide No. 40 U18.7.
- .7 Firestop Mortar: Self-levelling, self-curing, cementitious matrix. Density as recommended by manufacturer to suit application and fire resistance rating.
- .8 Fire- resistance rating of installed fire stopping assembly shall not be less than the fire-resistance rating of the surrounding floor and wall assembly.
- .9 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .10 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
- .11 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .12 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .13 Sealants for vertical joints: non-sagging.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine areas and conditions under which work is to be performed and notify the Consultant in writing of conditions detrimental to the proper and timely completion of the work.

3.1 **EXAMINATION (CONT'D)**

- .2 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.
- .3 Do not proceed with the work until unsatisfactory conditions have been corrected to the satisfaction of the installer.
- .4 Commencement of the installation will be construed as acceptance of the site conditions and, thereafter, the Contractor shall be fully responsible for satisfactory work as specified herein.

3.2 **PREPARATION**

- .1 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .2 Ensure all surfaces are dry and clean before beginning application of firestop materials.
- .3 Clean bonding surfaces of dust, rust, oil, grease and other foreign materials that may impair application and adhesion.
- .4 Do not apply firestop materials to surfaces that have been painted or treated with other coatings, unless tests have been performed to ensure compatibility of materials. Remove paint and other coatings as required.
- .5 Prepare and prime surfaces as recommended by firestop material manufacturer.
- .6 Mask adjacent surfaces as required to protect from damage due to application of firestop materials.
- .7 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

3.3 **INSTALLATION**

- .1 Install fire stopping and smoke seals at service penetrations through fire resistive construction and at all locations where the continuity of fire resistive construction is interrupted, as indicated on the drawings, as specified herein and as required for a complete project.
- .2 Install fire stopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions.
- .3 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

3.3 **INSTALLATION**

- .4 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .5 Tool or trowel exposed surfaces to a neat finish. Remove excess compound promptly as work progresses and upon completion.

3.4 **REVIEW**

- 1 Notify the Consultant when ready for review and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

3.5 **SCHEDULE**

- .1 Unless specified otherwise apply the following:
 - .1 Firestop mortar where surrounding surfaces are concrete or masonry.
 - .2 Sealant and insulation where surrounding surfaces are gypsum board.
- .2 Apply firestop materials to the following locations:
 - .1 Around pipes, conduits, ductwork and other mechanical or electrical components that penetrate through fire rated walls, ceilings and other assemblies.
 - .2 Along tops of fire rated walls and assemblies that extend to underside of floor and roof construction. Use firestop sealant and insulation, apply sealant to both sides of walls.
 - .3 Around supporting steel structures that penetrate fire rated walls and assemblies. Use firestop sealant and insulation, apply sealant to both sides of walls.
 - .4 Along tops of fire rated walls that extend to gypsum board assemblies applied around supporting steel structures. Use firestop sealant and insulation, apply sealant to both sides of walls.
 - .5 Around pipes conduits, ductwork and other mechanical or electrical components that penetrate through fire rated floor assemblies.

3.6 **CLEANING**

- .1 As work progresses, remove excess materials and clean adjacent surfaces immediately after application.
- .2 Remove temporary dams after initial set of fire stopping and smoke seal materials.
- .3 Upon completion of the work of this Section:

3.6 **CLEANING (CONT'D)**

- .1 Remove masking and temporary protection from adjacent surfaces.
- .2 Remove stains on adjacent surfaces and make good damage to adjacent surfaces caused by the work of this Section.
- .3 Remove from the premises all surplus material, dirt and debris caused by the work of this Section and leave the installation clean.
- .4 Remove temporary dams after initial set of fire stopping and smoke seals.

END OF SECTION

DIVISION 07 - THERMAL & MOISTURE PROTECTION

PART 1 - GENERAL

1.0 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.1 INTENT

- .1 To provide all sealing not specified under other Sections but required to make building tightly sealed from exterior and interior to withstand the action of the elements and to complete the building vapour barrier.

1.2 REFERENCES

- .1 American Society for Testing and materials (ASTM)
 - .1 ASTM C661- Standard Test Method for Indentation Hardness of Elastomeric Type Sealants by Means of Durometer.
 - .2 ASTM C679- Standard Test Method for Tack-Free Time of Elastomeric Sealants.
 - .3 ASTM C719- Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
 - .4 ASTM C920, Specification for Elastomeric Joint Sealants.
 - .5 ASTM C1135 Standard Test Method for Determining Tensile Adhesion Properties of Structural Sealants.
 - .6 ASTM C1248 - Standard Test Method for Staining Porous Substrate by Joint Sealants.
 - .7 ASTM C1330 - Cylindrical Sealant backing for Use with Cold Liquid Applied Sealants.
 - .8 ASTM D412 - Standard Test Method for Vulcanized Rubber and thermoplastic Rubbers and thermoplastic Elastomers – tension.
 - .9 ASTM D 2202 - Standard Test Method for Slump of Sealants.
 - .10 ASTM E119 9UL 263) – Standard Test Method for Fire Tests of Building Construction and Materials.

1.3 **SUBMITTALS**

- .1 Provide in accordance with Section 01 33 00 "Submittal Procedures":
 - .1 Product data for silicon sealant, primer, joint backing, and other accessories. Include material and safety data sheets (MSDSs) and certifications showing compliance with specified standards.
 - .2 Shop drawings detailing sealant joints and indicating joint dimensions, materials, sealant profile, and size limitations.
 - .3 Manufacturer's colour chart for selection by Architect, or custom colour where noted.
 - .4 Manufacturer's instructions for installation and field quality control testing.
 - .5 Copy of warranties specified in paragraph 1.8 for review by Architect.

1.4 **PROJECT CONDITIONS**

- .1 Do not install silicone sealant during inclement or windy weather when such conditions are expected. Allow wet surfaces to dry.
- .2 Do not install sealant when temperature is less than 5 degrees Fahrenheit (3° C) below dew point. Silicones approved for -29C.

1.5 **QUALIFICATIONS**

- .1 Perform the Work by recognized established sealant contractor having a minimum of five (5) years experience and skilled mechanics thoroughly trained and competent in the use of sealant equipment and specified materials.

1.6 **FIELD QUALITY CONTROL**

- .1 Arrange with sealant manufacturer for a technical representative to visit the work prior to beginning sealant installation to discuss procedures to be adopted, analyze site conditions, inspect surfaces to be sealed and make recommendations should adverse conditions exist.
- .2 The following items should be discussed:
 - .1 Weather conditions under which work to be done.
 - .2 Anticipated frequency and extent of joint movement.
 - .3 Joint Design.

1.6 **FIELD QUALITY CONTROL (CONT'D)**

- .4 Suitability of durometer hardness and other properties of material in relation to Items 1 and 3 above.
- .5 Primers to be used.

1.7 **WARRANTY**

- .1 Provide under provision of Section 01 78 00 – Closeout Submittals.
 - .1 Installer's (5) five years workmanship warranty.
 - .2 Manufacturer's 20- year material warranty for properly installed silicon sealant.

PART 2 - PRODUCTS

2.1 **ACCEPTABLE MANUFACTURERS**

- .1 Dow Corning Corporation. P.O. Box 994, Midland, MI 486886- 0994; (800) 248-2481; www.dowcorning.com/construction.
- .2 Tremco Commercial Sealants.
- .3 Approved Alternate.
- .4 Requests to use equivalent products of other manufacturers shall be submitted in accordance with Section 00 21 00, article 2.6 Specified Manufacturer.

2.2 **SEALANT**

- .1 Type: One-component, ultra-low modulus, neutral-cure silicone rubber sealant; Dow Corning® 790 Silicone Building Sealant, as manufactured by Dow Corning Corporation.
- .2 Compliance: Sealant shall meet or exceed requirements of these standards:
 - .1 ASTM C920, Type S, Grade NS, Class 100/50, Use T, NT, G, M, A, and O.
 - .2 GSA CID A-A-272A.
 - .3 GSA CID A-A-1556.
- .3 Colour: Refer to Manufacturer's standard colours. Custom colour as noted by Architect on Drawings.
- .4 Shelf life: 12 months.

2.2 SEALANT (CONT'D)

- .5 Application temperature range: Minus 20 to plus 120 degrees F. (Minus 29 to plus 50 degrees C.)
- .6 Tack-free time: 1 hour at 50 percent relative humidity, tested in accordance with ASTM C679.
- .7 Working time: 10 to 20 minutes.
- .8 Curing time at 3/8-inch (10-mm) depth: 7 to 14 days at 77 degrees F. (25 degrees C) and 50 percent relative humidity.
- .9 Flow, sag, or slump in [3 inches] [76 mm] wide joint: None, when tested in accordance with ASTM D2202.
- .10 Volatile organic compound (VOC) content: 43 grams/liter maximum.
- .11 Cured sealant properties after 21 days at [77 degrees F] [25 degrees C] and 50 percent relative humidity:
 - .1 Joint movement capability: Plus, 100 percent extension and 50 percent compression, tested in accordance with ASTM C719.
 - .2 Hardness: 15-durometer hardness, Shore A, tested in accordance with ASTM C661.
 - .3 Properties tested in accordance with ASTM D412.
 - .4 Minimum peel strength: [15 ppi] [2.67 kg/cm], tested in accordance with ASTM C794.
 - .5 Properties tested in accordance with ASTM C1135.
 - .6 Weathering after 22,400 hours, tested in accordance with ASTM C1135 using QUV Weatherometer.
 - .7 Staining after 14 days at 50 percent compression, 158 degrees F (70 degrees C): None on concrete, granite, limestone, and brick, when tested in accordance with ASTM C1248.
- .12 Low Dirt Pick-up, Non-Staining, Medium-modulus, one-component, pre-pigmented, neutral-cure elastomeric silicone sealant; Compliance: Sealant shall meet or exceed requirements of ASTM C920, Type S, Grade NS, Class 50, Use NT, G, M, A, and O. *Dow Corning® 756 SMS Silicone Building Sealant*, as manufactured by Dow Corning Corporation.
- .13 **Exterior Concrete Sidewalk Sealants:** One part silicone – Dow Corning Parking Structure SL or Dow Corning Contractors Concrete Sealant or approved Alternate.

2.2 **SEALANT (CONT'D)**

- .14 **Interior Building Sealants:** Acrylic emulsion compound fast setting, low odour and paintable equal to professional grade acrylic latex caulk by Tremco. Note: Use sealants from Item 7 where mildew resistance is required.
- .15 Joint Backing: Round, closed cell foamed polyethylene; closed cell urethane foam; rubber; rubber tubing; non-migrating plasticised vinyl having Shore 'A' hardness of 20 and tensile strength of 20 - 30 psi, type of which is compatible with sealant type, and as recommended by manufacturer.
- .16 Joint Filler - white non-absorbent closed cell foam polyethylene rope "Ethafoam", Dow Chemical of Canada Limited or approved alternative.
- .17 **Exterior Building Sealants:** One-part silicone Construction sealants series 790, 795, and 888 SL and mildew resistant where specified, by Dow Corning to Canadian Standard CAN2-19-13 or ASTM C920.

2.3 **ACCESSORIES**

- .1 Substrate primer: As recommended for project conditions and provided by silicone sealant manufacturer.
- .2 Sealant backing: Provide backing complying with ASTM C1330 (Type B non-absorbent, bi-cellular material with surface skin.) (Type O open-cell polyurethane.), as recommended by sealant manufacturer.
 - 1. Size: Greater than joint opening by 25 percent minimum.
- .3 Bond breaker tape: Provide tape to prevent adhesion to joint fillers or joint surfaces at back of joint and allow sealant movement.
 - 1. Type: Polyethylene or other plastic tape recommended by sealant manufacturer.
- .4 Masking tape: Non-staining, non-absorbent type compatible with silicone sealant and adjacent surfaces.

PART 3 - EXECUTION

3.1 **GENERAL**

- .1 Prepare substrates and apply silicone sealant in accordance with manufacturer's instructions.
- .2 Handle, store, and apply materials in compliance with applicable regulations and material safety data sheets (MSDSs).
- .3 Do not use silicone sealant for:

3.1 **GENERAL (CONT'D)**

- .1 Below-grade applications.
- .2 Surfaces to be immersed in water for prolonged time.
- .3 Brass and copper surfaces.
- .4 Materials bleeding oils, plasticizers, and solvents.
- .5 Structural glazing and adhesive.
- .6 Surfaces to be painted.
- .7 Surfaces in direct contact with food.
- .8 Medical and pharmaceutical applications.
- .4 Do not apply in totally confined spaces without ventilation for curing.

3.2 **PREPARATION**

- .1 Inspect new substrates to receive silicon sealant. Ensure surfaces are clean, dry, and free of frost, dust, dirt, grease, oil, curing compounds, form release agents, laitance, efflorescence, mildew, and previous films and coatings.
- .2 Clean substrates to receive silicone sealant.
 - .1 Porous surfaces: Abrasive-clean followed by blasting with oil-free compressed air.
 - .2 Nonporous surfaces: Use two-cloth solvent wipe in accordance with ASTM C1193.
 - .3 High-pressure water cleaning: Exercise care that water does not enter through failed joints.
- .3 Aluminum and other nonporous surfaces except glass require use of primer. Concrete, stone, masonry, and other nonporous surfaces typically do not require primer. Comply with Manufacturer's primer recommendations.
- .4 Adhesion test: Apply silicone sealant to small area and perform adhesion test in accordance with ASTM C1193, Method A, to determine if primer is required to achieve adequate adhesion. If necessary, apply primer at rate and in accordance with manufacturer's instructions. Allow primer to dry.
- .5 Masking: Apply masking tape as required to protect adjacent surfaces and to ensure straight bead line and facilitate cleaning.

3.3 **PREPARATION (CONT'D)**

- .6 Clean joints and spaces which are to be sealed and ensure that they are dry and free of dust, loose mortar, oil, grease and other foreign materials, which may damage or destroy bond of sealant. Thoroughly clean sides of joints and spaces to establish good bond between sealant and adjacent materials.
- .7 Clean ferrous metals free of all rust, mill scale and foreign materials by wire brush, grinding or sandblasting.
- .8 Do not install materials when ambient air temperature is less than 5⁰ C, when recesses are wet or damp, or to manufacturer's recommendations.
- .9 Do not install materials on Building Exterior if windy conditions exist and present possibility of wind-borne dust adhering to sealant materials.
- .10 Wipe all metal surfaces to be sealed, except painted metal, with cellulose sponges or clean rags soaked with ethyl alcohol, xylol and wipe dry with clean cloth. Clean painted metal with solutions or compounds which will not injure paint, and which are compatible with the primer and sealant.
- .11 Where joints are 12 mm or deeper, insert backing material in continuous 30% compression with set-back from finished face of adjoining materials equal to required depth of caulking (width/depth ratio) as recommended by manufacturer of sealant, but not less than a distance which leaves minimum 6 mm thickness of sealant.
- .12 On horizontal traffic surfaces, support joint filler against vertical movement which might result from loads, including foot traffic.
- .13 Prime surfaces of joints with primer to which adhesion is required, unless otherwise instructed by manufacturer.
- .14 Seal joints in surfaces to be painted before surfaces are painted. Where surfaces to be sealed are primed in shop before sealing, check to make sure prime paint and sealant are compatible. If they are incompatible inform Architect and change sealant to compatible type approved by Architect.
- .15 Prime sides of joints with primer where required. In any case, prime all metal surfaces to be sealed, including pre-coated metals.

3.3 **APPLICATION**

- .1 Sealant backing: Install without gaps, twisting, stretching, or puncturing backing material. Use gage to ensure uniform depth to achieve correct profile, coverage, and performance.
- .2 Bond breaker: Install on backside of joint where backing is not feasible.

3.3 APPLICATION (CONT'D)

- .3 Sealant:
 - .1 Use sealant-dispensing equipment to push sealant bead into opening. Fill joint opening to full and proper configuration. Apply in continuous operation.
 - .2 Before skinning or curing begins, tool sealant with metal spatula. Provide concave, smooth, uniform, sealant finish. Eliminate air pockets and ensure complete contact on both sides of joint opening. Tool joints in one continuous stroke.
- .4 Complete horizontal joints prior to vertical joints. Lap vertical sealant over horizontal joints.
- .5 Cleaning: Remove masking tape and excess sealant.
- .6 Apply joint filler to proper, uniform depth to give sealant bead of optimum size and shape for joint condition and expected movement condition.
- .7 Apply sealant using guns fitted with suitable nozzles and equipment approved by sealant manufacturer. Apply in strict accordance with manufacturer's directions and recommendations.
- .8 Apply sealants under pressure in such manner as to assure good adhesion to sides and to completely fill all voids in the joint.
- .9 Form surfaces of sealant smooth, concave, free from ridges, wrinkles, sags, air pockets and embedded foreign matter.
- .10 Apply fire stop sealants in strict conformance with manufactures directions to ensure compliance with U.L.C. rating of fire stop systems.
- .11 Upon completion, remove masking tape and sealant smears and droppings from adjacent and other surfaces.
- .12 Tool all joints smooth, minimum thickness of sealant over backing (1/4").
- .13 Ensure all wood shims and projections are cut back to ensure a full continuous bead of sealant.
- .14 All Exterior Precast Panel Joints are a three stage joint system, Exterior, Mid Panel & Interior. (except horizontal bearing joints). Mid joint is to vent/drain through to exterior. Horizontal bearing joint is a dual stage joint system within a 2" raked mortar joint. Refer to blow up details on drawings.
- .15 Around Curtain Wall System and components note: **Seal inside and outside of frame**, not at exterior location of pressure cap plate. A third line of sealant may be required behind the pressure plate to prevent water entry to the cavity wall if the curtain wall framing sits on a knee wall. Refer to Details on Drawings.

3.4 LOCATIONS (AS APPLICABLE)

.1 Seal the junction of the following **Interior Materials:**

- .1 Joint between full height masonry partitions and structure above.
- .2 Hollow Metal Frames with adjacent materials - both sides.
- .3 Provide silicone sealant at splash juncture of vanity and wall and at juncture of mirror and wall and at juncture of other counters and walls.
- .4 All chair rails and wall tiles
- .5 At base of toilets and floor.
- .6 At perimeter of shower and tub enclosure and wall finish.
- .7 Concrete floor slab control joints.
- .8 Around all window frames.
- .9 All wall/floor penetrations **fire stopped where required.**
- .10 Joints between pre-cast concrete slabs and perimeter.

.2 Seal the junction of the following **Exterior Materials:**

- .1 Exterior pressed steel frames with adjacent materials.
- .2 Seal all junctures between structural members and adjacent materials where space is less than 1" (25 mm).
- .3 Sidewalk control joints.
- .4 Masonry control joints.
- .5 All doors, windows, patio door frames and sills.
- .6 Under thresholds.
- .7 All wall penetrations.
- .8 Saw cut control joints in exterior concrete slabs.
- .9 At junction of concrete slabs/walks to building foundation.
- .10 Roof flashings, penetrations and joints.

3.4 **LOCATIONS (AS APPLICABLE)**

- .11 Where wood (including capped framing) and brick meet.
- .12 Where wood (including capped framing) and concrete meet.
- .13 Where aluminum and brick meet.
- .14 Recessed mortar joint in stone sills (one joint when window over 1.2 m wide).
- .15 To underside of balcony slab where concrete meets masonry wall.
- .16 Perimeter of all mechanical vents and louvers, electrical outlets, fixtures, hose bibs and exterior wall penetrations (including all PTAC sleeves).
- .17 All Exterior Precast Panel Joints. **Note:** Application is a three stage joint system, Exterior, Mid Panel & Interior and a two stage joint system for grouted panel bearing joints.
- .18 Around Curtain Wall System and components note: **Seal inside and outside of frame**, not at exterior location of pressure cap plate. A third line of sealant may be required behind the pressure plate to prevent water entry to the cavity wall if the curtain wall framing sits on a knee wall. Refer to Details on Drawings.

- .3 Provide sealant elsewhere as noted in drawings as caulking and/or sealant and not specifically noted to be provided by other Sections.

3.5 **TESTING AND CLEANUP**

- .1 Test all exterior joints with hose in presence of Architect if so requested. Clean adjacent and affected surfaces.

END OF SECTION

DIVISION 08 - OPENINGS

PART 1 – GENERAL

1.0 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.
- .2 Conform to Canadian Manufacturing Specifications for Steel Doors and Frames published by Canadian Steel Door and Frame Manufacturers Association, except as specified therein.

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Installation of Hollow Metal Doors Section 06 10 00
- .2 Door Hardware Section 08 71 00
- .3 Power Door Operators Section 08 71 13
- .4 Gypsum Board Assemblies Section 09 21 16
- .5 Painting Section 09 91 00
- .6 Door Louvers Section 23 37 00

1.2 SUBMITTALS

- .1 Submit Shop Drawings in accordance with Section 01 33 00 "Submittals Procedures".
- .2 Clearly indicate each type of door, frame, material, gauge, mortises, reinforcements and anchors.
- .3 Do not fabricate until Shop Drawings have been reviewed by the Consultant.

1.3 MEASUREMENTS

- .1 Where work is to be built into existing openings, measurements shall be taken on site at the actual location of the work. Fabricate the work to job measurements.

1.4 WARRANTY

- .1 Provide a warranty in accordance with the General Conditions, but for a period of five (5) years for all doors and ten (10) years for all frames.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- .1 Baron Metal, Steel Doors and Frames ASSA ABLOY
- .2 Allsteel Fabrication
- .3 Fleming Steel Products ASA ABLOY
- .4 Daybar

2.1 MATERIALS

- .1 Steel Sheet - Commercial grade hot rolled steel to ASTM-A526-71 with "wiped coated" zinc finish to ASTM-A525-71, 0.25 oz. per sq.ft.
- .2 Reinforcing Steel - To CAN/CSA-G40.21 Type 33W hot dip galvanized with minimum zinc coating G90 to CAN/CSA G.164.
- .3 Insulation - Loose fibreglass, minimum density 1.5 lbs./cu.ft. (24 kg per cu. m.).
- .4 Door Bumpers – Resilient Rubber.
- .5 Thermal break – rigid neoprene or polyvinyl chloride (PVC) extrusion.
- .6 Primer - Zinc rich to CGSB-1-GP.
- .7 Core Material - Resin impregnated, rot resistant kraft honeycomb for interior doors, rigid polyurethane board stock foam insulation for exterior doors to CGSB-41-GP-14a. Fire rated doors to conform to U.L.C. requirements.
- .8 Fabricate doors, frames and all internal reinforcements of hot dip galvanized steel to ASTN -97, minimum coating designation ZF 75 (A25).

2.2 METAL THICKNESS

.1	Building Doors & Frames	Gauge	Inches	mm
.1	Frames and Framing	16	.060	1.5
.2	Doors			
	§ Surface Sheets	18	.048	1.2
	§ Top and Bottom end channels	18	.048	1.2

2.2 METAL THICKNESS (CONT'D)

.3 Accessories

§ Lock and strike reinforcement	16	.060	1.5
§ Hinge reinforcement	10	.135	3.4
§ Flush bolt reinforcement	16	.060	1.5
§ Reinforcement for surface applied hardware	12	.105	2.7
§ Mortar guard boxes	22	.030	0.76
§ Jamb floor anchors	16	.060	1.5
§ Jamb spreaders	18	.048	1.2

.4 Anchors

§ "T" - Strap Type	16	.060	1.5
§ "L" - Strap Type	18	.048	1.2
§ Stud Type	18	.048	1.2

5 Glazing Stops	20	.040	1.0
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PART 3 - EXECUTION

3.1 FABRICATION OF WELDED FRAMES

- .1 Construct framing in accordance with details and reviewed shop drawings.
- .2 Fabricate fire rated frames to CAN/ULC – S105.
- .3 Provide fire labels to CSDMA Canadian Fire Labelling Guide for Commercial Steel Door & Frame Products.
- .4 Mortise, reinforce, drill and tap frames and reinforcement to receive hardware using templates provided.
- .5 Install 3 bumpers on strike jamb of frame for each single door and two bumpers at head of double door frames.
- .6 Protect strike, hinge and overhead concealed door closer reinforcement completely by guard boxes welded to frame.
- .7 Weld in 2 channel spreaders per frame, to ensure proper frame alignment.
- .8 Where frames terminate at finished floor, provide floor plates for anchorage to structural slab.
- .9 Cut mitre accurately and weld continuously on inside of frame profile.

3.1 **FABRICATION OF WELDED FRAMES (CONT'D)**

- .10 Grind welded corners to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.

 NOTE: Neatly mitred and reinforced corners may be accepted subject to Architect's approval of sample prior to installation.
- .11 Fill surface depressions and butted joints with metallic paste and sand to a uniform smooth finish.
- .12 Provide 3 T strap adjustable jamb anchors per jamb for frames up to 2133 mm (7'-0") high to be installed in masonry walls. Provide additional anchor for each 600 mm (24") over 2133 mm (7'-0") high.
- .13 Provide steel anchors of suitable design for frames to be installed in stud partitions and for frames adjacent to pre-cast concrete. Securely wedge or weld anchor inside each jamb as follows:
 - .1 Frames up to 2133 mm (7'-0") high - 4 anchors per jamb.
- .14 Exterior Hollow Metal Framers for Door (Thermal Broken Frame) to be 1.5 mm (16 ga) heavy galvanized, secured together by an extruded poly vinyl chloride thermal break without the use of any fastening devices by S.W Fleming or approved equal. Thermal frame shall be complete with anchors and accessories as specified for frames and framing members. Exterior hollow metal frames to be packed with injected foam insulation. Fabricate frames with sufficient rigidity to effectively receive the forced entry. Provide minimum 2.7 mm (12 ga) continuous hinge reinforcement.
- .15 Insulate frames for exterior doors with spray foam insulation for full height and depth.
- .16 Prepare interior door frames for single stud door silencers, as follows:
 - a. Single Door Frames: Three on strike jamb.
 - b. Double Egress Door Frames: Two on head for each door leaf.
- .17 All exterior window and door frames are to be thermally broken.
- .18 Guard box to accept 25 mm (1") throw or deadbolt.
- .19 Fabricate frames and screens to accommodate scheduled glazing. Secure glazing stops to frames with counter sunk oval head sheet metal screws.
- .20 Prepare frames for scheduled door hardware and building security system devices. Blank, mortise, reinforce, drill and tap components.

3.1 FABRICATION OF WELDED FRAMES (CONT'D)

- .21 Thermally-Broken Frames:
 - .1 Provide wall and floor anchors suitable for installation, purpose made not to permit thermal conductivity.
 - .2 Do not fix sections together with screws, grommets or other thermally conductive fastening device.
 - .3 Provide full frame width drip caps.
 - .4 Conform to accepted Shop Drawings.

3.2 FABRICATION OF DOORS

- .1 Construct doors in accordance with details and approved shop drawings, fully welded construction with no visible seams or joints on faces or vertical edges.
- .2 Assemble doors with full sheets laminated under pressure to honeycomb core.
- .3 Reinforce and frame openings required for glazing. Provide glazing stops with countersunk flat head screws.
- .4 Interior Hollow Metal Doors: D20 Series. Each face formed from one sheet 0.9mm (20 ga) steel. Lock seam and seal longitudinal joints. Core to be honeycomb laminated under pressure to face sheets and to fill core space completely. Close top and bottom with 1.2 mm (18 ga) channels, spot welded.
- .5 Exterior Hollow Metal Doors: D18 Series. Each face formed from one sheet 1.2 mm (18 ga) steel. Lock seam and seal longitudinal joints, tack weld lockseams 15 mm o.c.. fill flush, grind smooth. Core to be polyisocynurate RSI 2.1 (R12) board, laminated under pressure to face sheets and to fill core space completely. Provide minimum 2.7 mm (12 ga) continuous hinge reinforcement. Close top and bottom with 1.2 mm (18 ga) channels, spot welded. Close top of out swing doors with sealed watertight cap.
- .6 Mortise, reinforce, tap and drill doors and reinforcement to receive hardware using templates provided by hardware supplier. Refer to Finishing Hardware Schedule for mounting heights.
- .7 Provide sound deadening and thermal insulation material to fill all voids in doors.
- .8 Assemble components by means of spot or arc welding.
- .9 Fit exterior doors and all interior stair doors with flush steel channel caps at top of door and seal against moisture penetration.
- .10 Provide condensate weep holes at bottom of exterior doors.

3.3 SHOP PAINTING

- .1 Wipe coated steel frame: touch up areas where wipe coating has been removed using zinc rich paint.
- .2 Wipe coated steel doors: touch up areas where wipe coating has been removed, using zinc rich paint, and apply one full coat of rust inhibitive primer to CGSB-1-GP-105M.
- .3 Uncoated Steel - Apply one rust inhibitive primer conforming to GCSB-1-GP-105M.

3.4 INSTALLATION

- .1 Supply hollow metal frames to masonry or drywall Trades in good time for building in so that building program is not delayed.
- .2 Co-operate with all Trades as required for the execution of the complete work.
- .3 Cut openings for mechanical supplied louvres, center in bottom of door and instal. Refer to door schedule.

3.5 FIRE DOORS AND FRAMES

- .1 Supply fire doors and frames assemblies to meet fire resistance time rating called for and carry the appropriate U.L.C. Label.
- .2 Fire doors and frames shall be installed as tested and as approved by a nationally recognized agency having a factory inspection service.
- .3 Locate label on frame on jamb midway between top hinge and head of door frame. Provide labels on door edge, hinge side.
- .4 Provide label on hanging edge of door near frame.

END OF SECTION

DIVISION 08 - OPENINGS

PART 1 – GENERAL

1.0 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Allowances Section 01 21 00
- .2 Finish Carpentry Section 06 20 00
- .3 Hollow Metal Doors & Frames Section 08 11 13
- .4 Wood Doors Section 08 14 00

1.2 WORK INCLUDED

- .1 This section includes the supply of finishing hardware including but not limited to the following:
 - .1 Interior door hardware, Electronic key Fobs, privacy, dummy, passage sets, lock sets, exit devices, stops, closers, kick plates, dead bolts, cane bolts, push, pull plates, hinges etc. (Labelled where required).
 - .2 All other General Building hardware including kick plates and thresholds, weather stripping, stops, electric strikes, Electronic Key Fobs, lockset, exit devices, electromagnetic locks, hinges and closers (labelled where required).

1.3 REFERENCES

- .1 Hardware for labelled fire doors.
- .2 N.F.P.A..80 Fire Doors and windows.
- .3 N.F.P.A..101 Life Safety Code
- .4 N.F.P.A..105 Installation of Smoke Control Door Assemblies
- .5 Ontario Building Code

1.4 **PRODUCT DELIVERY, STORAGE AND HANDLING**

- .1 Delivery - supply hardware as and when required for each opening. Package hardware separately for each opening in a package which contains all the hardware for that opening and bears the number of the opening. Supply hardware to those who are to install it, complete with keys, templates and installation instructions together with all required screws, expansion shields, anchors and other related accessories for satisfactory attaching/installing hardware.
- .2 Hardware supplier to co-ordinate delivery of hardware to the site or to the appropriate parties.
- .3 Prior to delivery to the job site, a dry, secure room is to be provided for storage of finishing hardware.

1.6 **SUBMITTALS**

- .1 Submit product data, shop drawings and samples in compliance with Section 01 33 00.
- .2 Prepare a detailed finishing hardware schedule itemizing each opening.
List all doors by number including size, hand, swing and any and all relevant details affecting the application of finishing hardware.
- .3 Submit catalogue cuts of all proposed hardware.
- .4 Submit samples for approval as required.
- .5 Submit template information to the General Contractor for preparation of product in related sections and installation of finishing hardware.
- .6 Prepare for review a detailed key schedule.
- .7 Submit wiring diagrams and a description of operation for electrified hardware systems specified.
- .8 Upon job completion, submit to the Owners two "Owners Operation and Maintenance Manuals containing the following information:
 - .1 Maintenance instructions for each items of hardware.
 - .2 Final Hardware Schedule.
 - .3 Final Keying Schedule.

1.6 **GENERAL REQUIREMENTS**

- .1 Comply with all applicable ANSI/BHMA standards and requirements of Authorities.

1.6 **GENERAL REQUIREMENTS (CONT'D)**

- .2 Grade of hardware to be: heavy duty in accordance with WRDSB Standards.
- .3 All door closers shall have back checking features and shall be of proper size to operate door efficiently.
- .4 Confirm all kick plate and threshold sizes before ordering them.
- .5 Use no wall mounted door stops on drywall.
- .6 Exposed screws for installing hardware shall have Phillips or Robertson heads.
- .7 Rim panic device strikes shall be mortise type application. Equip panic devices with sex bolts.
- .8 Confirm degree of swing for door holders, closers, etc.
- .9 All locksets and passage sets to be lever handles.
- .10 A hardware schedule is to be provided by a Certified Hardware Consultant for submission and review.
- .11 ***Refer to Hardware Schedule contained in the Schedules on Drawings.** This schedule is to be used as a guide to represent the minimum standard and quantity of hardware required. It is in no way to represent the exclusion of any required hardware as part of the contract.
- .12 ***G.C. to have a door hardware schedule prepared in accordance with the guidelines in this specification section and School Board Standards for review by the Architect and School Board Representative.**

1.7 **KEYING**

- .1 All locks to be keyed using blanks.
- .2 All locks shall be keyed as required to Master Key system as later described by the Owner, for all doors.
- .3 Quantity of keys per keying group to be determined later by Owner.

1.8 **FIELD QUALITY CONTROL**

- .1 Check all hardware when it has been installed and notify Architect of any cases where it has been improperly installed, is defective or is not specified.
- .2 The door closer supplier shall review installation and operation of all door closers on site and issue a written report to the Architect.

1.9 **WARRANTY**

- .1 All hardware is to be guaranteed for an extended period of five (5) years.
- .2 Provide a minimum ten (10) year warranty for door closers.
- .3 Warranty to commence from date of Substantial Completion.

1.10 **MAINTENANCE**

- .1 Provide three wrenches for door closer adjustment.

PART 2 - PRODUCTS

2.1 **MATERIALS**

- .1 All hardware shall be supplied complete with the necessary screw, bolts and other fasteners so as to anchor in position all finishing hardware to the Consultants approval. Exposed fasteners to be finished to match hardware. When a door pull is utilized on one side of the door and a push plate on the other, the plate is to be applied so as to conceal the door pull fasteners.

2.2 **DOOR HARDWARE**

- .1 Bull Hinges: To ANSI/BHMA A156.1, Grade 1.
- .2 Continuous Hinges: To ANSI/BHMA A156.26.
- .3 Self-Closing Hinges and Pivots: To ANSI/BHMA A156.17.
- .4 Locksets and Latchsets: To ANSI/BHMA A156.2, Grade 1.
- .5 Exit Devices: To ANSI/BHMA A156.3.
- .6 Closers: To ANSI/BHMA A156.4; surface-mounted type.
- .7 Cylinders and Input Devices: To ANSI/BHMA A156.5, Operational Class, Grade 1.
- .8 Overhead Door Stops: To ANSI/BHMA A156.8.
- .9 Interconnected Locks and Latches: To ANSI/BHMA A156.12, Grade 1.
- .10 Mortise Locks: To ANSI/BHMA A156.13. Operational Class, Grade 1.
- .11 Auxiliary Locks: To ANSI/BHMA A156.36, Grade 1.
- .12 Multipoint Locks: To ANSI/BHMA A 156.13, Operational Class 1.

2.2 **DOOR HARDWARE (CONT'D)**

- .13 Sliding and Folding Door Hardware: To ANSI/BHMA A156.14.
- .14 Powered Release Devices: To ANSI/BHMA A156.15.
- .15 Powered Door Locks: To ANSI/BHMA A 156.23; electromagnetic type.
- .16 Powered Locking Devices: To ANSI/BHMA A156.25.
- .17 Powered Strikes and Actuators: To ANSI/BHMA A156.31.
- .18 Delayed Egress Locks: To ANSI/BHMA A156.24.
- .19 Alarms for Exit Devices: To ANSI/BMHA A156.29.
- .20 Door Trim: Protection plates, push plates, door pulls, push bars, and pull bars; to ANSI/BHMA 156.6.
- .21 Thresholds: To ANSI/BHMA A156.21.
- .22 Auxiliary Hardware: To ANSI/BHMA A156.16.
- .23 Door Gaskets and Weather Stripping: To ANSI/BHMA A156.21.

2.3 **FINISHES**

- .1 15/652 SATIN NICKEL
- 28 ANODIZED ALUMINUM
- 26D/626 SATIN CHROME
- 32D/630 SATIN STAINLESS STEEL
- 689 ALUMINUM PAINTED
- AL ALUMINUM
- PT PRIMED FOR PAINT

PART 3 - EXECUTION

3.1 **EXAMINATION**

- 1. Size and condition of opening shall be verified as to door frames being plumb and of correct tolerance to receive doors and hardware. [General Contractor]

3.2 **INSTALLATION**

- .1 Review proper mounting heights with the Architect and/or Owner.
- .2 Standard mounting heights (unless otherwise noted):

3.2 **INSTALLATION (CONT'D)**

- | | | |
|----|---------------|--|
| A. | Locks/Latches | 40-5/16" to centre line of strike from finished floor. |
| B. | Deadlocks | 48" to centre line of strike from finished floor. |
| C. | Exit Devices | 40-5/16" to centre line of strike from finished floor. |
| D. | Door Pulls | 42" to centre line of pull from finished floor. |
| E. | Push Plate | 45" to centre line of Push Plate from finished floor. |

The above noted mounting heights are a recommended standard and may vary under special applications and conditions.

3.3 **ADJUSTING AND CLEANING**

1. Upon final completion the hardware is to be left clean and free from defect. Hardware found defective is to be repaired or replaced.
2. All door closers are to be inspected for proper installation and adjustment. Provide a written report from the Manufacturer's Representative confirming proper door closer installation and submit the report to the Architect.

END OF SECTION

DIVISION 08 - OPENINGS

PART 1 - GENERAL

1.1 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.2 SUMMARY

- .1 This Section includes the following types of power door operators:
1. Exterior and interior, power door operators, low energy, with visible mounting.
 2. Automatic door operators shall be configured for doors as follows:
 1. Simultaneous pairs, out swing, in swing, or double egress.
 2. Simultaneous pairs, with single operator, out swing or in swing.
 3. Single doors, out swing or in swing.
 4. Refer to Plans and Schedules for locations.
- .2 Related Sections:
1. Door Hardware Section 08 71 00
 2. Electrical Specification: electrical connections including conduit and wiring for power door operators & push button controls. Division 26

1.3 REFERENCES

- .1 General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
- .2 UL 325 – Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.
- .3 ANSI/BHMA A156.19: Standard for Power Assist and Low Energy Power Operated Doors.
- .4 ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.3 REFERENCES (CONT'D)

- .5 ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- .6 BHMA A156.10 - Standard for Power Operated Pedestrian Doors.
- .7 NFPA 101 – Life Safety Code.
- .8 NFPA 70 – National Electric Code.
- .9 UBC: Uniform Building Code.
- .10 ISO 9001 - Standard for Manufacturing Quality Management Systems
- .11 Metal Finishes Manual for Architectural and Metal Products.
- .12 AAMA 607.1 - Clear Anodic Finishes for Architectural Aluminum.
- .13 AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.
- .14 CSA approved in compliance with the Provincial Building Code.

1.4 DEFINITIONS

- .1 Activation Device: Device that, when actuated, sends an electrical signal to the door operator to open the door.

1.5 PERFORMANCE REQUIREMENTS

- .1 Provide power door operators capable of withstanding structural loads and thermal movements based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.
- .2 Operating Range: Minus 30 deg F (29 deg C) to 130 deg F (54 deg C).
- .3 Opening-Force Requirements for Egress Doors: In the event power failure to the operator, swinging automatic entrance doors shall open with a manual force, not to exceed 30 lbf (133 N) applied at 1" (25 mm) from the latch edge of the door.
- .4 Break Away Requirements: Power door operators provided with a breakaway device shall require no more than 50 lbf (222 N) applied at 1" (25 mm) from the latch edge of the door.
- .5 Door Energy: The kinetic energy of a door in motion shall not exceed 1.25 lbf-ft (1.69 Nm).
- .6 Closing Time:
 - .1 Doors shall be field adjusted to close from 90 degrees to 10 degrees in 3 seconds or longer.

1.5 **PERFORMANCE REQUIREMENTS (CONT'D)**

- .2 Doors shall be field adjusted to close from 10 degrees to fully close in not less than 1.5 seconds.

1.6 **SUBMITTALS**

- .1 Submit listed submittals in accordance with Conditions of the Contract and Section 01 33 00 submittal procedures.
- .2 Shop Drawings: Include plans, elevations, sections, details, hardware mounting heights, and attachments to other work. Indicate wiring for electrical supply.
- .3 Color Samples for selection of factory-applied color finishes.
- .4 Closeout Submittals: Provide the following with project close-out documents.
 - .1 Owner's Manual.
 - .2 Warranties.

1.7 **QUALITY ASSURANCE**

- .1 Installer Qualifications: Manufacturer's authorized representative who is trained for installation and maintenance of units required for this Project.
- .2 Manufacturer Qualifications: A qualified manufacturer with a manufacturing facility certified under ISO 9001 and with company certificate issued by AAADM.
- .3 Certifications: Power door operators shall be certified by the manufacturer to meet performance design criteria in accordance with the following standards:
 - .1 ANSI A156.10.
 - .2 NFPA 101.
 - .3 UL 325 Listed (Fire Door Operator)
 - .4 ICBO (UBC Standard 10-1).
 - .5 CSA approved in compliance with the provincial code.
- .4 Source Limitations: Obtain power door operators through one source from a single manufacturer.
- .5 Product Options: Drawings indicate sizes, profiles, and dimensional requirements of automatic entrance door assemblies and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1.7 **QUALITY ASSURANCE (CONT'D)**

- .6 Power Operated Door Standard: ANSI/BHMA A156.19.
- .7 Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- .8 Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for swinging automatic entrance doors serving as a required means of egress.

1.8 **PROJECT CONDITIONS**

- .1 Field Measurements: General Contractor shall verify openings to receive power door operators by field measurements before fabrication and indicate measurements on Shop Drawings.
- .2 Mounting Surfaces: General Contractor shall verify all surfaces to be plumb, straight and secure; substrates to be of proper dimension and material.
- .3 Other trades: General Contractor Advise of any inadequate conditions or equipment.

1.9 **COORDINATION**

- .1 Templates: Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing power door operators to comply with indicated requirements.
- .2 Electrical System Roughing-in: Coordinate layout and installation of power door operators with connections to power supplies.
- .3 System Integration: Integrate power door operators with other systems as required for a complete working installation.
 - .1 Provide electrical interface control capability for card reader or keypad operation of power door operators on doors with electric locking.
 - .2 Where required for proper operation, provide a time delay relay to signal power door operator to activate only after electric lock system is released.

1.10 **WARRANTY**

- .1 Power door operators shall be free of defects in material and workmanship for a period of ten (10) years from the date of Substantial Performance.
- .2 During the warranty period the Owner shall engage a factory-trained technician to perform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and a completed inspection form shall be submitted to the Owner.

1.10 **WARRANTY (CONT'D)**

- .3 During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal working hours.

PART 2 - PRODUCTS

2.1 **POWER DOOR OPERATORS**

- .1 Manufacturer:
 - .1 Electra 150 By "Besam", ASSA ABLOY.
 - .2 Enex door (West)
 - .3 Approved Alternate.

2.2 **MATERIALS**

- .1 Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - .1 Headers: 6063-T6.
 - .2 Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - .3 Sheet and Plate: ASTM B 209.
- .2 Sealants and Joint Fillers: Refer to Division 07 Section "Joint Sealants".

2.3 **COMPONENTS**

- .1 Header Case: Header case shall not exceed 6-1/8 inch x 4 inch (156 mm x 102 mm) in rectangular section and shall be fabricated from extruded aluminum with structurally integrated end caps, designed to conceal door operators and controls. The operator shall be sealed against dust, dirt, and corrosion within the header case. Access to the operator and electronic control box shall be provided by a full-length removable cover, edge rabbeted to the header to ensure a flush fit. Removable cover shall be secured to prevent unauthorized access.
- .2 Door Arms and Linkage Assembly: A combination of door arms and linkage shall provide positive control of door through entire swing; units shall permit use of butt hung, center pivot, and offset pivot-hung doors.
- .3 Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
- .4 Signage: Provide signage in accordance with ANSI/BHMA A156.19.

2.4 SWINGING DOOR OPERATORS

- .1 Provide door operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.
- .2 Operators: Self-contained units powered by a minimum fractional horsepower, permanent-magnet AC or DC motors.
- .3 Electro-mechanical Operator: Transmit power from operator to door through reduction gear train, splined spindle, door arm, and linkage assembly. Drive train shall have positive constant engagement.
 - .1 Operation: Power opening and spring closing.
 - .2 Mounting: Visible
- .4 Features:
 - .1 Adjustable opening, open check, and closing speeds.
 - .2 Adjustable opening force.
 - .3 Adjustable hold-open time between 0 and 30 seconds.
 - .4 Reverse on obstruction.
- .5 Closing Operation: The operator shall close the door by spring energy employing the motor, as a dynamic brake to provide closing speed control. The closing spring shall be adjustable for positive closing action at a low material stress level for long spring life.
- .6 Manual Use: The operator shall function as a manual door closer in the direction of swing with or without electrical power. The operator shall deliver an even, consistent open force across the entire transition from door fully closed to door fully open.
- .7 Electrical service to door operators shall be provided under Division 16 Electrical. Minimum service to be 120 VAC, 10 amps for doors with operators in pairs, 5 amps for single doors.

2.5 ELECTRICAL CONTROLS

- .1 Electrical Control System: Electrical control system shall include a solid-state controller with quick connect plugs.
- .2 Controller Protection: The controller shall incorporate the following features to ensure trouble free operation:
 - .1 Fuse Protection.

2.5 **ELECTRICAL CONTROLS (CONT'D)**

- .2 Electronic Surge Protection.
- .3 Internal Power Supply Protection.
- .3 Program Dip Switches: The controller shall have program dip switches to allow selection or change at the following parameters: carpet or timer logic, single or dual door, and activation options.

2.6 **ACTIVATION DEVICES**

- .1 Push Plates: Provide 5 7/8 inch (150 mm) round SPDT push plates with UL listed switch. Face plates and mounting studs shall be stainless steel. Face plates shall be engraved with the international symbol for accessibility and "Push To Open".
- .2 Push Buttons to be as per FADM (Local Authority Facility Accessibility Design Manual):
 - .1 Push Buttons to be installed, so the centre located 1000-1100 mm (39- 3/8" – 43 1/4') from the floor;
 - .2 Incorporate controls that are clearly visible which are at least 150 mm (5-7/8") in diameter;
 - .3 Incorporate the International symbol of Access for Persons with Disabilities.
- .3 Interior and exterior push plates shall be wall mounted in single or double gang electrical boxes and hardwired to door operator controls.

2.7 **ALUMINUM FINISHES**

- .1 Comply with NAAMM Metal Finishes Manual for Architectural and Metal Products for recommendations for applying and designing finishes. Finish designations prefixed by AA comply with system established by Aluminum Association for designing finishes.
- .2 Class II, Clear Anodic Finish: AA-M10C22A31 Mechanical Finish: as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.40 mils minimum complying with AAMA 611, and the following:
 - .1 AAMA 607.1
 - .2 Applicator must be fully compliant with all applicable environmental regulations and permits, including wastewater and heavy metal discharge.

PART 3 - EXECUTION

3.1 INSPECTION

- .1 Examine conditions, with Installer present, for compliance with requirements for installation tolerances, header support, and other conditions affecting performance of swinging automatic entrance doors. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- .1 Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints.
- .2 Mounting: Install power door operators/headers plumb and true in alignment with established lines and grades. Anchor securely in place.
 - .1 Install surface-mounted hardware using concealed fasteners to greatest extent possible.
 - .2 Set headers, arms and linkages level and true to location with anchorage for permanent support.
- .3 Door Operators: Connect door operators to electrical power distribution system as specified in Division 16 Sections.
- .4 Sealants: Comply with requirements specified in Division 7 Section "Joint Sealants" to provide weather tight installation.

3.3 FIELD QUALITY CONTROL

- .1 Testing Services: Factory Trained Installer shall test and inspect each swinging automatic entrance door to determine compliance of installed systems with applicable ANSI standards.

3.4 ADJUSTING

- .1 Adjust door operators, controls, and hardware for smooth and safe operation, for weather-tight closure, and complying with requirements in ANSI A156 by AAADM Certified Technician.

3.5 CLEANING AND PROTECTION

- .1 Clean surfaces promptly after installation. Remove excess sealant compounds, dirt, and other substances. Repair damaged finish to match original finish.

END OF SECTION

DIVISION 08 - OPENINGS

PART 1 - GENERAL

1.1 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- .1 Glass and Glazing of:
 - .1 Hollow Metal Doors and Frames Section 08 11 13

1.3 REFERENCES

- .1 GANA, Glazing Manual and Glazing Sealing Systems Manual.
- .2 CAN/CGSB 12.1, Tempered or Laminated Safety Glass.
- .3 CAN/CGSB-12.3, Flat, Clear Float Glass.
- .4 CAN/CGSB-12.6, Transparent (One-Way) Mirrors.
- .5 CAN/CGSB 12.8, Insulating Glass Units.
- .6 CAN/CGSB-12.9, Glass, Spandrel.

1.4 SUBMISSIONS SAMPLES

- .1 Submit duplicate 300 x 300 mm (12"x 12") size samples of types of glazing and sealant material.
- .2 Submit samples as per Section 01 33 00 "Submittals Procedures".
- .3 Submit 600 mm x 1200 mm (24" x 48") printed film sample for approval.

1.5 WARRANTY

- .1 Warrant work under this Section against defects and deficiencies for a period of ten (10) years from date work is certified as Substantially Complete in accordance with the General Conditions of the Contract as amended by the Supplementary Conditions.
- .2 Promptly correct defects and deficiencies which become apparent within warranty period, including make good of work damaged by this work satisfactory to the Architect and at no expense to the Owner.

1.5 **WARRANTY (CONT'D)**

- .3 Defects shall include but shall not be limited to failure to seal of enclosed air space and deposits on inner faces of glass units, and delamination, discolouring or deposits on inner surfaces of laminated safety glass.

PART 2 – PRODUCTS

2.1 **ACCEPTABLE MANUFACTURERS**

- .1 PPG Industries
- .2 Guardian Glass
- .3 A.G.F. Glass
- .4 Approved Alternate.

2.2 **GLASS MATERIALS**

- .1 Where thickness of glazing is not specified, conform to requirements of Ontario Building Code.
- .2 Polished Plate or Float Glass: to CAN/ CGSB-12.3, 6 mm minimum thickness. Clear or tinted as indicated. Heat strengthened as required. As manufactured by Pittsburgh Plate Glass Co. (PPG)
- .3 Tempered (Laminated) Safety Glass: to CAN/ CGSB-12.1, 6 mm thick unless otherwise noted. 12 mm thick where vertical butt joints are used without mullion/frame. "Herculite" as manufactured by Pittsburgh Glass Co.
- .4 Low E Glass: CAN/CGSB 2, heat strengthened. ES72N by AFGD or approved alternate with manufacturer's 10 year warranty on the coating. Glass to meet minimum 2013 ANSI/ASHRAE 90.1 and Chapter 2 of the O.B.C.
- .5 Insulated Glass Unit (Sealed Unit): Total thickness 25 mm (1"): with warm edge spacer bar.
 - .1 Outer Pane: Clear float 6 mm (1/4") thick, Low-E coated on surface #2.
 - .2 Inner Pane: Clear float 6 mm (1/4") thick.
 - .3 Interpane Space: 13 mm (1/2") air space, Argon filled gas. Min.90%.
 - .4 Glass to meet minimum 2013 ANSI/Ashrae 90.1 and Chapter 2 of OBC requirements.
- .6 Insulated Glass Unit (Sealed Unit): Type "Tempered" Total thickness 25 mm (1"): with warm edge spacer bar.
 - .1 Outer Pane: Clear Tempered Glass 6 mm (1/4") thick, Low-E coated on surface #2.

2.2 **GLASS MATERIALS (CONT'D)**

- .2 Inner Pane: Clear Tempered Glass 6 mm (1/4") thick.
- .3 Interpane Space: 13 mm (1/2") air space, Argon filled gas. Mi. 90%.
- .4 Glass to meet minimum 2013 ANSI/Ashrae 90.1 and Chapter 2 of OBC requirements.
- .7 Insulated Tempered Glass: Provide insulated tempered glass in vestibule, doors and adjacent to doors.
- .8 Spandrel glass: CAN/CGSB-12.9, 6 mm thick unless otherwise indicated, with water-based silicone emulsion coating applied to backside, 'Opaci-Coat 300' by ICD High Performance or approved alternative.
- .9 Coloured Glass: GlasPro – CG coloured glass, from standard palette of colours: Sunflower, Lapis and Light Grey Ideascapes, Solarban 70XL by PPG/Vitro.
- .10 Fire Rated Glazing to be 5 mm (min.) thick "FireLite® NT" safety impact grade glass, conforming to CAN/CGSB – 12.11, ASTM E2010, CAN 4 S-104 and CAN 4 S-106 and thickness required by Manufacturer for fire rating required in the assembly in which the glazing is installed.
- .11 Where edges of glass are exposed, they shall be ground and polished.
- .12 Tinted Glass: For exterior glazing, tint colouring to be Bronze or Solar Grey. Refer to elevations for locations.
- .13 For locations of glazing and colours refer to Elevation Drawings and Door Frame Schedule.

2.3 **GLAZING AND SEALING COMPOUND MATERIALS**

- .1 Only compounds listed on the CGSB Qualified Products List are acceptable for use on this project.
- .2 Glazing compound: oil type, to CGSB 19-GP-2 type 1, to selected colour.
- .3 Sealant compound: multi-component, chemical curing to CAN/ CGSB -19.24 type 2, class A, of selected colour.
- .4 Non-shrink Grout: M-Bed by Sternson Ltd., or V-3 Pre-Mixed Construction Grout by W.R. Meadows of Canada, Ltd. or Masterflow 713 by Master Builders Co. Ltd., or Tartan No-Iron Grout by Webster & Sons Ltd., or Set Non-Shrink Grout by Set Products (Canada) Ltd., or In-Pakt by C.C. Chemicals Ltd.
- .5 Glazing tape: preformed butyl tape, 10-15 durometer hardness, paper released as manufactured by Tremco Manufacturing Co (Canada) Ltd., or 3 M ribbon sealer butyl tape manufactured by Minnesota Mining and Manufacturing Co. Ltd.

2.3 **GLAZING AND SEALING COMPOUND MATERIALS (CONT'D)**

- .6 Setting blocks: neoprene, Shore "A" durometer hardness 80-90, 100 mm long, wide enough to extend from stop to opposite glass face, of thickness suitable to provide adequate glazing "bite".
- .7 Spacer shims: neoprene, Shore "A" durometer hardness 80-90, 75 mm long x 2.4 mm thick x 9 mm high, or as indicated.
- .8 Glazing splines: neoprene manufacturer's standard dry glazing splines to suite aluminum extrusions, to selected colour.
- .9 Lock-strip gaskets: black neoprene to ASTM C542-76, type and style as recommended by frame manufacturer.
- .10 Primer-sealers and cleaners: to glass manufacturer's standard.
- .11 Provide decals, as shown, 100 mm (4") in diameter, vinyl, and with Applicable Building Code symbol showing both sides.

PART 3 - EXECUTION

3.1 **PREPARATION**

- .1 Openings shall be free from moisture, frost, rust, dirt and foreign matter.
- .2 Clean surfaces 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.

3.2 **INSTALLATION**

- .1 Conform to the recommendation of the Glazing Manual, Float Glass Marketing Association, revised Edition. Insulating Glass Manual Association of Canada.
- .2 Glaze hollow metal doors, interior windows and screens and wood doors scheduled to be glazed.
- .3 Protect glass edges from damage during handling and installation. Remove damaged glass Products from Place of Work and dispose of in accordance with the authorities having jurisdiction. Damaged glass is defined as glass with edge damage or other imperfections that, when installed, could weaken the glass and impair performance and appearance.
- .4 Place setting blocks, to manufacturer's instructions.
- .5 Install glass, rest on setting blocks, ensure full contact and adhesion at perimeter.
- .6 Insert spacer shims to centre glass in space. Place shims at 600 mm (24") o.c. and keep 6 mm (1/4") below sightline.

3.2 **INSTALLATION (CONT'D)**

- .7 Provide edge blocking necessary to prevent glass lites from moving sideways in glazing channel, in accordance with GANA Glazing Manual.
- .8 Tape Glazing: Position tapes on fixed stops so that, when compressed by glass their exposed edges are flush with or protrude slightly above sight line of stops. Install tapes continuously, but not necessarily in on continuous length. Do not stretch tapes to make them fit the opening.
 - .1 Cover the vertical framing joints by applying tapes first to heads and sills, and then to jambs.
 - .2 Cover horizontal framing joints by applying tapes first to jambs, and then to heads and sills.
 - .3 Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant.
 - .4 Center glass lites in openings on sitting blocks and press firmly against tape by inserting dense compression gaskets, formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work towards center of openings.
- .9 Gasket Glazing: Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
 - .1 Insert soft compression gasket between glass and frame of fixed stop such that it is securely in place, with joints mitre cut and bonded together at corners.
 - .2 Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets, formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work towards center of openings.
 - .3 Install gaskets so protrude evenly past face of glazing stops.
 - .4 Compress gaskets to produce weather tight seal without developing bending stress in glass.
 - .5 Seal gasket joints with compatible sealant.
- .10 Install removable stops, without displacing tape or sealant, and tightened all screws.
- .11 Provide edge clearance of 3 mm (1/8") minimum.
- .12 Apply sealant to uniform and level line, both sides of glass, flush with sightline and tooled or wiped with solvent to smooth appearance, or trim tape flush with sightline.
- .13 Do not cut or abrade tempered, heat treated, or coated glass.

3.3 **FINISHING AND CLEANING**

- .1 Immediately remove sealant and compound droppings from finished surfaces.
- .2 Remove labels after work are completed.
- .3 As work progresses clean all glass, including mirrors and fittings. Remove all setting and glazing compounds from adjacent surfaces. Remove all finger and handprints and other soil. Use mild domestic detergent in warm water, apply with soft clean wiping cloths.
- .4 Apply decals, using permanent adhesives.

END OF SECTION

DIVISION 09 - FINISHES

PART 1 - GENERAL

1.0 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.1 GENERAL REQUIREMENTS

- .1 Conform to CAN/CSA A-82.27, and CAN/CSA A-82.31 including appendixes.
- .2 Ensure strict compliance with Manufactures Literature.
- .3 ASTM C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- .4 Ontario Building Code Section 9.24 Sheet Steel Stud Wall Framing.
- .5 Canadian Sheet Steel Building Institute Technical Bulletins and Manuals.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- | | | |
|----|-----------------|------------------|
| .1 | Rough Carpentry | Section 06 10 00 |
| .2 | Painting | Section 09 91 00 |

1.3 QUALITY ASSURANCE

- .1 Requirements of Regulatory Agencies:
Install fire separations and fire protection exactly as specified in Underwriters' Laboratories test design specification that validates the specified rating.
- .2 Allowable Tolerances:
Install Work within 1/8" of dimensioned location unless approved otherwise, and flat to a tolerance of 1/8" maximum in 10'-0" and 1/16" maximum in any running 12".

1.4 DELIVERY AND STORAGE

- .1 Handle and store materials carefully to prevent damage.
- .2 Store gypsum board flat in piles with protected edges.
- .3 Obtain approval of proposed locations for stockpiling material.

1.4 **DELIVERY AND STORAGE (CONT'D)**

- .4 Do not install damaged or deteriorated material but remove from site immediately.
- .5 Provide any necessary temporary covers, skids and the like.
- .6 Materials as delivered shall bear manufacturer's name, brand name of material and where applicable, CSA classification.

1.5 **ENVIRONMENTAL REQUIREMENTS**

- .1 Do not apply gypsum board or joint filler to surfaces that are damp or contain frost.
- .2 In cold weather and during gypsum panel application and joint finishing, temperatures within work areas shall be within the range of 12 deg. C to 25 deg. C. for 7 days prior to application of joint compound and until cement and adhesives have cured.
- .3 Provide adequate ventilation to carry off excess moisture.

1.6 **RELATIONS WITH OTHER TRADES**

- .1 Co-ordinate with Mechanical and Electrical Trades to ensure that all services are installed prior to application of wall board.
- .2 Give directions to Section 06 10 00 for supplementary blocking.

1.7 **QUALIFICATIONS**

- .1 Sub-contractor to submit a list of 5 previous jobs where he has performed similar work in scale and scope, for review by the Consultant and Owner, and representative of his workmanship, prior to starting any work on site or submissions.
- .2 Sub-contractor to provide documentation that he has the required man power for the scale of his job, to meet the construction schedule.

PART 2 - PRODUCTS

2.1 **MATERIALS**

- .1 All materials to conform to CAN/CSA A82.27 unless specified otherwise.
- .2 Gypsum Board Types:
 - 1. Gypsum Board- Paper Faced (GB-PF): To ASTM C1396/C1396M, tapered edges, ivory paper faced, thickness as indicated on the drawings.

2.1 MATERIALS (CONT'D)

2. Gypsum Board- Fire-Rated (GB-FR): To ASTM C1396/C1396M, Type C, tapered edges, ivory paper faced, ULC labelled, thickness as indicated on the drawings.
3. Gypsum Board- Shaft-Liner (GB-SL): To ASTM C1658/C1658M, Type X, 25mm thick double bevelled edges, silicone treated gypsum core, with coated glass matt facers both sides.
4. Gypsum Board- Backing Board (GB-BB): To ASTM C1396/C1396M, 12.7mm thick paper faced, square edges.
5. Gypsum Board- Ceiling Board (GB-CLG): To ASTM C1396/C1396M, 12.7mm thick, paper faced, eased edges, maximum 6.5kg/m² weight.
6. Gypsum Board- Tile Backer (GB-TB): To ASTM C1178/C1178M, 12.7mm thick, Coated glass mat-faced gypsum panels, with silicone treated core, glass fibre mesh facers both sides and a co-polymer waterproof coating on the tile-face side, square edges.
7. Gypsum Board – Abuse Resistant Board (G.B.A.R.) to ASTM C1629, 16mm thick, Level 2 for abrasion, indentation and impact resistance paper faced, tapered edges.

.3 Partition Systems:

- .1 Steel Studs: 20 ga. min. steel, wiped coated, having knurled flanges 1-1/4" wide with edges doubled back at least 3/16", with girts as required, and with service access holes in webs at 18" o.c..
- .2 Partition Runner Tracks: As specified for studs, Min. 25 ga. electro zinc coated sheet steel with flanges minimum of 1 3/16" high, and to suit width of studs. Oversized to accommodate structural deflection and floor toppings. 2½" "Slotted Deflection" track and 2½" "Deep Track" to accommodate the installation of cementitious skim coat topping.
- .3 Bracing Channels: 18 ga. 1-1/2" x 3/4" cold rolled steel, wiped coated.
- .4 Steel Sheet Metal Blocking: 18 ga. 16" wide mtd. to face of studs for mounting of devices, accessories and millwork. Refer to details for mounting heights.
- .4 Corner Bead and Trims: 18 ga. galvanized steel with perforated flanges; one piece per location. Dur-A-Bead 1 ¼" x 1 ¼" metal bead for corners; "J" trim and "L" trim by "CGC" or approved alternate, fill type only. Paper or plastic beads are not acceptable.
- .5 Control Joint: C.G.C. No. 093.
- .6 Thermal Break: Permanent adhesive faced rubberized cork, 1/8" thick by width required.

2.1 MATERIALS (CONT'D)

.7 Fastenings and Ties:

.1 Screws: For metal furring. Self-drilling, self-tapping, case-hardened, Phillips head, drywall screws, with corrosion resistant finish. For wood furring: similar wood screws #6 x 1" for single thickness board fastening and #7 x 1-5/8" for double thickness board fastening.

.2 Tie Wire: 16 ga. galvanized soft annealed steel wire.

.3 Furring System: 16 ga. cold rolled steel, prime painted.

.1 1-1/2" x 1/2" where supported at centres of 3'-0" maximum.

.2 1-1/2" x 3/4" where supported at centres of 4'-0" maximum.

.4 Furring Channels: 25 ga. cold rolled steel, wiped coated, nominal size of 3/4" deep x 1-1/4" face, hat type with knurled face.

.8 Joint Treatment Material: (Joint compound, taping compound laminating compound). To ASTM C474 and C475. Use material recommended by board manufacturer for the proposed use.

.9 Resilient Sponge Tape: self sticking adhesive on one side, closed cell neoprene sponge tape Permastik 122X by Jacobs and Thompson Ltd. Or approved alternate.

.10 Adhesive: type acceptable to insulation manufacturers to provide vapour barrier of 1/8" thickness.

.11 Reinforcing Tape: Perf-A-Tape by C.G.C. or approved alternate.

.12 Ceiling Hanger System:

.1 Wire Hanger Anchoring Devices:

.1 Phillips Red Head by Phillips Drill Company of Canada Limited.

.2 T32, self-drilling for use in concrete deck.

.3 WS-3822 wedge anchor with tie wire insert for use in composite concrete and steel deck.

.4 "Grabber" H-2, 1/4" by 2" drill point screw eye lag with collar for use in steel deck, or as otherwise approved.

.5 All anchors with collars (Grabber H-2) to be fastened to side of deck flute.

2.1 MATERIALS (CONT'D)

- .2 Hangers:
 - .1 Zinc coated annealed steel wire; 12 ga. to support a maximum weight of 150 pounds per hanger.
 - .2 9 ga. to support a maximum weight of 310 pounds per hanger and zinc coated annealed steel rod.
 - .3 3/16" dia. to support a maximum weight of 500 pounds per hanger.
- .3 Sound Isolation Hangers: spring hangers of weight capacity required by Vibro Coustics Ltd. or approved alternate.
- .13 Tile Backer Board accessories: 2" wide 10 x 10 coated glass mesh tape, rust resistant fasteners. Mould resistant Drywall Type: Certain Teed Fiba Tape Mold-X10 Mould Resistant Drywall type with M2 Tech or approved alternate.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Before application of drywall commences, ensure that services have been installed, tested, and approved; that conduits, pipes, cables, and outlets are plugged, capped, or covered; and that fastenings and supports installed by others are in place.

3.2 INSTALLATION

- .1 General
 - .1 Coordinate the Work of this Section with that of other Sections.
 - .2 Install framing for support and incorporation of flush mounted and recessed components. Ensure adequacy of supports by consultation and verification of methods with those performing the Work of Divisions 22 to 28.
 - .3 **Do not use through-the-roof deck flange hangers or puncture steel deck.**
 - .4 Do not install metal framing, trim, casings, or accessories which have been bent, dented, or otherwise deformed.
 - .5 Framing and furring shown on Drawings is indicative but do not regard it as exact or complete.
 - .6 Provide for movement at intersections with structural members to avoid transference of loads to this Work.

3.2 **INSTALLATION (CONT'D)**

- .7 Make allowances for thermal movements in drywall systems of 1/2" min.
- .8 Do not support the Work of this Section from, nor make attachment to, ducts, pipes, conduit, or the support framing of the Work of other Sections.
- .9 Do not apply drywall in close proximity to hot pipes or heating ducts.
- .10 Install materials with the minimum of joints. Tightly butt joints, without force, and neatly align them.
- .11 Splice, framing members only where continuous lengths are not available from manufacturer.
- .12 Frame openings on every side with suitable sections. Provide clearances required at mechanical and electrical services, such as grilles, diffusers, access panels, and lighting fixtures only after verification of requirements in each case.
- .13 Coordinate Work with Section 06 10 00 to ensure that proper wood blocking for support of items secured to Work of this Section is installed and anchored adequately to prevent damage to Work of this Section.
- .14 Attach to framing adequate steel reinforcing members to support the load of, and to withstand the withdrawal and shear forces imposed by, items installed upon the Work of this Section.
- .15 Install each grab rail anchorage to withstand a force of 9500 pounds in all directions.
- .16 Include in Work; fire stopping bulkheads over doors, frames, screens, and changes in ceiling levels; stair soffits; furred beams; and pipe spaces; all as indicated on Drawings and required by the Ontario Building Code.

.2 **Suspended Ceiling Framing and Furring:**

- 1. Screw apply hanger anchoring devices with a collar to side of metal deck flute.
- 2. Space hangers for runner channels to suit structure, to support ceiling load, at a max. distance of 4'-0" o.c., and at no greater distance than 6" from ends of runner channel.
- 3. Install runner channels at 3'-0" o.c., generally, and at no greater distance than 6" from terminations of supported cross furring members. Bend rod hangers sharply under bottom flange or runners, and wire securely in place with saddle ties.
- 3. Splice runner channels by lapping at least 12" with interlocking flanges and wired at each end with two loops. Do not bunch or line up splices.

3.2 **INSTALLATION (CONT'D)**

5. Install cross furring at 16" o.c., generally, and at no greater distance than 6" from walls, openings, breaks in continuity of ceiling, and changes of direction. Space furring in all cases to suit incorporated services, and so as to avoid contact with perimeter walls. Span hat-type furring no greater than 4'-0". Use metal studs for greater spans 1-5/8" deep spanning to 5'-0", 2-1/2" deep to 6'-0", and 3-5/8" deep to 8'-0".
6. Secure cross furring to supports with double wire ties or approved equivalent attachment. Splice by nesting and tying together with 8" overlap.
7. Erect entire hanger and suspension system to adequately support the ceiling assembly, including incorporated services, with a maximum deflection of 1/360 in the span of each component member, and free from horizontal movement.

.3 Metal Stud Partition Framing:

- .1 Secure ceiling and floor runner tracks at floor and tops of partitions for their full length, at 24" o.c. with concrete nails, square cut nails, toggle bolts, or sheet metal screws as suitable for base material. Install runner tracks also at heads and sills of openings. Secure runner tracks at openings by cutting flanges, turning up webs, and screwing to studs.
- .2 Install top runner deflection tracks with slotted oversized flanges at top of non-load bearing partitions to compensate for deflection of structure.
- .3 Install base runner tracks with oversized flanges to compensate for installation of poured in place cementitious floor toppings (min.1" deep).
- .4 Butt, not mitre, runners at wall intersections and corners. At ceilings, lap and screw channels together.
- .5 Space studs at 16" O.C., generally; and at no greater distance than 2" from abutting walls, partitions and corners.
- .6 Secure studs to runners by screws, crimping, or welding, as required by stud type, and in accordance with manufacturer's design specification.
- .7 Install studs of depth indicated on Drawings: but in no case span studs 1-5/8" deep more than 9'-0" between supports; 2-1/2" deep, 12'-0"; and 3-5/8" deep, 16'-0".
- .8 Extend double studs on each side of all openings from floor to ceiling or structure above, which ever is indicated.
- .9 Erect three studs at corner and intermediate intersections of partitions.

3.2 **INSTALLATION (CONT'D)**

- .10 Install bracing channels in partitions, spaced equally in partition height, at no more than 3'-0" O.C. where not otherwise specified; over doors in partitions of greater height than 10'-0", spaced as preceding; and above and below window-type openings, spaced not more than 6" from the top and bottom of the opening. Install two lines of bracing in partitions up to 8'-0" high and three lines in partitions up to 12'-0" high. Install bracing channels in stud cut-outs, wire tied or welded to each stud, and extending horizontally across entire length of each braced partition and across two full stud spaces at each side of door and window openings.
- .11 Splice studs by nesting, with 8" minimum lap, and fastened with one screw in each flange.
- .12 Coordinate Work with others installing horizontal runs of service lines so that Work of all is done simultaneously.
- .13 Screw, or weld, frame anchor clips, of frames supplied under the Work of Section 08 11 13 "Hollow Metal Doors and Frames", to jamb studs, and head and sill runners. Ensure adequate fastening to prevent movement of the frame within the partition. Remove spreaders at floor after frames are anchored.
- .14 Unless shown otherwise on Drawings, partitions, together with wall board facings, shall extend above ceiling to underside of structure above or be laterally braced.
- .15 Ensure strict compliance with the limiting height tables for stud size, gauge and allowable deflection, and when used for alternate board products with different weights and performance.
- .16 Metal studs in walls required to have a fire resistance rating shall be installed so that there is a 1/2" clearance between the top of the stud and the top of the runner to allow for expansion in the event of fire.

.4 **Accessories**

- .1 At external corners install corner beads secured to framing at 6" o.c. on alternate flanges.
- .2 At board edges secure casing beads at 12' o.c. at edges exposed to view, where board butts against other materials with no trim to conceal junction, at control joints, at perimeter of ceiling surfaces, at tops of partitions where otherwise indicated on Drawings.
- .3 Install control joints in walls, partitions and ceilings at no greater spacing than 25'-0" in each direction, at perimeters of ceilings where they abut walls and other vertical surfaces, or as otherwise indicated. Line up control joints in other construction or with centre lines of mullions, columns, piers, or similar building elements.

3.2 **INSTALLATION (CONT'D)**

- .4 Install casings and thermal breaks at junctions of drywall with exterior door, window or screen frames. Apply self-sticking resilient sponge tape where gypsum board abuts, same, to casing bead.

.5 Application of Board

- .1 Extend board into door, window, and other opening reveals, and on metal stud partitions to structure above, unless noted otherwise on Drawings.
- .2 Board is to be cut to fit tight into deck flutes and around structural members to maintain acoustic & fire separations, thermal barriers and to provide a completed finish.
- .3 Apply board with long dimension perpendicular to supports except at stud partitions where they shall be parallel to studs for Fire Rated Assemblies.
- .4 Back all joints with a framing member. Locate joints on opposite sides of partitions on different studs, and at least 12" from opening jambs.
- .5 Install board in maximum lengths and widths to minimize joints, and in lengths of 6'-0" minimum. Stagger end joints where they are unavoidable.
- .6 Form neat joints at mill ends and at job cut edges of board panels. Cut paper on face with knife. Smooth by sanding and rubbing edges together.
- .7 Fasten wallboard to metal support members by sheet metal drywall screws 3/8" minimum and 1/2" maximum from centre of joints. Space screws:
 - .1 At ceilings of fire rated board at 8" o.c. at edges and in field.
 - .2 At walls of fire rated board at 8" o.c. at edges and 12" o.c. in field.
 - .3 Locate screws opposite one another in adjacent panels.
 - .4 At walls and ceilings where non-fire rated board is used at 12" o.c. at edges and in field.
 - .5 To both double jamb studs for all openings @ 8" o.c.
- .8 Start application on walls at corners of rooms, and on ceilings from centre line of spaces. Do not force adjacent boards into place; allow moderate contact. Install extension clips where required. Drive screws to form a slight depression, but not so paper cover is broken.
- .9 Nail board to wood furring as specified in CSA Standard A82.31.

3.2 **INSTALLATION (CONT'D)**

- .10 Ensure gypsum board sits tight to floor surface to provide full support for wall bases.
- .6 Control Joints for Gypsum Board partitions
 - .1 Control joints should be employed in long expanses of partitions at 25-foot intervals, from floor to ceiling. Control joints are recommended at doorjambs, extending from door head to ceiling. Where doorjambs extend from floor to ceiling and are spaced less than 25 feet apart, no control joints are required.
 - .2 Control joints are required in ceilings to limit areas to 2,500 square feet. Additionally, control joints should be installed in ceilings to limit dimensions in either direction to 50 feet. Control joints should be installed where ceiling framing or furring changes direction.
- .7 Finishing of Joints and Depressions:
 - .1 Fill joints, casing beads, corner beads, holes at board fasteners and depressions on board surfaces exposed to view to ensure smooth seamless surfaces and square neat corners. Use jointing compounds and reinforcing tapes in conformance with manufacturer's specification. Ensure that board is tight against framing members, fasteners are properly depressed, and adhesives have sufficiently cured.
 - .2 For joints not exposed to view but are part of an acoustic wall with insulation fill, an STC Rating or a Fire Rating, these are to be fully taped and mudded full height.
 - .3 Fill joints by three-coat method:
 - .1 Embed reinforcing tape in a cover coat of joint filler.
 - .2 Apply skim coat of topping cement when level coat has dried.
 - .3 Feather edges of compounds into surfaces of wallboards.
After skim coat has dried for at least 24 hours sand to leave smooth. Do not sandpaper face of wallboard.
 - .4 At bevelled joints: Apply cover coat 7" wide, level coat 10" wide, and skim coat 12" wide.
 - .5 At end joints and butt joints formed at cut edges of wallboard. Apply cover coat 14" wide, level coat 20" wide, and skim coat 24" wide. Camber treatment over end joints to 1/32" thick at most.

3.2 **INSTALLATION (CONT'D)**

- .6 At Internal Corners: First fill gaps between boards with joint filler. Embed creased reinforcing tape in a thin coat of joint filler applied 2" wide at each side of corner. Apply cover coat as specified for bevelled joints) to just one side of joint, and when dry, apply skim coat to other side.
- .7 At External Corners: Fill to nose of corner bead with joint filler and topping cement as specified for bevelled joints.
- .8 At casing beads: As specified for bevelled joints.
- .9 At Board Fasteners: Fill holes and depressions with a two coat application of joint filler.

.8 Caulking

- .1 Caulk between casing beads and other construction where junctions are exposed to view.
- .2 Caulk junctions between drywall fire separations and projections, and other construction to ensure that integrity of fire rating is maintained. Ensure that caulked joints provide a continuous seal and that they are caulked before other Work encloses them.
- .3 Clean joints, prime and install sealants in accordance with the requirements of Section "07 90 00 Joint Protection".

.9 Bracing:

- .1 Non-Full Height walls require lateral bracing every 6'-8'.
- .2 Corner braces and/or angle braces up to roof / floor structure on both sides of walls are required.
- .3 Securing top track only to the underside of an acoustic tile T-bar ceiling is not permitted. Lateral bracing is still required for walls as noted above , however, connection of top track to the framing for a suspended drywall ceiling is permitted.

.10 Openings:

- .1 All openings in fire separations require double studs on both sides.
- .2 Refer to the fire damper installation documents for framing requirements around dampers.

3.2 **INSTALLATION (CONT'D)**

- .3 In non-fire separations, openings >6' up to 12', provide double studs on both sides.
- .4 Openings up to 4 feet - Track only lintel is acceptable, except in a fire separation use a double track lintel.

3.3 **TILE BACKER BOARD APPLICATIONS**

- .1 Studs and retaining t's are to be spaced at 16" o.c. max. deflection = 1/360 of span.
- .2 Install 1/2" tile backer board in all areas and washrooms to receive ceramic tiling. Install board with the grey face out away from framing. Boards can be set parallel or perpendicular to the wall framing.
- .3 To extend 6'-0" from F.F.L. continuous around perimeter in Washrooms, full height in Showers.
- .4 Fasten at 150mm (6") o.c. and a min. of 12.7mm (1/2") from edges. Drive fasteners flush to coated surface of board.
- .5 Joint Treatment: Butt ends and edges snugly and fit tight around all cut-outs and adjacent surfaces. Reinforce all joints with a 50mm (2") wide 10 x 10 coated glass mesh tape embedded in the adhesive to be used by the tile installer.
- .6 Follow the manufacturers literature and instructions to ensure compliance with the limited warranty. If any part of these instructions are in conflict with the contract documents request clarification from the architect.

3.4 **ADJUSTMENT & CLEANING**

- .1 Remove droppings and excess of joint compound from Work of others, and from Work of this Section, before it sets.
- .2 Make good to cut-outs for services and other Work, fill in defective joints, holes and other depressions with joint compound.
- .3 Make good defective work, and ensure that surfaces are smooth, evenly textured and within specified tolerances to receive finish treatment.
- .4 Clean off beads, casings and other metal trim, and leave all surfaces ready for specified finishes.

END OF SECTION

DIVISION 09 - FINISHES

PART 1 - GENERAL

1.1 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- .1 Gypsum Board Assemblies Section 09 21 16

1.3 REFERENCE STANDARDS

- .1 Do tile work in accordance with Installation Manual 200 Ceramic Tile, produced by the Terrazzo, Tile and Marble Association of Canada (T.T.M.A.C.).

1.4 SUBMITTALS

- .1 Submit 2 random samples of each colour of ceramic tile used on this project; clearly identify with manufacturer's name, colour number and project number. Do not proceed with work until samples have been approved by Consultant.
- .2 Mount tile on ½" plywood 12" x 12" complete with grout colour to represent project installation.

1.5 PROTECTION

- .1 Protect Work of this Section against damage by other trades for minimum 72 hours after application by prohibiting passage of traffic over tile.
- .2 To prevent soiling or damage to finish flooring where pedestrian traffic occurs after the flooring has been installed, install and maintain 0.152mm polyethylene membrane or reinforced kraft paper temporary protection, secured in place and with joints sealed by reinforced pressure sensitive tape.
- .3 Install plywood panels of minimum 6mm thickness over completed finish flooring materials on which further construction work is performed or delivery of products is made, or both. Seal joints between panels with reinforced pressure sensitive tape.

1.6 QUALIFICATION

- .1 Contractor to require membership in good standing with the TTMAC and must have 10 years experience in the Work of this Section.

- * .2 Subcontractor to submit a list of 5 previous jobs where he has performed similar work in scale and scope for review by the Consultant and Owner, representative of his workmanship.

1.6 **QUALIFICATION (CONT'D)**

- * .3 Subcontractor to provide documentation that he has required manpower for the scale of this job, to meet the construction schedule.

PART 2 - PRODUCTS

2.1 **MATERIALS**

- .1 Ceramic Floor Tile and Base: Lea Stone Series or approved alternate, Unglazed Porcelain Tile, 12" x 24":
 - a. Grey Code: HV.LS.GRY.1224 MT by Olympia Tile.
- .2 Waterproofing Mortar : "Mapelastic 315" .
- .3 Cement: to CAN/CSA-A5-M77, colour to Consultant's selection.
- .4 Sand: to CAN/CSA A82.56-M1976.
- .5 Lime: to CAN/CSA A82.43-1950 (R1971).
- .6 Latex: formulated for use in cement mortar.
- .7 Water: potable and free of minerals which may discolour mortar.
- .8 Dry Set Mortar: to ANSI A118.1-1976 - Kerabond by Mapei.
- .10 Grouts:
 - .1 Keracolor S Grout by Mapei: For all floor tiles;
 - .2 Keracolor U Grout by Mapei: For all wall tiles
 - .3 All grouts to be sealed through.
- .11 Epoxy Mortar: "Flextile 100 Epoxy mortar or approved alternate.
- .12 Epoxy Grout: Kerapoxy or Kerapoxy CQ Grout by Mapei, or LATICRETE® SPECTRALOCK® PRO Premium Grout
- .13 Level Cure - LCB as manufactured by Master Builders Ltd.
- .14 Sealants - conform to Section 07 90 00.
NOTE: Colour selection for acid resistant grout shall match tile colour.
- .15 Sealers - as recommended by the Mortar Manufacturer. Wax for protection after sealer as recommended by the Mortar Manufacturer to meet pre-requirements of T.T.MAC #3000 series.

2.1 MATERIALS (CONT'D)

- .16 Special Tile Shapes - bullnosed, dado cap and coved bases.
- .17 Scratch & Levelling Coat: (by volume): One part Portland cement, 4 parts sand and latex additive where required by TTMAC Details. Premixed mortar may be used per manufacturer's instructions. Adjust water volume depending on moisture content of sand to obtain the required consistency and workability.

2.2 MANUFACTURED COMPONENTS AND ACCESSORIES

- .1 Edge and Transition Strips: Roll-formed stainless steel edge strips, 3 mm wide at top edge; with integral perforated anchoring leg for setting the strip into the setting material; height as required; brushed finish; eg. SCHIENE-EB by Schluter Systems (Canada) Inc.
- .2 Tapered Transition Strips – To Other Floor Finishes: Roll-formed stainless steel transition strips; profile and height as indicated; with integral perforated anchoring leg for setting the strip into the setting material; sloped transition and decorative edge strip for transition from tile to lower finish; brushed finish; eg. RENO-EBU by Schluter Systems (Canada) Inc.
- .3 Tapered Transition Strips: To Concrete Floors: Extruded aluminum transition strips; with integral perforated anchoring leg for setting the strip into the setting material; sloped transition and decorative edge strip for transition from tile to lower finish; height as requested satin anodized finish; eg. RENO-RAMP AE by Schluter Systems (Canada) Inc.
- .4 Stair Nosings: Photoluminescent tile nosing complete with Ecoglo step definition strip and slip resistance strip in anodized aluminum profile. M4 Series Nosing, Model M417.10 Black, for use with ceramic tile by Kinesik.
- .5 Decorative Edge Trim: Extruded aluminum decorative edge trim with integral perforated anchoring leg for setting the strip into the setting material; complete with pre-formed corners; satin anodized finish; e.g. RONDEC-DB 14 AE by Schluter Systems (Canada) Inc.
- .6 Tile Expansion and Control Joints for Thin-Set Applications: Roll formed stainless steel profiles joined by a soft CPE movement joint material, with integral perforated anchoring legs for setting the joint into the setting bed; height as required to suit application; insert colour as selected by Consultant; eg. DILEX-EKSN by Schluter Systems (Canada) Inc.
- .7 Waterproofing Membrane System: To ANSI A118.10; soft polyethylene membrane with fleece webbing laminated on both sides; use special cut-width rolls and special shapes for corners and pipe sleeves; KERDI by Schluter Systems (Canada) Inc.
- .8 Uncoupling Membrane: To ANSI A118.10; 3mm thick high density polyethylene membrane with grid structure of 12 x 12 mm square cavities, each cut back in dovetail configuration, and polypropylene anchoring fleece laminated to underside, eg. DITRA by Schluter Systems (Canada) Inc.

2.3 ACCESSORIES

- .1 Crack Isolation Membrane: Loadbearing membrane, ASNI A118.12, High Performance Rating.
- .2 Reinforcing Mesh: 50 x 50 mm size; 1.6 mm thick steel wire mesh; welded fabric, galvanized.
- .3 Metal Lath: To ASTM C847; 1.4 kg/m² galvanized steel lath.
- .4 Tape: 50 mm fibre mesh tape, as recommended by backer board manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine surfaces prepared to receive installation of tiling. If discrepancies exist, report to Architect. Installation of any part of the Work will be construed as acceptance of such surfaces as being satisfactory.
- .2 Ensure compatibility of abrasives and fillers supplied under this Section and which will bear contact with substrate materials.

3.2 INSTALLATION

- .1 **Prior to installation of floor finishes, the General Contractor is to verify and confirm that there is Positive Drainage to all floor and trench drains without ponding. Failure to comply with this requirement will result in the removal and replacement of the floor slab at his cost.**
- .2 Do not install any floor finishes until the requirement in 3.2.1 has been met.
- .3 Regard recommendations, installation methods specified and illustrated in Terrazzo, Tile and marble Association Manual No. 22 - 1979, and applicable manufacturer's instructions as minimum acceptable standard, except as varied by this Specification.
- .4 Use tile setting method specified hereinafter.
- .5 Obtain Architect's approval of surfaces over which tile is to be installed before commencing tiling.
- .6 Place tile snugly around piping, fixtures and other items built in or passing through tile work. Form external angles with round edge tile extending over edge of square edge adjacent tile. Internal angles shall be formed square, carrying 1 flat tile past edge of other.
- .7 Drill holes for fixing accessories of other trades.
- .8 Finish surfaces flat and level or sloped and graded as required.

3.2 **INSTALLATION (CONT'D)**

- .9 Provide strings, caps, coves, corners, angles and other moulded pieces to suit requirements of job. Ensure that striping and joints are in alignment.
- .10 Lay out borders and defined lines, wherever they occur, prior to setting of adjacent tiles. Keep inner edges of borders against fields or wall panels straight.
- .11 Cut tiles to conform to irregularities in wall lines and vertical planes along outer edges. Smooth cut edges with carborundum block or by other means to provide clean straight edges.
- .12 Make joints of tiles 3 mm (1/8") in width. Point joints with specified mortar or grout. Remove strings and wedges used for jointing and bracing prior to mortar or grouting.
- .13 Re-point joints after cleaning to eliminate imperfections. Avoid scratching tile surfaces.
- .14 Finished tile to be clean and free of tiles which are pitted, chipped, cracked or scratched.
- .15 Apply by steel trowel level cure where required to build up existing concrete floors to elevations as noted on the Drawings or as directed by the Consultant or Owner.
- .16 Install expansion joints at maximum 20'-0" o.c. in both directions.
- .17 All floor and wall tiles to be installed with acid resistant grout and waterproof mortar.
- .18 All grouts are to match colours in Schedules on Specification. All grouts to be sealed through.
- .19 Tile setting accessory installation
 - 1. Install solid metal edge strips at unprotected exposed edges of flooring and wall tiles.
 - 2. Install in continuous lengths, to level straight lines by pressing the perforated anchoring leg of the accessory solidly into the tile setting adhesive.
 - 3. Butt ends of units tightly together with hairline joints.
 - 4. Trowel an additional layer of tile setting material over the anchored leg of the accessory prior to placement of tiles.
 - 5. Set tile flush with top of setting accessory.
 - 6. Leave a 3mm joint between tile and tile setting accessory for the filling of grout.
 - 7. Install preformed corners, endcaps, and trim at changes in direction and at terminations.
 - 8. Mitred joints are not acceptable and will be rejected.

3.2 **INSTALLATION (CONT'D)**

- .20 **Layout tile pattern on walls and floors such that pieces at either end are no smaller than 1/3 of a full tile.**

3.3 **MOVEMENT JOINTS**

- .1 Install expansion and control joints in strict compliance with the TTMAC detail 301 MJ.
- .2 Keep expansion and control joints free of setting materials.
- .3 In addition to the guidelines outlined in the TTMAC Specification Guide 09 30 00, provide movement joints over cold joints, saw cuts, at columns and at wall plane changes.

3.4 **CLEANING**

- .1 Clean tile work progressively as work proceeds. Do not allow mortar to stain absorbent tile.
- .2 Do not use acids for cleaning unless specifically recommended by the manufacturer.
- .3 Clean tile in accordance to tile manufacturer's recommendations by procedures and products certified with the T.T.M.A.C. "Maintenance Guide".
- .4 Machine scrub unglazed tile.
- .5 Remove and replace defective, damaged, loose and unbonded tile, and point defective joints.

3.5 **SEALING**

- .1 Seal tiles subject to discolouration from grouts prior to grouting.
- .2 Seal tiles where recommended by manufacturer using procedures and products certified with the T.T.M.A.C.
- .3 Apply 2 coats of #3000 series sealer to unglazed floor tile after being cleaned and dried.

3.6 **PROTECTION**

- .1 Protect finished areas from traffic until setting materials have sufficiently cured.
- .2 Protect grouted areas from traffic for 24 hours after grouting.
- .3 Provide protective covering until Owner occupancy.
- .4 Protect wall tiles and bases from impact, vibration, heavy hammering on adjacent and opposite walls for at least 14 days after installation.

3.7 MAINTENANCE MATERIALS

- .1 Supply to owner min 4 boxes of each tile colour, pattern and type of material, labelled by colour and area of use.
- .2 Submit as per Specification Section 01 33 00.

3.8 TTMAC REFERENCE DETAILS

- .1 Tile Installed Over Masonry or Concrete Walls – Thin-Set Method: TTMAC Detail 303W.
- .2 Tile Installed Over Gypsum Board – Thin-Set Method: TTMAC Detail 304W.
- .3 Tile Installed on Coated Glass Mat Backer Board: TTMAC Detail 305W (B – Interior Wet/Dry Areas).
- .4 Tile Bonded to Concrete Slab – Thin-Set Method: TTMAC Detail 311F (A – Interior/Exterior), or (C – Crack Concrete Interior/Exterior – Full Coverage).
- .5 Tile Applied Over Wood Subfloor in Dry Areas – Thin-Set Method: TTMAC Detail 313F (A-Thin-Set on Plywood).
- .6 Tile Installed on Interior/Exterior Stairs (Concrete Stairs): TTMAC Detail 318 (E).
- .7 Tile on Shower Receptors: TTMAC Detail 319 SR (B – Thin-Set on Backer Unit/Board).
- .8 Tile on Shower Receptors – Curbless / Barrier Free Shower: TTMAC Detail 319 SR/BF/C (A-Curbless/Barrier Free Shower Construction on Recessed Concrete Slab).
- .9 Large Format Tile on Interior Floors: TTMAC Detail 329 LFT.
- .10 Large Format Tile on Interior Walls: TTMAC Detail 330 LFTW.

END OF SECTION

DIVISION 09 - FINISHES

PART 1 – GENERAL

1.0 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Gypsum Board Assemblies: Section 09 21 16
- .2 Painting: Section 09 91 00
- .3 Mechanical Divisions 20- 23
- .4 Electrical Divisions 26- 28

1.2 REFERENCE STANDARDS

- .1 Do all installation in accordance with ASTM C636, except where specified elsewhere.

1.3 DESIGN CRITERIA

- .1 Maximum deflection to be 1/360th. of span to ASTM C635-78, deflection test.

1.4 SUBMITTALS

- .1 Submit samples including all pertinent information showing basic construction and assembly, treatment at walls, recessed fixtures. Splicing, interlocking, finishes, acoustical unit installation.
- .2 At completion of the project provide an additional 2% of ceiling panels for future use. Package and label panels and turn over to Owner. Where the resultant 2% results in less than 1 full case of tiles provide a minimum 2 cases. Cut tiles will not be accepted as part of this submission.

1.5 WARRANTY

- .1 Acoustical Panels: 30 years against sagging and warping.
- .2 Grid System; 30 years against rusting and manufacturers defects.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Acoustic Ceiling Tiles:

- .1 Acoustic Ceiling Tile (ACT-1): To ASTM E1264, Type A, Form A1.2, Pattern E; well-formed mineral fibre non-sagging lay-in tile, complete with anti-mould and mildew treatment, and sag resisting treatment; as follows:

- .1 Size: 610 x 1 220 mm size.
- .2 Thickness: 16 mm.
- .3 Pattern: Medium texture, fissured.
- .4 Edge: Square.
- .5 Weight: 1.09lbs.ft²
- .6 Finish: Factory-applied latex paint, White colour.
- .7 Fire Resistance (CAN/ULC-S102): Class A.
- .8 Noise Reduction Coefficient: NRC ≥ 0.55.
- .9 Light Reflectance: LR ≥ 0.80.
- .10 Manufacturer and Product Name: Cortega Item No. 823 Fire Guard by Armstrong World Industries or approved alternate.

- .2 In rooms with existing tile and grid remaining, match existing.

- .3 All components shall be listed or labelled for fire resistance classification as required.

.4 Ceiling Hanger System:

.1 Wire Hanger Anchoring Devices:

- .1 Phillips Red Head by Phillips Drill Company of Canada Limited.
- .2 T32, self-drilling for use in concrete deck.
- .3 WS-3822 wedge anchor with tie wire insert for use in composite concrete and steel deck.
- .4 "Grabber" H-2,1/4"x2" Drill Point Screw Eye Lag for use in steel deck as otherwise approved.
- .5 All anchors to be fastened to lower/bottom flute of metal deck.

2.1 MATERIALS (CONT'D)

.2 Hangers:

- .1 Zinc coated annealed steel wire; 12 ga. to support a maximum weight of 150 pounds per hanger.
- .2 9 ga. to support a maximum weight of 310 pounds per hanger and zinc coated annealed steel rod.
- .3 3/16" dia. to support a maximum weight of 500 pounds per hanger

.5 Ceiling Grid:

- .1 Components: All main beams and cross tees shall be Class HD commercial quality, heavy duty, hot dipped galvanized (galvanized steel, aluminum or stainless steel) as per ASTM A 653. Main beams and cross tees are double-web steel construction with type exposed interlocking flange design. Exposed surfaces chemically cleansed, capping pre-finishes galvanized steel (aluminum or stainless steel) in baked polyester paint. Main beams and cross tees shall have rotary stitching (exception: extruded aluminum or stainless steel).
 - .1 Structural Classification: ASTM C 635 HD.
 - .2 Colour: Low sheen baked enamel White, unless noted otherwise.
 - .3 Acceptable Product: design based on DX/DXL as manufactured by CGC Inc. or Prelude XL by Armstrong World Industries.
- .2 Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct hung unless otherwise indicated.
- .3 Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least three times design load, but not less than 12 gauge.
- .4 Support channels and hangers, galvanized steel, to rigidly secure ceiling system with max deflection of L/360.
- .5 Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations, including light fixtures, that fit type of edge detail and suspension system indicated. Provide moldings with exposed flange of the same width as exposed runner.
- .6 All components to be rated for seismic "D,E,F" category. Refer to Structural Drawings.

2.1 MATERIALS (CONT'D)

- .6 Accessories: splices, clips, stabilizer bars, hold down clips, wire ties, retainers and flush type wall moulding to complement suspension system components as per manufacturer's instructions.
- .7 Ship materials to site in manufacturer's original cartons. Maintain dry condition, piled in accordance with manufacturer's recommendations.

PART 3 – EXECUTION

3.1 EXAMINATION

- .1 Verify layout of hangers will not interfere with other work.
- .2 Verify ducts, pipes, fittings and other penetrations have been properly installed.
- .3 Examine all site conditions and other work upon which this work depends. Advise Architect in writing of unsatisfactory preparation work. Commencement of work implies acceptance of conditions as satisfactory.

3.2 SUSPENDED CEILING GRID

- .1 Install suspended ceiling grid system to ASTM C636/C636M and Cisca installation standards.
- .2 Provide support channel and hanger assemblies necessary for suspended planks.
- .3 Suspended planks from support assembly using caps, cross tree plugs, and threaded studs, mounted at height above finished floor as indicated on Drawings.
- .4 Hang suspended ceiling grid directly from structural elements, independent of walls, columns, metal deck, ducts, pipe fittings and conduit. Provide additional support channels and hangers.
- .5 Install suspension system to manufacturer's instruction and to structure with screws and metal clip/anchors. **Do not puncture steel deck.**
- .6 Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers to span the extra distance.
- .7 Install additional hangers and reinforcing to accommodate loads being carried.

3.3 INSTALLATION

- .1 Examine site conditions and other work upon which this work depends. Advise Architect in writing of unsatisfactory preparation work. Commencement of work implies acceptance of conditions as satisfactory.
- .2 Install suspension system to manufacturer's instruction and to structure with screws and metal clip/anchors. **Do not puncture steel deck.**
- .3 Conform to ceiling pattern as shown on Drawings.
- .4 Space hanger wires 1210 mm (48") o.c. maximum along main tees and within 150 mm (6") of end of main tee.
- .5 Do not erect ceiling suspension system until work above ceiling has been inspected by the Consultant.
- .6 Lay out centre line of ceiling both ways, to provide balanced borders at room perimeter as indicated on the Reflected Ceiling Plan.
- .7 Install wall moulding to provide correct ceiling height. Level finished ceiling to within 1:1000.
- .8 Completed suspension system shall support-imposed loads, such as, lighting fixtures, diffusers and grilles and speakers.
- .9 Support light fixtures and diffusers with additional ceiling suspension hangers within 150 mm (6") and at maximum 610 mm (12 ½") around perimeter of fixture as directed by the Architect/Consultant.
- .10 Co-ordinate suspension system with location of related components.
- .11 Interlock cross tee to main tee to provide rigid assembly.
- .12 Install exposed perimeter trim at exposed system edges.
- .13 Do not install finished ceiling panels until suspension system has been inspected by Architect.
- .14 Install ceiling suspension system as required by manufacturer to meet all guidelines and requirements of seismic category "D,E,F".

3.4 CEILING TILES

- .1 Fit ceiling tiles within grid, free from damaged edges.
- .2 Neatly cut ceiling tiles to accommodate necessary penetrations.
- .3 Cut and rabbet ceiling tiles at border areas and vertical surfaces.

3.4 CEILING TILES (CONT'D)

- .4 Lay directional patterned units on way with pattern parallel to longest room axis. Fit border neatly against abutting surfaces.
- .5 Install hold-down clips to retain ceiling tiles tight to grid system within 6 000 mm of exterior door and entire vestibules.

3.5 ADJUSTMENT AND LEANING

- .1 All chipped or cracked tiles, scratched or abraded tiles, loosely fit tiles, or over cut tiles are to be replaced at direction of Architect.

3.6 MAINTENANCE MATERIALS

- .1 Supply to owner a minimum of 4 boxes of each acoustic ceiling tile type, labelled.
- .2 Submit as per Specification Section 01 33 00.

END OF SECTION

DIVISION 09 - FINISHES

PART 1 - GENERAL

1.1 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.2 WORK INCLUDED

- .1 Carpeting glue down method. 100 % glue down.
- .2 Supply and installation of all carpet tile, wall base and accessories.
- .3 Accessories.

1.3 REFERENCES

- .1 GSB 4-GP-129 Carpets, Commercial.
- .2 CGSB 4-GP-156 - Guide to Selection and Installation of Direct Glue-Down Carpet.
- .3 SB 71-GP-28M - Adhesive for Direct Glue Down Carpet Installation.

1.4 QUALITY ASSURANCE

- .1 Installer: Company with 5 years minimum experience.

1.5 SAMPLES

- .1 Submit samples to requirements of Section 01 33 00.
- .2 Submit samples of all edging trim and bases.

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Perform work to requirements of Section 01 50 00.
- .2 Store materials for 3 days prior to installation in area of installation to achieve temperature stability.
- .3 Maintain minimum 21 deg. C. ambient temperature three days prior to, during and 24 hours after installation materials.

1.7 WARRANTY

- .1 Provide the Owner with a written Guarantee covering all work in this section. Guarantee shall state that any defects in materials or workmanship which occur within a period of five (5) years from the date of acceptance of the building will be corrected/ replaced at Owner's discretion and at no additional cost.

PART 2 - PRODUCTS

2.1 CARPET TILES

- .1 Carpet Tile CP-1: Manufacturer: Kraus Modular Carpet, Colour: Glacier Carpet Tile 722305 or approved alternate.

2.2 ACCESSORIES

- .1 Sub-Floor Filler: White premix latex type recommended by carpet manufacturer.
- .2 Primers and Adhesives: CGSB 71-GP-28M, Waterproof; of Types recommended by carpet manufacturer.
- .3 Edge-bound by Brolain, extra wide edging only.
- .4 Edge Transition Strips and trims by Johnsonite. Colour: to match the carpet colour.
- .5 Rubber base to ASTM F1861: Tarkett / Johnsonite, 4" Traditional Rubber Wall Base, Cove (with Toe). Colour to match carpet as selected by the Architect.

PART 3 - EXECUTION

3.1 INSPECTION

- .1 Inspect the floors thoroughly with Superintendent and verify that surfaces are smooth and flat with maximum variation of 3 mm in 3 m and are ready to receive work.
- .2 Verify conc. floors are dry to a max. moisture content of 7% and exhibit negative alkalinity, carbonization, or dusting.
- .3 Beginning of installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION

- .1 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- .2 Apply, trowel, and float filler to leave smooth, flat hard surface.

3.2 PREPARATION (CONT'D)

- .3 Prohibit traffic until filler is cured.
- .4 Vacuum floor surface.

3.3 INSTALLATION

- .1 Apply carpet and adhesive in accordance with manufacturer's instruction, CGSB 4-GP-156.
- .2 Lay out rolls and tiles of carpet for approval.
- .3 Verify carpet match before cutting to ensure minimal variation between dye lot.
- .4 Double cut carpet, to allow intended seam and pattern match. Make cuts straight, true and unfrayed.
- .5 Locate seams in area of least traffic.
- .6 Fit seams straight, not crowded or peaked, free of gaps.
- .7 Lay carpet on floors with run of pile in same direction as anticipated traffic. Lay carpet on stairs with the run of the pile in opposite direction of anticipated traffic to avoid peeking of backing at nosing's.
- .8 Do not change run of pile in any room where carpet is continuous through a wall opening into another room. Locate change of colour or pattern between rooms under door centre line.
- .9 Cut and fit carpet tight around interruptions with vertical surfaces without gaps.
- .10 Carpet is to run continuously without interruption of demising walls between offices.

3.4 APPLICATION OF COVE BASES

- .1 Fill cracks and level irregularities of surfaces to which base is to be applied with filler approved by adhesive manufacturer so as to provide solid backing over entire area behind base. Cement cove base to vertical surfaces so that gaps do not occur behind base, so that front lip of base cove bears firmly and uniformly on floor surface and so that good and permanent bond is produced between base and surface to which it is applied. For right angled external corners use preformed matching cove corner units. Make end joints flush with gap.
- .2 At wall ends and openings where ends of preformed corners come close together or touch or overlap, cut each corner unit equally so that a neat, inconspicuous joint is formed in middle of wall end or opening. A filled gap, if necessary, is not less than 1-1/2" wide and located in middle of wall or end of opening.
- .3 Use as long a piece as possible. Numerous short pieces will not be accepted.

3.5 **PROTECTION**

- .1 Prohibit traffic from carpet for 24 hours after installation.
- .2 Protect carpet with 6 mil. polyethylene sheets taped at perimeter once installed, to accommodate the later installation of shelving and product.

3.6 **CLEANING**

- .1 Remove access adhesive from floor, base, and wall surfaces without damage.
- .2 Clean and vacuum carpet surfaces, prior to Substantial Performance Inspection.

3.7 **SPARE CARPET**

- .1 Leave with owner min. 1% or 150 s.f. which ever is larger of each type of carpet, in packaged containers, clearly identified.

END OF SECTION

DIVISION 09 - FINISHES

PART 1 - GENERAL

1.0 CONTRACT DOCUMENTS

1. The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.1 SECTION INCLUDES

1. Acoustical wall panels.

1.2 RELATED SECTIONS

- | | | |
|----|---|------------------|
| 1. | Steel Decking | Section 05 31 00 |
| 2. | Gypsum Board Assemblies | Section 09 21 16 |
| 3. | Suspended Acoustical Ceilings:
Conventional grid-supported acoustic ceilings | Section 09 51 00 |
| 4. | Paints and Coatings | Section 09 91 00 |

1.3 REFERENCES

1. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2000.
2. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2000a.

1.4 PERFORMANCE REQUIREMENTS

1. Acoustical Absorption: Perform testing in accordance with ASTM C 423, Type A mounting method unless otherwise specified.
2. Flame Spread Rating: Provide all components with Class A flame spread rating when tested in accordance with ASTM E 84, unless otherwise specified.

1.5 SUBMITTALS

1. Submit under provisions of Section 01 30 00.

1.5 SUBMITTALS (CONT'D)

2. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
 4. Independent testing agency test reports.
3. Selection Samples: For each product specified, two complete sets of color samples representing manufacturer's full range of available colors and patterns.
4. Verification Samples: For each product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.6 QUALITY ASSURANCE

1. Manufacturer Qualifications: Minimum 10 years of experience in producing acoustical products of the types specified herein.
2. Installer Qualifications: Acceptable to the manufacturer of the acoustical products being installed.
3. Mock-Up: Provide a mock-up for evaluation of installed appearance.
 1. Install acoustical products in areas designated by Architect.
 2. Do not proceed with remaining work until Architect approves workmanship and appearance.
 3. Approved mock-up may remain as part of the work.
4. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:
 1. Thickness: 50 mm.
 2. Edge straightness.
 3. Overall length and width (Refer to Atrium/Cafeteria Elevations).
 4. Squareness from corner to corner.
 5. Chords, radii and diameters.

1.7 DELIVERY, STORAGE, AND HANDLING

1. Protect acoustical products from moisture during shipment, storage, and handling.
2. Store products in manufacturer's unopened packaging until ready for installation.
 1. Store materials flat, in dry, well-ventilated space.
 2. Do not stand panels on end.
 3. Protect edges from damage.
3. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

1. Do not begin installation of acoustical products until building has been enclosed and environmental conditions approximate those that will prevail when building is occupied.
2. Environmental Requirements: Do not install panels until wet work, such as concrete and plastering, is complete; the building is enclosed; and the temperature and relative humidity are stabilized at 60 – 80 degrees F (16 – 27 degrees C) and 40% to 50% respectively, by the building HVAC system. Use of propane heaters in areas with acoustic panels can cause chemical reactions with resin spots causing them to become visible through the face of the panels. Do not use propane heaters in areas where panels are installed.

1.9 EXTRA MATERIALS

1. See Section 01 60 00 - Product Requirements, for additional provisions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Acceptable Manufacturer: G&S Acoustics; 3555 Scarlet Oak Blvd., St. Louis, MO 63122. Tel: (636) 225-8800 or (800) 737-0307. Email: inquiry@gsacoustics.com. www.gsacoustics.com.
2. Provide all acoustical products specified herein by a single manufacturer.

2.2 ACOUSTICAL PANELS

1. Painted Ceiling Panels: aCapella Floats (AFC) Clouds panels; core of 6 to 7 pcf (96 to 112 kg/cu m) fiberglass, with chemically hardened edges and a paintable scrim fiber facing sheet, Class A rating per ASTM E84.

2.2 ACOUSTICAL PANELS (CONT'D)

1. Core Thickness: 2 inch (51 mm); NRC 1.05.
2. Size: As indicated plans.
3. Finish: Latex paint as selected from manufacturers standards.
4. Color 1: to be selected by Architect.
5. Color 2: to be selected by Architect.
6. Edges: Square/Angular and painted.
7. Ceiling Suspended Panel Mounting: Cable lock Plates with cable TC plate and ceiling grid.

PART 2 EXECUTION

3.1 EXAMINATION

1. Do not begin installation until substrates have been properly prepared.
2. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

1. Clean surfaces thoroughly prior to installation.
2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

1. Install acoustical units in accordance with manufacturer's instructions.
2. Refer to Reflected Ceiling plan for layout and configuration.

3.4 PROTECTION

1. Protect installed products until completion of project.
2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

DIVISION 09 - FINISHES

PART 1 – GENERAL

1.0 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.1 RELATED WORK SPECIFIED ELSEWHERE

- | | | |
|-----|---|------------------|
| .1 | Rough Carpentry | Section 06 10 00 |
| .2 | H.M. Doors and Frames | Section 08 14 00 |
| .3 | Gypsum Board Assemblies | Section 09 21 16 |
| .4 | Shop Priming Specified in Various Sections of the Specification | |
| .5 | Factory Applied Paint Coatings Unless otherwise Specified | |
| .6 | Fire Suppression | Division 21 |
| .7 | Plumbing | Division 22 |
| .8 | HVAC | Division 23 |
| .9 | Integrated Automation | Division 25 |
| .10 | Electrical | Division 26 |
| .11 | Communications | Division 27 |
| .12 | Electronic Safety and Security | Division 28 |

1.2 SCOPE OF WORK

- .1 With exceptions specified above or specifically called for in other Sections of the Specification, all paintwork is included in the scope of this Section of the Specification. Colours will be specified at a later date by the Owner, allow for accent walls of primary colour to some areas, **maximum 12 colours.** Refer to Finish Plans & Details on Drawings &/or in Specification.
- .2 In locations where Drawings do not call for paint or similar finish on walls and/or ceilings, the intent of this Specification is that all wood and metal surfaces normally painted or similarly finished shall be so treated.

1.2 SCOPE OF WORK (CONT'D)

- .3 Paint exposed drywall and the like in locations where finish is not otherwise specified or noted. Do not paint such surfaces in mechanical shafts, unless specifically noted.
- .4 In locations where Drawings do not call for paint or similar finish on walls and/or ceilings, the intent of this Specification is that items such as new work or patched work, including miscellaneous metal work, shall be painted.
- .5 Patched work on walls or ceilings shall require a complete surface to be painted, back to a proper cut off point, i.e. corner or change in direction from floor to ceiling for walls and wall to wall for ceilings.
- .6 Paint all perimeter and interior walls floor to ceiling prior to the installation of equipment, millwork or other devices.
- .7 Paint new pipes, conduit, ducts and related thermal insulation and all prime painted mechanical and electrical equipment and supports located in mechanical and electrical storage and maintenance rooms in all locations where Drawings call for paint or similar finish on walls and/or ceilings.
- .8 Do not paint pipe, conduit, ducts, insulation and the like where concealed above ceilings or in service shafts.
- .9 Items exposed on the roof shall be shop painted. Refinish all new and existing H.V.A.C. units to selected colours where noted on Elevation, Plans and Schedules.
- .10 Make good paint finish on shop coated work where damaged.
- .11 Paint edges and all faces of doors where primed for paint supplied.
- .12 Paint all exposed suspension rods and hanging devices located in an exposed ceiling being painted.
- .13 Interior of ducts and diffusers visible from exterior on room side.
- .14 Repaint existing surfaces after approved preparation, includes all previously painted surfaces, i.e. walls, doors, frames, handrails, closets, etc.
- .15 Paint all exposed roof deck, steel joists, beams, conduits, sprinklers and plumbing lines and all other items in ceiling area where left exposed.

NOTE: Care is to be taken NOT to paint sensitive services/devices.
- .16 Finish all wood where exposed to view.
- .17 Paint all exposed steel columns and R.W.L./piping where not concealed.
- .18 Prepare, prime & paint concrete floors.

1.3 REFERENCE STANDARDS

- .1 Do painting and finishing to CGSB-85-GP series standards including Appendix A and to material manufacturer's instructions and/or to Canadian Painting Contractor's Association except where specifically specified otherwise.

1.4 ENVIRONMENT

- .1 Do not commence interior painting in temperatures below 15 deg. C or when adequately controlled ventilation is not available. Do not paint exterior surfaces during cold, windy, rainy, dusty, foggy or frosty weather when temperature is likely to drop below 5 deg. C.
- .2 Test for moisture content in each location immediately before commencing application of paint. Do not apply paint on surfaces where moisture content exceeds 14%. Promptly notify Architect if such conditions are encountered.
- .3 Provide approved equipment for testing moisture content of surfaces to receive paint finishes and have available on Site at all times during Work of this Section.

1.5 SUBMITTALS

- .1 Submit triplicate samples 12" x 8" (300 mm x 200 mm) panels of each type of paint finish specified. Panels shall be of same material as that on which sample coatings are to be applied in the field where possible. Identify each sample as to job, name of paint manufacturer, finish, colour, name and number, sheen and gloss units and name of Contractor.
- .2 Submit in accordance to Section 01 33 00.

1.6 MAINTENANCE MATERIALS

- .1 Provide one sealed can, 4 litre capacity, of each product in each colour used in the Work for Owner's use in maintenance Work.
- .2 Container to be new fully labelled with manufacturer's name, type of paint, and colour.
- .3 No paint is to be left on site once work is completed. Provide copies of mix data in maintenance manuals for use at a later date.

1.7 STORAGE

- .1 Store paint and painter's materials in locations approved by the Architect.
- .2 Provide CO2 fire extinguisher minimum 20 lbs. (9 kg.) capacity in paint storage area.

1.8 SIGNS

- .1 Provide legible signs throughout the Work reading "WET PAINT" in prominent positions during painting and while paint is drying.

1.8 SIGNS (CONT'D)

- .2 Use 75 mm (3 inch) high letters on white card or board.

1.9 TEMPORARY COVERS AND PROTECTION

- .1 Protect floors and other surfaces with temporary covers such as dust sheets, polyethylene film or tarpaulins. All to Architect's approval.
- .2 Mask identification plates occurring on equipment, switch boxes, and fire rating labels, etc. which require painting.
- .3 Protect, remove and replace hardware, accessories, lighting fixtures, and similar items as required except primed for paint door closures which shall be painted. Light switches and electrical communication outlet plates to be removed and reinstalled on completion of paint application.
- 4. Keep oily rags, waste and other similar combustible materials in closed metal containers; take every precaution to avoid spontaneous combustion, remove waste and combustible materials daily.
- .5 Clean surfaces soiled by spillage of paint, paint spattering and the like. If such cleaning operations damage the surface, repair and replace damaged work at no cost to the Owner.

1.10 RETOUCHING

- .1 Do all retouching, etc. to ensure that the building may be handed over to the Owner in perfect condition, free of spatter, fingerprints, rust, watermarks, scratches, blemishes of other disfiguration.
- .2 After fully decorating and retouching a room or other area, notify Architect. After inspection and final approval by Architect post sign 'DECORATING COMPLETE - NO ADMITTANCE WITHOUT PERMISSION'.

1.11 TEST AREA

- .1 A room or area in the building will be designated by the Architect as a test area to establish standard of workmanship, texture, gloss and coverage.
- .2 Prior to any painting being started, request a meeting between Architect, Contractor, Subcontractor and Material Manufacturer's Representative to review conditions, surfaces, anticipated problems and to clarify quality of workmanship acceptable to Architect.
- .3 Apply finishes to each type of surface within room with correct material, coats, colour, texture and degree of gloss in sample area and have same approved prior to providing Work of this Section.
- .4 Retain test area until after completion of Work. Test area to be minimum standard for the Work.

1.11 TEST AREA (CONT'D)

- .5 Failure to comply with the above will be cause for Architect to request all Work previously painted to be repainted.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Paint and finishing materials - highest grade, Acrylic Latex, stain resistance, easy to clean, first line quality provided by manufacturer who agrees to provide supervision service during painting operations. The following manufacturers are acceptable:

- .1 Benjamin Moore Company (Preferred Vendor)
- .2 Glidden Company, Division of S.C.C. (Canada) Ltd.
- .3 Para Paints Ltd.
- .4 Pratt & Lambert Inc.
- .5 Pittsburgh Paint
- .6 Sherwin Williams
- .7 Dulux

Or other approved manufacturer providing inspection service and proving same prior to bidding.

- .2 Paint Gloss Rating Description: Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following gloss level categories, as defined in the MPI Architectural Specification Manual:

- .1 Gloss Level G1: Matte or Flat Finish.
- .2 Gloss Level G2: Velvet Finish.
- .3 Gloss Level G3: Eggshell Finish.
- .4 Gloss Level G4: Satin Finish.
- .5 Gloss Level G5: Sem-Gloss Finish.
- .6 Gloss Level G6: Gloss Finish.
- .7 Gloss Level G7: High Gloss Finish.

2.1 MATERIALS (CONT'D)

- .3 Paints, enamels, fillers, primers, varnishes and stains- ready mixed products of one of the manufacturers listed herein. Substitutes will not be allowed.
- .4 Thinners, cleaners - type and brand recommended by the paint manufacturer.
- .5 Only products manufactured by paint manufacturer stated at time of submission of samples will be allowed on Site unless other materials specifically specified herein. No painting to be performed until paint manufacturer identified and acceptance received from the Architect.
- .6 Deliver materials to Site in original unbroken containers bearing brand and maker's name. The presence of any unauthorized material or containers for such, on Site shall be of sufficient cause for rejection of ALL paint materials on Site at that time.

PART 3 - EXECUTION

3.1 GENERAL PREPARATION OF SURFACES

NOTE: ALL NOTED SURFACES MAY NOT BE APPLICABLE TO THIS PROJECT.

- .1 Prepare surfaces in accordance with the following standards unless otherwise specified:
 - .1 Prepare wood surfaces to MPI Architectural Paint Specification Manual and Approved Product List as standards of reference for vinyl sealer over knots and resinous areas, wood paste filler for nail holes. Tint filler to match for stained woodwork.
 - .2 Touch up damaged spots of shop paint primer on steel MPI # 79 Primer, Alkyd Anti-Corrosion and MPI Architectural Paint Specification Manual Surface Preparation.
 - .3 Prepare galvanized steel and zinc coated surfaces to CGSB 85-GP-16. This includes wiped coated steel surfaces. Use top finish coat manufacturers recommended products and procedures for preparation.
 - .4 Prepare masonry and concrete surfaces to CGSB 85-GP-31. Refer to MPI Architectural Paint Specification Manual Surface Preparation and the Paint Manufacturers Recommended Instructions.
 - .5 Prepare wallboard surfaces to CGSB 85-GP-33. Fill minor cracks with plaster patching compound. Refer to MPI Architectural Paint Specification Manual Surface Preparation.
 - .6 Prepare concrete floors to CGSB 85-GP-32. Refer to MPI Architectural Paint Specification Manual Surface Preparation.
 - .7 Prepare copper piping and accessories to CGSB 85-GP-20. Refer to MPI Architectural Paint Specification Manual Surface Preparation.
 - .8 Apply prime coat on wood scheduled for paint finish before installation.

3.1 **GENERAL PREPARATION OF SURFACES (CONT'D)**

- .9 Back prime wood scheduled for transparent finish. Do not prime surfaces scheduled for transparent finish.
- .10 The basic standards for preparing metal substrates and cleaning shall be to the Society for Protective Coatings (SSPC) and the National Association of Corrosion Engineers International (NACE) Standards SP1 to SP14, and as per the Manufacturers recommendations.

3.2 **APPLICATION**

- .1 In accordance with manufacturer's printed instructions and manufacturers Site representative.
- .2 With suitable, clean equipment in good condition.
- .3 Clean all structure, services, ducts, diffusers, destratification fans, prior to painting. Do not paint any dirty surface.
- .4 In dust-free suitable conditions on the surfaces free from machine, tool or sandpaper marks, insects, grease, or any other condition liable to impair finished work to prevent production or good results.
- .5 Even, uniform in sheen, colour and texture, free from brush or roller marks, well brushed or rolled in and free of crawls, runs, join marks or other defects.
- .6 Painting coats are intended to cover surfaces perfectly; if in painter's opinion, formula specified is inadequate to provide a first class finished surface, report to the Architect before commencing work. Surfaces imperfectly covered shall receive additional coats at no additional cost.
- .7 Use paint unadulterated. Use same brand of paint for primer, intermediate and finish coats. Factory mix all paints.
- .8 Paint finish shall be applied by roller except in the case of wood trim, door frames, base board and similar work of small surface area which shall be painted by brush. Do not use roller for applying finish other than paint.
- .9 Spray painting will not be permitted unless specifically approved in writing by the Architect in each instance. Architect may withdraw approval at any time and prohibit spray painting for reasons such as carelessness, poor masking or protection measures drifting paint fog, disturbance to other Trades or failure to obtain a dense, even, opaque finish. Spray painting shall be full double coat, i.e. at least two passes for each coat. Do not use spray or roller on wood or metal surfaces, brush only unless approved in writing by Architect.
- .10 Finish edges of doors with paint or stain treatment as required to match face of door. Seal hidden edges of wood doors with one coat of shellac and one coat gloss varnish or two coats paint. Repaint tops and edges of wood doors after fitting.

3.2 APPLICATION (CONT'D)

- .11 Even up stained woodwork in colour as required by nature of wood and as directed by Architect. Apply same finish on trim, fitments, cupboards and other protecting ledges as on surrounding work, disregard sight lines.
- .12 Carefully hand smooth and sandpaper wood between coats (including priming). Apply one coat sealer before applying first coat print filler to knots or sap blemishes on wood surfaces to receive paint or stain finish.
- .13 Remove rust, oil, grease and loose shop paint from metal work by brushing or with wire brushes and make good shop coat before proceeding with final finish. Feather out edges to make touch up patches inconspicuous.
- .14 After first coat, fill nail holes, splits and scratches, using putty coloured to match finish.
- .15 Clean castings with wire brush before application of first paint coat.
- .16 Clean galvanized metal surfaces thoroughly with xylol. Do not etch galvanized metal. Use zinc rich primer. This includes metal door frames and the like with wiped zinc coating.
- .17 Remove form oil or parting compounds from concrete surfaces. Use Xylol or approved compound.
- .18 Where clean finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- .19 Back prime interior woodwork with enamel primer sealer paint.
- .20 Back prime exterior woodwork with exterior primer paint.
- .21 Pigmented (Opaque) Finishes: Completely cover substrate to a smooth, opaque surface of uniform finish, colour, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be accepted.
- .22 Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even lustre. Provide a finish free of laps, cloudiness, colour irregularity, runs, brush marks, orange peel, nail holes of other surface imperfections.
- .23 During the application of paint to the underside of exposed steel deck, structure and mechanical and electrical components this contractor is to ensure the provision of adequate lighting to enable a consistent, even and thorough coating.
- .24 Conform with Architect's colour schedule and exactly match approved samples.

3.3 FACILITY SERVICES

- .1 Commence Work when mechanical and electrical installation is complete in the area concerned.

3.3 FACILITY SERVICES (CONT'D)

- .2 Do not paint plated or other pre-finished surfaces, unless otherwise noted.
- .3 Unless otherwise specified or noted, paint “unfinished” conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and texture to match adjacent surfaces, in the following areas:
 - .1 Where exposed-to-view in exterior and interior areas.
 - .2 In high humidity interior areas.
 - .3 In mechanical and electrical rooms.
- .4 Remove finished louvres, grilles, covers, and access panels on mechanical and electrical components from location and paint separately. Finish paint primed equipment to colour as selected by Consultant.
- .5 Paint the inside of air ducts, convection, and baseboard heating cabinets where visible behind louvres, grilles and diffusers for a minimum of 460 mm or beyond sight line, whichever is greater with primer and one coat of matt black (non-reflecting) paint.
- .6 Paint the inside of light valance gloss white.
- .7 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .8 Paint red or band fire protection piping and sprinkler lines in accordance with mechanical specifications requirements. Keep sprinkler heads free of paint.
- .9 Paint yellow or band natural gas piping in accordance with mechanical specification requirements.
- .10 Back prime and paint face and edges of plywood service panels a semi-gloss, grey colour before installation of telephone and electrical equipment. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
- .11 Paint exterior steel electrical light standards. Do not paint outdoor transformers and substation equipment.
- .12 Colour code equipment, piping, conduit, and exposed ductwork in accordance with colour schedule. Colour band and identify with flow arrows, names, and numbering.
- .13 In unfinished areas, leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .14 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by equipment manufacturer.

3.3 **FACILITY SERVICES (CONT'D)**

- .15 Use heat resistant epoxy paint on pipes and surfaces where operating surface temperature exceeds 65 degrees C.
- .16 Paint exposed piped and ducts and their supports and related items in colours to suit colour coding adopted by Owner, to Architect's later instructions. Refer to Mechanical Division 20 for further instruction.

3.4 **REPAIRS**

- .1 Cracks occurring in walls or ceilings requiring patching during "Warranty Period" shall be repainted in such a way that the patch is not visible at a distance of 3'-0".
- .2 If patch painting is not acceptable, repaint entire wall, or ceiling.
- .3 Patch and make good existing damaged masonry surfaces: Provide smooth, brush grade patching compound for cracks in masonry. Spot Prime: WL700GLSB - Masonry Patch And Seal Brush-Grade, Smooth.

3.5 **FORMULAE**

- .1 The finish called for is eggshell, semi-gloss or gloss may be ordered for specific applications at no additional charge. On drywall eggshell shall be mixed with flat to provide low sheen to hide imperfections to Architect's approval or method agreed between Architect and material manufacturer's representative.

.2 **INTERIOR WORK**

Drywall

- 1 Coat Latex primer
- 2 Coats Latex paint (where paint noted).
Gloss Level 2 (Velvet)
Gloss Level 3 (Eggshell)
Gloss Level 5 (Semi-Gloss)
Prime all walls whether paint scheduled at this time or not.

Concrete Block Interior

- 1 Coat block filler. Apply at maximum coverage of 80 sq.ft. per gallon
 - 2 Coats Latex paint.
Gloss Level 2 (Velvet)
Gloss Level 3 (Eggshell)
Gloss Level 5 (Semi-Gloss)
-

3.5	FORMULAE (CONT'D)		
	Cast-In-Place Concrete (not floors)	1 2	Coat alkali resistant primer. Coats Latex paint Gloss Level 2 (Velvet) Gloss Level 3 (Eggshell) Gloss Level 5 (Semi-Gloss)
	Concrete Floors (Epoxy Finish)	1 1	Abrade surface to grit 60 roughness Coat application Amerlock-2 high performance epoxy coating
	Concrete Floors (Enamel Paint Finish)	2	Coat application
	Woodwork (Opaque Finish)	1 2	Coat wood primer Coats Latex trim enamel Gloss Level 5 (Semi-Gloss)
	Woodwork (Natural Finish)	1 3 2	Coat paste-filler Coats varnish Coats varnish satin finish
	Ferrous Metal	1 2	Coat metal primer Coats enamel
	Shop Primed Ferrous Metal	2	Touch-up prime coat where damaged Coats enamel
	Galvanized Metal	1 1 2	Coat zinc rich primer to touch up galvanized only Coat galvanized iron primer Coats enamel
	Insulation on Pipes & Ducts	1 2	Coat standard latex primer/ sealer – reference Coat enamel

3.5 FORMULAE (CONT'D)

Mechanical Equipment	1	Coat alkyd enamel undercoat
	1	Coat enamel

Piping, conduit & ductwork (uncoated)	1	Coat metal primer
	1	Coat enamel, gloss

PVC primer for pipes	1	Primer: .09403429 - UMA BRAND WH 3.78L
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Surfaces behind grilles	2	Coats vinyl latex matt within 12" of grille black
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NOTE: Use heat resistant paint where required.

.3 EXTERIOR WORK

Concrete Block	1	Coat block filler. Apply at maximum coverage of 80 sq.ft. per gallon.
	2	Coats Latex paint. Latex - Gloss Level 1 (Flat) Gloss Level 3/4 (Low Sheen) Gloss Level 5 (Semi-Gloss)

Galvanized Steel	1	Coat zinc rich primer to touch up zinc coat only
	1	Coat Galvanized iron primer
	2	Coats exterior enamel

Ferrous Metals Structural Steel	2	Coats exterior alkyd enamel
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NOTE: Touch up shop primer and field welds using zinc rich primer.

Wood Stain	2	Coat Olympic Semi-transparent stain
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3.6 **COLOUR SCHEDULE**

- .1 Refer to the Colour, Material & Finish Schedules on Drawings

3.7 **MAINTENANCE MATERIALS**

- .1 Provide one sealed, 5 Gallon Pail capacity c/w pour spout, of each product in each colour used in the Work for Owner's use in maintenance Work.
- .2 Container to be new fully labelled with manufacturer's name, type of paint, colour and area of application.

END OF SECTION

DIVISION 10 - SPECIALITIES

PART 1 - GENERAL

1.0 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.1 RELATED WORK SPECIFIED ELSEWHERE

- | | | |
|----|------------------|------------------|
| .1 | Unit Masonry | Section 04 20 00 |
| .2 | Finish Carpentry | Section 06 20 00 |
| .3 | Gypsum Board | Section 09 21 16 |

1.2 REFERENCES

- .1 AA Designation System for Aluminum Finishes.
- .2 ANSIA208.1-2009: Particleboard.
- .3 ASTM A653/A653M-23: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .4 ASTM B221M-21: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- .5 PEI 1002: Manual and Performance Specifications for Porcelain Enamel Wiring Surfaces.
- .6 CAN/ULC-S102-2018 (REV1): Standard Method of Test for Surface Bruning Characteristics of Building Materials and Assemblies.
- .7 CAN/ULC-S706.1-2020: Standard for Wood Fibre Insulating Boards for Buildings.

1.3 SHOP DRAWINGS

- .1 Submit Shop Drawings as specified in Section 01 33 00.
- .2 Shop Drawings: Project-specific drawings, illustrating materials, layouts, component dimensions and thicknesses, details of connections and fastening, trim, hardware and shop-applied finishes.

1.4 SAMPLES

- .1 Submit samples as specified in Section 01 33 00.

1.4 SAMPLES (CONT'D)

- .2 Samples: A composite sample of markerboard and tackboard; minimum 1 000 x 1 000 mm size; illustrating quality of each material, trim pieces and method of joining adjacent panels.

1.5 CLOSE-OUT SUBMITTALS

- .1 Submit closeout submittals as specified in Section 01 78 00.
- .2 Maintenance Data: Manufacturer's standard maintenance and cleaning guidelines; sufficient quantity for inclusion in operation and maintenance manuals.
- .3 Apply removable maintenance instruction labels to each markerboard.

1.6 WARRANTY

- .1 Submit extended warranty in accordance with General Conditions of the Contract.
- .2 Manufacturer's Extended Warranty: Warrant markerboards for a period of 10 years against defects other than those due to normal usage and wear, including fading, crazing, chipping, peeling and surface becoming slick, glassy or otherwise unsuitable for use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- .1 Manufacturers having Product considered acceptable for use:
 - .1 ASI Visual Display Products, Inc.
 - .2 Claridge.
 - .3 Delta Products, Ltd.
 - .4 Global School Products Inc.
 - .5 Martack Specialties Ltd.
- .2 Substitution Procedures: Refer to Section 01 25 00.

2.2 DESCRIPTION

- .1 Use matching components sourced from a single manufacturer's series of Products.

2.3 REGULATORY REQUIREMENTS

- .1 Test Products for fire performance to CAN/ULC-S102.

2.4 MATERIALS

- .1 Extruded Aluminum: To ASTM B221M, 6063 alloy, T5 temper.
- .2 Sheet Steel: To ASTM A653/A653M, Commercial Steel (CS), Types A, B and C.
- .3 Cork: Natural cork, Tan colour.
- .4 Fibreboard: To CAN/ULC-S706.1, Type I; Impregnated, sound absorbing type.
- .5 Particleboard: To ANSI A208.1, Grade M-2.

2.5 COMPONENTS

- .1 Markerboard: Sandwich type construction, as follows:
 - .1 Face Panel: 0.76 mm thick electroplated steel; Vit-Rite porcelain enamel writing surface, acid-resistant, washable surface; White colour.
 - .2 Core: 11 mm impregnated sound absorbing fibreboard.
 - .3 Back-up Balancing Sheet: 0.4 mm thick galvanized steel.
- .2 Tackboards: 13 mm thick; factory laminated; as follows:
 - .1 Tackable Surface: 6 mm thick cork.
 - .2 Back-up Panel: 6 mm thick particleboard.
- .3 Aluminum Trim: 1.5 mm thick extruded aluminum profiles; eg. Series 9300 by ASI Visual Display Products, Inc., comprised of:
 - .1 Perimeter and divider trim.
 - .2 Concealed mechanical joining system, with integral slotted PVC insert laminated into ends of panels, and 2.0 mm thick galvanized steel spline.
 - .3 Marker trays with contour fitting end castings; flat and non-protruding types as noted on Drawings.
- .4 Horizontal Sliding Trim: 1.5 mm thick extruded aluminum, eg. Series 9300 by ASI Visual Display Products, Inc., comprised of:
 - .1 Continuous one-piece head with integral map rail and fully enclosed single or double track section as required by Drawings.
 - .2 Two 4-wheel moulded nylon rollers per panel.

2.5 **COMPONENTS (CONT'D)**

- .3 Tubular jamb sections rigidly attached to top and bottom sections complete with shock absorbing and noise-reducing rubber bumpers.
- .4 Single tubular sill section, and support angle with single or double rigid vinyl guide for sliding panels.

2.6 **FABRICATION**

- .1 Markerboards: Factory laminate core to face panel and back-up balancing sheet under heat and pressure.
 - .1 Provide permanent music score lines to one markerboard in each Music Room.
- .2 Tackboards: Factory laminate tackable surface to back-up panel under mechanical pressure, using a waterproof adhesive.
- .3 Sliding Tackboards:
 - .1 Provide white painted back surface for horizontal sliding tackboard units.
 - .2 Fabricate sliding tackboards with adequate steel reinforcing to ensure they will remain wrap-free.

2.7 **FINISHES**

- .1 Porcelain Enamel Panels: To PEI 1002; gloss factor of 6-8 measured by 45 degree.
- .2 Aluminum: To AA-A41; clear etches and anodized 0.051 mm satin finish, free from extruding draw marks and surface scratches.
- .3 Galvannealed Coating on Sheet Steel: To ASTM A653/A653M, Coating Designation ZF-120; wiped zinc-iron coating, with streak-free matte grey appearance.

PART 3 – EXECUTION

3.1 **EXAMINATION**

- .1 Refer to Section 01 71 00.
- .2 Verify millwork units designated to incorporate visual display surfaces are installed.

3.2 **INSTALLATION**

- .1 Install Products to a rigid, straight, square and plumb installation, with horizontal lines level.
- .2 Securely attach aluminum trims to ensure fastenings are concealed.

3.2 **INSTALLATION (CONT'D)**

- .3 Adhere tackboards to wall surface with approved adhesive applied egg-sized blobs at approximately 200 mm OC. Press tackboards firmly into adhesive, ensuring proper adhesion.
- .4 Joint markerboards together using concealed mechanical joining system. Ensure flush butt joints with hairline appearance.

3.3 **ADJUSTING**

- .1 Leave visual display boards in a state suitable for immediate use by Owner.

3.4 **CLEANING**

- .1 Refer to Section 01 74 00.
- .2 Clean down, remove dirt and leave elements in a first class condition.

END OF SECTION

DIVISION 12 - FURNISHINGS

PART 1 - GENERAL

1.0 CONTRACT DOCUMENTS

- .1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2020, Supplementary Conditions and all Sections of Division 01 apply to and form part of this section of the specification.

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Unit Masonry Section 04 20 00
- .2 Gypsum Board Assemblies Section 09 21 16

1.2 REFERENCES

- .1 AAMA 2604-22: Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (With Coil Coating Appendix).
- .2 ASTM B209/B209M-21a: Standard Specifications for Aluminum and Aluminum-Alloy Sheet and Plate.
- .3 ASTM B221M-21: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- .4 Canada Consumer Products Safety Act, SOR/2019-97: Corded Window Coverings Regulations.
- .5 NFPA 701-2004: Methods of Fire Tests for Flame Propagation of Textiles and Films.
- .6 CAN/ULC-S109-14 (R2019): Standard Method for Flame Tests of Flame-Resistant Fabrics and Films.
- .7 ANSI/WCMA A100.1-2018: American National Standard for Safety of Corded Window Covering Products.

1.3 PRODUCT DATA

- .1 Submit Product data as specified in Section 01 33 00.
- .2 Product Data: Manufacturer's standard data sheets, indicating materials, components and accessories, component sizes, available fabrics and finishes, and installation instructions.

1.4 SHOP DRAWINGS

- .1 Submit Shop Drawings as specified in Section 01 33 00.

1.4 SHOP DRAWINGS (CONT'D)

- .2 Shop Drawings: Project-specific drawings, illustrating wall opening dimensions, shade sizes, operator details, top rail, anchorage details, joint locations, hardware and accessory details, conditions between adjacent units, corner conditions and required clearances.

1.5 SAMPLES

- .1 Submit samples as specified in Section 01 33 00.
- .2 Verification Samples: Duplicate samples of the following:
 - .1 Shade Fabric: 200 x 200 mm size samples of each specified fabric.
 - .2 Visually-Exposed Components: 300 mm long samples of each visually-exposed component, illustrating material, colour, surface texture and sheen.
 - .3 Metal Finish: 50 x 100 mm size samples, illustrating specified finish and colour.

1.6 SOURCE QUALITY CONTROL SUBMITTALS

- .1 Submit source quality control submittals as specified in Section 01 33 00.
- .2 Fire Test Reports: Manufacturer's standard fire test reports, prepared by independent testing agency deemed acceptable by authorities having jurisdiction, indicating fire hazard classification of shade fabric meets regulatory requirements.

1.7 CLOSE-OUT SUBMITTALS

- .1 Submit closeout submittals as specified in Section 01 78 00.
- .2 Operation and Maintenance Data: Manufacturer's standard operating instructions and maintenance and cleaning guidelines; sufficient quantity for inclusion in operation and maintenance manual.

1.8 QUALIFICATIONS

- .1 Supplier: A manufacturer-certified firm, approved to supply specified Products, and to honour warranty claims.
- .2 Installer: A manufacturer-certified firm, trained and experienced in installing specified Products.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Refer to Section 01 60 00.
- .2 Protect Products with suitable heavy weight wrapping before delivery to Place of the Work.

1.9 **DELIVERY, STORAGE AND HANDLING (CONT'D)**

- .3 Store Products at Place of the Work in a designated area, allowing for natural ventilation over finished surfaces.

1.10 **WARRANTY**

- .1 Submit extended warranty in accordance with General Conditions of the Contract.
- .2 Extended Warranty: For a period of 10 years, covering complete replacement cost of defective Product, including removal and disposal of defective assembly, and installation of replacement Product. Covered defects to include the following:
 - .1 Fading of shade fabric colour,
 - .2 Shrinkage of shade fabric,
 - .3 Loss of flame-retardant properties of shade fabric,
 - .4 Punctures, rips or tears in shade fabric, and
 - .5 Mechanical failure of operating mechanisms.

PART 2 - PRODUCTS

2.1 **MANUFACTURERS**

- .1 Manufacturers having Products considered acceptable for use:
 - .1 Altex Inc.

2.2 **DESCRIPTION**

- .1 Roller Window Shades: Manual wand-controlled operation, single sprocket roller shade, rectangular-shaped, with infinite positioning; each unit consisting of two end brackets, shade roller tube, cassette fascia, exposed hembar and sun control fabric; powder coated finish; sizes as indicated on Drawings.

2.3 **DESIGN CRITERIA**

- .1 Basis of Design: Newton High-Speed Lite-Lift with Fascia by Altex Inc.
- .2 Design manual roller window shades to operate without any exposed cords or chains, in accordance with Canada Consumer Product Safety Act SOR/2019-97 and ANSI/WCMA A100.1.
- .3 Design system to allow lowering shade by pulling on hembar without damaging clutch or spring.

2.3 **DESIGN CRITERIA (CONT'D)**

- .4 Design system with embedded upper limit stop device to ensure constant upper position and avoid shade being over lifted.
- .5 Design system to be operable with one hand, from any height while sitting.
- .6 Design system to be operated using two wands per roller, as follows:
 - .1 Front Wand: To raise shade.
 - .2 Rear Wand: To lower shade.

2.4 **PERFORMANCE CRITERIA**

- .1 Fire Classification of Fabrics: Flame-retardant and fire-resistant to CAN/ULC-S109 and NFPA 701.
- .2 Required Lifting Force: Minimum 1.134 kg and maximum 1.814 kg to raise or lower shade.
- .3 Operating Speed: ≥ 1.0 m/s.
- .4 Durability: $\geq 5\,500$ cycles.

2.5 **MATERIALS**

- .1 Extruded Aluminum: To ASTM B221M, 6063 alloy, T5 temper; unless specified otherwise.
- .2 Sheet Aluminum: To ASTM B209/B209M, 3003 alloy, H14 temper.
- .3 Sun Control Fabric (SCF); Vinyl-coated polyester yarn, consisting of 79 percent vinyl and 21 denier polyester core yarn; with antimicrobial coating; tensioned prior to heat setting; colour as selected by Consultant.
 - .1 SCF-1: 3 percent openness factor.
 - .2 SCF-2: 5 percent openness factor.
- .4 Bituminous Coating: Fibrous asphalt emulsion.
- .5 Screw Fasteners: Non-corrosive type, size as recommended by shade manufacturer.

2.6 **COMPONENTS**

- .1 End Bracket: 77 x 96 mm, two-piece moulded ABS construction; 64 mm OD nylon Drive sprocket; finish to match fascia colour.

2.6 **COMPONENTS (CONT'D)**

- .2 Shade Roller Tube: 1.52 mm thick extruded aluminum with 3 internal 4.82 mm high continuous fins spaced 120 degrees apart.
- .3 Cassette: Two-piece interlocking 1.9 mm thick extruded aluminum housing, rectangular profile.
- .4 Fascia: 1.7 mm thick extruded aluminum complete with three continuous screw flute.
- .5 Drive Assembly: Factory set for size and travel of shades, field adjustable; complete with built-in shock absorber.
- .6 Wand: Extruded aluminum, with powder coated finish to match assembly.
- .7 Hem Bar: 32 x 19 mm size, extruded aluminum, with upper groove to secure shading fabric; complete with high-impact nylon plugs inserted into each end.

2.7 **FINISHES**

- .1 Powder Coated Finish on Metal Components: To AAMA 2604; electrostatically sprayed polymer powder, factory-applied to 0.05 mm dry film thickness; colour as selected by Consultant.

PART 3 – EXECUTION

3.1 **PREPARATION**

- .1 Apply heavy coat of bituminous paint on surfaces of aluminum surfaces placed in direct contact with concrete, mortar, plaster or dissimilar metals.
- .2 Supply fastenings and anchors required to be built in to adjacent work to other Sections.

3.2 **INSTALLATION**

- .1 Install Products inside window openings level, plumb, and square.
- .2 Install Products parallel with window plane.
- .3 Install Products rigidly coupled and adequately anchored.
- .4 Maintain uniform clearances, and accurate alignment levels.
- .5 Conform to manufacturer's Product data and accepted Shop Drawings.
- .6 Conceal brackets and rollers with closure panels for full width of opening.

3.3 **TOLERANCES**

- .1 Gap variation Along Perimeter: ≤ 6 mm per 2 440mm of shade height.

3.3 **TOLERANCES (CONT'D)**

- .2 Offset from Level: ≤ 3 mm.
- .3 Conform to manufacturer's edge clearance requirements for shades exceeding a 1:3 width-to-height ratio.

3.4 **ADJUSTING**

- .1 Adjust Products to ensure smooth and trouble free operation without binding.
- .2 Adjust shade and fabric to hang flat without buckling or distortion.
- .3 Leave shades in raised position upon completion.

3.5 **CLEANING**

- .1 Refer to Section 01 74 00.
- .2 Clean exposed surfaces using non-abrasive materials and methods.

3.6 **DEMONSTRATION**

- .1 Refer to Section 01 79 00.
- .2 Demonstrate proper operation and maintenance of roller shades.

END OF SECTION

TABLE OF CONTENTS

PART 1 - GENERAL	3
1.1. DESCRIPTION	3
1.2. DEFINITIONS	3
1.3. RELATED WORK	3
1.4. APPLICABLE PUBLICATIONS	3
1.5. SUBMITTALS	4
1.6. DUTIES OF MECHANICAL CONTRACTOR	4
1.7. SCHEDULING OF WORK	5
1.8. INTENT	5
1.9. INTERFERENCES	6
1.10. EXAMINE SITE	7
1.11. INTERFERENCE DRAWINGS	7
1.12. MAINTENANCE DATA AND OPERATING INSTRUCTIONS	8
1.13. MATERIALS AND STANDARDS OF ACCEPTANCE	8
1.14. MATERIAL SUBSTITUTIONS	8
1.15. CODES, PERMITS, FEES AND CONNECTIONS	8
1.16. CONSULTANT'S INSTRUCTIONS	9
1.17. ADDITIONAL WORK AND CHANGES	9
1.18. QUALITY ASSURANCE	9
1.19. EXECUTION (INSTALLATION, CONSTRUCTION) QUALITY	10
1.20. CLEANLINESS OF PIPING AND EQUIPMENT SYSTEMS	11
1.21. DELIVERY, STORAGE AND HANDLING	11
1.22. AS-BUILT DOCUMENTATION	12
PART 2 - PRODUCTS	12
2.1. MATERIALS FOR VARIOUS SERVICES	12
2.2. FACTORY-ASSEMBLED PRODUCTS	13
2.3. COMPATIBILITY OF RELATED EQUIPMENT	13
2.4. SAFETY GUARDS	13

2.5.	LIFTING ATTACHMENTS.....	14
2.6.	EQUIPMENT AND MATERIALS IDENTIFICATION	14
2.7.	GALVANIZED REPAIR COMPOUND	15
2.8.	PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS	15
2.9.	PIPE PENETRATIONS	18
2.10.	TOOLS AND LUBRICANTS.....	19
2.11.	WALL, FLOOR AND CEILING PLATES	19
PART 3 - EXECUTION		19
3.1.	ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING	19
3.2.	PROTECTION AND CLEANING:	20
3.3.	WORK IN EXISTING BUILDING:	21
3.4.	TEMPORARY PIPING AND EQUIPMENT	22
3.5.	RIGGING.....	22
3.6.	THERMOMETERS AND PRESSURE GAUGES	22
3.7.	PIPE AND EQUIPMENT SUPPORTS.....	23
3.8.	LUBRICATION	24
3.9.	PLUMBING SYSTEMS DEMOLITION	25
3.10.	CLEANING AND PAINTING	26
3.11.	IDENTIFICATION SIGNS	26
3.12.	STARTUP AND TEMPORARY OPERATION	27
3.13.	OPERATING AND PERFORMANCE TESTS	27
3.14.	OPERATION AND MAINTENANCE MANUALS	27
3.15.	CLOSE-OUT DOCUMENTATION	28
3.16.	COMMISSIONING	28
3.17.	OPERATING AND PERFORMANCE TESTS	28
3.18.	DEMONSTRATION AND TRAINING	29

PART 1 - GENERAL

1.1. DESCRIPTION

- 1.1.1. The requirements of this Section shall apply to all sections of Division 22 - Plumbing.

1.2. DEFINITIONS

- 1.2.1. Exposed: Piping and equipment exposed to view in finished rooms.

1.3. RELATED WORK

- 1.3.1. Section: 01 33 23 Shop Drawings, Product Data, and Samples.
- 1.3.2. Section: 22 05 53 Identification for Plumbing Piping and Equipment.
- 1.3.3. Section: 22 07 00 Plumbing Insulation.
- 1.3.4. Section: 26 05 00 Common Work Results for Electrical.
- 1.3.5. Section: 26 05 19 Low-Voltage Electrical Power Conductors and Cables.

1.4. APPLICABLE PUBLICATIONS

- 1.4.1. The publications listed below shall form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- 1.4.2. Ontario Building Code – Part 7 latest edition
- 1.4.3. Ontario Standard CSA-B149.1 latest edition
- 1.4.4. American Society for Testing and Materials (ASTM):
- 1.4.4.1. A36/A36M-2012 Standard Specification for Carbon Structural Steel
 - 1.4.4.2. F1760-01(R2011) Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Non-Pressure Plastic Pipe Having Reprocessed-Recycled Content
- 1.4.5. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry, Inc:
- 1.4.5.1. SP-58-2009 Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation
 - 1.4.5.2. SP-69-2003 Pipe Hangers and Supports - Selection and Application
- 1.4.6. National Fire Protection Association (NFPA):

- 1.4.6.1. 51B-2014 Standard for Fire Prevention During Welding, Cutting and Other Hot Work
- 1.4.6.2. 70-2011 National Electrical Code (NEC)

1.5. SUBMITTALS

- 1.5.1. Submittals, including number of required copies, shall be submitted in accordance with Section: 01 33 23 Shop Drawings, Product Data, and Samples.
- 1.5.2. Manufacturer's Literature and Data: submit all equipment and material performance and characteristics, operational curves, diagrams and schematic, power wiring schematics and all other pertinent operational information. Submit all equipment physical sizes, weights, methods of lifting and installation, support requirements.
- 1.5.3. Electric motor data and variable speed drive data shall be submitted with the driven equipment.
- 1.5.4. Equipment and materials identification.
- 1.5.5. Fire stopping materials.
- 1.5.6. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.
- 1.5.7. Wall, floor, and ceiling plates.
- 1.5.8. Submittals and shop drawings for interdependent items, containing applicable descriptive information, shall be furnished together and complete in a group. Coordinate and properly integrate materials and equipment in each group to provide a completely compatible and efficient installation. Final review and approvals will be made only by groups.

1.6. DUTIES OF MECHANICAL CONTRACTOR

- 1.6.1. The mechanical contractor shall assume the responsibilities and duties including but not limited to the ones described below:
- 1.6.2. Superintendence
 - 1.6.2.1. Provide full time on-site superintendent personnel and supporting staff with proven experience in project of similar value and complexity.
 - 1.6.2.2. Site superintendent shall have over-all authority to speak for and represent the mechanical contractor.

1.6.3. Coordination

- 1.6.3.1. Coordinate the work with all the sub-trades involved to ensure that the work will be carried out on schedule and in proper sequence.
- 1.6.3.2. Take complete responsibility for all remedial work that results from failure to coordinate any aspect of the mechanical work prior to its fabrication and/or installation.
- 1.6.3.3. Take responsibility for the delivery of equipment necessary to complete the work in accordance with the approved schedule.

1.6.4. Staffing and Scheduling

- 1.6.4.1. Within seven days after the award of the contract, the Mechanical Contractor shall provide to the Client representative the following information:
 - 1.6.4.1.1. Appointment of official representatives in the project.
 - 1.6.4.1.2. Schedule of work.
 - 1.6.4.1.3. Delivery schedule for specified equipment.
 - 1.6.4.1.4. Requirements for temporary facilities, site signs, storage, etc.

1.6.5. Work Completion Meeting

- 1.6.5.1. Prior to application for Substantial Performance of the Work, the mechanical contractor shall participate in the take-over meeting. Agenda to include the following:
 - 1.6.5.1.1. Review of outstanding deficiencies.
 - 1.6.5.1.2. Submission of maintenance manuals, warranties and as-built drawings.
 - 1.6.5.1.3. Results of performance tests and described further in this section.
 - 1.6.5.1.4. Scheduling of training to Board's personnel.

1.7. SCHEDULING OF WORK

- 1.7.1. For all work to be performed under this contract, adhere to Construction Schedule agreed upon with the Client.

1.8. INTENT

- 1.8.1. Bidders for this work shall include for all labor, material, equipment and all other related cost including all applicable taxes (except GST) and fees to provide the work as indicated on the drawings.
- 1.8.2. Provide and supply a new counter mounted sink.

- 1.8.3. New domestic cold water and domestic hot water piping to be installed c/w isolation valves as per design drawings.
- 1.8.4. Install new sanitary piping and plumbing vent as indicated on design drawings.
- 1.8.5. Misinterpretation of any requirement of the drawings and specifications will not relieve the Mechanical Contractor of responsibility. If in any doubt, the Mechanical Contractor shall contact the Consultant for written clarification prior to submitting a bid for the Work.

1.9. INTERFERENCES

- 1.9.1. The mechanical drawings do not show all the architectural and structural details, and any information involving accurate measuring of the building shall be taken from the building drawings or at the building. Make without additional charge, any necessary changes or additions to the runs of drains, pipes, ducts, etc., to accommodate the above conditions. The location of equipment may be altered without charge providing the change is made before installation and does not necessitate major additional material.
- 1.9.2. Wherever differences occur between specifications, riser diagrams or schematics and drawings, the maximum conditions shall govern and the bid shall be based on whichever information indicates the greater cost.
- 1.9.3. Field verifications of dimensions on plans shall be made since actual locations, distances, and levels will be governed by actual field conditions.
- 1.9.4. Discrepancies between different plans, or between plans and actual field conditions, or between plans and specifications shall promptly be brought to the attention of the Consultant for a decision.
- 1.9.5. Install all mechanical services including but not exclusive to drains, pipes, and ducts, to conserve headroom and interfere as little as possible with the free use of the space through which they pass. All drains, pipes, ducts, etc., particularly those which may interfere with the inside treatment of the building, or conflicting with other trades, shall be installed only after the locations have been approved by the Consultant. Special care shall be taken in the installation of all mechanical services including, but not exclusive to drains, pipes, and ducts, which are to be concealed, to see that they come within the finished lines of floors, walls, and ceilings. Where such drains, pipes, ducts, etc., have been installed in such a manner as to cause interference, they shall be removed and re installed in suitable locations without extra cost to the Board.
- 1.9.6. Before commencing work, check and verify all grade and invert elevations, stacks, levels, and dimensions, to ensure proper and correct installation of the work.

- 1.9.7. In every place where there is space indicated as reserved for future or other equipment, leave such space clear, install blank offs, shut off valves with blind flanges and other work so that the necessary connections can be made without any stoppages to the system. Consult with the consultant whenever necessary for this purpose.
- 1.9.8. In addition to the work specifically mentioned in the Specifications and shown on the drawings, provide all other items that are obviously necessary to make a complete working installation, including those required by the Authorities Having Jurisdiction over the work.
- 1.9.9. The mechanical plans show approximate locations for wall mounted devices. Obtain Consultant's approval of mounting heights and locations before commencement of work.

1.10. EXAMINE SITE

- 1.10.1. Examine the site and the local conditions affecting the work. Examine carefully all drawings and the complete specifications to ensure that the work can be satisfactorily carried out as shown. No allowance will be made later for any expenses incurred through the failure to make these examinations or to report any such discrepancies in writing to the Consultant.

1.11. INTERFERENCE DRAWINGS

- 1.11.1. Complete consolidated and coordinated interference drawings shall be submitted for all new systems, and for existing systems that are in the same areas. The drawings shall include plan views, elevations and sections of all systems and shall be on a scale of not less than 1:200. Clearly identify and dimension the proposed locations of the principal items of equipment. The drawings shall clearly show the proposed location and adequate clearance for all equipment, controls, piping, pumps, valves and other items. All valves, trap primer valves, water hammer arrestors, strainers, and equipment requiring service shall be provided with an access door sized for the complete removal of plumbing device, component, or equipment. Equipment foundations shall not be installed until equipment or piping layout drawings have been approved. Detailed layout drawings shall be provided for all piping systems. In addition, details of the following shall be provided.
 - 1.11.2. Mechanical equipment rooms.
 - 1.11.3. Interstitial space.
 - 1.11.4. Pipe sleeves.
 - 1.11.5. Equipment penetrations of floors, walls, ceilings, or roofs.

1.12. MAINTENANCE DATA AND OPERATING INSTRUCTIONS

- 1.12.1. Maintenance and operating manuals, for systems and equipment. Include complete list indicating all components of the systems with diagrams of the internal wiring for each item of equipment.
- 1.12.2. Include listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment shall be provided. The listing shall include belts for equipment: Belt manufacturer, model number, size and style, and distinguished whether of multiple belt sets.

1.13. MATERIALS AND STANDARDS OF ACCEPTANCE

- 1.13.1. Where materials, equipment, apparatus, or other products are specified by the manufacturer, brand name, type or catalogue number, such designation is to establish standards of desired quality style or dimensions and shall be the basis of the Bid. Materials so specified shall be furnished under this Contract.
- 1.13.2. Where two or more designations are listed, the contractor shall choose one of those listed and state the choice made on the Bid Form (where applicable). *First choice shall be given to the equipment selected as the basis of design; equipment listed as equal shall be considered only if it suits the local conditions in terms of clearances, power supply availability and weight restrictions.*

1.14. MATERIAL SUBSTITUTIONS

- 1.14.1. After execution of the Contract, requests for substitution of materials or makes other than those specifically named in the Contract Documents may be reviewed and approved by the Consultant, subject to Client's review and acceptance of the financial credits involved.
- 1.14.2. In the absence of such express approval by the Consultant, the Mechanical Contractor will be held to furnish specified items under the base bid as the standard of acceptance.
- 1.14.3. If equipment is submitted which differs in arrangement from that specified/shown on the documents, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.

1.15. CODES, PERMITS, FEES AND CONNECTIONS

- 1.15.1. Conform to Federal, Provincial and Municipal regulations and perform work in accordance with requirements of By Laws and Regulations in force in area where the building is to be erected.

- 1.15.2. Apply for, obtain, and pay for all permits, fees and service connections for the work and the inspections required by Authorities Having Jurisdiction in the area where the building is to be erected.
- 1.15.3. For information, a specific code or standard might be mentioned. This information must not be taken as the only code or standard applicable.
- 1.15.4. When part of equipment does not bear the required CSA label, the contractor shall obtain from CSA or Hydro Electric Power Commission, when that part of the equipment is an electric component, a special approval and pay the applicable fees.
- 1.15.5. Furnish necessary certificates as evidence that the work installed conforms with laws and regulations of Authorities having jurisdiction. Changes in work requested by an Authority having jurisdiction shall be carried out without charge.

1.16. CONSULTANT'S INSTRUCTIONS

- 1.16.1. During construction the Consultant will issue such instructions as may be necessary for verification and correction of the work. These instructions shall be binding as part of the specification.

1.17. ADDITIONAL WORK AND CHANGES

- 1.17.1. Unless a written order, reviewed by the Consultant and countersigned or otherwise approved by the Client Representative, no additional work shall be undertaken by the Contractor.

1.18. QUALITY ASSURANCE

1.18.1. Products Criteria:

- 1.18.1.1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture, supply and servicing of the specified products for at least 5 years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least 5 years.
- 1.18.1.2. Equipment Service: There shall be permanent service organizations, authorized and trained by manufacturers of the equipment supplied, located within 160 km (100 miles) of the project. These organizations shall come to the site and provide acceptable service to restore operations within four hours of receipt of notification by phone, e-mail or fax in event of an emergency, such as the shut-down of equipment; or within 24 hours in a non-emergency. Names, mail and e-

mail addresses and phone numbers of service organizations providing service under these conditions for (as applicable to the project): pumps, compressors, water heaters, critical instrumentation, computer workstation and programming shall be submitted for project record and inserted into the operations and maintenance manual.

- 1.18.1.3. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
 - 1.18.1.4. The products and execution of work specified in Division 22 shall conform to the referenced codes and standards as required by the specifications. Local codes and amendments enforced by the local code official shall be enforced, if required by local authorities such as the natural gas supplier. If the local codes are more stringent, then the local code shall apply. Any conflicts shall be brought to the attention of the Consultant.
 - 1.18.1.5. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
 - 1.18.1.6. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
 - 1.18.1.7. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
- 1.18.2. Welding: Before any welding is performed, contractor shall submit a certificate certifying that welders comply with the following requirements:
- 1.18.2.1. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualifications".
 - 1.18.2.2. Comply with provisions of ASME B31 series "Code for Pressure Piping".
- 1.18.3. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Consultant and then incorporated in the Operations and Maintenance Manuals prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

1.19. EXECUTION (INSTALLATION, CONSTRUCTION) QUALITY

- 1.19.1. All items shall be applied and installed in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract documents shall be referred to the Consultant for resolution at least 10 working days prior to commencing installation of any item.
- 1.19.2. All items that require access, such as for operating, cleaning, servicing, maintenance, and calibration, shall be easily and safely accessible by persons standing at floor level, or standing on permanent platforms, without the use of portable ladders. Examples of these items include, but are not limited to: all types of valves, filters and strainers, transmitters, and control devices. Prior to commencing installation work, refer conflicts between this requirement and contract documents to COR for resolution.
- 1.19.3. Plumbing Systems: Unless otherwise required herein, perform plumbing work in accordance with the latest version of OBC section 7 and other applicable by-laws by the Authorities Having Jurisdiction.

1.20. CLEANLINESS OF PIPING AND EQUIPMENT SYSTEMS

- 1.20.1. Care shall be exercised in the storage and handling of equipment and piping material to be incorporated in the work. Debris arising from cutting, threading and welding of piping shall be removed.
- 1.20.2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
- 1.20.3. The interior of all tanks shall be cleaned prior to delivery and beneficial use by the Client. All piping shall be tested in accordance with the specifications and OBC requirements. All filters, strainers, fixture faucets shall be flushed of debris prior to final acceptance.
- 1.20.4. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.21. DELIVERY, STORAGE AND HANDLING

1.21.1. Protection of Equipment:

- 1.21.1.1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Government has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
- 1.21.1.2. Damaged equipment shall be replaced with an identical unit as determined and directed by the COR. Such replacement shall be at no additional cost or additional time to the Client.

- 1.21.1.3. Interiors of new equipment and piping systems shall be protected against entry of foreign matter. Both inside and outside shall be cleaned before painting or placing equipment in operation.
- 1.21.1.4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.

1.22. AS-BUILT DOCUMENTATION

- 1.22.1. Submit manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- 1.22.2. Submit operation and maintenance data updated to include submittal review comments, substitutions and construction revisions shall be inserted into a three ring binder. All aspects of system operation and maintenance procedures, including piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. Notes on all special systems or devices such as damper and door closure interlocks shall be included. A List of recommended spare parts (manufacturer, model number, and quantity) shall be furnished. Information explaining any special knowledge or tools the owner will be required to employ shall be inserted into the As-Built documentation.
- 1.22.3. The installing contractor shall maintain as-built drawings of each completed phase for verification; and, shall provide the complete set at the time of final systems certification testing. As-built drawings are to be provided in at least three hard copies, and a copy of them on Auto-Cad version 2007 or higher provided on at least one USB drive. Should the installing contractor engage the consulting company to provide as-built or any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party company' requirement.
- 1.22.4. Certification documentation shall be provided prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and a certification that all results of tests were within limits specified.

PART 2 - PRODUCTS

2.1. MATERIALS FOR VARIOUS SERVICES

- 2.1.1. Plastic pipe, fittings and solvent cement shall meet C-NSF/ANSI 14 and C-NSF/ANSI 61. Solder or flux containing lead shall not be used with copper pipe.
- 2.1.2. n-line devices such as water meters, building valves, check valves, stops, valves, fittings, tanks and backflow preventers shall comply with C-NSF/ANSI 61 and C-NSF/ANSI 372.
- 2.1.3. End point devices such as drinking fountains, lavatory faucets, kitchen and bar faucets, ice makers supply stops, and end-point control valves used to dispense drinking water must meet requirements of C-NSF/ANSI 61 and C-NSF/ANSI 372.

2.2. FACTORY-ASSEMBLED PRODUCTS

- 2.2.1. Standardization of components shall be maximized to reduce spare part requirements.
- 2.2.2. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
- 2.2.3. All components of an assembled unit need not be products of same manufacturer.
- 2.2.4. Constituent parts that are alike shall be products of a single manufacturer.
- 2.2.5. Components shall be compatible with each other and with the total assembly for intended service.
- 2.2.6. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly at no additional cost or time to the Government.
- 2.2.7. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.
- 2.2.8. Major items of equipment, which serve the same function, shall be the same make and model.

2.3. COMPATIBILITY OF RELATED EQUIPMENT

- 2.3.1. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational system that conforms to contract requirements.

2.4. SAFETY GUARDS

2.4.1. Pump shafts and couplings shall be fully guarded by a sheet steel guard, covering coupling and shaft but not bearings. Material shall be minimum 16-gage sheet steel; ends shall be braked and drilled and attached to pump base with minimum of four 8 mm (¼ inch) bolts. Reinforce guard as necessary to prevent side play forcing guard onto couplings.

2.4.2. All Equipment shall have moving parts protected from personal injury.

2.5. LIFTING ATTACHMENTS

2.5.1. Equipment shall be provided with suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered, without bending or distortion of shape, such as rapid lowering and braking of load.

2.6. EQUIPMENT AND MATERIALS IDENTIFICATION

2.6.1. Use symbols, nomenclature and equipment numbers specified, shown on the drawings, or shown in the maintenance manuals. Coordinate equipment and valve identification with facility maintenance staff. In addition, provide bar code identification nameplate for all equipment which will allow the equipment identification code to be scanned into the system for maintenance and inventory tracking. Identification for piping is specified in Section: 22 05 53 Identification for Plumbing Piping and Equipment.

2.6.2. Interior (Indoor) Equipment: Engraved nameplates, with letters not less than 7 mm (3/16 inch) high of brass with black filled letters, or rigid black plastic with white letters specified in Section: 22 05 53 Identification for Plumbing Piping and Equipment shall be permanently fastened to the equipment. Unit components such as water heaters, tanks, coils, filters, etc. shall be identified.

2.6.3. Exterior (Outdoor) Equipment: Brass nameplates, with engraved black filled letters, not less than 7 mm (3/16 inch) high riveted or bolted to the equipment.

2.6.4. Control Items: All temperature, pressure, and controllers shall be labeled and the component's function identified. Identify and label each item as they appear on the control diagrams.

2.6.5. Valve Tags and Lists:

2.6.5.1. Plumbing: All valves shall be provided with valve tags and listed on a valve list (Fixture stops not included).

2.6.5.2. Valve tags: Engraved black filled numbers and letters not less than 15 mm (1/2 inch) high for number designation, and not less than 8 mm (1/4 inch) for service

designation on 19 gage, 40 mm (1 1/2 inches) round brass disc, attached with brass "S" hook or brass chain.

2.6.5.3. Valve lists: Valve lists shall be created using a word processing program and printed on plastic coated cards. The plastic coated valve list card(s), sized 215 mm (8 1/2 inches) by 275 mm (11 inches) shall show valve tag number, valve function and area of control for each service or system. The valve list shall be in a punched 3 ring binder notebook. An additional copy of the valve list shall be mounted in picture frames for mounting to a wall. COR shall instruct contractor where frames shall be mounted.

2.6.5.4. A detailed plan for each floor of the building indicating the location and valve number for each valve shall be provided in the 3-ring binder notebook. Each valve location shall be identified with a color coded sticker or thumb tack in ceiling or access door.

2.7. GALVANIZED REPAIR COMPOUND

2.7.1. Mil. Spec. DOD P 21035B, paint.

2.8. PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS

2.8.1. Type Numbers Specified: For materials, design, manufacture, selection, application, and installation refer to MSS SP 58. For selection and application refer to MSS SP 69.

2.8.2. For Attachment to Concrete Construction:

2.8.2.1. Concrete insert: Type 18, MSS SP 58.

2.8.2.2. Self drilling expansion shields and machine bolt expansion anchors: Permitted in concrete not less than 100 mm (4 inches) thick when approved by the COR for each job condition.

2.8.2.3. Power driven fasteners: Permitted in existing concrete or masonry not less than 100 mm (4 inches) thick when approved by the COR for each job condition.

2.8.3. For Attachment to Steel Construction: MSS SP 58.

2.8.3.1. Welded attachment: Type 22.

2.8.3.2. Beam clamps: Types 20, 21, 28 or 29. Type 23 C clamp may be used for individual copper tubing up to 23 mm (7/8 inch) outside diameter.

2.8.4. Attachment to Metal Pan or Deck: As required for materials specified

2.8.5. For Attachment to Wood Construction: Wood screws or lag bolts.

- 2.8.6. Hanger Rods: Hot rolled steel, ASTM A36/A36M or ASTM A575 for allowable load listed in MSS SP 58. For piping, provide adjustment means for controlling level or slope. Types 13 or 15 turn buckles shall provide 40 mm (1 1/2 inches) minimum of adjustment and incorporate locknuts. All thread rods are acceptable.
- 2.8.7. Multiple (Trapeze) Hangers: Galvanized, cold formed, lipped steel channel horizontal member, not less than 43 mm by 43 mm (1 5/8 inches by 1 5/8 inches), 2.7 mm (No. 12 gage), designed to accept special spring held, hardened steel nuts.
- 2.8.8. Guide individual pipes on the horizontal member of every other trapeze hanger with 8 mm (1/4 inch) U bolt fabricated from steel rod. Provide Type 40 insulation shield, secured by two 15 mm (1/2 inch) galvanized steel bands, or insulated calcium silicate shield for insulated piping at each hanger.
- 2.8.9. Pipe Hangers and Supports: (MSS SP 58), use hangers sized to encircle insulation on insulated piping. Refer to Section 22 07 11, PLUMBING INSULATION for insulation thickness. To protect insulation, provide Type 39 saddles for roller type supports or insulated calcium silicate shields. Provide Type 40 insulation shield or insulated calcium silicate shield at all other types of supports and hangers including those for insulated piping.
- 2.8.10. General Types (MSS SP 58):
 - 2.8.10.1. Standard clevis hanger: Type 1; provide locknut.
 - 2.8.10.2. Riser clamps: Type 8.
 - 2.8.10.3. Wall brackets: Types 31, 32 or 33.
 - 2.8.10.4. Roller supports: Type 41, 43, 44 and 46.
 - 2.8.10.5. Saddle support: Type 36, 37 or 38.
 - 2.8.10.6. Turnbuckle: Types 13 or 15.
 - 2.8.10.7. U-bolt clamp: Type 24.
- 2.8.11. Copper Tube:
 - 2.8.11.1. Hangers, clamps and other support material in contact with tubing shall be painted with copper colored epoxy paint, copper-coated, plastic coated or taped with isolation tape to prevent electrolysis.
 - 2.8.11.2. For vertical runs use epoxy painted, copper-coated or plastic-coated riser clamps.
 - 2.8.11.3. For supporting tube to strut: Provide epoxy painted pipe straps for copper tube or plastic inserted vibration isolation clamps.
 - 2.8.11.4. Insulated Lines: Provide pre-insulated calcium silicate shields sized for copper tube.

2.8.12. Supports for plastic or glass piping: As recommended by the pipe manufacturer with black rubber tape extending one inch beyond steel support or clamp.

2.8.13. Spring Supports (Expansion and contraction of vertical piping):

- 2.8.13.1. Movement up to 20 mm (3/4 inch): Type 51 or 52 variable spring unit with integral turn buckle and load indicator.
- 2.8.13.2. Movement more than 20 mm (3/4 inch): Type 54 or 55 constant support unit with integral adjusting nut, turn buckle and travel position indicator.
- 2.8.13.3. Spring hangers are required on all plumbing system pumps one horsepower and greater.

2.8.14. Plumbing Piping (Other Than General Types):

- 2.8.14.1. Horizontal piping: Type 1, 5, 7, 9, and 10.
- 2.8.14.2. Chrome plated piping: Chrome plated supports.
- 2.8.14.3. Hangers and supports in pipe chase: Prefabricated system ABS self-extinguishing material, not subject to electrolytic action, to hold piping, prevent vibration and compensate for all static and operational conditions.

2.8.15. Blocking, stays and bracing: Angle iron or preformed metal channel shapes, 1.3 mm (18 gage) minimum.

2.8.16. Pre-insulated Calcium Silicate Shields:

- 2.8.16.1. Provide 360 degree water resistant high density 965 kPa (140 psig) compressive strength calcium silicate shields encased in galvanized metal.
- 2.8.16.2. Pre-insulated calcium silicate shields to be installed at the point of support during erection.
- 2.8.16.3. Shield thickness shall match the pipe insulation.
- 2.8.16.4. The type of shield is selected by the temperature of the pipe, the load it must carry, and the type of support it will be used with.
- 2.8.16.5. Shields for supporting cold water shall have insulation that extends a minimum of 25 mm (1 inch) past the sheet metal.
- 2.8.16.6. The insulated calcium silicate shield shall support the maximum allowable water filled span as indicated in MSS SP-69. To support the load, the shields shall have one or more of the following features: structural inserts 4138 kPa (600 psig) compressive strength, an extra bottom metal shield, or formed structural steel (ASTM A36/A36M) wear plates welded to the bottom sheet metal jacket.
- 2.8.16.7. Shields may be used on steel clevis hanger type supports, trapeze hangers, roller supports or flat surfaces.

2.9. PIPE PENETRATIONS

- 2.9.1. Pipe penetration sleeves shall be installed for all pipe other than rectangular blocked out floor openings for risers in mechanical bays.
- 2.9.2. Pipe penetration sleeve materials shall comply with all firestopping requirements for each penetration.
- 2.9.3. To prevent accidental liquid spills from passing to a lower level, provide the following:
 - 2.9.3.1. For sleeves: Extend sleeve 50 mm (2 inch) above finished floor and provide sealant for watertight joint.
 - 2.9.3.2. For blocked out floor openings: Provide 40 mm (1 1/2 inch) angle set in silicone adhesive around opening.
 - 2.9.3.3. For drilled penetrations: Provide 40 mm (1 1/2 inch) angle ring or square set in silicone adhesive around penetration.
 - 2.9.3.4. Penetrations are not allowed through beams or ribs, but may be installed in concrete beam flanges, with structural engineer prior approval. Any deviation from these requirements must receive prior approval of the Consultant.
- 2.9.4. Sheet metal, plastic, or moisture resistant fiber sleeves shall be provided for pipe passing through floors, interior walls, and partitions, unless brass or steel pipe sleeves are specifically called for below.
- 2.9.5. Cast iron or zinc coated pipe sleeves shall be provided for pipe passing through exterior walls below grade. The space between the sleeve and pipe shall be made watertight with a modular or link rubber seal. The link seal shall be applied at both ends of the sleeve.
- 2.9.6. Galvanized steel or an alternate black iron pipe sleeve with asphalt coating sleeves shall be used for pipe passing through concrete beam flanges, except where brass pipe sleeves are called for. A galvanized steel sleeve shall be provided for pipe passing through floor of mechanical rooms, laundry work rooms, and animal rooms above basement. Except in mechanical rooms, sleeves shall be connected with a floor plate.
- 2.9.7. Brass Pipe Sleeves shall be provided for pipe passing through quarry tile, terrazzo or ceramic tile floors. The sleeve shall be connected with a floor plate.
- 2.9.8. Sleeve clearance through floors, walls, partitions, and beam flanges shall be 25 mm (1 inch) greater in diameter than external diameter of pipe. Sleeve for pipe with insulation shall be large enough to accommodate the insulation plus 25 mm (1 inch) in diameter. Interior openings shall be caulked tight with firestopping material and sealant to prevent the spread of fire, smoke, water and gases.

- 2.9.9. Pipe passing through roof shall be installed through a 4.9 kg per square meter copper flashing with an integral skirt or flange. Skirt or flange shall extend not less than 200 mm (8 inches) from the pipe and set in a solid coating of bituminous cement. Extend flashing a minimum of 250 mm (10 inches) up the pipe. Pipe passing through a waterproofing membrane shall be provided with a clamping flange. The annular space between the sleeve and pipe shall be sealed water

2.10. TOOLS AND LUBRICANTS

- 2.10.1. Furnish, and turn over to the Client, special tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- 2.10.2. Grease Guns with Attachments for Applicable Fittings: One for each type of grease required for each motor or other equipment.
- 2.10.3. Tool Containers: metal, permanently identified for intended service and mounted, or located, where directed by the Client.
- 2.10.4. Lubricants: A minimum of 0.95 L (1 quart) of oil, and 0.45 kg (1 pound) of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application. Bio-based materials shall be utilized when possible.

2.11. WALL, FLOOR AND CEILING PLATES

- 2.11.1. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes and cover the entire pipe sleeve projection.
- 2.11.2. Thickness: Not less than 2.4 mm (3/32 inch) for floor plates. For wall and ceiling plates, not less than 0.64 mm (0.025 inch) for up to 75 mm (3 inch) pipe, 0.89 mm (0.035 inch) for larger pipe.
- 2.11.3. Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, in finished areas only. Wall plates shall be used where insulation ends on exposed water supply pipe drop from overhead. A watertight joint shall be provided in spaces where brass or steel pipe sleeves are specified.

PART 3 - EXECUTION

3.1. ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- 3.1.1. Location of piping, sleeves, inserts, hangers, and equipment, access provisions shall be coordinated with the work of all trades. Piping, sleeves, inserts, hangers, and equipment shall be located clear of windows, doors, openings, light outlets, and other services and utilities. Equipment layout drawings shall be prepared to coordinate proper location and personnel access of all facilities. The drawings shall be submitted for review.
- 3.1.2. Manufacturer's published recommendations shall be followed for installation methods not otherwise specified.
- 3.1.3. Operating Personnel Access and Observation Provisions: All equipment and systems shall be arranged to provide clear view and easy access, without use of portable ladders, for maintenance, testing and operation of all devices including, but not limited to: all equipment items, valves, backflow preventers, filters, strainers, transmitters, sensors, meters and control devices. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Maintenance and operating space and access provisions that are shown on the drawings shall not be changed nor reduced.
- 3.1.4. Structural systems necessary for pipe and equipment support shall be coordinated to permit proper installation.
- 3.1.5. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.
- 3.1.6. Cutting Holes:
 - 3.1.6.1. Holes shall be located to avoid interference with structural members such as beams or grade beams. Holes shall be laid out in advance and drilling done only after approval by COR. If the Contractor considers it necessary to drill through structural members, this matter shall be referred to COR for approval.
 - 3.1.6.2. Waterproof membrane shall not be penetrated. Pipe floor penetration block outs shall be provided outside the extents of the waterproof membrane.
 - 3.1.6.3. Holes through concrete and masonry shall be cut by rotary core drill. Pneumatic hammer, impact electric, and hand or manual hammer type drill will not be allowed, except as permitted by the Consultant where working area space is limited.
- 3.1.7. Minor Piping: Generally, small diameter pipe runs from drips and drains, water cooling, trap priming and other service are not shown but must be provided.

3.2. PROTECTION AND CLEANING:

- 3.2.1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations. Damaged or defective items in the opinion of the Consultant, shall be replaced at no additional cost or time to the Client.
- 3.2.2. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Pipe openings, equipment, and plumbing fixtures shall be tightly covered against dirt or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
- 3.2.3. Concrete and Grout: Concrete and shrink compensating grout 25 MPa (3000 psig) minimum, shall be used for all pad or floor mounted equipment.
- 3.2.4. Gages, thermometers, valves and other devices shall be installed with due regard for ease in reading or operating and maintaining said devices. Thermometers and gages shall be located and positioned to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.
- 3.2.5. Interconnection of Electrical Instrumentation and Controls: Electrical interconnection is generally not shown but shall be provided as specified. This includes interconnections of sensors, transmitters, transducers, control devices, control and instrumentation panels, alarms, instruments and computer workstations. Comply with NFPA 70.

3.3. WORK IN EXISTING BUILDING:

- 3.3.1. Make alterations to existing service piping at times that will cause the least interfere with normal operation of the facility.
- 3.3.2. Work in bathrooms, restrooms, housekeeping closets: All pipe penetrations behind escutcheons shall be sealed with plumbers putty.
- 3.3.3. Switchgear Drip Protection: Every effort shall be made to eliminate the installation of pipe above data equipment, and electrical and telephone switchgear. If this is not possible, encase pipe in a second pipe with a minimum of joints. Drain valve shall be provided in low point of casement pipe.
- 3.3.4. Inaccessible Equipment:
 - 3.3.4.1. Where the Client determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost or additional time to the Client.

- 3.3.4.2. The term "conveniently accessible" is defined as capable of being reached without climbing or crawling under or over obstacles such as electrical conduit, motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

3.4. TEMPORARY PIPING AND EQUIPMENT

- 3.4.1. Continuity of operation of existing facilities may require temporary installation or relocation of equipment and piping. Temporary equipment or pipe installation or relocation shall be provided to maintain continuity of operation of existing facilities.
- 3.4.2. The Contractor shall provide all required facilities in accordance with the requirements of phased construction and maintenance of service. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities.
- 3.4.3. Temporary facilities and piping shall be completely removed back to the nearest active distribution branch or main pipe line and any openings in structures sealed. Dead legs are not allowed in potable water systems. Necessary blind flanges and caps shall be provided to seal open piping remaining in service.

3.5. RIGGING

- 3.5.1. Openings in building structures shall be planned to accommodate design scheme.
- 3.5.2. Alternative methods of equipment delivery may be offered and will be considered by Government under specified restrictions of phasing and service requirements as well as structural integrity of the building.
- 3.5.3. All openings in the building shall be closed when not required for rigging operations to maintain proper environment in the facility for Government operation and maintenance of service.
- 3.5.4. Contractor shall provide all facilities required to deliver specified equipment and place on foundations. Attachments to structures for rigging purposes and support of equipment on structures shall be Contractor's full responsibility.
- 3.5.5. Contractor shall check all clearances, weight limitations and shall prepare a rigging plan; All modifications to structures, including reinforcement thereof, shall be at Contractor's cost, time and responsibility.

3.6. THERMOMETERS AND PRESSURE GAUGES

3.6.1. General:

- 3.6.1.1. Locate direct reading thermometers and gauges for reading from floor or platform.
- 3.6.1.2. Provide remote reading thermometers and gauges where direct reading instruments cannot be satisfactorily located.
- 3.6.1.3. Locate engraved lamacoid nameplate as specified in Section Identification, identifying medium adjacent to thermometers and gauges.

3.6.2. Thermometers:

- 3.6.2.1. Industrial, 9" adjustable angle cast aluminum case, CGSB standard CAN/CGSB-14.4-M88 red reading mercury, lens front tube, white scale black embossed figures, clear glass or acrylic window, tapered aluminum stem.
- 3.6.2.2. Scale shall be suitable for 2 times the temperature range of service. Scale shall be combined Celsius and Fahrenheit.
- 3.6.2.3. Standard of Acceptance: Weiss, Ashcroft, Terrice.

3.6.3. Pressure Gauges:

- 3.6.3.1. 5" dial, solid front blow out back, fiberglass reinforced polypropylene case, phosphor bronze bourdon tube and brass 1/4" N.P.T. socket, bottom connection, stainless steel rotary type movement, gauge to be registered with the Provincial Boiler and Pressure Vessel Safety Branch with a registration number and conform to ANSI B40.1. Accuracy to be grade "A".
- 3.6.3.2. On pumps liquid filled gauges shall be utilized.
- 3.6.3.3. Standard of Acceptance: Weiss, Ashcroft, Terrice.
- 3.6.3.4. Provide bronze stop cock, bronze bar stock 1/4" N.P.T. bronze porous core pressure snubber for pulsating operation and diaphragm for corrosive service.
- 3.6.3.5. Use materials compatible with system requirements.

3.6.4. Gauges shall have combined kilopascal and psi scales.

3.7. PIPE AND EQUIPMENT SUPPORTS

- 3.7.1. Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels secured directly to joist and rib structure that will correspond to the required hanger spacing, and then suspend the equipment and piping from the channels. Holes shall be drilled or burned in structural steel ONLY with the prior written approval of the Consultant

- 3.7.2. The use of chain pipe supports, wire or strap hangers; wood for blocking, stays and bracing, or hangers suspended from piping above shall not be permitted. Rusty products shall be replaced.
- 3.7.3. Hanger rods shall be used that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. A minimum of 15 mm (1/2 inch) clearance between pipe or piping covering and adjacent work shall be provided.
- 3.7.4. Overhead Supports:
 - 3.7.4.1. The basic structural system of the building is designed to sustain the loads imposed by equipment and piping to be supported overhead.
 - 3.7.4.2. Provide steel structural members, in addition to those shown, of adequate capability to support the imposed loads, located in accordance with the final approved layout of equipment and piping.
- 3.7.5. Tubing and capillary systems shall be supported in channel troughs.
- 3.7.6. Floor Supports:
 - 3.7.6.1. Provide concrete bases, concrete anchor blocks and pedestals, and structural steel systems for support of equipment and piping. Concrete bases and structural systems shall be anchored and doweled to resist forces under operating and seismic conditions (if applicable) without excessive displacement or structural failure.
 - 3.7.6.2. Bases and supports shall not be located and installed until equipment mounted thereon has been approved. Bases shall be sized to match equipment mounted thereon plus 50 mm (2 inch) excess on all edges. Structural drawings shall be reviewed for additional requirements. Bases shall be neatly finished and smoothed, shall have chamfered edges at the top, and shall be suitable for painting.
 - 3.7.6.3. All equipment shall be shimmed, leveled, firmly anchored, and grouted with epoxy grout. Anchor bolts shall be placed in sleeves, anchored to the bases. Fill the annular space between sleeves and bolts with a grout material to permit alignment and realignment.

3.8. LUBRICATION

- 3.8.1. All equipment and devices requiring lubrication shall be lubricated prior to initial operation. All devices and equipment shall be field checked for proper lubrication.

- 3.8.2. All devices and equipment shall be equipped with required lubrication fittings. A minimum of one liter (one quart) of oil and 0.45 kg (1 pound) of grease of manufacturer's recommended grade and type for each different application shall be provided. All materials shall be delivered to COR in unopened containers that are properly identified as to application.
- 3.8.3. A separate grease gun with attachments for applicable fittings shall be provided for each type of grease applied.
- 3.8.4. All lubrication points shall be accessible without disassembling equipment, except to remove access plates.
- 3.8.5. All lubrication points shall be extended to one side of the equipment.

3.9. PLUMBING SYSTEMS DEMOLITION

- 3.9.1. In an operating plant, cleanliness and safety shall be maintained. The plant shall be kept in an operating condition. Client's personnel will be carrying on their normal duties of operating, cleaning and maintaining equipment and plant operation. Work shall be confined to the immediate area concerned; maintain cleanliness and wet down demolished materials to eliminate dust. Dust and debris shall not be permitted to accumulate in the area to the detriment of plant operation. All flame cutting shall be performed to maintain the fire safety integrity of this plant. Adequate fire extinguishing facilities shall be available at all times. All work shall be performed in accordance with recognized fire protection standards.
- 3.9.2. Unless specified otherwise, all piping, wiring, conduit, and other devices associated with the equipment not re-used in the new work shall be completely removed from Client's property. This includes all concrete equipment pads, pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. All openings shall be sealed after removal of equipment, pipes, ducts, and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the drawings and specifications of the other disciplines in the project for additional facilities to be demolished or handled.
- 3.9.3. All valves including gate, globe, ball, butterfly and check, all pressure gages and thermometers with wells shall remain Client property and shall be removed and delivered to Client and stored as directed. The Contractor shall remove all other material and equipment, devices and demolition debris under these plans and specifications. Such

material shall be removed from Client's property expeditiously and shall not be allowed to accumulate.

3.10. CLEANING AND PAINTING

3.10.1. Prior to final inspection and acceptance of the plant and facilities for beneficial use by the Client, the plant facilities, equipment and systems shall be thoroughly cleaned and painted.

3.10.2. In addition, the following special conditions apply:

3.10.2.1. Cleaning shall be thorough. Solvents, cleaning materials and methods recommended by the manufacturers shall be used for the specific tasks. All rust shall be removed prior to painting and from surfaces to remain unpainted. Scratches, scuffs, and abrasions shall be repaired prior to applying prime and finish coats.

3.10.3. The following Material and Equipment shall NOT be painted:

- 3.10.3.1. Motors, controllers, control switches, and safety switches.
- 3.10.3.2. Control and interlock devices.
- 3.10.3.3. Regulators.
- 3.10.3.4. Pressure reducing valves.
- 3.10.3.5. Control valves and thermostatic elements.
- 3.10.3.6. Lubrication devices and grease fittings.
- 3.10.3.7. Copper, brass, aluminum, stainless steel and bronze surfaces.
- 3.10.3.8. Valve stems and rotating shafts.
- 3.10.3.9. Pressure gages and thermometers.
- 3.10.3.10. Glass.
- 3.10.3.11. Name plates.

3.10.4. Control and instrument panels shall be cleaned and damaged surfaces repaired. Touch-up painting shall be made with matching paint type and color obtained from manufacturer or computer matched.

3.10.5. Pumps, motors, steel and cast iron bases, and coupling guards shall be cleaned, and shall be touched-up with the same paint type and color as utilized by the pump manufacturer.

3.10.6. The final result shall be a smooth, even-colored, even-textured factory finish on all items. The entire piece of equipment shall be repainted, if necessary, to achieve this. Lead based paints shall not be used.

3.11. IDENTIFICATION SIGNS

- 3.11.1. Laminated plastic signs, with engraved lettering not less than 7 mm (3/16 inch) high, shall be provided that designates equipment function, for all equipment, switches, motor controllers, relays, meters, control devices, including automatic control valves. Nomenclature and identification symbols shall correspond to that used in maintenance manual, and in diagrams specified elsewhere. Attach by chain, adhesive, or screws.
- 3.11.2. Factory Built Equipment: Metal plate, securely attached, with name and address of manufacturer, serial number, model number, size, and performance data shall be placed on factory built equipment.
- 3.11.3. Pipe Identification: Refer to Section: 22 05 53 Identification for Plumbing Piping and Equipment.

3.12. STARTUP AND TEMPORARY OPERATION

- 3.12.1. Startup of equipment shall be performed as described in the equipment specifications. Vibration within specified tolerance shall be verified prior to extended operation.
- 3.12.2. Where commission is applicable, the commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the Commissioning Agent. Provide a minimum of 1 week weeks prior notice.

3.13. OPERATING AND PERFORMANCE TESTS

- 3.13.1. Prior to the final inspection, all required tests shall be performed. Submit the test reports and records to the Consultant.
- 3.13.2. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost to the Client.
- 3.13.3. When completion of certain work or systems occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then conduct such performance tests and finalize control settings during the first actual seasonal use of the respective systems following completion of work. Rescheduling of these tests shall be requested in writing to the Consultant for approval.

3.14. OPERATION AND MAINTENANCE MANUALS

- 3.14.1. All new and temporary equipment and all elements of each assembly shall be included.

- 3.14.2. Data sheet on each device listing model, size, capacity, pressure, speed, horsepower, impeller size, and other information shall be included.
- 3.14.3. Manufacturer's installation, maintenance, repair, and operation instructions for each device shall be included. Assembly drawings and parts lists shall also be included. A summary of operating precautions and reasons for precautions shall be included in the Operations and Maintenance Manual.
- 3.14.4. Lubrication instructions, type and quantity of lubricant shall be included.
- 3.14.5. Schematic diagrams and wiring diagrams of all control systems corrected to include all field modifications shall be included.
- 3.14.6. Set points of all interlock devices shall be listed.
- 3.14.7. Trouble-shooting guide for the control system troubleshooting shall be inserted into the Operations and Maintenance Manual.
- 3.14.8. The control system sequence of operation corrected with submittal review comments shall be inserted into the Operations and Maintenance Manual.
- 3.14.9. Emergency procedures for shutdown and startup of equipment and systems.

3.15. CLOSE-OUT DOCUMENTATION

- 3.15.1. 10 (ten) days prior to substantial performance of work obtain documentation and/or prepare certification of the following items and submit them to the Client representative:
 - 3.15.1.1. All inspection certificates.
 - 3.15.1.2. Guarantee certificates as called for under "Warranty".
 - 3.15.1.3. Record drawings.
 - 3.15.1.4. Operating and Maintenance Manuals.
 - 3.15.1.5. Test certifications as called for under "Testing".
 - 3.15.1.6. Provide a signed statement to the effect that all tests for mechanical systems and equipment have been completely carried out in the Trade Sections of these Specifications and to the manufacturer's recommendations, and in accordance with the requirements of all authorities having jurisdiction.

3.16. COMMISSIONING

- 3.16.1. Where applicable, provide commissioning documentation in accordance with the requirements of Section: 22 08 00 Commissioning of Plumbing.

3.17. OPERATING AND PERFORMANCE TESTS

- 3.17.1. Prior to the final inspection, perform required tests as specified and submit the test reports and records to the Consultant. The timing of the tests shall be arranged to suit the convenience of the Consultant, and the manner and duration shall be as the Consultant deems necessary. Record the daily start and stop times, operating hours and functions performed. Ensure that the performance tests are witnessed by the Consultant.
- 3.17.2. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost to the Client.
- 3.17.3. At the successful completion of Performance Tests and all testing and balancing, make the systems ready for final inspection and subsequent acceptance of the Client. Replace and clean filters, flush out lines and equipment, remove and clean strainers, fill liquid systems and purge air. Provide water treatment to pipes and report in accordance to current by-laws. Disinfect all domestic water as required by current by-laws and Authorities Having Jurisdiction.
- 3.17.4. When completion of certain work or system occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then make performance tests for heating systems and for cooling systems respectively during first actual seasonal use of respective systems following completion of work.

3.18. DEMONSTRATION AND TRAINING

- 3.18.1. Provide services of manufacturer's technical representative for four hours to instruct Client's personnel in operation and maintenance of the system.
- 3.18.2. Where commissioning is applicable, submit training plans and instructor qualifications in accordance with the requirements of Section: 22 08 00 Commissioning of Plumbing.

TABLE OF CONTENTS

PART 1 - GENERAL.....	2
1.1. DESCRIPTION	2
1.2. RELATED WORK	2
1.3. APPLICABLE PUBLICATIONS	2
1.4. SUBMITTALS	3
1.5. DELIVERY, STORAGE, AND HANDLING	4
PART 2 - PRODUCTS	4
2.1. VALVES, GENERAL.....	4
2.2. SHUT-OFF VALVES.....	5
2.3. BALANCING VALVES.....	5
2.4. STRAINERS	6
2.5. TRAP PRIMERS	6
2.6. WATER HAMMER ARRESTORS (SHOCK ABSORBERS)	7
PART 3 - EXECUTION	7
3.1. EXAMINATION	7
3.2. INSTALLATION.....	8
3.3. STRAINERS	9
3.4. WATER HAMMER ARRESTORS.....	9
3.5. ELECTRONIC TRAP PRIMING	9
3.6. THERMOSTATIC MIXING VALVES.....	9
3.7. LABELING AND IDENTIFYING	9
3.8. ADJUSTING.....	10
3.9. COMMISSIONING	Error! Bookmark not defined.
3.10. DEMONSTRATION AND TRAINING	Error! Bookmark not defined.

PART 1 - GENERAL

1.1. DESCRIPTION

- 1.1.1. This section describes the requirements for general-duty valves for domestic water and sewer systems.

1.2. RELATED WORK

- 1.2.1. Section: 01 33 23 Shop Drawings, Product Data, and Samples.
- 1.2.2. Section: 22 05 00 Common Work Results for Plumbing.

1.3. APPLICABLE PUBLICATIONS

- 1.3.1. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

- 1.3.2. American Society of Mechanical Engineers (ASME):

- 1.3.2.1. A112.14.1-2003 Backwater Valves

- 1.3.3. American Society of Sanitary Engineering (ASSE):

- 1.3.3.1. 1001-2008 Performance Requirements for Atmospheric Type Vacuum Breakers
 - 1.3.3.2. 1003-2009 Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems
 - 1.3.3.3. 1017-2009 Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems
 - 1.3.3.4. 1069-2005 Performance Requirements for Automatic Temperature Control Mixing Valves
 - 1.3.3.5. 1070-2004 Performance Requirements for Water Temperature Limiting Devices
 - 1.3.3.6. 1071-2012 Performance Requirements for Temperature Actuated Mixing Valves for Plumbed Emergency Equipment

- 1.3.4. American Society for Testing and Materials (ASTM):

- 1.3.4.1. A126-2004(R2009) Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
 - 1.3.4.2. A276-2013a Standard Specification for Stainless Steel Bars and Shapes
 - 1.3.4.3. A536-1984(R2009) Standard Specification for Ductile Iron Castings

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

- | | | |
|----------|-------------|---|
| 1.3.5.1. | SP-25-2008 | Standard Marking Systems for Valves, Fittings, Flanges and Unions |
| 1.3.5.2. | SP-67-2011 | Butterfly Valves |
| 1.3.5.3. | SP-70-2011 | Gray Iron Gate Valves, Flanged and Threaded Ends |
| 1.3.5.4. | SP-71-2011 | Gray Iron Swing Check Valves, Flanged and Threaded Ends |
| 1.3.5.5. | SP-80-2013 | Bronze Gate, Globe, Angle, and Check Valves |
| 1.3.5.6. | SP-85-2011 | Gray Iron Globe & Angle Valves, Flanged and Threaded Ends |
| 1.3.5.7. | SP-110-2010 | Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends |

1.3.6. NSF International (NSF):

- | | | |
|----------|----------|---|
| 1.3.6.1. | 61-2012 | Drinking Water System Components – Health Effects |
| 1.3.6.2. | 372-2011 | Drinking Water System Components – Lead Content |

1.4. SUBMITTALS

1.4.1. Submittals, including number of required copies, shall be submitted in accordance with Section: 01 33 23 Shop Drawings, Product Data, and Samples.

1.4.2. Manufacturer's Literature and Data Including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.

- | | |
|-----------|---|
| 1.4.2.1. | Ball Valves. |
| 1.4.2.2. | Gate Valves. |
| 1.4.2.3. | Butterfly Valves. |
| 1.4.2.4. | Balancing Valves. |
| 1.4.2.5. | Check Valves. |
| 1.4.2.6. | Globe Valves. |
| 1.4.2.7. | Water Pressure Reducing Valves and Connections. |
| 1.4.2.8. | Backwater Valves. |
| 1.4.2.9. | Backflow Preventers. |
| 1.4.2.10. | Vacuum Breakers |
| 1.4.2.11. | Chainwheels. |
| 1.4.2.12. | Thermostatic Mixing Valves. |
| 1.4.2.13. | Trap primer devices |
| 1.4.2.14. | Strainers |
| 1.4.2.15. | Non-freezing wall hydrants |

1.4.3. Test and Balance reports for balancing valves.

1.4.4. Piping diagrams of thermostatic mixing valves to be installed.

1.5. DELIVERY, STORAGE, AND HANDLING

1.5.1. Valves shall be prepared for shipping as follows:

- 1.5.1.1. Protect internal parts against rust and corrosion.
- 1.5.1.2. Protect threads, flange faces, grooves, and weld ends.
- 1.5.1.3. Set angle, gate, and globe valves closed to prevent rattling.
- 1.5.1.4. Set ball and plug valves open to minimize exposure of functional surfaces.
- 1.5.1.5. Set butterfly valves closed or slightly open.
- 1.5.1.6. Block check valves in either closed or open position.

1.5.2. Valves shall be prepared for storage as follows:

- 1.5.2.1. Maintain valve end protection.
- 1.5.2.2. Store valves indoors and maintain at higher than ambient dew point temperature.

PART 2 - PRODUCTS

2.1. VALVES, GENERAL

- 2.1.1. Asbestos packing and gaskets are prohibited.
- 2.1.2. All valves shall have seats, stem seals and disc materials compatible with intended fluid, temperature, pressure and service.
- 2.1.3. Bronze valves shall be made with dezincification resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc shall not be permitted.
- 2.1.4. Valves in insulated piping shall have 50 mm or DN50 (2 inch) stem extensions and extended handles of non-thermal conductive material that allows operating the valve without breaking the vapor seal or disturbing the insulation. Memory stops shall be fully adjustable after insulation is applied.
- 2.1.5. Exposed Valves over 65 mm or DN65 (2-1/2 inches) installed at an elevation over 3.6 m (12 feet) shall have a chain-wheel attachment to valve hand-wheel, stem, or other actuator.
- 2.1.6. All valves used to supply potable water shall meet the requirements of NSF 61 and NSF 372.

2.1.7. Unless noted otherwise, valves shall be same size as piping.

2.1.8. Standards of acceptance: Jenkins, Crane, Toyo, Kitz

2.2. SHUT-OFF VALVES

2.2.1. Cold, Hot and Re-circulating Hot Water:

2.2.1.1. 50 mm or DN50 (2 inches) and smaller: Ball, MSS SP-110, Ball valve shall be full port three piece or two piece with a union design with adjustable stem package. Threaded stem designs are not allowed. The ball valve shall have a SWP rating of 1035 kPa (150 psig) and a CWP rating of 4138 kPa (600 psig). The body material shall be Bronze ASTM B584, Alloy C844. The ends shall be non-lead solder.

2.2.1.2. Less than 100 mm DN100 (4 inches): Butterfly shall have an iron body with EPDM seal and aluminum bronze disc. The butterfly valve shall meet MSS SP-67, type I standard. The butterfly valve shall have a SWP rating of 1380 kPa (200 psig). The valve design shall be lug type suitable for bidirectional dead-end service at rated pressure. The body material shall meet ASTM A536, ductile iron.

2.2.1.3. 100 mm DN100 (4 inches) and larger:

2.2.1.3.1. Class 125, OS&Y, Cast Iron Gate Valve. The gate valve shall meet MSS SP-70 type I standard. The gate valve shall have a CWP rating of 1380 kPa (200 psig). The valve materials shall meet ASTM A126, grey iron with bolted bonnet, flanged ends, bronze trim, and positive-seal resilient solid wedge disc. The gate valve shall be gear operated for sizes under 200 mm or DN200 (8 inches) and crank operated for sizes 200 mm or DN200 (8 inches) and above.

2.2.1.3.2. Single flange, ductile iron butterfly valves: The single flanged butterfly valve shall meet the MSS SP-67 standard. The butterfly valve shall have a CWP rating of 1380 kPa (200 psig). The butterfly valve shall be lug type, suitable for bidirectional dead-end service at rated pressure without use of downstream flange. The body material shall comply with ASTM A536 ductile iron. The seat shall be EPDM with stainless steel disc and stem.

2.3. BALANCING VALVES

2.3.1. Hot Water Re-circulating, 75 mm or DN75 (3 inches) and smaller: manual balancing valve shall be of bronze body, brass ball construction with glass and carbon filled TFE seat rings and designed for positive shutoff. The manual balancing valve shall have differential pressure read-out ports across the valve seat area. The read out ports shall be fitting with internal EPT inserts and check valves. The valve body shall have 8 mm or DN8 NPT (1/4 inch NPT) tapped drain and purge port. The valves shall have memory stops that allow the valve to close for service and then reopened to set point without disturbing the

balance position. All valves shall have calibrated nameplates to assure specific valve settings.

2.3.2. Larger than 75 mm or DN75 (3 inches): Manual balancing valves shall be of heavy duty cast iron flanged construction with 861 kPa (125 psig) flange connections. The flanged manual balancing valves shall have either a brass ball with glass and carbon filled TFE seal rings or fitted with a bronze seat, replaceable bronze disc with EPDM seal insert and stainless steel stem. The design pressure shall be 1200 kPa (175 psig) at 121 degrees C (250 degrees F).

2.3.3. Standard of Acceptance: Armstrong, Bell&Gossett, T&A suitable for potable water.

2.4. STRAINERS

2.4.1. Minimum service rating of 860 kPa (125 psi) gauge pressure or 1½ times system pressure whichever is greater.

2.4.2. Cast iron body, cleanable Y pattern, Wye-pattern, removable stainless steel 20 (standard) mesh screen.

2.4.3. NSF 61/ANSI 372 compliant.

2.4.4. NPS 50 mm (2") nominal and under, screwed with brass cap.

2.4.5. NPS 65 mm (2½") and over flanged with bolted cap. Threaded screwed off center opening; blow down valve same diameter as threaded opening.

2.4.6. Standard of Acceptance; Zurn, Watts, Apollo

2.5. TRAP PRIMERS

2.5.1. Pressure operated (max. 4 traps)

2.5.1.1. Diaphragm operated primer with 13 mm (½") NPT connection, automatically activated when the pressure drops. Operating range of 138 to 552 kPa (20 to 80 psig) for a maximum of four (4) drain traps. To be installed on a cold fresh water line of 38 mm (1½") or less. Max. distance between trap primer and most remote trap: as per manufacturer's instruction

2.5.1.2. Provide ½" Type K hard copper tubing connection between trap primer valve and floor drain.

2.5.1.3. Acceptable product: PPP Oregon series.

2.5.2. Electronic trap primer (max. 12 traps)

- 2.5.2.1. With 13 mm (½") NPT connection, for a maximum of twelve (12) drain traps.
- 2.5.2.2. Supplied in a NEMA 1 box, power supply 115V. To be installed on a cold fresh water line of 38 mm (1½") or less. The prime-time priming assembly will supply a minimum of 600 ml (1 oz.) of potable water at 20 PSIG at a preset factory setting of 6 seconds every 24 hours.
- 2.5.2.3. The entire unit is pre-assembled in a steel cabinet ready to be either surface or flush wall mounted. The Priming assembly must be mounted above the finished floor.
- 2.5.2.4. Factory assembled with a bronze body ball valve, water hammer arrestor, solenoid valve, atmospheric vacuum breaker, 24 hour timer, 3/4" NPT connection, and a type L copper manifold. Electronic single point power connection 120V/1 amp draw and manual override switch
- 2.5.2.5. Provide ½" Type K hard copper tubing connection between trap primer valve and floor drain.
- 2.5.2.6. Acceptable product: PPP PTS series.

2.6. WATER HAMMER ARRESTORS (SHOCK ABSORBERS)

- 2.6.1. Closed copper tube chamber with permanently sealed 410 kPa (60 psig) air charge above a Double O-ring piston. Two high heat Buna-N O-rings pressure packed and lubricated with FDA approved Dow Corning No. 11 silicone compound. All units shall be designed in accordance with ASSE 1010 for sealed wall installations without an access panel.
- 2.6.2. Provide arrestors at all solenoid valves and on branch supplies to each fixture or group of fixtures and where indicated. Conform to ASSE-1010. Stainless steel or copper construction.
- 2.6.3. Water-hammer arrestors dimension must conform to ASSE-1010. Water inlet maximum pressure is 468.8 kPa (68 psi). NSF 61/ANSI 372 compliant.
- 2.6.4. Standard of Acceptable: Watts, Zurn, PPP

PART 3 - EXECUTION

3.1. EXAMINATION

- 3.1.1. Valve interior shall be examined for cleanliness, freedom from foreign matter, and corrosion. Special packing materials shall be removed, such as blocks, used to prevent disc movement during shipping and handling.
- 3.1.2. Valves shall be operated in positions from fully open to fully closed. Guides and seats shall be examined and made accessible by such operations.

- 3.1.3. Threads on valve and mating pipe shall be examined for form and cleanliness.
- 3.1.4. Mating flange faces shall be examined for conditions that might cause leakage. Bolting shall be checked for proper size, length, and material. Gaskets shall be verified for proper size and that its material composition is suitable for service and free from defects and damage.
- 3.1.5. Do not attempt to repair defective valves; replace with new valves.

3.2. INSTALLATION

- 3.2.1. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- 3.2.2. Valves Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- 3.2.3. Valves shall be located for easy access and shall be provide with separate support.
- 3.2.4. Valves shall be accessible with access doors when installed inside partitions or above hard ceilings.
- 3.2.5. Valves shall be installed in horizontal piping with stem at or above center of pipe.
- 3.2.6. Valves shall be installed in a position to allow full stem movement.
- 3.2.7. Install chain wheels on operators for all valves 100 mm (4 inches) and larger and more than 3.6 m (12 feet) above floor. Chains shall be extended to 1524 mm (60 inches) above finished floor.
- 3.2.8. Check valves shall be installed for proper direction of flow and as follows:
 - 3.2.8.1. Swing Check Valves: In horizontal position with hinge pin level and on top of valve.
 - 3.2.8.2. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction. Locate backflow preventers in same room as connected equipment or system.
 - 3.2.8.3. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
 - 3.2.8.4. Install pressure gages on outlet of backflow preventers.

- 3.2.8.5. Do not install bypass piping around backflow preventers.
- 3.2.9. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets.
- 3.2.10. Install cabinet-type units recessed in or surface mounted on wall as specified.

3.3. STRAINERS

- 3.3.1. Install upstream of all:
 - 3.3.1.1. Solenoid valves
 - 3.3.1.2. Pressure reducing valves

3.4. WATER HAMMER ARRESTORS

- 3.4.1. Arrestors should always be installed so that there is an unobstructed shock path to the arrestor. Doing otherwise could result in shake and rattle of the pipes when the valve is closed.
- 3.4.2. Arrestors should always be placed as near to the source of shock as possible (shower valves, dishwashers, laundry machines, flush valves) - one each on the hot and cold water lines.

3.5. ELECTRONIC TRAP PRIMING

- 3.5.1. Make all wiring and power supply connections in accordance with the manufacturer's instructions.

3.6. THERMOSTATIC MIXING VALVES

- 3.6.1. Install and pipe in strict accordance with the manufacturer's instructions
- 3.6.2. Provide all accessories required by the manufacturer's instructions (balancing valves, check valves, etc)
- 3.6.3. Start-up and adjustment: by manufacturer's representative

3.7. LABELING AND IDENTIFYING

- 3.7.1. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
- 3.7.2. Calibrated balancing valves.

- 3.7.3. Master, thermostatic, water mixing valves.
- 3.7.4. Manifold, thermostatic, water-mixing-valve assemblies.
- 3.7.5. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

3.8. ADJUSTING

- 3.8.1. Valve packing shall be adjusted or replaced after piping systems have been tested and put into service but before final adjusting and balancing. Valves shall be replaced if persistent leaking occurs.
- 3.8.2. Set field-adjustable flow set points of balancing valves and record data. Ensure recorded data represents actual measured or observed conditions. Permanently mark settings of valves and other adjustment devices allowing settings to be restored. Set and lock memory stops. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- 3.8.3. Set field-adjustable temperature set points of temperature-actuated water mixing valves.
- 3.8.4. Testing and adjusting of balancing valves shall be performed by an independent NEBB Accredited Test and Balance Contractor. A final settings and flow report shall be submitted to the Client.

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

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SECTION 22 05 53
PAGE 1
MARCH 2026

TABLE OF CONTENTS

PART 1 - GENERAL	2
1.1. RELATED DOCUMENTS	2
1.2. SUMMARY	2
1.3. ACTION SUBMITTALS	2
1.4. COORDINATION	2
1.5. WORK INCLUDED	2
PART 2 - PRODUCTS	3
2.1. GENERAL	3
2.2. EQUIPMENT NAMEPLATES	3
2.3. PIPE IDENTIFICATION AND VALVE TAGS	4
2.4. VALVE DATA BASE	5
2.5. UTILITY ENTRANCE DESIGNATIONS	6
PART 3 - EXECUTION	6
3.1. PREPARATION	6
3.2. INSTALLATION	6

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104

SECTION 22 05 53
PAGE 2
MARCH 2026

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- 1.1.1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 - General Requirements, apply to this Section.

1.2. SUMMARY

- 1.2.1. Section Includes:

- 1.2.1.1. Equipment labels.
- 1.2.1.2. Pipe labels.
- 1.2.1.3. Valve tags.
- 1.2.1.4. Warning tags.

1.3. ACTION SUBMITTALS

- 1.3.1. Product Data: For each type of product indicated.
- 1.3.2. Samples: For color, letter style, and graphic representation required for each identification material and device.
- 1.3.3. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- 1.3.4. Valve numbering scheme.
- 1.3.5. Valve Schedules: For each piping system to include in maintenance manuals.

1.4. COORDINATION

- 1.4.1. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- 1.4.2. Coordinate installation of identifying devices with locations of access panels and doors.
- 1.4.3. Install identifying devices before installing acoustical ceilings and similar concealment.

1.5. WORK INCLUDED

- 1.5.1. Furnish and install nameplates, valve tags, valve charts, and pipe markers on all Plumbing equipment, and piping.

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

**TENDER NO. 26-7855-RFT
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PROJECT NO. 25-104**

**SECTION 22 05 53
PAGE 3
MARCH 2026**

- 1.5.2. Provide nameplates with the unit number and service designation on all plumbing equipment.
- 1.5.3. Indicate all valve tag numbers on Record Drawings and submit framed under glass valve tag charts including valve service and location.
- 1.5.4. Install color coded ceiling tacks in acoustical tile ceilings or color coded tape on ceiling grid to identify location of equipment, valves and dampers that require regular maintenance or are part of a life safety system (fire dampers, smoke dampers, sprinkler valves or main isolation valves).
- 1.5.5. Concealed fire protection valves shall be marked by red label triangles (3" equilateral) and circle dots (1" diameter). Triangles shall be placed on the wall nearest the valve with the apex pointing toward the ceiling tile. Dots shall be placed on border of ceiling tile.
- 1.5.6. Provide underground plastic pipe markers 6 to 8 inches below finish grade, directly above buried pipes.
- 1.5.7. Prepare valve charts and frame under glass. All valves and the tag numbers shall be shown on the Record As-Built Drawings.
- 1.5.8. Provide valve computer data base to match chart.
- 1.5.9. Prepare and install exterior protected brass plaques indicating underground service entrances.

PART 2 - PRODUCTS

2.1. GENERAL

- 2.1.1. Acceptable manufactures contingent on compliance with the specification.

- 2.1.1.1. Seton
- 2.1.1.2. Brady Corporation
- 2.1.1.3. Marking Services Incorporated

2.2. EQUIPMENT NAMEPLATES

- 2.2.1. Equipment nameplates shall be 3" x 6" long, 0.02" aluminum with a black enamel background with engraved natural aluminum letters similar to Seton Style 2065-20. Nameplate shall have pressure sensitive taped backing.
- 2.2.2. The nameplate shall contain the unit or equipment designation ("AHU" for air handling unit, "P" for circulating pump, etc.), unit number and area or system served.

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104

SECTION 22 05 53
PAGE 4
MARCH 2026

2.2.3. Nameplates for exterior equipment shall be applied with waterproof adhesive.

2.3. PIPE IDENTIFICATION AND VALVE TAGS

2.3.1. General Requirements for Manufactured Pipe Labels:

- 2.3.1.1. Preprinted, color-coded, with lettering indicating service, showing flow direction, and area served (i.e. "domestic cold water").
- 2.3.1.2. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- 2.3.1.3. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
- 2.3.1.4. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction, and visible all around pipe.
- 2.3.1.5. Lettering Size: At least 1-1/2 inches high.

2.3.2. All piping, except that piping which is within inaccessible chases, shall be identified.

2.3.3. Each marker background shall be appropriately color coded with a clearly printed legend to identify the contents of the pipe in conformance with the "Scheme for the Identification of Piping Systems" (ASME A13.1-1981).

2.3.4. Setmark snap-around markers shall be used for overall diameters up to 6" and strap around markers shall be used above 6" overall diameters.

2.3.5. Markers shall be located:

- 2.3.5.1. Adjacent to each valve
- 2.3.5.2. At each branch
- 2.3.5.3. At each cap for future
- 2.3.5.4. At each riser takeoff,
- 2.3.5.5. At each pipe passage through wall (each side)
- 2.3.5.6. At each pipe passage at 20' – 0" intervals maximum.
- 2.3.5.7. At each piece of equipment.
- 2.3.5.8. At all access doors.
- 2.3.5.9. A minimum of one (1) marker shall be provided at each room.

2.3.6. Underground pipe markers:

- 2.3.6.1. Provide detectable tape on all underground piping:
- 2.3.6.2. Labels shall be color coded and labeled the same as indoors.

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104

SECTION 22 05 53
PAGE 5
MARCH 2026

2.3.7. Valve tags

2.3.7.1. All valves shall be designated by distinguishing numbers and letters carefully coordinated with a valve chart. Valve tags shall include what room(s) the valve serves and piece of equipment served.

2.3.7.2. Valve tags shall be color coded 0.032" anodized aluminum tags, with engraved letters similar to Seton S Type 250-BL or approved equal.

2.3.8. HVAC tags shall be round 2" diameter, similar to Seton 15426.

2.3.9. Plumbing tags shall be square 2" x 2" similar to Seton 42769.

2.3.10. Fire Protection tags shall be square 2" x 2" similar to Seton 42769 RED.

2.3.11. Lettering shall be ¼" high for type service and ½" for valve number. Tag shall indicate service and valve number.

2.3.12. Each service shall be a different color.

2.3.13. Tag shall be attached to valves with chain similar to Seton No 16 stainless steel jack chain.

2.3.14. Whenever a valve is above a hung ceiling, the valve tag shall be located immediately above the hung ceiling.

2.3.15. Provide a tag for every valve except:

2.3.15.1. Perimeter radiation shut-off valves that are located at the finned tube radiation element within the accessible (from the space) heating enclosure.

2.3.16. Furnish a minimum of two (2) typed valve lists

2.3.17. Each framed under glass or Plexiglas. Each chart shall be enclosed in an approved 0.015" thick plastic closure for permanent protection.

2.3.18. Valve numbers shall correspond to those indicated on the Record Drawings and on the printed valve lists.

2.3.19. The printed list shall include the valve number, location and purpose of each valve. It shall state other necessary information such as the required opening or closing of another valve when one valve is to be opened or closed.

2.3.20. Printed framed valve lists shall be displayed in each Mechanical Room or in a location designated by the Client.

2.4. VALVE DATA BASE

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104

SECTION 22 05 53
PAGE 6
MARCH 2026

2.4.1. Provide a valve data base for all valves to operate on the building computer.

2.4.2. Every valve shall include:

- 2.4.2.1. Tag Number
- 2.4.2.2. Service (Hot water, Chilled water, Sprinkler, etc.)
- 2.4.2.3. Size
- 2.4.2.4. Operation
- 2.4.2.5. Location
- 2.4.2.6. Manufacture
- 2.4.2.7. Model number
- 2.4.2.8. Submittal reference

2.5. UTILITY ENTRANCE DESIGNATIONS

2.5.1. Provide a brass wall plaque, minimum 0.020" thickness, secured to the exterior wall just above the grade line for all buried service entrances or exits. Samples are: Water Service Below; Gas Service Below; Sanitary Sewer Below; Storm Sewer Below; Irrigation Water Below; etc.

2.5.2. Ceiling Tacks or Tape.

- 2.5.2.1. Provide steel color coded 3/4 inch diameter ceiling tacks in acoustical tile ceilings or color coded tape applied to ceiling grid to locate equipment, valves or dampers that require regular maintenance or are part of a Life Safety System.
- 2.5.2.2. The tacks or tapes shall be color codes as follows:
 - 2.5.2.2.1. Yellow – HVAC
 - 2.5.2.2.2. Red – Life Safety (fire dampers, sprinkler valves, etc.)
 - 2.5.2.2.3. Green - Plumbing Valves.
 - 2.5.2.2.4. Blue – Heating/Cooling Valves.

PART 3 - EXECUTION

3.1. PREPARATION

3.1.1. All surfaces shall be cleaned and insulated (if applicable) prior to installing any identification.

3.1.2. Exterior surfaces of outdoor equipment shall be dry and prepared to accept the specified identification.

3.2. INSTALLATION

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

**TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104**

**SECTION 22 05 53
PAGE 7
MARCH 2026**

- 3.2.1. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion. Seal with clear lacquer.
- 3.2.2. Install valve tags with chain.
- 3.2.3. Install plastic pipe markers in accordance with manufacturer's Instructions.
- 3.2.4. Install plastic tape markers complete around pipe in accordance with manufacturer's instructions.
- 3.2.5. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- 3.2.6. Identify air handling units, pumps, domestic hot water heaters, fire pumps, heat transfer equipment tanks, water treatment devices, etc. with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- 3.2.7. Identify control panels and major control components outside panels with plastic nameplates.
- 3.2.8. Install detector tape on all underground services in accordance with the manufacture's recommendations.
- 3.2.9. Identify thermostats relating to air handling equipment serving multiple spaces.
- 3.2.10. Identify valves in main and branch piping with valve tags.
- 3.2.11. Tag automatic controls, instruments and relays. Key to control schematic.
- 3.2.12. Identify piping, concealed or exposed, with pipe markers or where buried using plastic tape pipe markers. Use tags on piping $\frac{3}{4}$ inch diameter and smaller. Identify service, flow direction and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 7 m (20 feet) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

TABLE OF CONTENTS

PART 1 - GENERAL..... 2

1.1. DESCRIPTION 2

1.2. RELATED WORK 2

1.3. QUALITY ASSURANCE 2

1.4. SUBMITTALS 3

1.5. STORAGE AND HANDLING OF MATERIAL..... 3

1.6. APPLICABLE PUBLICATIONS..... 3

1.7. STANDARDS OF ACCEPTANCE 4

PART 2 - PRODUCTS 4

2.1. MINERAL FIBER OR FIBER GLASS 4

2.2. INSULATION FACINGS AND JACKETS 5

2.3. PIPE COVERING PROTECTION SADDLES..... 6

2.4. ADHESIVE, MASTIC, CEMENT 6

2.5. MECHANICAL FASTENERS..... 6

2.6. FLAME AND SMOKE 6

PART 3 - EXECUTION 7

3.1. GENERAL REQUIREMENTS..... 7

3.2. INSULATION INSTALLATION..... 8

3.3. FIELD-APPLIED JACKET APPLICATION 9

PART 1 - GENERAL

1.1. DESCRIPTION

1.1.1. Field applied insulation for thermal efficiency and condensation control for Plumbing piping and equipment.

1.1.2. Re-insulation of plumbing piping and equipment after asbestos abatement.

1.1.3. Definitions

1.1.3.1. ASJ: All service jacket, white finish facing or jacket.

1.1.3.2. Air conditioned space: Space having air temperature and/or humidity controlled by mechanical equipment.

1.1.3.3. Cold: Equipment or piping handling media at design temperature of 16 degrees C (60 degrees F) or below.

1.1.3.4. Concealed: Piping above ceilings and in chases, interstitial space, and pipe chases.

1.1.3.5. Exposed: Piping and equipment exposed to view in finished areas including mechanical equipment rooms or exposed to outdoor weather. Shafts, chases, interstitial spaces, unfinished attics, crawl spaces and pipe basements are not considered finished areas.

1.1.3.6. Hot: Plumbing equipment or piping handling media above 41 degrees C (105 degrees F).

1.1.3.7. Thermal conductance: Heat flow rate through materials.

1.1.3.8. Flat surface: Watts per square meter (BTU per hour per square foot).

1.1.3.9. Pipe or Cylinder: Watts per square meter (BTU per hour per linear foot).

1.1.3.10. Thermal Conductivity (k): Watt per meter, per degree C (BTU per inch thickness, per hour, per square foot, per degree F temperature difference).

1.1.3.11. Vapor Retarder (Vapor Barrier): A material which retards the transmission (migration) of water vapor. Performance of the vapor retarder is rated in terms of permeance (perms). or the purpose of this specification, vapor retarders shall have a maximum published permeance of 0.1 perms and vapor barriers shall have a maximum published permeance of 0.001 perms.

1.2. RELATED WORK

1.2.1. Section: 22 05 00 Common Work Results for Plumbing: General mechanical requirements

1.3. QUALITY ASSURANCE

1.3.1. Criteria:

- 1.3.1.1. Comply with NFPA 90A, particularly paragraphs 4.3.3.1 through 4.3.3.6, 4.3.10.2.6, and 5.4.6.4,
- 1.3.1.2. Specified k factors are at 24 degrees C (75 degrees F) mean temperature unless stated otherwise. For pipe, use insulation manufacturer's published heat flow tables. For domestic hot water supply and return, run out insulation and condensation control insulation, no thickness adjustment need be made.
- 1.3.1.3. All materials shall be compatible and suitable for service temperature, and shall not contribute to corrosion or otherwise attack surface to which applied in either the wet or dry state.
- 1.3.1.4. Every package or standard container of insulation or accessories delivered to the job site for use must have a manufacturer's stamp or label giving the name of the manufacturer and description of the material.

1.4. SUBMITTALS

- 1.4.1. Submit in accordance with Section: 01 33 23 Shop Drawings, Product Data, and Samples.
- 1.4.2. Shop Drawings:
 - 1.4.2.1. All information, clearly presented, shall be included to determine compliance with drawings and specifications and ASTM, federal and military specifications.
 - 1.4.2.2. Insulation materials: Specify each type used and state surface burning characteristics.
 - 1.4.2.3. Insulation facings and jackets: Each type used.
 - 1.4.2.4. Insulation accessory materials: Each type used.
 - 1.4.2.5. Manufacturer's installation and fitting fabrication instructions for flexible unicellular insulation.
 - 1.4.2.6. Make reference to applicable specification paragraph numbers for coordination.

1.5. STORAGE AND HANDLING OF MATERIAL

- 1.5.1. Store materials in clean and dry environment, pipe covering jackets shall be clean and unmarred. Place adhesives in original containers. Maintain ambient temperatures and conditions as required by printed instructions of manufacturers of adhesives, mastics and finishing cements.

1.6. APPLICABLE PUBLICATIONS

- 1.6.1. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
- 1.6.2. National Fire Protection Association (NFPA):

- 1.6.2.1. 101-09 Life Safety Code
- 1.6.2.2. 251-06 Standard methods of Tests of Fire Endurance of Building Construction Materials
- 1.6.2.3. 255-06 Standard Method of tests of Surface Burning Characteristics of Building Materials
- 1.6.3. Underwriters Laboratories, Inc (UL):
 - 1.6.3.1. 723 UL Standard for Safety Test for Surface Burning Characteristics of Building Materials with Revision of 08/03
- 1.6.4. Manufacturer's Standardization Society of the Valve and Fitting Industry (MSS):
 - 1.6.4.1. SP58-2002 Pipe Hangers and Supports Materials, Design, and Manufacture

1.7. STANDARDS OF ACCEPTANCE

- 1.7.1. Owens/Corning, Knauf, Johns Mansville

PART 2 - PRODUCTS

2.1. MINERAL FIBER OR FIBER GLASS

- 2.1.1. ASTM C547 (Pipe Fitting Insulation and Preformed Pipe Insulation), class 1, k = 0.037 (0.26) at 24 degrees C (75 deg. F), for use at temperatures from -20 deg. C (-4 deg. F) and up to 230 deg. C (450 deg. F) with an all service vapor retarder jacket with polyvinyl chloride premolded fitting covering.
- 2.1.2. Application: all domestic water supply piping (hot, cold, recirculation), all horizontal sections of storm drains.
- 2.1.3. Thickness:
 - 2.1.3.1. Piping larger than 75mm (3"): 38 mm thickness
 - 2.1.3.2. Piping nominal 25mm-75mm (1-3"): 25 mm thickness
 - 2.1.3.3. Piping nominal 19mm (3/4") and less: 12 mm thickness
 - 2.1.3.4. Outdoor insulation (any size): increase insulation thickness by 12 mm (1/2")
- 2.1.4. At fittings and flanges (including water meter and body of roof drains), insulate with wrapped fiberglass insulation of same thickness as adjacent pipe, and cover with pre-molded PVC jackets. Seal edge of jacket with self-sealing vapor barrier tape.
- 2.1.5. Elbows, flanges and other fittings shall be insulated with the same material as is used on the pipe straights.

2.2. INSULATION FACINGS AND JACKETS

2.2.1. Vapor Retarder, higher strength with low water permeance = 0.02 or less perm rating, Beach puncture 50 units for insulation facing on pipe insulation jackets.

2.2.2. Facings and jackets

2.2.2.1. Concealed indoor areas:

2.2.2.1.1. Shall be all service type (ASJ) in concealed spaces and PVC Vapor Retarder jacketing in all exposed areas, including mechanical rooms and service areas.

2.2.2.1.2. All service Jacket (ASJ) shall be white kraft bonded to 0.025 mm (1 mil) thick aluminum foil, fiberglass reinforced, with pressure sensitive adhesive closure. Comply with ASTM C1136. Beach puncture 50 units, Suitable for painting without sizing. Jackets shall have minimum 40 mm (1-1/2 inch) lap on longitudinal joints and minimum 75mm (3 inch) butt strip on end joints. Butt strip material shall be same as the jacket. Lap and butt strips shall be self-sealing type with factory-applied pressure sensitive adhesive.

2.2.2.1.3. Standard of Acceptance: Zeston, Ceeco, Proto

2.2.2.2. Exposed indoor areas:

2.2.2.2.1. Shall be heavy PVC fitting covers (0.75 mm thickness. Overlap PVC covers on pipe insulation jackets as least 1 inch (25 mm) at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

2.2.2.3. Indoor Fittings Jackets

2.2.2.3.1. Pipe fitting insulation covering (jackets): Fitting covering shall be premolded to match shape of fitting and shall be polyvinyl chloride (PVC) minimum thickness 0.7 mm (0.03 inches). Provide color matching vapor retarder pressure sensitive tape.

2.2.2.3.2. Adhesive: Compatible with PVC jacket, and recommended by insulation material manufacturer.

2.2.2.3.3. Standard of Acceptance: Zeston, Ceeco, Proto

2.2.2.4. Aluminum Jackets – Outdoor Piping and Fittings

2.2.2.4.1. Aluminum Jacket-Piping systems: ASTM B209, 3003 alloy, H-14 temper, 0.6 mm (0.023 inch) minimum thickness with locking longitudinal joints. Jackets for elbows, tees and other fittings shall be factory-fabricated to match shape of fitting and of 0.6 mm (0.024) inch minimum thickness aluminum. Fittings shall be of same construction as straight run jackets but need not be of the same alloy. Factory-fabricated stainless steel bands shall be installed on all circumferential joints. Bands shall be 13 mm (0.5 inch) wide on 450 mm (18 inch) centers. System shall be weatherproof if utilized for outside service.

- 2.2.2.4.2. Field applied vapor barrier jackets shall be provided, in addition to the specified facings and jackets, on all exterior piping as well as on interior piping exposed to outdoor air (i.e.; in ventilated attics, piping in ventilated (not air conditioned) spaces, etc.) The vapor barrier jacket shall consist of a multi-layer laminated cladding with a maximum water vapor permeance of 0.001 perms. The minimum puncture resistance shall be 35 cm-kg (30 inch-pounds) for interior locations and 92 cm-kg (80 inch-pounds) for exterior or exposed locations or where the insulation is subject to damage.
- 2.2.2.4.3. Neither rivets, screws, staples nor any other fastener capable of penetrating the underlying vapor retarder shall be used to secure the aluminum jacketing.
- 2.2.2.4.4. Standards of Acceptance: Childers-Lock-on and Pabco-Surfeit.

2.3. PIPE COVERING PROTECTION SADDLES

- 2.3.1. Cold pipe support - indoors: Premolded pipe insulation 180 degrees (half-shells) on bottom half of pipe at supports. Material shall be cellular glass or high density Polyisocyanurate insulation of the same thickness as adjacent insulation. Density of Polyisocyanurate insulation shall be a minimum of 48 kg/m³ (3.0 pcf).
- 2.3.2. Warm or hot pipe supports - indoors: Premolded pipe insulation (180 degree half-shells) on bottom half of pipe at supports. Material shall be high density Polyisocyanurate (for temperatures up to 149 degrees C [300 degrees F]), cellular glass or calcium silicate. Insulation at supports shall have same thickness as adjacent insulation. Density of Polyisocyanurate insulation shall be a minimum of 48 kg/m³ (3.0 pcf).
- 2.3.3. All piping – outdoors: Metallic shield shall be made of galvanized steel painted on both sides with a minimum two coats of aluminum paint. 180 degrees for clevises and roller type hangers and 360 degrees for clamp type hangers and supports. Shield and insert length and gauge shall be 400 mm (16") long and min. 2.75 mm (12ga) thickness.

2.4. ADHESIVE, MASTIC, CEMENT

- 2.4.1. Insulation manufacturers' published recommendations.

2.5. MECHANICAL FASTENERS

- 2.5.1. Wire: 1.3 mm thick (18 gage) soft annealed galvanized or 1.9 mm (14 gage) copper clad steel or nickel copper alloy.
- 2.5.2. Bands: 13 mm (1/2 inch) nominal width, brass, galvanized steel, aluminum or stainless steel.

2.6. FLAME AND SMOKE

- 2.6.1. Unless shown otherwise all assembled systems shall meet flame spread 25 and smoke developed 50 rating as developed under ASTM, NFPA and UL standards and specifications. See paragraph 1.3 "Quality Assurance".

PART 3 - EXECUTION

3.1. GENERAL REQUIREMENTS

- 3.1.1. Required pressure tests of piping joints and connections shall be completed and the work approved by the Consultant for application of insulation. Surface shall be clean and dry with all foreign materials, such as dirt, oil, loose scale and rust removed.
- 3.1.2. Except for specific exceptions, insulate all specified equipment, and piping (pipe, fittings, valves, accessories). Insulate each pipe individually. Do not use scrap pieces of insulation where a full length section will fit.
- 3.1.3. Insulation materials shall be installed in a first class manner with smooth and even surfaces, with jackets and facings drawn tight and smoothly cemented down at all laps. Insulation shall be continuous through all sleeves and openings, except at fire dampers and duct heaters (NFPA 90A). Vapor retarders shall be continuous and uninterrupted throughout systems with operating temperature 16 degrees C (60 degrees F) and below. Lap and seal vapor barrier over ends and exposed edges of insulation. Anchors, supports and other metal projections through insulation on cold surfaces shall be insulated and vapor sealed for a minimum length of 150 mm (6 inches).
- 3.1.4. Install vapor stops at all insulation terminations on either side of valves, pumps and equipment and particularly in straight lengths of pipe insulation.
- 3.1.5. Construct insulation on parts of equipment such as cold water pumps and heat exchangers that must be opened periodically for maintenance or repair, so insulation can be removed and replaced without damage. Install insulation with bolted 1 mm thick (20 gage) galvanized steel or aluminum covers as complete units, or in sections, with all necessary supports, and split to coincide with flange/split of the equipment.
- 3.1.6. Insulation on hot piping and equipment shall be terminated square at items not to be insulated, access openings and nameplates. Cover all exposed raw insulation with white sealer or jacket material.
- 3.1.7. Protect all insulations outside of buildings with aluminum jacket using lock joint or other approved system for a continuous weather tight system. Access doors and other items requiring maintenance or access shall be removable and sealable.
- 3.1.8. Plumbing work not to be insulated:

- 3.1.8.1. Piping and valves of fire protection system.
- 3.1.8.2. Factory pre-insulated components.
- 3.1.8.3. Over equipment nameplates.
- 3.1.8.4. Chromium plated brass piping.
- 3.1.8.5. Water piping in contact with earth.
- 3.1.8.6. Vibration control devices
- 3.1.8.7. Air chambers, unions, strainers, check valves, flow regulators.
- 3.1.8.8. Small horizontal cold water branch runs in partitions to individual fixtures may be without insulation for maximum distance of 900 mm (3 feet).
- 3.1.9. Apply insulation materials subject to the manufacturer's recommended temperature limits. Apply adhesives, mastic and coatings at the manufacturer's recommended minimum coverage.
- 3.1.10. Firestop Pipe insulation:
 - 3.1.10.1. Provide firestopping insulation at fire and smoke barriers through penetrations. Fire stopping insulation shall be UL listed.
 - 3.1.10.2. Pipe penetrations requiring fire stop insulation including, but not limited to the following:
 - 3.1.10.2.1. Pipe risers through floors
 - 3.1.10.2.2. Pipe chase walls and floors
 - 3.1.10.2.3. Smoke partitions
 - 3.1.10.2.4. Fire partitions
 - 3.1.10.2.5. Freeze protection of above grade outdoor piping (over heat tracing tape): 20 mm (0.75) thick insulation, for all pipe sizes 75 mm(3 inches) and smaller and 25 mm(1inch) thick insulation for larger pipes. Provide metal jackets for all pipes. Provide where indicated on the drawings
- 3.1.11. Provide vapor barrier jackets over insulation as follows:
 - 3.1.11.1. All piping exposed to outdoor weather.
 - 3.1.11.2. All interior piping conveying fluids exposed to outdoor air (i.e. in attics, ventilated (not air conditioned) spaces, etc.
- 3.1.12. Provide metal jackets over insulation as follows:
 - 3.1.12.1. All plumbing piping exposed to outdoor weather.

3.2. INSULATION INSTALLATION

- 3.2.1. Molded Mineral Fiber Pipe and Tubing Covering:

- 3.2.1.1. Fit insulation to pipe, aligning longitudinal joints. Seal longitudinal joint laps and circumferential butt strips by rubbing hard with a nylon sealing tool to assure a positive seal. Staples may be used to assist in securing insulation. Seal all vapor retarder penetrations on cold piping with a generous application of vapor barrier mastic. Provide inserts and install with metal insulation shields at outside pipe supports. Install freeze protection insulation over heating cable.
- 3.2.2. Contractor's options for fitting, flange and valve insulation:
 - 3.2.2.1. Factory molded, ASTM C547 or field mitered sections, joined with adhesive or wired in place. For hot piping finish with a smoothing coat of finishing cement. For cold fittings, 16 degrees C (60 degrees F) or less, vapor seal with a layer of glass fitting tape imbedded between two 2 mm (1/16 inch) coats of vapor barrier mastic.
 - 3.2.2.2. Fitting tape shall extend over the adjacent pipe insulation and overlap on itself at least 50 mm (2 inches).
 - 3.2.2.3. Nominal thickness in millimeters and inches specified in the schedule at the end of this section.

3.3. FIELD-APPLIED JACKET APPLICATION

- 3.3.1. Apply PVC jacket where indicated, with 1 inch (25 mm) overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
- 3.3.2. Apply metal jacket where indicated, with 2-inch (50 mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel band 12 inches (300 mm) o.c. and at end joints. Provide vapor-barrier jackets. Aluminum jackets shall have seams located below the horizontal plane of the horizontal piping route. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and cover with aluminum jackets.

TABLE OF CONTENTS

PART 1 - GENERAL	2
1.1. DESCRIPTION	2
1.2. RELATED WORK	2
1.3. SUBMITTALS	2
1.4. APPLICABLE PUBLICATIONS	2
1.5. QUALITY ASSURANCE	3
PART 2 - PRODUCTS	3
2.1. MATERIALS	3
2.2. UNDERGROUND WATER SERVICE CONNECTIONS TO BUILDINGS	4
2.3. ABOVE GROUND (INTERIOR) WATER PIPING	4
2.4. EXPOSED WATER PIPING	5
2.5. TRAP PRIMER WATER PIPING	5
2.6. STRAINERS	5
2.7. DIELECTRIC FITTINGS	6
2.8. STERILIZATION CHEMICALS	6
PART 3 - EXECUTION	6
3.1. INSTALLATION	6
3.2. COPPER PIPE JOINTS	7
3.3. THREADED PIPE JOINTS	7
3.4. PIPE HANGERS, SUPPORTS AND ACCESSORIES	7
3.5. PENETRATIONS	8
3.6. TESTS	8
3.7. VALVES INSTALLATION	9
3.8. STERILIZATION	9

PART 1 - GENERAL

1.1. DESCRIPTION

- 1.1.1. Domestic water systems, including piping, equipment and all necessary accessories as designated in this section.

1.2. RELATED WORK

- 1.2.1. Section: 22 05 00 Common Work Results for Plumbing.
- 1.2.2. Section: 22 07 00 Plumbing Insulation.

1.3. SUBMITTALS

- 1.3.1. Submit in accordance with Section: 01 33 23 Shop Drawings, Product Data, and Samples.
- 1.3.2. Manufacturer's Literature and Data: All items listed in Part 2 - Products.

1.4. APPLICABLE PUBLICATIONS

- 1.4.1. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- 1.4.2. Ontario Building Code – Part 7
- 1.4.3. American National Standards Institute (ANSI):
- 1.4.4. A13.1 Scheme for Identification of Piping Systems
- 1.4.5. B16.3-2011 Malleable Iron Threaded Fittings Classes 150 and 300
- 1.4.6. B16.9-2007 Factory-Made Wrought Butt Welding Fittings
- 1.4.7. B16.11-2011 Forged Fittings, Socket-Welding and Threaded
- 1.4.8. B16.15-2006 Cast Copper Alloy Threaded Fittings Classes 125 and 250
- 1.4.9. B16.18-2001 Cast Copper Alloy Solder-Joint Pressure Fittings
- 1.4.10. B16.22-2012 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
- 1.4.11. NSF/ANSI 61-2012 Drinking Water System Components - Health Effects
- 1.4.12. American Society for Testing and Materials (ASTM):
 - 1.4.12.1. A183-03(2009) Carbon Steel Track Bolts and Nuts

- 1.4.12.2. B32-08 Solder Metal
- 1.4.12.3. B61-08 Steam or Valve Bronze Castings
- 1.4.12.4. B75/B75M-11 Seamless Copper Tube
- 1.4.12.5. B88-09 Seamless Copper Water Tube
- 1.4.12.6. B584-12a Copper Alloy Sand Castings for General Applications
- 1.4.12.7. B687-99(2011) Brass, Copper, and Chromium-Plated Pipe Nipples
- 1.4.12.8. E1120-08 Liquid Chlorine
- 1.4.12.9. E1229-08 Calcium Hypochlorite
- 1.4.13. American Water Works Association (AWWA):
- 1.4.14. C110/A21.10-12 Ductile Iron and Gray Iron
- 1.4.15. C151/A21.51-09 Ductile-Iron Pipe, Centrifugally Cast
- 1.4.16. C153/A21.53-11 Ductile-Iron Compact Fittings
- 1.4.17. C651-05 Disinfecting Water Mains
- 1.4.18. NSF International (NSF)
 - 1.4.18.1. NSF/ANSI 61 (2012) Drinking Water System Components – Health Effects
 - 1.4.18.2. NSF/ANSI 372 (2011) Drinking Water System Components – Lead Content

1.5. QUALITY ASSURANCE

- 1.5.1. All piping materials shall be compatible for temperature, pressure and service.
- 1.5.2. All piping materials of a given type shall be manufactured by a single source, and supplied by a single supplier.
- 1.5.3. All wetted seals shall be made from materials that are immune from chloramine degradation.
- 1.5.4. All joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer.
- 1.5.5. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

PART 2 - PRODUCTS

2.1. MATERIALS

- 2.1.1. Material or equipment containing a weighted average of greater than 0.25 percent lead shall not be used in any potable water system intended for human consumption, and shall be certified in accordance with NSF/ANSI 61 or NSF 372. Endpoint devices used to dispense water for drinking must meet the requirements of NSF/ANSI 61, Section 9.

2.2. UNDERGROUND WATER SERVICE CONNECTIONS TO BUILDINGS

- 2.2.1. From inside face of exterior wall to a distance of approximately 5 feet (1500 mm) outside of building and underground inside building, material to be the same for the size specified inside of the building.
- 2.2.2. Three inches (75 mm) Diameter and Over: Ductile iron, AWWA C151, 125 psi (850 kPa) water steam pressure (WSP), exterior bituminous coating, and cement lined. Provide flanged and anchored connection to interior piping.
- 2.2.3. Under 3 inch (75 mm) Diameter: Copper tubing, ASTM B88, Type K, seamless, annealed. Fittings as specified under Part 2, INTERIOR DOMESTIC WATER PIPING. Use brazing alloys, AWS A5.8, Classification BCuP.
- 2.2.4. Flexible Expansion Joint: Ductile iron with ball joints rated for 250 psi (1725 kPa) working pressure conforming to ANSI/AWWA C153/A21.53, capable of deflecting a minimum of 20 degrees in each direction and expanding simultaneously to the amount shown on the drawings. Flexible expansion joint size shall match the pipe size it is connected to and shall have the expansion capability designed as an integral part of the ductile iron ball castings. Pressure containing parts shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213 and shall be factory tested with a 1500 volt spark test. Flexible expansion joint shall have flanged connections conforming to ANSI/AWWA C110. Bolts and nuts shall be 316 stainless steel and gaskets shall be neoprene. The flexible expansion fitting shall not expand or exert an axial thrust under internal water pressure. Provide piping joint restraints at each mechanical joint end connection and piping restraints at the penetration of the building wall. The restraints shall be provided to address the developed thrust at the change of piping direction.

2.3. ABOVE GROUND (INTERIOR) WATER PIPING

- 2.3.1. Pipe: Copper tube, ASTM B88, Type K or L, drawn.
- 2.3.2. Fittings for Copper Tube:
 - 2.3.2.1. Wrought copper or bronze castings conforming to ANSI B16.18 and B16.22. Unions shall be bronze, MSS SP72 & SP 110, Solder or braze joints. Use 95/5 tin and antimony for all soldered joints.

2.3.2.2. Adapters: Provide adapters for joining screwed pipe to copper tubing.

2.3.3. Unions And Flanges:

2.3.3.1. Unions, flanges and gasket materials to have a pressure rating of not less than 150 psig at 180 degrees. Gasket material for flanges and flanged fittings shall be teflon type. Treated paper gaskets are not acceptable.

2.3.3.2. 50 mm (2") and smaller copper unions:

2.3.3.2.1. ANSI B16.18 cast bronze union coupling or ANSI B15.24 Class 150 cast bronze flanges.

2.3.3.3. 65 mm (2½ ") and larger flanges:

2.3.3.3.1. ANSI B15.24 Class 150 cast bronze flanges with full face teflon gaskets.

2.3.4. Solder: For installation of the potable water systems, only lead free solder shall be used, as required by the Ontario Act. Regulation 815/84 of the Ontario Water Resources.

2.4. EXPOSED WATER PIPING

2.4.1. Finished Room: Use full iron pipe size chrome plated brass piping for exposed water piping connecting fixtures, casework, cabinets, equipment when not concealed.

2.4.2. Fittings: ANSI B16.15 cast bronze threaded fittings with chrome finish.

2.4.3. Nipples: ASTM B 687, Chromium-plated.

2.4.4. Unions: Mss SP-72, SP-110, Brass or Bronze with chrome finish. Unions 2-1/2 inches (65 mm) and larger shall be flange type with approved gaskets.

2.4.5. Unfinished Rooms, Mechanical Rooms and Kitchens: Chrome plated brass piping is not required.

2.5. TRAP PRIMER WATER PIPING

2.5.1. Pipe: Copper tube, ASTM B88, type K, hard drawn.

2.5.2. Fittings: Bronze castings conforming to ANSI B16.18 Solder joints.

2.5.3. Solder: ASTM B32 composition Sb5. Provide non-corrosive flux.

2.6. STRAINERS

2.6.1. Provide on high pressure side of pressure reducing valves, upstream of solenoid valves, on suction side of pumps, on inlet side of indicating and control instruments and

equipment subject to sediment damage and where shown on drawings. Strainer element shall be removable without disconnection of piping.

2.6.2. Water: Basket or "Y" type with easily removable cover and brass strainer basket.

2.6.3. Body: Smaller than 3 inches (80 mm), brass or bronze; 3 inches (80 mm) and larger, cast iron or semi-steel.

2.7. DIELECTRIC FITTINGS

2.7.1. Provide dielectric couplings or unions between ferrous and non-ferrous pipe.

2.8. STERILIZATION CHEMICALS

2.8.1. Hypochlorite: ASTM E1120-08

2.8.2. Liquid Chlorine: ASTM E1229-08

PART 3 - EXECUTION

3.1. INSTALLATION

3.1.1. Install branch piping for water from the piping system and connect to all fixtures, valves, cocks, outlets, casework, cabinets and equipment.

3.1.2. Pipe shall be round and straight. Cutting shall be done with proper tools. Pipe, except for plastic and glass, shall be reamed to full size after cutting.

3.1.3. Install union and shut-off valve on pressure piping at connections to equipment.

3.1.4. Lay out pipe lines straight, plumb and in true alignment. Offset as required to avoid interference with other work, to conceal piping, to allow maximum headroom and to avoid interference with windows and doors. Lay out all pipes and establish their levels from bench marks, existing floors or finished grades.

3.1.5. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

3.1.6. Piping shall be concealed unless indicated otherwise on drawings. Do not conceal piping until it has been inspected, tested, flushed and approved.

3.1.7. Use eccentric reducing fittings to increase or decrease pipe sizes. Bushings are not acceptable. Orient reducers to prevent trapping of water.

- 3.1.8. Locate groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves. Install hot and cold water lines at least 6 inches apart. Install piping at least 3 inches clear of electrical conduit and avoid running pipe within 3'-6" of electrical equipment, from floor to ceiling.
- 3.1.9. Grade all lines to facilitate drainage. Provide drain valves at bottom of risers and all low points in system. Design domestic hot water circulating lines with no traps.
- 3.1.10. All domestic water piping shall be insulated throughout. For cold water, use vapor barrier.
- 3.1.11. Connect branch lines at bottom of main serving fixtures below and pitch down so that main may be drained through fixture. Connect branch lines to top of main serving only fixtures located on floor above.

3.2. COPPER PIPE JOINTS

- 3.2.1. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

3.3. THREADED PIPE JOINTS

- 3.3.1. Use a thread lubricant or teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.4. PIPE HANGERS, SUPPORTS AND ACCESSORIES

- 3.4.1. All piping shall be supported per the requirements of the Ontario Building Code part 7
- 3.4.2. Shop Painting and Plating: Hangers, supports, rods, inserts and accessories used for pipe supports shall be shop coated with red lead or zinc chromate primer paint. Electroplated copper hanger rods, hangers and accessories may be used with copper tubing.
- 3.4.3. Floor, Wall and Ceiling Plates, Supports, Hangers:
 - 3.4.3.1. Solid or split un-plated cast iron.
 - 3.4.3.2. All plates shall be provided with set screws.
 - 3.4.3.3. Pipe Hangers: Height adjustable clevis type.
 - 3.4.3.4. Adjustable Floor Rests and Base Flanges: Steel.
 - 3.4.3.5. Concrete Inserts: "Universal" or continuous slotted type.

- 3.4.3.6. Hanger Rods: Mild, low carbon steel, fully threaded or Threaded at each end with two removable nuts at each end for positioning rod and hanger and locking each in place.
 - 3.4.3.7. Riser Clamps: Malleable iron or steel.
 - 3.4.3.8. Rollers: Cast iron.
 - 3.4.3.9. Self-drilling type expansion shields shall be "Phillips" type, with case hardened steel expander plugs.
 - 3.4.3.10. Hangers and supports utilized with insulated pipe and tubing shall have 180 degree metal protection shield Centered on and welded to the hanger and support. The shield shall be 4 inches in length and be 16 gauge steel. The shield shall be sized for the insulation.
- 3.4.4. For cold piping, install hangers and supports to maintain an effective continuous thermal and vapor barrier between cold piping and hangers and supports.
 - 3.4.5. Miscellaneous Materials: As specified, required, directed or as noted on the drawings for proper installation of hangers, supports and accessories.
 - 3.4.6. With the installation of each flexible expansion joint, provide piping restraints for the upstream and downstream section of the piping at the flexible expansion joint. Provide calculations supporting the restraint length design and type of selected restraints.
 - 3.4.7. Install chrome plated cast brass escutcheon with set screw at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.

3.5. PENETRATIONS

- 3.5.1. Install pipe sleeves where piping passes through building construction including all walls, floors and ceilings.
- 3.5.2. For new wall construction, promptly and accurately locate and securely set sleeves in forms before concrete is poured. For masonry construction, set the sleeves over the piping for Masonry Contractor to build around.
- 3.5.3. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section: 07 84 00 Fire Stopping. Completely fill and seal clearances between raceways and openings with the fire stopping materials.
- 3.5.4. Waterproofing: At floor penetrations, completely seal clearances around the pipe and make watertight with sealant

3.6. TESTS

- 3.6.1. General: Test system either in its entirety or in sections.
- 3.6.2. Potable Water System: Test after installation of piping and domestic water heaters, but before piping is concealed, before covering is applied, and before plumbing fixtures are connected. Fill systems with water and maintain hydrostatic pressure of 150 psi (1040 kPa) gage for two hours. No decrease in pressure is allowed. Provide a pressure gage with a shutoff and bleeder valve at the highest point of the piping being tested.
- 3.6.3. All Other Piping Tests: Test new installed piping under 1-1/2 times actual operating conditions and prove tight.

3.7. VALVES INSTALLATION

- 3.7.1. Install valves with stem in horizontal position whenever possible. All valves shall be easily accessible. Install valve in each water connection to fixture.
- 3.7.2. Install union and shut off valve on piping at connections to equipment and at all other locations indicated on the drawings.
- 3.7.3. Provide isolation valves on all main branch feeds to washroom fixture groups. Where possible, locate all valves in accessible ceilings. In hard ceiling areas, group valves to be accessed from one access door.
- 3.7.4. Backflow prevention device shall be installed in an accessible location, 5 (five) feet above finish floor.
- 3.7.5. Connect to fixtures and equipment in accordance with manufacturer's instructions.

3.8. STERILIZATION

- 3.8.1. After tests have been successfully completed, thoroughly flush and sterilize the interior domestic water distribution system in accordance with the Ontario Building Code part 7, the requirements of Authorities Having Jurisdiction and AWWA C651.
- 3.8.2. Use liquid chlorine or hypochlorite for sterilization.

TABLE OF CONTENTS

PART 1 - GENERAL	2
1.1. DESCRIPTION	2
1.2. RELATED WORK	2
1.3. APPLICABLE PUBLICATIONS	2
1.4. SUBMITTALS	2
1.5. AS-BUILT DOCUMENTATION	2
PART 2 - PRODUCTS	3
2.1. UNDERGROUND SANITARY DRAINS – GRAVITY FLOW	3
2.2. ABOVE GROUND SANITARY DRAINS/VENTS - GRAVITY FLOW	3
2.3. ACID RESISTANT PIPING.....	4
2.4. SPECIALTY PIPE FITTINGS.....	5
2.5. PENETRATION SLEEVES.....	6
PART 3 - EXECUTION	6
3.1. PIPE INSTALLATION.....	6
3.2. JOINT CONSTRUCTION.....	7
3.3. SPECIALTY PIPE FITTINGS.....	8
3.4. PIPE HANGERS, SUPPORTS AND ACCESSORIES	8
3.5. TESTS.....	10

PART 1 - GENERAL

1.1. DESCRIPTION

- 1.1.1. This section pertains to storm and sanitary sewer and sanitary vent systems, including piping, equipment and all necessary accessories as designated in this section.

1.2. RELATED WORK

- 1.2.1. Section: 01 33 23 Shop Drawings, Product Data, and Samples.
- 1.2.2. Section: 22 05 00 Common Work Results for Plumbing.
- 1.2.3. Section: 22 07 00 Plumbing Insulation.

1.3. APPLICABLE PUBLICATIONS

- 1.3.1. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

- 1.3.1.1. Ontario Building Code – Part 7

1.4. SUBMITTALS

- 1.4.1. Submittals, including number of required copies, shall be submitted in accordance with Section 01 23 33, SHOP DRAWINGS AND PROJECT DOCUMENTATION.
- 1.4.2. Manufacturer's Literature and Data including: Full item description and optional features and accessories. Include dimensions, weights, materials, applications, standard compliance, model numbers, size, and capacity.
 - 1.4.2.1. Piping.
 - 1.4.2.2. Penetration Sleeves.
 - 1.4.2.3. Pipe Fittings.
 - 1.4.2.4. Exposed Piping and Fittings.
- 1.4.3. Detailed shop drawing of clamping device and extensions when required in connection with the waterproofing membrane or the floor drain.

1.5. AS-BUILT DOCUMENTATION

- 1.5.1. The installing contractor shall maintain as-built drawings of each completed phase for verification; and, shall provide the complete set at the time of final systems certification testing. As-built drawings are to be provided, and a copy of them on Auto-Cad version 2007 or higher provided on compact disk or DVD. Should the installing contractor engage

the testing company to provide as-built or any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party testing company' requirement.

- 1.5.2. Certification documentation shall be provided prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and a certification that all results of tests were within limits specified.

PART 2 - PRODUCTS

2.1. UNDERGROUND SANITARY DRAINS – GRAVITY FLOW

- 2.1.1. Main line sewers will be PVC SDR35 sewer pipe and shall be in compliance with ASTM D3040 or ASTM F1760 and third party certified to CSA B182.2.
- 2.1.2. Sewer laterals will be PVC SDR28 sewer pipe and shall be third party certified by CSA as above.
- 2.1.3. Joints
 - 2.1.3.1. Sealing gaskets must meet the requirements of ASTM D3034 or ASTM F1760, CSA B182.2.
 - 2.1.3.2. In addition, the pipe joints must be able to withstand a minimum hydrostatic pressure of 345 kPa (50 psi) without leakage.
- 2.1.4. Pipe Stiffness
 - 2.1.4.1. The minimum ring stiffness shall be 320 kPa (46 psi) for SDR35 pipe and 625 kPa (90 psi) for SDR 28.
 - 2.1.4.2. This stiffness will be determined using the test methods prescribed by ASTM D3034 and ASTM F1760.
- 2.1.5. Fittings
 - 2.1.5.1. Injection-molded gasketed PVC fittings shall meet the requirements of ASTM 3034 and ASTM F1336 and shall be certified to CSA B182.1 or CSA B182.2.
 - 2.1.5.2. Fabricated fittings must conform to ASTM F1336 and CSA B182.2.
- 2.1.6. Standard of Acceptance: IPEX Ring-Tite

2.2. ABOVE GROUND SANITARY DRAINS/VENTS - GRAVITY FLOW

- 2.2.1. Smaller than 75 mm (3") diam.

- 2.2.1.1. Copper DWV tube sanitary waste, drain and vent drawn temper conforming to ASTM B306.
- 2.2.1.2. The copper drainage fittings shall be cast copper or wrought copper conforming to CSA B158.1, ASME B16.23 or ASME B16.29.
- 2.2.1.3. The joints shall be lead free, using a water flushable flux, and conforming to ASTM B32.
- 2.2.2. Larger than 100 mm (4") diam
 - 2.2.2.1. Cast iron Pipe shall be bell and spigot or hubless (plain end or no-hub or hubless).
 - 2.2.2.2. The material for all pipe and fittings shall be cast iron soil pipe and fittings and shall conform to the requirements of CSA B70, ASTM A888, or ASTM A74.
 - 2.2.2.3. Cast iron pipe and fittings shall be made from a minimum of 95 percent post-consumer recycled material.
 - 2.2.2.4. Joints for hubless pipe and fittings shall conform to the manufacturer's installation instructions. Couplings for hubless joints shall conform to CISPI 310. Joints for hub and spigot pipe shall be installed with compression gaskets conforming to the requirements of ASTM C564.

2.3. ACID RESISTANT PIPING

2.3.1. General

- 2.3.1.1. Acid waste drain and vent system, as shown on drawings, shall be NSF listed, Schedule 40, polypropylene as manufactured by IPEX to include pipe supplied in 10 ft. lengths (or 20 ft lengths if NFRPP is specified), and matched fittings, traps and neutralization tanks from the same manufacturer.
- 2.3.1.2. It shall also include recommended adapters to connect to other piping materials, where applicable.

2.3.2. Material

- 2.3.2.1. Pipe shall be made from NSF listed Type 110 or 210, flame retardant polypropylene conforming to ASTM D4101, with a maximum average flame spread of zero seconds and a maximum extent of burning of 13 mm, in accordance with ASTM D635.
- 2.3.2.2. Matched fittings shall be made from NSF listed flame retardant polypropylene with average maximum burn time of 80 seconds and maximum extent of burning of 20 mm in accordance with ASTM D635.

- 2.3.2.3. If NFRPP pipe is specified, it shall be made from NSF 14 listed and CSA certified Schedule 40 PP as manufactured by IPEX. Pipe shall comply with ASTM F1412 and material used shall comply with the material requirements of ASTM D4101.

2.3.3. Fittings

- 2.3.3.1. Fittings shall be NSF listed, be of all plastic construction and be designed to lock into a machined groove on the mating piping. All fittings shall have integrally molded union connections. No metallic grab rings or clamps shall be allowed.
- 2.3.3.2. Fittings containing EVA (ethylene vinyl acetate) are strictly prohibited. Couplings shall not be added to make mechanical joint fittings. Fittings shall be Labline or approved equivalent.

2.3.4. Joints

- 2.3.4.1. Connections between polypropylene pipe and matched fittings shall be made using the Labline Joint.

2.3.5. Installation And Testing

- 2.3.5.1. Installation and testing shall be in accordance with the contract drawings, the manufacturer's recommendations and the local plumbing codes. Testing with compressed air is prohibited. The entire system shall be installed free of stress and in proper alignment.
- 2.3.5.2. Horizontal supports shall provide a wide bearing area and be free of burrs or sharp edges. Support spacings shall be in accordance with the manufacturer's recommendations and local plumbing codes.
- 2.3.5.3. Vertical piping shall have riser clamps at each floor. Pipe supports shall be installed so that horizontal piping is in uniform alignment and with a uniform slope of at least 1/8" per foot, or in accordance with the local plumbing codes.

2.3.6. Standard of Acceptance: IPEX Labline

2.4. SPECIALTY PIPE FITTINGS

- 2.4.1. Transition pipe couplings shall join piping with small differences in outside diameters or different materials. End connections shall be of the same size and compatible with the pipes being joined. The transition coupling shall be elastomeric, sleeve type reducing or transition pattern and include shear and corrosion resistant metal, tension band and tightening mechanism on each end. The transition coupling sleeve coupling shall be of the following material:

- 2.4.1.1. For cast iron drain pipes, the sleeve material shall be rubber conforming to ASTM C564.
- 2.4.1.2. For PVC drain pipes, the sleeve material shall be elastomeric seal or PVC, conforming to ASTM F477 or ASTM D5926.
- 2.4.1.3. For dissimilar pipes, the sleeve material shall be PVC conforming to ASTM D5926, or other material compatible with the pipe materials being joined.
- 2.4.2. The dielectric fittings shall conform to ASSE 1079 with a pressure rating of 861 kPa (125 psig) at a minimum temperature of 82 degrees C (180 degrees F). The end connection shall be solder joint copper alloy and threaded ferrous.
- 2.4.3. Dielectric flange insulating kits shall be of non-conducting materials for field assembly of companion flanges with a pressure rating of 1035 kPa (150 psig). The gasket shall be neoprene or phenolic. The bolt sleeves shall be phenolic or polyethylene. The washers shall be phenolic with steel backing washers.
- 2.4.4. The di-electric nipples shall be electroplated steel nipple complying with ASTM F1545 with a pressure rating of 2070 kPa (300 psig) at 107 degrees C (225 degrees F). The end connection shall be male threaded. The lining shall be inert and noncorrosive propylene.

2.5. PENETRATION SLEEVES

- 2.5.1. A sleeve flashing device shall be provided at points where pipes pass through membrane waterproofed floors or walls. The sleeve flashing device shall be manufactured, cast iron fitting with clamping device that forms a sleeve for the pipe floor penetration of the floor membrane. A galvanized steel pipe extension shall be included in the top of the fitting that will extend 50 mm (2 inches) above finished floor and galvanized steel pipe extension in the bottom of the fitting that will extend through the floor slab. A waterproof caulked joint shall be provided at the top hub.

PART 3 - EXECUTION

3.1. PIPE INSTALLATION

- 3.1.1. The pipe installation shall comply with the requirements of the Ontario Building Code part 7 and these specifications.
- 3.1.2. Branch piping shall be installed for waste from the respective piping systems and connect to all fixtures, valves, cocks, outlets, casework, cabinets and equipment.
- 3.1.3. Provide and size venting to all plumbing fixtures and fixture groups in accordance to Ontario Water Resources Act, Plumbing Code most recent edition, and local authorities having jurisdiction.

- 3.1.4. Pipe shall be round and straight. Cutting shall be done with proper tools. Pipe shall be reamed to full size after cutting.
- 3.1.5. All pipe runs shall be laid out to avoid interference with other work.
- 3.1.6. The piping shall be installed above accessible ceilings where possible.
- 3.1.7. The piping shall be installed to permit valve servicing or operation.
- 3.1.8. The piping shall be installed free of sags and bends.
- 3.1.9. Seismic restraint shall be installed where required by code.
- 3.1.10. Changes in direction for soil and waste drainage and vent piping shall be made using appropriate branches, bends and long sweep bends. Sanitary tees and short sweep quarter bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Long turn double wye branch and eighth bend fittings shall be used if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Proper size of standard increaser and reducers shall be used if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- 3.1.11. Provide minimum slope of 1% for all horizontal sections larger than 100 mm (4") diam and 2% for all horizontal sections of 75 mm (3") or less. Buried drain lines and vent piping shall be laid beginning at the low point of each system. Piping shall be installed true to grades and alignment indicated with unbroken continuity of invert. Hub ends shall be placed upstream. Required gaskets shall be installed according to manufacturer's written instruction for use of lubricants, cements, and other installation requirements.
- 3.1.12. Except for where a single sink is served, no buried sanitary line shall be less than 100 mm (4") diam. Run buried piping min 200 mm (8") below the bottom of concrete slabs.

3.2. JOINT CONSTRUCTION

- 3.2.1. Hub and spigot, cast iron piping with gasket joints shall be joined in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- 3.2.2. Hub and spigot, cast iron piping with calked joints shall be joined in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
- 3.2.3. Hubless or No-hub, cast iron piping shall be joined in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless piping coupling joints.

3.2.4. For threaded joints, thread pipe with tapered pipe threads according to ASME B1.20.1. The threads shall be cut full and clean using sharp disc cutters. Threaded pipe ends shall be reamed to remove burrs and restored to full pipe inside diameter. Pipe fittings and valves shall be joined as follows:

3.2.4.1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is required by the pipe service.

3.2.4.2. Pipe sections with damaged threads shall be replaced with new sections of pipe.

3.2.5. Copper tube and fittings with soldered joints shall be joined according to ASTM B828. A water flushable, lead free flux conforming to ASTM B813 and a lead free alloy solder conforming to ASTM B32 shall be used.

3.2.6. For PVC piping, solvent cement joints shall be used for joints. All surfaces shall be cleaned and dry prior to applying the primer and solvent cement. Installation practices shall comply with ASTM F402. The joint shall conform to ASTM D2855 and ASTM D2665 appendixes.

3.3. SPECIALTY PIPE FITTINGS

3.3.1. Transition coupling shall be installed at pipe joints with small differences in pipe outside diameters.

3.3.2. Dielectric fittings shall be installed at connections of dissimilar metal piping and tubing.

3.4. PIPE HANGERS, SUPPORTS AND ACCESSORIES

3.4.1. All piping shall be supported according to the requirement of Ontario Building Code and these specifications. Where conflicts arise between the code, these specifications and Section: 22 05 00 Common Work Results for Plumbing the most restrictive or the requirement that specifies supports with highest loading or shortest spacing shall apply.

3.4.2. Hangers, supports, rods, inserts and accessories used for pipe supports shall be painted. Electroplated copper hanger rods, hangers and accessories may be used with copper tubing.

3.4.3. Horizontal piping and tubing shall be supported within 300 mm (12 inches) of each fitting or coupling.

3.4.4. Horizontal cast iron piping shall be supported with the following maximum horizontal spacing and minimum hanger rod diameters:

- 3.4.4.1. 40 mm or DN40 to 50 mm or DN50 (NPS 1-1/2 inch to NPS 2 inch): 1500 mm (60 inches) with 10 mm (3/8 inch) rod.
- 3.4.4.2. 75 mm or DN75 (NPS 3 inch): 1500 mm (60 inches) with 15 mm (1/2 inch) rod.
- 3.4.4.3. 100 mm or DN100 to 125 mm or DN125 (NPS 4 inch to NPS 5 inch): 1500 mm (60 inches) with 18 mm (5/8 inch) rod.
- 3.4.4.4. 150 mm or DN150 to 200 mm or DN200 (NPS 6 inch to NPS 8 inch): 1500 mm (60 inches) with 20 mm (3/4 inch) rod.
- 3.4.4.5. 250 mm or DN250 to 300 mm or DN300 (NPS 10 inch to NPS 12 inch): 1500 mm (60 inch) with 23 mm (7/8 inch) rod.
- 3.4.5. Vertical piping and tubing shall be supported at the base, at each floor, and at intervals no greater than 4.6 m (15 feet).
- 3.4.6. In addition to the requirements in Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, Floor, Wall and Ceiling Plates, Supports, Hangers shall have the following characteristics:
 - 3.4.6.1. Solid or split unplated cast iron.
 - 3.4.6.2. All plates shall be provided with set screws.
 - 3.4.6.3. Height adjustable clevis type pipe hangers.
 - 3.4.6.4. Adjustable floor rests and base flanges shall be steel.
 - 3.4.6.5. Hanger rods shall be low carbon steel, fully threaded or threaded at each end with two removable nuts at each end for positioning rod and hanger and locking each in place.
 - 3.4.6.6. Riser clamps shall be malleable iron or steel.
 - 3.4.6.7. Rollers shall be cast iron.
 - 3.4.6.8. See Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING SYSTEMS, for requirements on insulated pipe protective shields at hanger supports.
 - 3.4.6.9. Miscellaneous materials shall be provided as specified, required, directed or as noted on the drawings for proper installation of hangers, supports and accessories. If the vertical distance exceeds 6.1 m (20 feet) for cast iron pipe additional support shall be provided in the center of that span. All necessary auxiliary steel shall be provided to provide that support.
 - 3.4.6.10. Cast escutcheon with set screw shall be provided at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.
- 3.4.7. Penetrations:
 - 3.4.7.1. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, a fire stop shall be installed that provides an effective barrier

against the spread of fire, smoke and gases. Clearances between raceways and openings shall be completely filled and sealed with the fire stopping materials.

- 3.4.7.2. Water proofing: At floor penetrations, clearances shall be completely sealed around the pipe and make watertight with sealant
- 3.4.8. Sanitary vents shall be extended separately through roof.

3.5. TESTS

- 3.5.1. Storm and sanitary waste and drain systems shall be tested either in third entirety or in sections.
- 3.5.2. If tests are required by an Authority Having Jurisdiction, perform tests in the presence of each governing authority and obtain certification. Repeat tests as often as necessary to obtain certification.
- 3.5.3. Tests shall be conducted before trenches are backfilled or fixtures are connected. A water test or air test shall be conducted, as directed.
- 3.5.4. If entire system is tested for a water test, tightly close all openings in pipes except highest opening, and fill system with water to point of overflow. If the waste system is tested in sections, tightly plug each opening except highest opening of section under test, fill each section with water and test with at least a 3 m (10 foot) head of water. In testing successive sections, test at least upper 3 m (10 feet) of next preceding section so that each joint or pipe except upper most 3 m (10 feet) of system has been submitted to a test of at least a 3 m (10 foot) head of water. Water shall be kept in the system, or in portion under test, for at least 15 minutes before inspection starts. System shall then be tight at all joints.
- 3.5.5. For an air test, an air pressure of 34 kPa (5 psig) gage shall be maintained for at least 15 minutes without leakage. A force pump and mercury column gage shall be used for the air test.
- 3.5.6. After installing all fixtures and equipment, open water supply so that all p-traps can be observed. For 15 minutes of operation, all p-traps shall be inspected for leaks and any leaks found shall be corrected.

TABLE OF CONTENTS

PART 1 - GENERAL	2
1.1. DESCRIPTION	2
1.2. RELATED WORK	2
1.3. APPLICABLE PUBLICATIONS	2
1.4. SUBMITTALS	2
1.5. FIXTURES AND TRIM	3
1.6. QUALITY ASSURANCE	3
1.7. WARRANTY	3
PART 2 - PRODUCTS	3
2.1. GENERAL	3
2.2. [LV-1] LAVATORY (SINGLE COUNTER MOUNTED SINK)	4
PART 3 - EXECUTION	4
3.1. EXAMINATION AND PREPARATION	4
3.2. INSTALLATION OF FIXTURES	5
3.3. INSTALLATION OF WATER CLOSETS AND URINALS - STANDARD AND BARRIER FREE	5
3.4. INSTALLATION OF THERMOSTATIC MIXING VALVES (NON-EMERGENCY FIXTURES)	6
3.5. COMMISSIONING	6
3.6. ADJUSTING AND CLEANING	6

PART 1 - GENERAL

1.1. DESCRIPTION

1.1.1. This section specifies materials and installation for the following plumbing fixtures as applicable to the project:

1.1.1.1. Lavatories, sinks, service sinks, and related Faucets and Trim

1.2. RELATED WORK

1.2.1. Section: 01 00 00 General Requirements.

1.2.2. Section: 01 33 23 Shop Drawings, Product Data, and Samples.

1.2.3. Section: 22 05 00 Common Work Results for Plumbing.

1.2.4. Section: 22 13 00 Facility Sanitary Sewerage.

1.2.5. Division 26 – Electrical.

1.3. APPLICABLE PUBLICATIONS

1.3.1. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

1.3.2. Do the work in accordance with CAN 3-B45 Series-M81 and CSA B125-1975 except where specified otherwise.

1.3.3. Ontario Building Code (OBC)

1.3.3.1. Part 7 Plumbing

1.4. SUBMITTALS

1.4.1. Submittals, including number of required copies, shall be submitted in accordance with Section: 01 33 23 Shop Drawings, Product Data, and Samples.

1.4.2. Manufacturer's Literature and Data:

1.4.2.1. Construction details, material descriptions, rated capacities, operating characteristics dimensions of individual components and profiles, and finishes for fixtures.

1.4.2.2. Water consumption data.

1.4.2.3. Wiring diagrams for power, signal, and control wiring.

- 1.4.3. Complete operating and maintenance manuals including wiring diagrams, technical data sheets and information for ordering replaceable parts:
- 1.4.4. Include complete list indicating all components of the systems.
- 1.4.5. Diagrams shall have their terminals identified to facilitate installation, operation and maintenance.

1.5. FIXTURES AND TRIM

- 1.5.1. Architectural drawings to govern in determination of number and location of fixtures.
- 1.5.2. Fixtures to be product of one manufacturer.
- 1.5.3. Unless specified otherwise, trim to be product of one manufacturer.

1.6. QUALITY ASSURANCE

- 1.6.1. Manufacturers and Products: The products and manufacturers specified in this Section establish the standard of quality for the Work. Subject to compliance with all requirements, provide specified products from the manufacturers named in Part 2.
- 1.6.2. The Contractor shall verify and resolve compatibility between separate components (e.g. that lavatory hole quantity and centering match that of the specified faucet, supports are compatible with respective urinals and water closets, etc.). Model numbers, when provided, are partial model numbers for identifying style. Provide fixtures that meet all the specified requirements.

1.7. WARRANTY

- 1.7.1. Provide a complete parts and labor warranty for a minimum of one year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1. GENERAL

- 2.1.1. Plumbing fixtures shall be as indicated and specified with all required supports, accessories, wastes, vent and water connections as required to make the fixture complete and operational.
- 2.1.2. Unless specified otherwise, fixtures shall be in accordance with the Architect's color schedule.

- 2.1.3. Unless specified otherwise, all exposed valves, pipe, escutcheon, etc., shall be polished chrome finish.
- 2.1.4. Fixtures and trim shall be new and free of all defects or blemishes. Finished surfaces shall be clean, smooth, and bright guaranteed not to craze, change colour or scale. Imperfections of any kind shall be sufficient reason for rejection and the item shall be removed and an acceptable replacement installed at no additional cost.
- 2.1.5. Provide all lavatory hot and cold-water supply lines with a renewable disc, chromium plated lock shield stop valve.
- 2.1.6. Provide cast brass chrome plated escutcheon plates with set screws on all water and drain pipes where such lines pass through, floors, walls and partitions.
- 2.1.7. Protect fixtures with enamel or glazed surface from damage by covering or coating as recommended in the Bulletin "Handling & Care of Enameled C.I. Plumbing Fixtures".
- 2.1.8. Fixture type is specified below. Refer to plumbing drawings for fixture quantity.

2.2. [LV-1] LAVATORY (SINGLE COUNTER MOUNTED SINK)

- 2.2.1. Basin: Franke Model LBS6408P-1 single sink with faucet ledge, 18 gauge, type 304 18-10 stainless steel. Self rimming. Exposed surfaces are satin finished. Undercoated to reduce condensation and resonance.
- 2.2.2. Waste and Trim: 100LF-HDF single lever sink faucet with hot limit stop, all metal fabricated body, long spot swings 180deg, vandal resistant aerator, mixing valve and McGuire #155A CP 32 mm (1.¼") cast plug with open grid strainer trap, McGuire #8872C CP 32mm (1.¼") cast "P" trap with cleanout escutcheon, McGuire H165LKN5 supplies.
- 2.2.3. Thermostatic mixing valve: Delta Model R2570, installed in recess mount housing (box 10.13" (257 mm) high) c/w stainless steel cover.

PART 3 - EXECUTION

3.1. EXAMINATION AND PREPARATION

- 3.1.1. Verify existing grades, inverts, utilities, obstacles, and topographical conditions prior to installations.
- 3.1.2. Examine rough-in requirements for plumbing fixtures and other equipment having drain connections to verify actual locations of piping connections prior to installation.

- 3.1.3. Examine walls, floors, roof, and plumbing chases for suitable conditions where piping and specialties are to be installed.

3.2. INSTALLATION OF FIXTURES

- 3.2.1. Connect fixtures complete with supplies and drains, traps and cleanouts, supported level and square, such as to make them completely functional.
- 3.2.2. Hot water faucets shall be on left. Where indicated and applicable, supply and install the tempering valves in accordance with the manufacturer's instructions.
- 3.2.3. Provide venting for all plumbing fixtures as required by codes.
- 3.2.4. All barrier-free fixtures to be mounted at heights to be in accordance with all codes and local Authorities Having Jurisdiction.
- 3.2.5. Provide chrome plated flexible supplies to fixtures with screw driver stops, reducers and escutcheons.
- 3.2.6. All piping shall be recessed unless otherwise approved. Piping to be installed in recessed areas (such as under cabinetry, counters and other millwork or ceiling spaces) shall be run in neat parallel lines as tight as possible to walls and ceilings.
- 3.2.7. Provide ball isolation valves for connections to all fixtures.
- 3.2.8. All angle valves for fixtures shall be chrome plated.
- 3.2.9. All sanitary drains visible under the counter shall be either chromed or painted to match the color of the wall behind.

3.3. INSTALLATION OF WATER CLOSETS AND URINALS - STANDARD AND BARRIER FREE

- 3.3.1. Mounting Heights:
- 3.3.2. Water closets - standard: 15 in. to 17 in. from top of toilet seat to finished floor.
- 3.3.3. Water closets - barrier free: 17 in. from top of toilet seat to finished floor.
- 3.3.4. Urinals- standard: 24 in. from rim to finished floor.
- 3.3.5. Urinals - barrier free: 17 in. from rim to finished floor, 44 in. maximum from hand operated flush valve to finished floor.
- 3.3.6. Flush Valve: Mount flush valve handle on wide side of stall or room.

3.3.7. Apply dual flush instruction plates to wall centered above flushometer.

3.3.8. Install toilet seats on water closets.

3.4. INSTALLATION OF THERMOSTATIC MIXING VALVES (NON-EMERGENCY FIXTURES)

3.4.1. Install in a location readily accessible for cleaning, adjustment, and valve/cartridge replacement.

3.4.2. Install mixing valve after checks and stops are installed. Thoroughly flush all piping immediately prior to mixing valve installation.

3.4.3. Install isolation valves on the hot and cold water inlet pipe connections, near the mixing valve.

3.4.4. Install check valves between the mixing valve and the mixing valve isolation valves. These check valves are in addition to the mixing valve's integral check valves.

3.4.5. Adjust valve temperature set point to 110 deg. F, following manufacturer's adjustment instructions.

3.5. COMMISSIONING

3.5.1. Perform the commissioning activities as outlined in the Division 01 Section for Commissioning and other requirements of the Contract Documents.

3.6. ADJUSTING AND CLEANING

3.6.1. Flush all water closets and urinals and verify performance. Adjust or clean flush valves to produce proper flow.

3.6.2. Back-flush shower heads, faucet aerators/spray heads, and in-line strainers at electric water coolers, emergency fixtures, and wherever installed, and reinstall.

3.6.3. Adjust pop-up drains for proper operation.

3.6.4. Adjust eyewashes to provide proper flow.

3.6.5. Adjust shower control valve limit stops to deliver maximum 120 deg. water.

3.6.6. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise or overflow.

3.6.7. Replace dead batteries in sensor operated flush valves and faucets. Adjust sensor operation to satisfaction of commissioner.

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**SECTION 22 42 00
PAGE 7
MARCH 2026**

- 3.6.8. At completion of project, remove excess caulk and sealants and clean plumbing fixtures and equipment.

TABLE OF CONTENTS

PART 1 - GENERAL	4
1.1. DESCRIPTION	4
1.2. DEFINITIONS	4
1.3. RELATED WORK	4
1.4. QUALITY ASSURANCE	4
1.5. PRODUCTS CRITERIA.....	4
1.6. EQUIPMENT SERVICE ORGANIZATIONS	5
1.7. EXECUTION (INSTALLATION, CONSTRUCTION) QUALITY	5
1.8. DUTIES OF MECHANICAL CONTRACTOR.....	6
1.9. COMMISSIONING	6
1.10. SCHEDULING OF WORK	7
1.11. INTENT	7
1.12. INTERFERENCES	8
1.13. EXAMINE SITE	9
1.14. INTERFERENCE AND SLEEVING DRAWINGS.....	9
1.15. WARRANTY	9
1.16. SUBMITTALS	10
1.17. MATERIALS AND STANDARDS OF ACCEPTANCE.....	11
1.18. MATERIAL SUBSTITUTIONS.....	11
1.19. CODES, PERMITS, FEES AND CONNECTIONS	11
1.20. CONSULTANT'S INSTRUCTIONS	12
1.21. ADDITIONAL WORK AND CHANGES	12
1.22. DELIVERY, STORAGE AND HANDLING.....	12
1.23. HAULING OPERATIONS	13
1.24. JOB CONDITIONS – WORK IN EXISTING BUILDING	14
PART 2 - PRODUCTS	14
2.1. FACTORY-ASSEMBLED PRODUCTS.....	14
2.2. COMPATIBILITY OF RELATED EQUIPMENT	15

2.3.	LIFTING ATTACHMENTS.....	15
2.4.	EQUIPMENT REQUIREMENTS AND INSTALLATION	15
2.5.	EQUIPMENT AND MATERIALS IDENTIFICATION	16
2.6.	FIRESTOPPING	16
2.7.	GALVANIZED REPAIR COMPOUND	17
2.8.	HVAC PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS	17
2.9.	PIPE PENETRATIONS THROUGH INTERIOR BUILDING ELEMENTS	20
2.10.	SPECIAL TOOLS AND LUBRICANTS	21
2.11.	WALL, FLOOR AND CEILING PLATES	21
PART 3 - EXECUTION		21
3.1.	ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING	21
3.2.	THERMOMETERS AND PRESSURE GAUGES	22
3.3.	EQUIPMENT AND PIPING SUPPORT	23
3.4.	ITEMS NOT SHOWN BUT REQUIRED.....	23
3.5.	PROTECTION AND CLEANING	23
3.6.	WORK IN EXISTING BUILDING.....	24
3.7.	TEMPORARY PIPING AND EQUIPMENT	24
3.8.	RIGGING.....	25
3.9.	PIPE AND EQUIPMENT SUPPORTS.....	25
3.10.	CLEANING AND PAINTING	27
3.11.	IDENTIFICATION SIGNS	28
3.12.	MOTOR AND DRIVE ALIGNMENT	28
3.13.	LUBRICATION	28
3.14.	CONCRETE.....	28
3.15.	METALS	28
3.16.	CUTTING, PATCHING, ROOFING, AND X-RAY	29
3.17.	OPERATING AND MAINTENANCE MANUALS	29
3.18.	CLOSE-OUT DOCUMENTATION	29
3.19.	COMMISSIONING	30
3.20.	STARTUP AND TEMPORARY OPERATION	30

3.21. OPERATING AND PERFORMANCE TESTS 30

PART 1 - GENERAL

1.1. DESCRIPTION

- 1.1.1. The requirements of this Section apply to all sections of Division 23.

1.2. DEFINITIONS

- 1.2.1. Exposed: Piping, ductwork, and equipment exposed to view in finished rooms.
- 1.2.2. Option or optional: Contractor's choice of an alternate material or method.

1.3. RELATED WORK

- 1.3.1. Section: 01 33 23 Shop Drawings, Product Data, and Samples.
- 1.3.2. Section: 22 05 53 Identification for Plumbing Piping and Equipment.
- 1.3.3. Section: 23 05 93 Testing, Adjusting and Balancing For HVAC.
- 1.3.4. Section: 23 07 00 HVAC Insulation.

1.4. QUALITY ASSURANCE

- 1.4.1. Mechanical, electrical and associated systems shall be safe, reliable, efficient, durable, easily and safely operable and maintainable, easily and safely accessible, and in compliance with applicable codes as specified. The systems shall be comprised of high quality institutional-class and industrial-class products of manufacturers that are experienced specialists in the required product lines. All construction firms and personnel shall be experienced and qualified specialists in industrial and institutional HVAC.

1.5. PRODUCTS CRITERIA

- 1.5.1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years (or longer as specified elsewhere). The design, model and size of each item shall have been in satisfactory and efficient operation on at least three installations for approximately three years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least three years. See other specification sections for any exceptions and/or additional requirements.

- 1.5.2. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
- 1.5.3. Conform to codes and standards as required by the specifications. Conform to local codes, if required by local authorities such as the natural gas supplier, if the local codes are more stringent than those specified. Refer any conflicts to the Consultant.
- 1.5.4. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
- 1.5.5. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
- 1.5.6. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
- 1.5.7. Asbestos products or equipment or materials containing asbestos shall not be used.

1.6. EQUIPMENT SERVICE ORGANIZATIONS

- 1.6.1. HVAC: Products and systems shall be supported by service organizations that maintain a complete inventory of repair parts and are located within 50 miles to the site.
- 1.6.2. HVAC Mechanical Systems Welding: Before any welding is performed, contractor shall submit a certificate certifying that welders comply with the following requirements:
 - 1.6.2.1. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualifications".
 - 1.6.2.2. Comply with provisions of ASME B31 series "Code for Pressure Piping".

1.7. EXECUTION (INSTALLATION, CONSTRUCTION) QUALITY

- 1.7.1. Apply and install all items in accordance with manufacturer's written instructions. Refer conflicts between the manufacturer's instructions and the contract drawings and specifications to the Consultant for resolution.
- 1.7.2. Provide complete layout drawings, schematics, diagrams, sections, notes and specifications as required to allow for competitive bidding and construction. Do not commence construction work on any system until the layout drawings have been approved.

1.8. DUTIES OF MECHANICAL CONTRACTOR

1.8.1. The mechanical contractor shall assume the responsibilities and duties of a general contractor including but not limited to the ones described below:

1.8.1.1. Superintendence

- 1.8.1.1.1. Provide full time on-site superintendent personnel and supporting staff with proven experience in project of similar value and complexity.
- 1.8.1.1.2. Site superintendent shall have over-all authority to speak for and represent the mechanical contractor.

1.8.1.2. Coordination

- 1.8.1.2.1. Coordinate the work with all the sub-trades involved to ensure that the work will be carried out on schedule and in proper sequence.
- 1.8.1.2.2. Take complete responsibility for all remedial work that results from failure to coordinate any aspect of the mechanical work prior to its fabrication and/or installation.
- 1.8.1.2.3. Take responsibility for the delivery of equipment necessary to complete the work in accordance with the approved schedule.

1.8.1.3. Staffing and Scheduling

- 1.8.1.3.1. Within seven days after the award of the contract, the Mechanical Contractor shall provide to the Board representative the following information:
 - Appointment of official representatives in the project.
 - Schedule of work.
 - Delivery schedule for specified equipment.
 - Requirements for temporary facilities, site signs, storage, etc.

1.8.1.4. Work Completion Meeting

- 1.8.1.4.1. Prior to application for Substantial Performance of the Work, the mechanical contractor shall participate in the take-over meeting. Agenda to include the following:
 - Review of outstanding deficiencies.
 - Submission of maintenance manuals, warranties and as-built drawings.
 - Results of performance tests and described further in this section.
 - Scheduling of training to Board's personnel.

1.9. COMMISSIONING

1.9.1. The Board may at its discretion use a third party as a commissioning agent for the construction portion of the work. The requirement for commissioning shall be included in the front-end documents of the bidders' package.

- 1.9.2. If commissioning is included, the contractor shall provide all manpower and will take into account all the hours required to participate in the commissioning process including meetings with the commissioning agent, completion of forms and check-lists, verifications, simulations, rectifications of deficiencies and other activities associated with the commissioning process.

1.10. SCHEDULING OF WORK

- 1.10.1. For all work to be performed under this contract, adhere to Construction Schedule agreed upon with the Board.

1.11. INTENT

- 1.11.1. Bidders for this work shall include for all labor, material, equipment and all other related cost including all applicable taxes (except HST) and fees to provide the work as indicated on the drawings.
- 1.11.2. Misinterpretation of any requirement of the drawings and specifications will not relieve the Mechanical Contractor of responsibility. If in any doubt, the Mechanical Contractor shall contact the Consultant for written clarification prior to submitting a bid for the Work.
- 1.11.3. The scope of work for this project includes but is not limited to:

1.11.3.1. Demolition work

- 1.11.3.1.1. Remove existing supply diffusers c/w flexible ducts and grilles as indicated on design drawings.
- 1.11.3.1.2. Remove section of heating piping c/w accessories as indicated on design drawings.
- 1.11.3.1.3. Contractor to include for removal existing T-bar ceiling in as required for the demolition & new work. Include for removal of ceiling tiles, lighting, and any other services such as fire alarm devices that need to be removed. Ceiling and existing services shall be re-instated upon completion of the work. any removed and re-installed fire alarm devices shall be re-verified.
- 1.11.3.1.4. Remove existing lighting fixtures c/w wiring, receptacles and other accessories, including switches.

1.11.3.2. New Layout Work

- 1.11.3.2.1. Upon removal of the raised reading area, new heating piping is to be installed above the new ceiling.
- 1.11.3.2.2. Install new finned radiator along the exterior wall c/w new associated heating piping, control valve and thermostat.
- 1.11.3.2.3. Supply and install new supply diffusers, flexible ducts and grilles.

1.11.3.2.4. Upon completion of work, contractor to perform a full duct cleaning on all ductwork serving renovated area as well as air balancing for all new diffusers and grilles.

1.11.3.2.5. Provide and install new lighting fixtures c/w new wiring and switches.

1.12. INTERFERENCES

1.12.1. The mechanical drawings do not show all the architectural and structural details, and any information involving accurate measuring of the building shall be taken from the building drawings or at the building. Make without additional charge, any necessary changes or additions to the runs of drains, pipes, ducts, etc., to accommodate the above conditions. The location of equipment may be altered without charge providing the change is made before installation and does not necessitate major additional material.

1.12.2. Wherever differences occur between specifications, riser diagrams or schematics and drawings, the maximum conditions shall govern and the bid shall be based on whichever information indicates the greater cost.

1.12.3. Field verifications of dimensions on plans shall be made since actual locations, distances, and levels will be governed by actual field conditions.

1.12.4. Discrepancies between different plans, or between plans and actual field conditions, or between plans and specifications shall promptly be brought to the attention of the Consultant for a decision.

1.12.5. Install all mechanical services including but not exclusive to drains, pipes, and ducts, to conserve headroom and interfere as little as possible with the free use of the space through which they pass. All drains, pipes, ducts, etc., particularly those which may interfere with the inside treatment of the building, or conflicting with other trades, shall be installed only after the locations have been approved by the Consultant. Special care shall be taken in the installation of all mechanical services including, but not exclusive to drains, pipes, and ducts, which are to be concealed, to see that they come within the finished lines of floors, walls, and ceilings. Where such drains, pipes, ducts, etc., have been installed in such a manner as to cause interference, they shall be removed and re installed in suitable locations without extra cost to the Board.

1.12.6. Before commencing work, check and verify all grade and invert elevations, stacks, levels, and dimensions, to ensure proper and correct installation of the work.

1.12.7. In every place where there is space indicated as reserved for future or other equipment, leave such space clear, install blank offs, shut off valves with blind flanges and other work

so that the necessary connections can be made without any stoppages to the system. Consult with the consultant whenever necessary for this purpose.

1.12.8. In addition to the work specifically mentioned in the Specifications and shown on the drawings, provide all other items that are obviously necessary to make a complete working installation, including those required by the Authorities Having Jurisdiction over the work.

1.12.9. The mechanical plans show approximate locations for wall mounted devices. Obtain Consultant's approval of mounting heights and locations before commencement of work.

1.13. EXAMINE SITE

1.13.1. Examine the site and the local conditions affecting the work prior to submission of the tender price. Examine carefully all drawings and the complete specifications to ensure that the work can be satisfactorily carried out as shown. No allowance will be made later for any expenses incurred through the failure to make these examinations or to report any such discrepancies in writing to the Consultant.

1.14. INTERFERENCE AND SLEEVING DRAWINGS

1.14.1. Submit complete consolidated and coordinated interference drawings for all new air handling systems, and for existing systems that are in the same areas.

1.14.2. The drawings shall include plan views, elevations and sections of all systems and shall be on a scale of not less than 1:200. Clearly identify and dimension the proposed locations of the principal items of equipment. The drawings shall clearly show locations and adequate clearance for all equipment, ductwork, piping, valves, control panels and other items. Show the access means for all items requiring access for operations and maintenance. Provide detailed layout drawings of all piping and duct systems.

1.14.3. Do not install equipment foundations, equipment, ductwork or piping until interference drawings have been approved.

1.15. WARRANTY

1.15.1. All work completed under this contract shall carry a min. 1 years warranty (labour and material) from the date of substantial completion.

1.15.2. **All equipment supplied under this contract shall carry a 1 years warranty.** Where certain equipment specifications call for a for a longer warranty on certain components, the longest period shall apply.

1.16. SUBMITTALS

- 1.16.1. Submit documentation in accordance with Section: 01 33 23 Shop Drawings, Product Data, and Samples, and with requirements in the individual specification sections.
- 1.16.2. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements.
- 1.16.3. If equipment is submitted which differs in arrangement from that shown, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.
- 1.16.4. Prior to submitting shop drawings for approval, contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.
- 1.16.5. Submittals and shop drawings for interdependent items, containing applicable descriptive information, shall be furnished together and complete in a group. Coordinate and properly integrate materials and equipment in each group to provide a completely compatible and efficient.
- 1.16.6. Manufacturer's Literature and Data:
 - 1.16.6.1. Submit all information pertaining to the performance and capacity of the equipment.
 - 1.16.6.2. Submit all information pertaining to methods of connection to piping and ductwork, electrical wiring, controls and noise generated by the equipment (as applicable to the project).
 - 1.16.6.3. Submit belt drive with the driven equipment. Submit selection data for specific drives when requested by the Consultant.
 - 1.16.6.4. Submit electric motor data and variable speed drive data with the driven equipment.
 - 1.16.6.5. Equipment and materials identification.
 - 1.16.6.6. Fire-stopping materials.
 - 1.16.6.7. Hangers, inserts, supports and bracing, for both indoor and outdoor installations. Where applicable, provide load ratings and deflection for spring supports and hangers.
 - 1.16.6.8. Wall, floor, and ceiling plates.
- 1.16.7. HVAC Maintenance Data and Operating Instructions:

- 1.16.7.1. Provide a listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment. Include in the listing belts for equipment: Belt manufacturer, model number, size and style, and distinguished whether of multiple belt sets.
- 1.16.7.2. Provide copies of approved HVAC equipment submittals to the Testing, Adjusting and Balancing Subcontractor.

1.17. MATERIALS AND STANDARDS OF ACCEPTANCE

- 1.17.1. Where materials, equipment, apparatus, or other products are specified by the manufacturer, brand name, type or catalogue number, such designation is to establish standards of desired quality style or dimensions and shall be the basis of the Bid. Materials so specified shall be furnished under this Contract.
- 1.17.2. Where two or more designations are listed, the contractor shall choose one of those listed and state the choice made on the Bid Form (where applicable). *Note that the basis of design equipment has specific physical characteristics in terms of footprint and clearances requirements. Inclusion of a manufacturer other than the one for the Basis of Design in the Standard of Acceptance is not an automatic approval for submission of equipment which cannot be installed due to specific site conditions.*
- 1.17.3. *Should the contractor select a approved alternate manufacturer, the contractor remains responsible for all structural, electrical, and mechanical adjustments necessary to install the new equipment.*

1.18. MATERIAL SUBSTITUTIONS

- 1.18.1. After execution of the Contract, requests for substitution of materials or makes other than those specifically named in the Contract Documents may be reviewed and approved by the Consultant, subject to Board's review and acceptance of the financial credits involved.
- 1.18.2. In the absence of such express approval by the Consultant, the Mechanical Contractor will be held to furnish specified items under the base bid as the standard of acceptance.
- 1.18.3. If equipment is submitted which differs in arrangement from that specified/shown on the documents, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.

1.19. CODES, PERMITS, FEES AND CONNECTIONS

- 1.19.1. Conform to Federal, Provincial and Municipal regulations and perform work in accordance with requirements of By Laws and Regulations in force in area where the building is to be erected.
- 1.19.2. Apply for, obtain, and pay for all permits, fees and service connections for the work and the inspections required by Authorities Having Jurisdiction in the area where the work will take place
- 1.19.3. Where applicable, apply for, obtain, and pay for all permits, fees and service connections for the work and the inspections required by Authorities Having Jurisdiction in the area where the work will take place, including TSSA and ESA. Where applicable, have the work inspected and certified by PV [Boilers and Pressure Vessels Reg], OE [Operating Engineers Reg.] and FS [Fuel Safety Reg.] branches of TSSA. At the end of the work, the new plant shall be fully TSSA certified.
- 1.19.4. For information, a specific code or standard might be mentioned. This information must not be taken as the only code or standard applicable.
- 1.19.5. When part of equipment does not bear the required CSA label, the contractor shall obtain from CSA or Hydro Electric Power Commission, when that part of the equipment is an electric component, a special approval and pay the applicable fees.
- 1.19.6. Furnish necessary certificates as evidence that the work installed conforms with laws and regulations of Authorities having jurisdiction. Changes in work requested by an Authority having jurisdiction shall be carried out without charge.

1.20. CONSULTANT'S INSTRUCTIONS

- 1.20.1. During construction the Consultant will issue such instructions as may be necessary for verification and correction of the work. These instructions shall be binding as part of the specification.

1.21. ADDITIONAL WORK AND CHANGES

- 1.21.1. Unless a written order, reviewed by the Consultant and countersigned or otherwise approved by the Board Representative, no additional work shall be undertaken by the Contractor.

1.22. DELIVERY, STORAGE AND HANDLING

- 1.22.1. Protection of Equipment:

- 1.22.1.1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Board has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
 - 1.22.1.2. Place damaged equipment in first class, new operating condition; or, replace same as determined and directed by the Consultant. Such repair or replacement shall be at no additional cost to the Board.
 - 1.22.1.3. Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
 - 1.22.1.4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.
- 1.22.2. Cleanliness of Piping and Equipment Systems:
- 1.22.2.1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
 - 1.22.2.2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
 - 1.22.2.3. Clean interior of all tanks prior to delivery for beneficial use by the Board.
 - 1.22.2.4. Boilers shall be left clean following final internal inspection by Board insurance representative or inspector.
 - 1.22.2.5. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.23. HAULING OPERATIONS

- 1.23.1. Maintain roadways and paving in the hauling areas clean on a daily basis and as required by Municipal Authorities.
- 1.23.2. Parking is not ample or readily available in the area where the building is located. Coordinate delivery of equipment with the Board representatives.
- 1.23.3. Contractor is responsible for all craning & lifting operations. It is the Contractor's responsibility to coordinate with the respective Municipality & pay/obtain all required permits.
- 1.23.4. Contractor is responsible for providing a craning plan for review & approval by the Client.

1.24. JOB CONDITIONS – WORK IN EXISTING BUILDING

- 1.24.1. Building Operation: Board employees will be continuously operating and managing all facilities, including temporary facilities, that serve the building.
- 1.24.2. Maintenance of Service: Schedule all work to permit continuous service as required by the Board.
- 1.24.3. Services Interruptions: Limited service interruptions, as required for interconnections of new and existing systems, will be coordinated with the Board and permitted by the Board during the agreed-upon schedule of interruption. Provide at least one week advance notice to the Board representatives.
- 1.24.4. Phasing of Work: Comply with all requirements shown on drawings or specified.
- 1.24.5. Building Working Environment: Maintain the architectural and structural integrity of the building and the working environment at all times. Maintain the interior of building at 18 degrees C (65 degrees F) minimum. Limit the opening of doors, windows or other access openings to brief periods as necessary for rigging purposes. No storm water or ground water leakage permitted. Provide daily clean up of construction and demolition debris on all floor surfaces and on all equipment being operated by the Board.
- 1.24.6. Acceptance of Work for Board Operation: As new facilities are made available for operation and these facilities are of beneficial use to the Board, inspections will be made and tests will be performed. Based on the inspections, a list of contract deficiencies will be issued to the Contractor. After correction of deficiencies as necessary for beneficial use, the Consultant will process necessary acceptance and the equipment will then be under the control and operation of Board personnel.

PART 2 - PRODUCTS

2.1. FACTORY-ASSEMBLED PRODUCTS

- 2.1.1. Provide maximum standardization of components to reduce spare part requirements.
- 2.1.2. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
- 2.1.3. All components of an assembled unit need not be products of same manufacturer.
- 2.1.4. Constituent parts that are alike shall be products of a single manufacturer.
- 2.1.5. Components shall be compatible with each other and with the total assembly for intended service.

- 2.1.6. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.
- 2.1.7. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.
- 2.1.8. Major items of equipment, which serve the same function, must be the same make and model. Exceptions will be permitted if performance requirements cannot be met.

2.2. COMPATIBILITY OF RELATED EQUIPMENT

- 2.2.1. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational plant that conforms to contract requirements.

2.3. LIFTING ATTACHMENTS

- 2.3.1. Provide equipment with suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered, without bending or distortion of shape, such as rapid lowering and braking of load.

2.4. EQUIPMENT REQUIREMENTS AND INSTALLATION

- 2.4.1. Permit equipment maintenance and disassembly by use of unions or flanges to minimize disturbance to connecting piping and duct systems and without interference from building structure or other equipment.
- 2.4.2. Provide accessible means for lubricating equipment including permanent lubricated bearings.
- 2.4.3. For all base mounted boilers, pumps, compressors, air handling units, fans and other rotating equipment, provide chamfered edge housekeeping pads a minimum of 4" high and 4" larger than equipment dimensions all around. Work shall be performed by the trades specializing in this work.
- 2.4.4. Pipe drain lines, overflows and safety relief vents to drains. If the horizontal drains present a tripping hazard, use aluminum checkered plate covers.

- 2.4.5. Line up equipment, rectangular cleanouts and similar items with building walls wherever possible.

2.5. EQUIPMENT AND MATERIALS IDENTIFICATION

- 2.5.1. Refer to Section: 23 05 53 Identification for HVAC Piping and Equipment.

2.6. FIRESTOPPING

- 2.6.1. Provide either factory built (Firestop Devices) or field installed (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke. Firestop systems to accommodate building movements without impairing their integrity.
- 2.6.2. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 101 mm (4 inches) nominal pipe or 0.01 square meter (16 square inches) in overall cross sectional area.
- 2.6.3. Firestop sealants used for firestopping or smoke sealing to have the following properties:
 - 2.6.3.1. Contain no flammable or toxic solvents.
 - 2.6.3.2. Release no dangerous or flammable out gassing during the drying or curing of products.
 - 2.6.3.3. Water-resistant after drying or curing and unaffected by high humidity, condensation or transient water exposure.
 - 2.6.3.4. When installed in exposed areas, capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.
- 2.6.4. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials to have following properties:
 - 2.6.4.1. Classified for use with the particular type of penetrating material used.
 - 2.6.4.2. Penetrations containing loose electrical cables, computer data cables, and communications cables protected using firestopping systems that allow unrestricted cable changes without damage to the seal.
- 2.6.5. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84 or UL 723. Material to be an approved firestopping material as listed in UL Fire Resistance Directory or by a nationally recognized testing laboratory.
- 2.6.6. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.

- 2.6.7. Materials to be nontoxic and noncarcinogen at all stages of application or during fire conditions and to not contain hazardous chemicals. Provide firestop material that is free from Ethylene Glycol, PCB, MEK, and asbestos.
- 2.6.8. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
- 2.6.8.1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
- 2.6.8.2. For floor penetrations with annular spaces exceeding 101 mm (4 inches) or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means acceptable to the firestop manufacturer.
- 2.6.8.3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

2.7. GALVANIZED REPAIR COMPOUND

- 2.7.1. Mil. Spec. DOD P 21035B, paint form.

2.8. HVAC PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS

- 2.8.1. Vibration Isolators: Refer to Section: 23 05 48 Vibration and Seismic Controls for HVAC.

- 2.8.2. Supports for Roof Mounted Items:

- 2.8.2.1. Equipment: Refer to details on mechanical and structural drawings.
- 2.8.2.2. Pipe Supports: Refer to details on the drawings.
- 2.8.2.3. Supports for Indoor Mounted Items

- 2.8.2.3.1. Attachment to Concrete Building Construction:

- Concrete insert: MSS SP-58, Type 18.
- Self drilling expansion shields and machine bolt expansion anchors: Permitted in concrete not less than 102 mm (four inches) thick when approved by the Consultant for each job condition.
- Power driven fasteners: Permitted in existing concrete or masonry not less than 102 mm (four inches) thick when approved by the Consultant for each job condition.

- 2.8.2.3.2. Attachment to Steel Building Construction:

- Welded attachment: MSS SP 58, Type 22.

- Beam clamps: MSS SP-58, Types 20, 21, 28 or 29. Type 23 C clamp may be used for individual copper tubing up to 23mm (7/8 inch) outside diameter.

2.8.2.3.3. Attachment to existing structure: Support from existing floor/roof frame

- Attachment to Wood Construction: Wood screws or lag bolts.
- Hanger Rods: Hot rolled steel, ASTM A36 or A575 for allowable load listed in MSS SP 58. For piping, provide adjustment means for controlling level or slope. Types 13 or 15 turn buckles shall provide 38 mm (1 1/2 inches) minimum of adjustment and incorporate locknuts. All thread rods are acceptable.

2.8.2.3.4. Hangers Supporting Multiple Pipes (Trapeze Hangers): Galvanized, cold formed, lipped steel channel horizontal member, not less than 41 mm by 41 mm (1 5/8 inches by 1 5/8 inches), 2.7 mm (No. 12 gage), designed to accept special spring held, hardened steel nuts. Not permitted for steam supply and condensate piping.

2.8.2.3.5. Allowable hanger load: Manufacturers rating less 91kg (200 pounds).

2.8.2.3.6. Guide individual pipes on the horizontal member of every other trapeze hanger with 6 mm (1/4 inch) U bolt fabricated from steel rod. Provide Type 40 insulation shield, secured by two 13mm (1/2 inch) galvanized steel bands, or preinsulated calcium silicate shield for insulated piping at each hanger.

2.8.3. Supports for Piping Systems:

- 2.8.3.1. Select hangers sized to encircle insulation on insulated piping. Refer to Section 23 07 11 for insulation thickness. To protect insulation, provide Type 39 saddles for roller type supports or pre-insulated calcium silicate shields. Provide Type 40 insulation shield or pre-insulated calcium silicate shield at all other types of supports and hangers including those for pre-insulated piping.**

2.8.4. Piping Systems (MSS SP 58):

- 2.8.4.1. Standard clevis hanger: Type 1; provide locknut.**
- 2.8.4.2. Riser clamps: Type 8.**
- 2.8.4.3. Wall brackets: Types 31, 32 or 33.**
- 2.8.4.4. Roller supports: Type 41, 43, 44 and 46.**
- 2.8.4.5. Saddle support: Type 36, 37 or 38.**
- 2.8.4.6. Turnbuckle: Types 13 or 15. Preinsulate.**
- 2.8.4.7. U bolt clamp: Type 24.**

2.8.5. Copper Tube:

- 2.8.5.1. Hangers, clamps and other support material in contact with tubing shall be painted with copper colored epoxy paint, plastic coated or taped with non-adhesive isolation tape to prevent electrolysis.
- 2.8.5.2. For vertical runs use epoxy painted or plastic coated riser clamps.
- 2.8.5.3. For supporting tube to strut: Provide epoxy painted pipe straps for copper tube or plastic inserted vibration isolation clamps.
- 2.8.6. Insulated Lines: Provide pre-insulated calcium silicate shields sized for copper tube.
- 2.8.7. Supports for plastic or glass piping: As recommended by the pipe manufacturer with black rubber tape extending one inch beyond steel support or clamp.
- 2.8.8. Piping with Vertical Expansion and Contraction:
 - 2.8.8.1. Movement up to 20 mm (3/4 inch): Type 51 or 52 variable spring unit with integral turn buckle and load indicator.
 - 2.8.8.2. Movement more than 20 mm (3/4 inch): Type 54 or 55 constant support unit with integral adjusting nut, turn buckle and travel position indicator.
 - 2.8.8.3. Convertor and Expansion Tank Hangers: May be Type 1 sized for the shell diameter. Insulation where required will cover the hangers.
- 2.8.9. For pipe sizes larger than (50 mm) 2-inches:
 - 2.8.9.1. Pre-insulated Calcium Silicate Shields:
 - 2.8.9.1.1. Provide 360 degree water resistant high density 965 kPa (140 psi) compressive strength calcium silicate shields encased in galvanized metal.
 - 2.8.9.1.2. Pre-insulated calcium silicate shields to be installed at the point of support during erection.
 - 2.8.9.1.3. Shield thickness shall match the pipe insulation.
 - 2.8.9.1.4. The type of shield is selected by the temperature of the pipe, the load it must carry, and the type of support it will be used with.
 - 2.8.9.1.5. Shields for supporting chilled or cold water shall have insulation that extends a minimum of 1 inch past the sheet metal. Provide for an adequate vapor barrier in chilled lines.
 - 2.8.9.1.6. The pre-insulated calcium silicate shield shall support the maximum allowable water filled span as indicated in MSS-SP 69. To support the load, the shields may have one or more of the following features: structural inserts 4138 kPa (600 psi) compressive strength, an extra bottom metal shield, or formed structural steel (ASTM A36) wear plates welded to the bottom sheet metal jacket.

- 2.8.9.1.7. Shields may be used on steel clevis hanger type supports, roller supports or flat surfaces

2.9. PIPE PENETRATIONS THROUGH INTERIOR BUILDING ELEMENTS

- 2.9.1. Install sleeves during construction for other than blocked out floor openings for risers in mechanical bays.
- 2.9.2. To prevent accidental liquid spills from passing to a lower level, provide the following:
 - 2.9.2.1. For sleeves: Extend sleeve 25 mm (one inch) above finished floor and provide sealant for watertight joint.
 - 2.9.2.2. For blocked out floor openings: Provide 40 mm (1½ inch) angle set in silicone adhesive around opening.
 - 2.9.2.3. For drilled penetrations: Provide 40 mm (1½ inch) angle ring or square set in silicone adhesive around penetration.
- 2.9.3. Penetrations are not allowed through beams or ribs, but may be installed in concrete beam flanges. Any deviation from these requirements must receive prior approval of Consultant.
- 2.9.4. Sheet Metal, Plastic, or Moisture resistant Fiber Sleeves: Provide for pipe passing through floors, interior walls, and partitions, unless brass or steel pipe sleeves are specifically called for below.
- 2.9.5. Cast Iron or Zinc Coated Pipe Sleeves: Provide for pipe passing through exterior walls below grade. Make space between sleeve and pipe watertight with a modular or link rubber seal. Seal shall be applied at both ends of sleeve.
- 2.9.6. Galvanized Steel or an alternate Black Iron Pipe with asphalt coating Sleeves: Provide for pipe passing through concrete beam flanges, except where brass pipe sleeves are called for. Provide sleeve for pipe passing through floor of mechanical rooms, laundry work rooms, and animal rooms above basement. Except in mechanical rooms, connect sleeve with floor plate.
- 2.9.7. Brass Pipe Sleeves: Provide for pipe passing through quarry tile, terrazzo or ceramic tile floors. Connect sleeve with floor plate.
- 2.9.8. Sleeves are not required for wall hydrants for fire department connections or in drywall construction.
- 2.9.9. Sleeve Clearance: Sleeve through floors, walls, partitions, and beam flanges shall be one inch greater in diameter than external diameter of pipe. Sleeve for pipe with insulation

shall be large enough to accommodate the insulation. Interior openings shall be caulked tight with fire stopping material and sealant to prevent the spread of fire, smoke, and gases.

2.10. SPECIAL TOOLS AND LUBRICANTS

- 2.10.1. Furnish, and turn over to the Board, tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- 2.10.2. Grease Guns with Attachments for Applicable Fittings: One for each type of grease required for each motor or other equipment.
- 2.10.3. Refrigerant Tools: Provide system charging/Evacuation equipment, gauges, fittings, and tools required for maintenance of furnished equipment.
- 2.10.4. Tool Containers: Hardwood or metal, permanently identified for intended service and mounted, or located, where directed by the Consultant.
- 2.10.5. Lubricants: A minimum of 0.95 L (one quart) of oil, and 0.45 kg (one pound) of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application.

2.11. WALL, FLOOR AND CEILING PLATES

- 2.11.1. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes and cover the entire pipe sleeve projection.
- 2.11.2. Thickness: Not less than 2.4 mm (3/32 inch) for floor plates. For wall and ceiling plates, not less than 0.64 mm (0.025-inch) for up to 80 mm (3 inch pipe), 0.89 mm (0.035-inch) for larger pipe.
- 2.11.3. Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, in finished areas only. Provide a watertight joint in spaces where brass or steel pipe sleeves are specified.

PART 3 - EXECUTION

3.1. ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- 3.1.1. Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers, ductwork and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Prepare equipment layout

drawings to coordinate proper location and personnel access of all facilities. Submit the interference drawings for review as required by Part 1. Follow manufacturer's published recommendations for installation methods not otherwise specified.

- 3.1.2. Operating Personnel Access and Observation Provisions: Select and arrange all equipment and systems to provide clear view and easy access, without use of portable ladders, for maintenance and operation of all devices including, temperature but not limited to: all equipment items, valves, filters, strainers, transmitters, sensors, control devices. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Do not reduce or change maintenance and operating space and access provisions that are shown on the drawings.

3.2. THERMOMETERS AND PRESSURE GAUGES

3.2.1. General:

- 3.2.1.1. Locate direct reading thermometers and gauges for reading from floor or platform.
- 3.2.1.2. Provide remote reading thermometers and gauges where direct reading instruments cannot be satisfactorily located.
- 3.2.1.3. Locate engraved lamacoid nameplate as specified in Section Identification, identifying medium adjacent to thermometers and gauges.

3.2.2. Thermometers:

- 3.2.2.1. Industrial, 9" adjustable angle cast aluminum case, CGSB standard CAN/CGSB-14.4-M88 red reading mercury, lens front tube, white scale black embossed figures, clear glass or acrylic window, tapered aluminum stem.
- 3.2.2.2. Scale shall be suitable for 2 times the temperature range of service. Scale shall be combined Celsius and Fahrenheit.
- 3.2.2.3. Standard of Acceptance: Weiss, Ashcroft, Terice.

3.2.3. Pressure Gauges:

- 3.2.3.1. 5" dial, solid front blow out back, fibreglass reinforced polypropylene case, phosphor bronze bourdon tube and brass 1/4" N.P.T. socket, bottom connection, stainless steel rotary type movement, gauge to be registered with the Provincial Boiler and Pressure Vessel Safety Branch with a registration number and conform to ANSI B40.1. Accuracy to be grade "A".
- 3.2.3.2. On pumps liquid filled gauges shall be utilized.
- 3.2.3.3. Standard of Acceptance: Weiss, Ashcroft, Terice.

- 3.2.3.4. Provide bronze stop cock, bronze bar stock ¼" N.P.T. bronze porous core pressure snubber for pulsating operation and diaphragm for corrosive service.
- 3.2.3.5. Use materials compatible with system requirements.
- 3.2.4. Gauges shall have combined kilopascal and psi scales.

3.3. EQUIPMENT AND PIPING SUPPORT

- 3.3.1. Coordinate structural systems necessary for pipe and equipment support with pipe and equipment locations to permit proper installation.
- 3.3.2. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.
- 3.3.3. Cutting Holes:
 - 3.3.3.1. Cut holes through concrete and masonry by rotary core drill. Pneumatic hammer, impact electric, and hand or manual hammer type drill will not be allowed, except as permitted by Consultant where working area space is limited.
 - 3.3.3.2. Locate holes to avoid interference with structural members such as beams or grade beams. Holes shall be laid out in advance and drilling done only after approval by Consultant. If the Contractor considers it necessary to drill through structural members, this matter shall be referred to Consultant for approval.
 - 3.3.3.3. Do not penetrate membrane waterproofing.

3.4. ITEMS NOT SHOWN BUT REQUIRED

- 3.4.1. Interconnection of Instrumentation or Control Devices: Generally, electrical and pneumatic interconnections are not shown but must be provided.
- 3.4.2. Minor Piping: Generally, small diameter pipe runs from drips and drains, water cooling, and other service are not shown but must be provided.
- 3.4.3. Electrical and Pneumatic Interconnection of Controls and Instruments: This generally not shown but must be provided. This includes interconnections of sensors, transmitters, transducers, control devices, control and instrumentation panels, instruments and computer workstations. Comply with NFPA-70.

3.5. PROTECTION AND CLEANING

- 3.5.1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the

manufacturer's recommendations and as approved by the Consultant. Damaged or defective items in the opinion of the Consultant, shall be replaced.

- 3.5.2. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water chemical, or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.

3.6. WORK IN EXISTING BUILDING

- 3.6.1. Make alterations to existing service piping at times that will least interfere with normal operation of the facility.
- 3.6.2. Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric drills, and hand or manual hammer type drills, will be permitted only with approval of the Board. Locate openings that will least effect structural slabs, columns, ribs or beams. Refer to the Consultant for determination of proper design for openings through structural sections and opening layouts approval, prior to cutting or drilling into structure. After Consultant's approval, carefully cut opening through construction no larger than absolutely necessary for the required installation.
- 3.6.3. Switchgear/Electrical Equipment Drip Protection: Every effort shall be made to eliminate the installation of pipe above electrical and telephone switchgear. If this is not possible, encase pipe in a second pipe with a minimum of joints. Installation of piping, ductwork, leak protection apparatus or other installations foreign to the electrical installation shall be located in the space equal to the width and depth of the equipment and extending from to a height of 1.8 m (6 ft.) above the equipment to ceiling structure, whichever is lower (NFPA 70).
- 3.6.4. Inaccessible Equipment:
 - 3.6.4.1. Where the Board determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost to the Board.
 - 3.6.4.2. The term "conveniently accessible" is defined as capable of being reached without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

3.7. TEMPORARY PIPING AND EQUIPMENT

- 3.7.1. Continuity of operation of existing facilities will generally require temporary installation or relocation of equipment and piping.
- 3.7.2. The Contractor shall provide all required facilities in accordance with the requirements of phased construction and maintenance of service. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities.
- 3.7.3. Temporary facilities and piping shall be completely removed and any openings in structures sealed. Provide necessary blind flanges and caps to seal open piping remaining in service.

3.8. RIGGING

- 3.8.1. Design is based on application of available equipment. Openings in building structures are planned to accommodate design scheme.
- 3.8.2. Alternative methods of equipment delivery may be offered by Contractor and will be considered by Board under specified restrictions of phasing and maintenance of service as well as structural integrity of the building.
- 3.8.3. Close all openings in the building when not required for rigging operations to maintain proper environment in the facility for Board operation and maintenance of service.
- 3.8.4. Contractor shall provide all facilities required to deliver specified equipment and place on foundations. Attachments to structures for rigging purposes and support of equipment on structures shall be Contractor's full responsibility. Upon request, the Board will check structure adequacy and advise Contractor of recommended restrictions.
- 3.8.5. Contractor shall check all clearances, weight limitations and shall offer a rigging plan designed by a Registered Professional Engineer. All modifications to structures, including reinforcement thereof, shall be at Contractor's cost, time and responsibility.
- 3.8.6. Rigging plan and methods shall be referred to Consultant for evaluation prior to actual work.
- 3.8.7. Restore building to original condition upon completion of rigging work.

3.9. PIPE AND EQUIPMENT SUPPORTS

- 3.9.1. Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels secured directly to joist and rib structure that will correspond to the required

hanger spacing, and then suspend the equipment and piping from the channels. Drill or burn holes in structural steel only with the prior approval of the Consultant.

- 3.9.2. Use of chain, wire or strap hangers; wood for blocking, stays and bracing; or, hangers suspended from piping above will not be permitted. Replace or thoroughly clean rusty products and paint with zinc primer.
- 3.9.3. Use hanger rods that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. Provide a minimum of 15 mm (1/2 inch) clearance between pipe or piping covering and adjacent work.
- 3.9.4. HVAC Horizontal Pipe Support Spacing: Refer to MSS SP 69. Provide additional supports at valves, strainers, in line pumps and other heavy components. Provide a support within one foot of each elbow.
- 3.9.5. HVAC Vertical Pipe Supports:
 - 3.9.5.1. Up to 150 mm (6 inch pipe), 9 m (30 feet) long, bolt riser clamps to the pipe below couplings, or welded to the pipe and rests supports securely on the building structure.
 - 3.9.5.2. Vertical pipe larger than the foregoing, support on base elbows or tees, or substantial pipe legs extending to the building structure.
- 3.9.6. Overhead Supports:
 - 3.9.6.1. The basic structural system of the building is designed to sustain the loads imposed by equipment and piping to be supported overhead.
 - 3.9.6.2. Provide steel structural members, in addition to those shown, of adequate capability to support the imposed loads, located in accordance with the final approved layout of equipment and piping.
- 3.9.7. Tubing and capillary systems shall be supported in channel troughs.
- 3.9.8. Floor Supports:
 - 3.9.8.1. Provide concrete bases, concrete anchor blocks and pedestals, and structural steel systems for support of equipment and piping. Anchor and dowel concrete bases and structural systems to resist forces under operating and seismic conditions (if applicable) without excessive displacement or structural failure.
 - 3.9.8.2. Do not locate or install bases and supports until equipment mounted thereon has been approved. Size bases to match equipment mounted thereon plus 50 mm (2 inch) excess on all edges. Boiler foundations shall have horizontal dimensions that exceed boiler base frame dimensions by at least 150 mm (6 inches) on all sides.

Refer to structural drawings. Bases shall be neatly finished and smoothed, shall have chamfered edges at the top, and shall be suitable for painting.

- 3.9.9. All equipment shall be shimmed, leveled, firmly anchored, and grouted with epoxy grout. Anchor bolts shall be placed in sleeves, anchored to the bases. Fill the annular space between sleeves and bolts with a granular material to permit alignment and realignment.

3.10. CLEANING AND PAINTING

- 3.10.1. Prior to final inspection and acceptance of the plant and facilities for beneficial use by the Board, the plant facilities, equipment and systems shall be thoroughly cleaned and painted.

- 3.10.2. At the completion of the project, clean and prepare all floors in the fan rooms for painting. Cover the entire floors for the mechanical room (in the area of work) with two coats of urethane-based paint (colour: battleship gray). Refer to Section 09 91 00.

- 3.10.3. In addition, the following special conditions apply:

- 3.10.3.1. Cleaning shall be thorough. Use solvents, cleaning materials and methods recommended by the manufacturers for the specific tasks. Remove all rust prior to painting and from surfaces to remain unpainted. Repair scratches, scuffs, and abrasions prior to applying prime and finish coats.

- 3.10.4. Material And Equipment Not To Be Painted Includes:

- 3.10.4.1. Motors, controllers, control switches, and safety switches.
- 3.10.4.2. Control and interlock devices.
- 3.10.4.3. Regulators.
- 3.10.4.4. Pressure reducing valves.
- 3.10.4.5. Control valves and thermostatic elements.
- 3.10.4.6. Lubrication devices and grease fittings.
- 3.10.4.7. Copper, brass, aluminum, stainless steel and bronze surfaces.
- 3.10.4.8. Valve stems and rotating shafts.
- 3.10.4.9. Pressure gauges and thermometers.
- 3.10.4.10. Glass.
- 3.10.4.11. Name plates.

- 3.10.5. Control and instrument panels shall be cleaned, damaged surfaces repaired, and shall be touched-up with matching paint obtained from panel manufacturer.

- 3.10.6. Pumps, motors, steel and cast iron bases, and coupling guards shall be cleaned, and shall be touched-up with the same color as utilized by the pump manufacturer

3.10.7. Temporary Facilities: Apply paint to surfaces that do not have existing finish coats.

3.10.8. Final result shall be smooth, even-colored, even-textured factory finish on all items. Completely repaint the entire piece of equipment if necessary to achieve this.

3.11. IDENTIFICATION SIGNS

3.11.1. Refer to Section: 23 05 53 Identification for HVAC Piping and Equipment.

3.12. MOTOR AND DRIVE ALIGNMENT

3.12.1. Belt Drive: Set driving and driven shafts parallel and align so that the corresponding grooves are in the same plane.

3.12.2. Direct connect Drive: Securely mount motor in accurate alignment so that shafts are free from both angular and parallel misalignment when both motor and driven machine are operating at normal temperatures.

3.13. LUBRICATION

3.13.1. Lubricate all devices requiring lubrication prior to initial operation. Field-check all devices for proper lubrication.

3.13.2. Equip all devices with required lubrication fittings or devices. Provide a minimum of one liter (one quart) of oil and 0.5 kg (one pound) of grease of manufacturer's recommended grade and type for each different application; also provide 12 grease sticks for lubricated plug valves. Deliver all materials to Consultant in unopened containers that are properly identified as to application.

3.13.3. Provide a separate grease gun with attachments for applicable fittings for each type of grease applied.

3.13.4. All lubrication points shall be accessible without disassembling equipment, except to remove access plates.

3.14. CONCRETE

3.14.1. All concrete work required to complete this project, whether shown on the drawings or not, shall be the Contractor's responsibility.

3.14.2. Refer to this specification section for requirements for housekeeping pad.

3.15. METALS

3.15.1. All steel construction required for the completion of this project, whether shown on the drawings or not, shall be the Contractor's responsibility.

3.16. CUTTING, PATCHING, ROOFING, AND X-RAY

3.16.1. All cutting, patching, roofing and X-Rays required for the completion of this project whether shown on the drawings or not, shall be the Contractor's responsibility. The cutting and patching work shall be performed in accordance with the following:

- 3.16.1.1. All cutting and patching shall be done by the trades specializing in the materials to be cut.
- 3.16.1.2. All flashing and equipment supports on the roof shall be done in strict accordance with the Board standards by Board-approved roofing contractors only.
- 3.16.1.3. Should any cutting, roofing and/or repairing of finished surfaces be required, the Sub-trade contractor for the Contractor shall employ the particular trades engaged on the site for this type of work.
- 3.16.1.4. None of the roofing work shall affect any current roof warranty. Coordinate with the Board representative the status of the roof, and if under warranty, coordinate all the work with the warranty holder.
- 3.16.1.5. Supporting members of any floor, wall or the building structure shall be cut only in such a location and manner as approved by the Consultant.
- 3.16.1.6. Where slabs in the portions of the building which are existing must be saw-cut or core drilled, all locations shall be x-rayed prior to saw-cutting or core-drilling. All x-raying shall be done by personnel qualified in the use of the type of equipment required to x-ray the saw-cuts shall be permitted to perform this work on the site. No allowance will be made later for expenses incurred through the failure of performing these x-rays.

3.17. OPERATING AND MAINTENANCE MANUALS

3.17.1. Refer to Section: 01 33 23 Shop Drawings, Product Data, and Samples.

3.18. CLOSE-OUT DOCUMENTATION

3.18.1. 10 (ten) days prior to substantial performance of work obtain documentation and/or prepare certification of the following items and submit them to the Board representative:

- 3.18.1.1. All inspection certificates.
- 3.18.1.2. Guarantee certificates as called for under "Warranty".
- 3.18.1.3. Record drawings.
- 3.18.1.4. Operating and Maintenance Manuals.
- 3.18.1.5. Test certifications as called for under "Testing".

- 3.18.1.6. Provide a signed statement to the effect that all tests for mechanical systems and equipment have been completely carried out in the Trade Sections of these Specifications and to the manufacturer's recommendations, and in accordance with the requirements of all authorities having jurisdiction.

3.19. COMMISSIONING

- 3.19.1. Where applicable and the commissioning process is part of the project, provide commissioning documentation and all the manpower required for all inspection, start up, and contractor testing required above and required by the Checklists provided by the Commissioning Agent.
- 3.19.2. Coordinate with the Commissioning Agent if the start up and operation of the installed equipment is part of larger systems which require additional testing and verification.

3.20. STARTUP AND TEMPORARY OPERATION

- 3.20.1. Startup equipment as described in equipment specifications. Verify that vibration is within specified tolerance prior to extended operation.

3.21. OPERATING AND PERFORMANCE TESTS

- 3.21.1. Prior to the final inspection, perform required tests as specified and submit the test reports and records to the Consultant. The timing of the tests shall be arranged to suit the convenience of the Consultant, and the manner and duration shall be as the Consultant deems necessary. Record the daily start and stop times, operating hours and functions performed. Ensure that the performance tests are witnessed by the Consultant.
- 3.21.2. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost to the Board.
- 3.21.3. At the successful completion of Performance Tests and all testing and balancing, make the systems ready for final inspection and subsequent acceptance of the Board. Replace and clean filters, flush out lines and equipment, remove and clean strainers, fill liquid systems and purge air. Provide water treatment to pipes and report in accordance to current by-laws. Disinfect all domestic water as required by current by-laws and Authorities Having Jurisdiction.
- 3.21.4. When completion of certain work or system occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then make performance tests for heating systems and for cooling systems respectively during first actual seasonal use of respective systems following completion of work.

TABLE OF CONTENTS

PART 1 - GENERAL..... 2

1.1. RELATED DOCUMENTS 2

1.2. SUMMARY 2

1.3. SUBMITTAL 2

PART 2 - PRODUCTS 2

2.1. STANDARDS OF ACCEPTANCE 2

2.2. EQUIPMENT LABELS 2

2.3. WARNING SIGNS AND LABELS 3

2.4. PIPE LABELS 4

2.5. VALVE TAGS 5

PART 3 - EXECUTION 5

3.1. PREPARATION 5

3.2. EQUIPMENT LABEL INSTALLATION 5

3.3. VALVE TAG INSTALLATION AND DOCUMENTATION 5

3.4. DUCT LABEL INSTALLATION 6

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

1.1.1. Drawings and general provisions of the Contract apply to this Section.

1.1.1.1. Section: 23 21 13 Hydronic Piping.

1.1.1.2. Section: 23 31 13 Metal Ducts.

1.2. SUMMARY

1.2.1. Section Includes:

1.2.1.1. Equipment labels.

1.2.1.2. Warning signs and labels.

1.2.1.3. Pipe labels.

1.2.1.4. Valve tags.

1.2.1.5. Duct labels.

1.2.2. For BAS identification, also refer to requirements of Section: 23 09 00 Instrumentation and Control for HVAC.

1.3. SUBMITTAL

1.3.1. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1. STANDARDS OF ACCEPTANCE

2.1.1.1. Brady, Kolbi, or Panduit.

2.2. EQUIPMENT LABELS

2.2.1.1. Metal Labels for Equipment:

2.2.1.1.1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having pre-drilled or stamped holes for attachment hardware.

2.2.1.1.2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

2.2.1.1.3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

- 2.2.2. Fasteners: Stainless-steel rivets or self-tapping screws.
- 2.2.3. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- 2.2.4. Plastic Labels for Equipment:
 - 2.2.4.1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
 - 2.2.4.2. Letter Color: White.
 - 2.2.4.3. Background Color: Black.
 - 2.2.4.4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 - 2.2.4.5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 2.2.4.6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- 2.2.5. Fasteners: Stainless-steel rivets or self-tapping screws.
- 2.2.6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- 2.2.7. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- 2.2.8. Label is to also indicate area and type of service being provided.
 - 2.2.8.1. For Example AHU - 3 - floors 1-4
 - 2.2.8.2. P3 HW Hot Water Pump - building perimeter
- 2.2.9. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.3. WARNING SIGNS AND LABELS

- 2.3.1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- 2.3.2. Letter Color: White.

- 2.3.3. Background Color: Red.
- 2.3.4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- 2.3.5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- 2.3.6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- 2.3.7. Fasteners: Stainless-steel rivets or self-tapping screws.
- 2.3.8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- 2.3.9. Label Content: Include caution and warning information, plus emergency notification instructions.

2.4. PIPE LABELS

- 2.4.1. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, showing flow direction, and area served (i.e. perimeter heating hot water).
- 2.4.2. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- 2.4.3. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
- 2.4.4. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction, and visible all around pipe.
- 2.4.5. Lettering Size: At least 1-1/2 inches high.
- 2.4.6. All piping, except that piping which is within inaccessible chases, shall be identified.
- 2.4.7. Each marker background shall be appropriately color coded with a clearly printed legend to identify the contents of the pipe in conformance with the "Scheme for the Identification of Piping Systems" (ASME A13.1-1981).

2.4.8. Set mark snap-around markers shall be used for overall diameters up to 6" and strap around markers shall be used above 6" overall diameters.

2.4.9. Markers shall be located:

- 2.4.9.1. Adjacent to each valve
- 2.4.9.2. At each branch
- 2.4.9.3. At each cap for future
- 2.4.9.4. At each riser takeoff,
- 2.4.9.5. At each pipe passage through wall (each side)
- 2.4.9.6. At each pipe passage at 20' – 0" intervals maximum.
- 2.4.9.7. At each piece of equipment.
- 2.4.9.8. At all access doors.
- 2.4.9.9. A minimum of one (1) marker shall be provided at each room.

2.5. VALVE TAGS

2.5.1. Valve tags shall be according to project valve specification section(s). Unless required differently in project valve specification section(s), valve tags to be minimum 1.5" round brass, attached with metallic chains.

PART 3 - EXECUTION

3.1. PREPARATION

3.1.1. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2. EQUIPMENT LABEL INSTALLATION

- 3.2.1. Install or permanently fasten labels on each major item of mechanical equipment.
- 3.2.2. Locate equipment labels where accessible and visible.

3.3. VALVE TAG INSTALLATION AND DOCUMENTATION

- 3.3.1. Tag valves according to project valve specification section(s), and provide typed list (loose and framed under glass) per same specification section(s).
- 3.3.2. A valve tag schedule is to be mounted in each mechanical room and on every floor (for that respective floor) in a location to be determined by the Consultant

- 3.3.3. Each valve tag schedule will have an associated architectural print showing each valve location.
- 3.3.4. At project completion two additional hard copies are to be provided in addition to an electronic copy.
- 3.3.5. Two copies of the mechanical piping flow diagram will be supplied. All prints that are supplied that are located in mechanical rooms are to be laminated.
- 3.3.6. Pipe tags that are the first isolation for a utility in a mechanical room or building need to have indicated where the next upstream valve is located and the associated valve number indicated on the valve tag.
- 3.3.7. This is applicable for all utility isolation valves for each mechanical room space.

3.4. DUCT LABEL INSTALLATION

- 3.4.1. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
 - 3.4.1.1. Blue: For cold-air supply ducts.
 - 3.4.1.2. Yellow: For hot-air supply ducts.
 - 3.4.1.3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
 - 3.4.1.4. ASME A13.1 Colors and Designs: For hazardous material exhaust.
- 3.4.2. Locate labels at maximum intervals of 10 feet, at every change in direction, and within 3' of wall and floor penetrations on both sides of same.
- 3.4.3. Along with all other ducting on the job, label toxic exhaust.

TABLE OF CONTENTS

PART 1 - GENERAL.....	2
1.1. DESCRIPTION	2
1.2. RELATED WORK	2
1.3. QUALITY ASSURANCE	2
1.4. SUBMITTALS	4
1.5. APPLICABLE PUBLICATIONS.....	5
PART 2 - PRODUCTS	6
2.1. PLUGS	6
2.2. INSULATION REPAIR MATERIAL.....	6
PART 3 - EXECUTION	6
3.1. GENERAL.....	6
3.2. DESIGN REVIEW REPORT	6
3.3. SYSTEMS INSPECTION REPORT	6
3.4. SYSTEM READINESS REPORT	7
3.5. TAB REPORTS	7
3.6. TAB PROCEDURES.....	7
3.7. LOCATION OF MEASUREMENTS AND MEASURED PARAMETERS	8
3.8. MARKING OF SETTINGS	9
3.9. IDENTIFICATION OF TEST PORTS	9
3.10. COMMISSIONING	9

PART 1 - GENERAL

1.1. DESCRIPTION

1.1.1. Testing, adjusting, and balancing (TAB) of heating, ventilating and air conditioning (HVAC) systems. TAB includes the following:

- 1.1.1.1. Planning systematic TAB procedures.
- 1.1.1.2. Design Review Report.
- 1.1.1.3. Systems Inspection report.
- 1.1.1.4. Duct Air Leakage test report.
- 1.1.1.5. Systems Readiness Report.
- 1.1.1.6. Balancing air and water distribution systems; adjustment of total system to provide design performance; and testing performance of equipment and automatic controls.
- 1.1.1.7. Recording and reporting results.

1.1.2. Definitions:

- 1.1.2.1. TAB: Testing, Adjusting and Balancing; the process of checking and adjusting HVAC systems to meet design objectives.
- 1.1.2.2. AABC: Associated Air Balance Council.
- 1.1.2.3. NEBB: National Environmental Balancing Bureau.

1.1.3. Hydronic Systems: Includes chilled water, condenser water, heating hot water and glycol water systems as applicable to the project.

1.1.4. Air Systems: Includes all outside air, supply air, return air, exhaust air and relief air systems, as applicable to the project.

1.1.5. Flow rate tolerance: The allowable percentage variation, minus to plus, of actual flow rate from values (design) in the contract documents.

1.2. RELATED WORK

- 1.2.1. Section: 23 05 00 Common Work Results for HVAC.
- 1.2.2. Section: 23 31 13 Metal Ducts.
- 1.2.3. Section: 23 37 00 Air Outlets and Inlets.
- 1.2.4. Section: 23 21 13 Hydronic Piping.

1.3. QUALITY ASSURANCE

1.3.1. Qualifications:

- 1.3.1.1. TAB Agency: The TAB agency shall be a subcontractor of the General Contractor and shall report to and be paid by the General Contractor.
- 1.3.1.2. The TAB agency shall be either a certified member of AABC or certified by the NEBB to perform TAB service for HVAC, water balancing and vibrations and sound testing of equipment. The certification shall be maintained for the entire duration of duties specified herein. If, for any reason, the agency loses subject certification during this period, the General Contractor shall immediately notify the Consultant and submit another TAB firm for approval.
- 1.3.2. TAB Specialist: The TAB specialist shall be either a member of AABC or an experienced technician of the Agency certified by NEBB. The certification shall be maintained for the entire duration of duties specified herein.
- 1.3.3. TAB Specialist shall be identified by the General Contractor within 10 days after the notice to proceed. The TAB specialist will be coordinating, scheduling and reporting all TAB work and related activities and will provide necessary information as required by the Consultant. The responsibilities would specifically include:
 - 1.3.3.1. Shall directly supervise all TAB work.
 - 1.3.3.2. Shall sign the TAB reports that bear the seal of the TAB standard. The reports shall be accompanied by report forms and schematic drawings required by the TAB standard, AABC or NEBB.
 - 1.3.3.3. Would follow all TAB work through its satisfactory completion.
 - 1.3.3.4. Shall provide final markings of settings of all HVAC adjustment devices.
 - 1.3.3.5. Permanently mark location of duct test ports.
- 1.3.4. All TAB technicians performing actual TAB work shall be experienced and must have done satisfactory work on a minimum of 3 projects comparable in size and complexity to this project. Consultant is to ensure that the Tab Technicians are qualified before work is performed. The lead technician shall be certified by AABC or NEBB
- 1.3.5. Test Equipment Criteria: The instrumentation shall meet the accuracy/calibration requirements established by AABC National Standards or by NEBB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems and instrument manufacturer. Provide calibration history of the instruments to be used for test and balance purpose.
- 1.3.6. Tab Criteria:

- 1.3.6.1. Flow rate tolerance: Following tolerances are allowed. For tolerances not mentioned herein follow ASHRAE Handbook "HVAC Applications", Chapter 36, as a guideline. Air Filter resistance during tests, artificially imposed if necessary, shall be at least 100 percent of manufacturer recommended change over pressure drop values for pre-filters and after-filters.
- 1.3.6.2. Tolerances:
 - 1.3.6.2.1. Air handling unit and all other fans, cubic meters/min (cubic feet per minute): +/-5% of design values noted in the equipment schedules.
 - 1.3.6.2.2. Air terminal units (maximum values): +/-5% of the design values noted on the equipment schedules.
 - 1.3.6.2.3. Exhaust hoods/cabinets: 0% to +10% of the design values noted on the equipment schedules
 - 1.3.6.2.4. Minimum outside air: 0% to +10% of the design values noted on the equipment schedules
 - 1.3.6.2.5. Individual room air outlets and inlets, and air flow rates not mentioned above: +/-5% of the design values noted on the equipment schedules.
 - 1.3.6.2.6. Heating hot water pumps and hot water coils: +/-5% of the design values noted on the equipment schedules.
 - 1.3.6.2.7. Chilled water and condenser water pumps: 0% to +5% of the design values noted on the equipment schedules
 - 1.3.6.2.8. Chilled water coils: 0% to +5% of the design values noted on the equipment schedules.
 - 1.3.6.2.9. Heat output capacities: 0% to +10% of the design values noted on the equipment schedules
 - 1.3.6.2.10. Cooling output capacities: +/-5% of the design values noted on the equipment schedules
- 1.3.7. Typical TAB procedures and results shall be demonstrated to the Consultant for one air distribution system (including all fans, three terminal units, three rooms randomly selected by the Consultant) and one hydronic system (pumps and three coils) as follows:
 - 1.3.7.1. When field TAB work begins.
 - 1.3.7.2. During each partial final inspection and the final inspection for the project if requested by the Board

1.4. SUBMITTALS

- 1.4.1. Submit in accordance with Section: 01 33 23 Shop Drawings, Product Data, and Samples.

- 1.4.2. Submit names and qualifications of TAB agency and TAB specialists within 10 days after the notice to proceed. Submit information on three recently completed projects and a list of proposed test equipment.
- 1.4.3. Submit Following for Review and Approval:
 - 1.4.3.1. Design Review Report within 10 days after the award of contract from the General Contractor.
 - 1.4.3.2. Systems inspection report on equipment and installation for conformance with design.
 - 1.4.3.3. Duct Air Leakage Test Report.
 - 1.4.3.4. Systems Readiness Report.
- 1.4.4. Intermediate and Final TAB reports covering flow balance and adjustments, performance tests, vibration tests and sound tests.
- 1.4.5. Include in final reports uncorrected installation deficiencies noted during TAB and applicable explanatory comments on test results that differ from design requirements.
- 1.4.6. Prior to request for Final or Partial Final inspection, submit completed Test and Balance report for the area.

1.5. APPLICABLE PUBLICATIONS

- 1.5.1. The following publications form a part of this specification to the extent indicated by the reference thereto. In text the publications are referenced to by the acronym of the organization.
 - 1.5.1.1. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE):
 - 1.5.1.2. 2007 HVAC Applications ASHRAE Handbook, Chapter 37, Testing, Adjusting, and Balancing and Chapter 47, Sound and Vibration Control
 - 1.5.1.3. Associated Air Balance Council (AABC):
 - 1.5.1.3.1. AABC National Standards for Total System Balance
 - 1.5.1.3.2. National Environmental Balancing Bureau (NEBB):
 - 1.5.1.3.3. 7th Edition 2005 Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems
 - 1.5.1.3.4. 2nd Edition 2006 Procedural Standards for the Measurement of Sound and Vibration
 - 1.5.1.3.5. 3rd Edition 2009 Procedural Standards for Whole Building Systems Commissioning of New Construction
 - 1.5.1.4. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

1.5.1.4.1. 3rd Edition 2002 HVAC SYSTEMS Testing, Adjusting and Balancing

PART 2 - PRODUCTS

2.1. PLUGS

2.1.1. Provide plastic plugs to seal holes drilled in ductwork for test purposes.

2.2. INSULATION REPAIR MATERIAL

2.2.1. See Section: 23 07 00 HVAC Insulation.

2.2.2. Provide for repair of insulation removed or damaged for TAB work.

PART 3 - EXECUTION

3.1. GENERAL

3.1.1. Obtain applicable contract documents and copies of approved submittals for HVAC equipment and automatic control systems.

3.1.2. *Coordinate all balancing work with the BAS vendor. Where balancing variable flow systems, fine tune the pressure differential sensor settings to ensure that all end users receive adequate water and air flows.*

3.2. DESIGN REVIEW REPORT

3.2.1. The TAB Specialist shall review the Contract Plans and specifications and advise the Consultant of any design deficiencies that would prevent the HVAC systems from effectively operating in accordance with the sequence of operation specified or prevent the effective and accurate TAB of the system. The TAB Specialist shall provide a report individually listing each deficiency and the corresponding proposed corrective action necessary for proper system operation.

3.3. SYSTEMS INSPECTION REPORT

3.3.1. Inspect equipment and installation for conformance with design.

3.3.2. The inspection and report are to be done after piping and air distribution equipment is on site and piping/duct installation has begun, but well in advance of performance testing and balancing work. The purpose of the inspection is to identify and report deviations from design and ensure that systems will be ready for TAB at the appropriate time.

3.3.3. Reports: Follow check list format developed by AABC, NEBB or SMACNA, supplemented by narrative comments, with emphasis on air handling units and fans. Check for

conformance with submittals. Verify that diffuser and register sizes are correct. Check air terminal unit installation including their duct sizes and routing.

3.4. SYSTEM READINESS REPORT

- 3.4.1. The TAB Contractor shall measure existing air and water flow rates associated with existing systems utilized to serve renovated areas as indicated on drawings. Submit report of findings to Consultant.
- 3.4.2. Inspect each System to ensure that it is complete including installation and operation of controls. Submit report to Consultant in standard format and forms prepared and or approved by the Commissioning Agent, as applicable to the project.
- 3.4.3. Verify that all items such as ductwork piping, ports, terminals, connectors, etc., that is required for TAB are installed. Provide a report to the Consultant.

3.5. TAB REPORTS

- 3.5.1. The TAB contractor shall provide raw data immediately in writing to the Consultant if there is a problem in achieving intended results before submitting a formal report.
- 3.5.2. If over 20 percent of readings in the intermediate report fall outside the acceptable range, the TAB report shall be considered invalid and all contract TAB work shall be repeated and re-submitted for approval at no additional cost to the Board.
- 3.5.3. Do not proceed with the remaining systems until intermediate reports are reviewed by the Consultant.

3.6. TAB PROCEDURES

- 3.6.1. Tab shall be performed in accordance with the requirement of the Standard under which TAB agency is certified by either AABC or NEBB.
- 3.6.2. General: During TAB all related system components shall be in full operation. Fan and pump rotation, motor loads and equipment vibration shall be checked and corrected as necessary before proceeding with TAB. Set controls and/or block off parts of distribution systems to simulate design operation of variable volume air or water systems for test and balance work.
- 3.6.3. For air handling systems, perform balancing work when the building envelope is substantially completed (windows and doors installed, ceilings completed, transfer grilles installed)

- 3.6.4. For air handling systems equipped with hydronic components, make air and hydronic balancing at the same time.
- 3.6.5. Air Balance and Equipment Test: Include air handling units, fans, terminal units, fan coil units, room diffusers/outlets/inlets, computer room AC units, and laboratory fume hoods and biological safety cabinets.
- 3.6.6. Artificially load air filters by partial blanking to produce air pressure drop of manufacturer's recommended pressure drop.
- 3.6.7. Adjust fan speeds to provide design air flow.
- 3.6.8. Test and balance systems in all specified modes of operation, including variable volume, economizer, and fire emergency modes. Verify that dampers and other controls function properly.
- 3.6.9. Variable air volume (VAV) systems:
 - 3.6.9.1. Not applicable to this project
- 3.6.10. Water Balance and Equipment Test: Include circulating pumps, convertors, heat exchangers, boilers, coils, coolers and condensers
 - 3.6.10.1. Adjust flow rates for equipment.
 - 3.6.10.2. Primary secondary (variable volume) systems: Balance systems at design water flow and then verify that variable flow controls function as designed.
 - 3.6.10.3. Record final measurements for hydronic equipment on performance data sheets. Include entering and leaving water temperatures for heating and cooling coils, and for convertors. Include entering and leaving air temperatures (DB/WB for cooling coils) for air handling units and reheat coils. Make air and water temperature measurements at the same time.

3.7. LOCATION OF MEASUREMENTS AND MEASURED PARAMETERS

- 3.7.1. Perform hydronic measurements at each:
 - 3.7.1.1. Boiler
 - 3.7.1.2. Coil
 - 3.7.1.3. Heat Exchanger
 - 3.7.1.4. Control Valve
 - 3.7.1.5. Balancing Valve

- 3.7.2. Perform air measurements at each:

- 3.7.2.1. Fan/Air Handling System discharge
- 3.7.2.2. Exhaust fan
- 3.7.2.3. Coil
- 3.7.2.4. Fresh air/Exhaust damper
- 3.7.2.5. Terminal unit
- 3.7.2.6. Air distribution equipment

3.7.3. Measured parameters

- 3.7.3.1. Air flows
- 3.7.3.2. Hydronic flows
- 3.7.3.3. Temperatures entering/leaving coils (hydronic and air)
- 3.7.3.4. Pressure drops at each measured equipment/device (hydronic and air)
- 3.7.3.5. Electric Power drawn by electrical equipment

3.8. MARKING OF SETTINGS

- 3.8.1. Following approval of Tab final Report, the setting of all HVAC adjustment devices including valves, splitters and dampers shall be permanently marked by the TAB Specialist so that adjustment can be restored if disturbed at any time. Style and colors used for markings shall be coordinated with the Consultant.

3.9. IDENTIFICATION OF TEST PORTS

- 3.9.1. The TAB Specialist shall permanently and legibly identify the location points of duct test ports. If the ductwork has exterior insulation, the identification shall be made on the exterior side of the insulation. All penetrations through ductwork and ductwork insulation shall be sealed to prevent air leaks and maintain integrity of vapor barrier.

3.10. COMMISSIONING

- 3.10.1. Provide commissioning documentation in accordance with the requirements of Section: 23 08 00 Commissioning of HVAC for all inspection, start up, and contractor testing required above and required by the System Readiness Checklist provided by the Commissioning Agent.
- 3.10.2. Components provided under this section of the specification will be tested as part of a larger system. Refer to Section: 23 08 00 Commissioning of HVAC related sections for contractor responsibilities for system commissioning.

TABLE OF CONTENTS

PART 1 - GENERAL..... 2

1.1. DESCRIPTION 2

1.2. RELATED WORK 2

1.3. QUALITY ASSURANCE 2

1.4. SUBMITTALS 3

1.5. STORAGE AND HANDLING OF MATERIAL..... 3

1.6. APPLICABLE PUBLICATIONS..... 3

1.7. STANDARDS OF ACCEPTANCE 4

PART 2 - PRODUCTS 4

2.1. HVAC PIPING INSULATION..... 4

2.2. FITTINGS, FLANGE AND VALVE INSULATION – HOT AND COLD PIPING 7

2.3. EQUIPMENT INSULATION 7

2.4. DUCTWORK INSULATION..... 7

PART 3 - EXECUTION 8

3.1. GENERAL REQUIREMENTS..... 8

3.2. INSULATION INSTALLATION..... 10

3.3. INSULATION JOINTS..... 12

3.4. INSULATION AT DUCT SUPPORTS..... 12

PART 1 - GENERAL

1.1. DESCRIPTION

- 1.1.1. Field applied insulation for thermal efficiency and condensation control for HVAC piping, ductwork and equipment.
- 1.1.2. Re-insulation of HVAC piping, ductwork and equipment after asbestos abatement.
- 1.1.3. Definitions
 - 1.1.3.1. ASJ: All service jacket, white finish facing or jacket.
 - 1.1.3.2. Air conditioned space: Space having air temperature and/or humidity controlled by mechanical equipment.
 - 1.1.3.3. Cold: Equipment or piping handling media at design temperature of 16 degrees C (60 degrees F) or below.
 - 1.1.3.4. Concealed: Piping above ceilings and in chases, interstitial space, and pipe chases.
 - 1.1.3.5. Exposed: Piping and equipment exposed to view in finished areas including mechanical equipment rooms or exposed to outdoor weather. Shafts, chases, interstitial spaces, unfinished attics, crawl spaces and pipe basements are not considered finished areas.
 - 1.1.3.6. Hot: Hot water equipment or piping handling media above 41 degrees C (105 degrees F).
 - 1.1.3.7. Thermal conductance: Heat flow rate through materials.
 - 1.1.3.8. Thermal Conductivity (k): Watt per meter, per degree C (BTU per inch thickness, per hour, per square foot, per degree F temperature difference).
 - 1.1.3.9. Vapor Retarder (Vapor Barrier): A material which retards the transmission (migration) of water vapor. Performance of the vapor retarder is rated in terms of permeance (perms). or the purpose of this specification, vapor retarders shall have a maximum published permeance of 0.1 perms and vapor barriers shall have a maximum published permeance of 0.001 perms.

1.2. RELATED WORK

- 1.2.1. Section: 23 05 00 Common Work Results for HVAC.
- 1.2.2. Section: 23 31 13 Metal Ducts.
- 1.2.3. Section: 23 21 13 Hydronic Piping.

1.3. QUALITY ASSURANCE

- 1.3.1. Comply with OBC requirements for flame spread and smoke development rates.

- 1.3.2. Specified k factors are at 24 degrees C (75 degrees F) mean temperature unless stated otherwise. For pipe, use insulation manufacturer's published heat flow tables. For domestic hot water supply and return, run out insulation and condensation control insulation, no thickness adjustment need be made.
- 1.3.3. All materials shall be compatible and suitable for service temperature, and shall not contribute to corrosion or otherwise attack surface to which applied in either the wet or dry state.
- 1.3.4. Every package or standard container of insulation or accessories delivered to the job site for use must have a manufacturer's stamp or label giving the name of the manufacturer and description of the material

1.4. SUBMITTALS

- 1.4.1. Submit in accordance with Section: 01 33 23 Shop Drawings, Product Data, and Samples.
- 1.4.2. Shop Drawings:
 - 1.4.2.1. All information, clearly presented, shall be included to determine compliance with drawings and specifications and ASTM, federal and military specifications.
 - 1.4.2.2. Insulation materials: Specify each type used and state surface burning characteristics.
 - 1.4.2.3. Insulation facings and jackets: Each type used.
 - 1.4.2.4. Insulation accessory materials: Each type used.
 - 1.4.2.5. Manufacturer's installation and fitting fabrication instructions for flexible unicellular insulation.
 - 1.4.2.6. Make reference to applicable specification paragraph numbers for coordination.

1.5. STORAGE AND HANDLING OF MATERIAL

- 1.5.1. Store materials in clean and dry environment, pipe covering jackets shall be clean and unmarred. Place adhesives in original containers. Maintain ambient temperatures and conditions as required by printed instructions of manufacturers of adhesives, mastics and finishing cements.

1.6. APPLICABLE PUBLICATIONS

- 1.6.1. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
- 1.6.2. National Fire Protection Association (NFPA):

- 1.6.2.1. 101-09 Life Safety Code
- 1.6.2.2. 251-06 Standard methods of Tests of Fire Endurance of Building Construction Materials
- 1.6.2.3. 255-06 Standard Method of tests of Surface Burning Characteristics of Building Materials
- 1.6.3. Underwriters Laboratories, Inc (UL):
 - 1.6.3.1. 723 UL Standard for Safety Test for Surface Burning Characteristics of Building Materials with Revision of 08/03
- 1.6.4. Manufacturer's Standardization Society of the Valve and Fitting Industry (MSS):
 - 1.6.4.1. SP58-2002 Pipe Hangers and Supports Materials, Design, and Manufacture

1.7. STANDARDS OF ACCEPTANCE

- 1.7.1. Owens/Corning, Knauf, Johns Mansville

PART 2 - PRODUCTS

2.1. HVAC PIPING INSULATION

- 2.1.1. Application (as applicable to the project)
 - 2.1.1.1. All hot water heating/glycol
 - 2.1.1.2. All chilled water/glycol
 - 2.1.1.3. All steam piping
 - 2.1.1.4. All condensate piping
 - 2.1.1.5. All piping conveying water and located in spaces where the temperature can drop below freezing. Also refer to heat tracing specifications
 - 2.1.1.6. All other piping conveying fluids warmer than 30°C or colder than 18°C
- 2.1.2. Mineral Fiber Or Fiber Glass
 - 2.1.2.1. ASTM C547 (Pipe Fitting Insulation and Preformed Pipe Insulation), class 1, k = 0.037 (0.26) at 24 degrees C (75 deg. F), for use at temperatures from -20 deg. C (-4 deg.F) and up to 230 deg.C (450 deg. F)with an all service vapor retarder jacket with polyvinyl chloride premolded fitting covering.
 - 2.1.2.2. Thickness:
 - 2.1.2.2.1. Piping larger than 75mm (3"): 38 mm thickness
 - 2.1.2.2.2. Piping nominal 25mm-75mm (1-3"): 25 mm thickness
 - 2.1.2.2.3. Piping nominal 19mm (3/4") and less: 12 mm thickness

2.1.2.2.4. Outdoor insulation (any size): increase insulation thickness by 12 mm (½")

2.1.2.3. At fittings and flanges (including water meter and body of roof drains), insulate with wrapped fiberglass insulation of same thickness as adjacent pipe, and cover with pre-molded PVC jackets. Seal edge of jacket with self-sealing vapor barrier tape.

2.1.3. Insulation Facings And Jackets

2.1.3.1. Vapor Retarder, higher strength with low water permeance = 0.02 or less perm rating, Beach puncture 50 units for insulation facing on pipe insulation jackets.

2.1.3.2. Facings and jackets

2.1.3.2.1. Concealed indoor areas:

- Shall be all service type (ASJ) in concealed spaces and PVC Vapor Retarder jacketing in all exposed areas, including mechanical rooms and service areas.
- All service Jacket (ASJ) shall be white kraft bonded to 0.025 mm (1 mil) thick aluminum foil, fiberglass reinforced, with pressure sensitive adhesive closure. Comply with ASTM C1136. Beach puncture 50 units, Suitable for painting without sizing. Jackets shall have minimum 40 mm (1-1/2 inch) lap on longitudinal joints and minimum 75mm (3 inch) butt strip on end joints. Butt strip material shall be same as the jacket. Lap and butt strips shall be self-sealing type with factory-applied pressure sensitive adhesive.
- Standard of Acceptance: Zeston, Ceeco, Proto

2.1.3.2.2. Exposed indoor areas:

- Shall be heavy PVC fitting covers (0.75 mm thickness. Overlap PVC covers on pipe insulation jackets as least 1 inch (25 mm) at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

2.1.3.2.3. Indoor Fittings Jackets

- Pipe fitting insulation covering (jackets): Fitting covering shall be premolded to match shape of fitting and shall be polyvinyl chloride (PVC) minimum thickness 0.7 mm (0.03 inches). Provide color matching vapor retarder pressure sensitive tape.
- Adhesive: Compatible with PVC jacket, and recommended by insulation material manufacturer.
- Standard of Acceptance: Zeston, Ceeco, Proto

2.1.3.2.4. Aluminum Jackets – Outdoor Piping and Fittings

- Aluminum Jacket-Piping systems: ASTM B209, 3003 alloy, H-14 temper, 0.6 mm (0.023 inch) minimum thickness with locking longitudinal joints. Jackets for elbows, tees and other fittings shall be factory-fabricated to match shape of fitting and of 0.6 mm (0.024) inch minimum thickness aluminum. Fittings shall be of same construction as straight run jackets but need not be of the same alloy. Factory-fabricated stainless steel bands shall be installed on all circumferential joints. Bands shall be 13 mm (0.5 inch) wide on 450 mm (18 inch) centers. System shall be weatherproof if utilized for outside service.
- Field applied vapor barrier jackets shall be provided, in addition to the specified facings and jackets, on all exterior piping as well as on interior piping exposed to outdoor air (i.e.; in ventilated attics, piping in ventilated (not air conditioned) spaces, etc.) The vapor barrier jacket shall consist of a multi-layer laminated cladding with a maximum water vapor permeance of 0.001 perms. The minimum puncture resistance shall be 35 cm-kg (30 inch-pounds) for interior locations and 92 cm-kg (80 inch-pounds) for exterior or exposed locations or where the insulation is subject to damage.
- Neither rivets, screws, staples nor any other fastener capable of penetrating the underlying vapor retarder shall be used to secure the aluminum jacketing.
- Standards of Acceptance: Childers-Lock-on and Pabco-Surfeit.

2.1.4. Pipe Covering Protection Saddles

- 2.1.4.1. Cold pipe support - indoors: Premolded pipe insulation 180 degrees (half-shells) on bottom half of pipe at supports. Material shall be cellular glass or high density Polyisocyanurate insulation of the same thickness as adjacent insulation. Density of Polyisocyanurate insulation shall be a minimum of 48 kg/m³ (3.0 pcf).
- 2.1.4.2. Warm or hot pipe supports - indoors: Premolded pipe insulation (180 degree half-shells) on bottom half of pipe at supports. Material shall be high density Polyisocyanurate (for temperatures up to 149 degrees C [300 degrees F]), cellular glass or calcium silicate. Insulation at supports shall have same thickness as adjacent insulation. Density of Polyisocyanurate insulation shall be a minimum of 48 kg/m³ (3.0 pcf).
- 2.1.4.3. All piping – outdoors: Metallic shield shall be made of galvanized steel painted on both sides with a minimum two coats of aluminum paint. 180 degree for clevises and roller type hangers and 360 degree for clamp type hangers and supports. Shield and insert length and gauge shall be 400 mm (16") long and min. 2.75 mm (12ga) thickness.

2.1.5. Adhesive, Mastic, Cement

- 2.1.5.1. Insulation manufacturers' published recommendations.

2.1.6. Mechanical Fasteners

- 2.1.6.1. Wire: 1.3 mm thick (18 gage) soft annealed galvanized or 1.9 mm (14 gage) copper clad steel or nickel copper alloy.
- 2.1.6.2. Bands: 13 mm (1/2 inch) nominal width, brass, galvanized steel, aluminum or stainless steel.

2.1.7. Flame And Smoke

- 2.1.7.1. Unless shown otherwise all assembled systems shall meet flame spread 25 and smoke developed 50 rating as developed under ASTM, NFPA and UL standards and specifications. See paragraph 1.3 "Quality Assurance".

2.2. FITTINGS, FLANGE AND VALVE INSULATION – HOT AND COLD PIPING

- 2.2.1. Factory molded, ASTM C547 or field mitered sections, joined with adhesive or wired in place.
- 2.2.2. For hot piping finish with a smoothing coat of finishing cement.
- 2.2.3. For cold fittings, 16 degrees C (60 degrees F) or less, vapor seal with a layer of glass fitting tape imbedded between two 2 mm (1/16 inch) coats of vapor barrier mastic.
- 2.2.4. Fitting tape shall extend over the adjacent pipe insulation and overlap on itself at least 50 mm (2 inches).
- 2.2.5. Nominal thickness: same as piping of same size.

2.3. EQUIPMENT INSULATION

- 2.3.1. Applications: all heat exchangers, chilled water pumps, chilled water expansion tanks, chiller headers or evaporator vessels
- 2.3.2. Flexible Elastomeric Cellular Thermal insulation, ASTM C177, C518, k = 0.039 (0.27) at 24 degrees C (75 degrees F), flame spread not over 25, smoke developed not over 50, for temperatures from minus 4 degrees C (40 degrees F) to 93 degrees C (200 degrees F). No jacket required.

2.4. DUCTWORK INSULATION

- 2.4.1. Application

- 2.4.1.1. All concealed ductwork, or exposed in mechanical rooms conveying air at temperatures above 30°C or below 18°C and running through heated spaces.
 - 2.4.1.2. All ductwork running through unheated spaces (attics)
 - 2.4.1.3. All exhaust air ductwork 3m upstream of the point of discharge to the outdoors
 - 2.4.1.4. All fresh air supply ductwork
 - 2.4.1.5. All ductwork mounted outdoors
 - 2.4.1.6. All combustion air ductwork
- 2.4.2. Round Ductwork or Rectangular Ductwork – any side less than 750 mm (30")
- 2.4.2.1. Insulate ductwork with 40 mm (1½") thick, blanket-type, fiberglass insulation with factory-applied vapor barrier, and 2" stapling and taping flange along one edge. Insulation: ASTM C553, density of 0.75, conductivity of 0.32. Vapor barrier: aluminum foil, permeance of 0.02, and puncture resistance of 50 units. Composite flame spread/ smoke density of 25/50.
 - 2.4.2.2. Apply insulation from outlet of air handling equipment to air distribution equipment
 - 2.4.2.3. Jacket
 - 2.4.2.3.1. Apply for exposed ductwork a zero permeability, all weather, multi-layered laminate coated with a cold weather acrylic adhesive, superior resistance to weathering, mold, UV and extreme environmental conditions. Designed for use as a vapour barrier for insulation cladding and jacketing applications.
 - 2.4.2.3.2. Zero permeability vapour barrier for insulation cladding and jacketing applications
 - 2.4.2.3.3. Cold weather acrylic adhesive applies easily at temperatures as cold as -23°C (-10°F)
 - 2.4.2.3.4. Puncture and Tear resistant
 - 2.4.2.3.5. Self-Adhesive material installs easily with no offsite fabrication required
 - 2.4.2.3.6. Cuts and installs easily on-site, no special tools required
 - 2.4.2.3.7. Flexible, strong, reinforced insulation cladding
 - 2.4.2.3.8. Standard Acceptance: 3M™ VentureClad™ Insulation Jacketing

PART 3 - EXECUTION

3.1. GENERAL REQUIREMENTS

- 3.1.1. Required pressure tests of piping and ductwork joints and connections shall be completed and the work approved by the Consultant for application of insulation. Surface shall be clean and dry with all foreign materials, such as dirt, oil, loose scale and rust removed.

- 3.1.2. Except for specific exceptions, insulate all specified equipment, and piping (pipe, fittings, valves, accessories). Insulate each pipe individually. Do not use scrap pieces of insulation where a full length section will fit.
- 3.1.3. Insulation materials shall be installed in a first class manner with smooth and even surfaces, with jackets and facings drawn tight and smoothly cemented down at all laps. Insulation shall be continuous through all sleeves and openings, except at fire dampers and duct heaters (NFPA 90A). Vapor retarders shall be continuous and uninterrupted throughout systems with operating temperature 16 degrees C (60 degrees F) and below. Lap and seal vapor barrier over ends and exposed edges of insulation. Anchors, supports and other metal projections through insulation on cold surfaces shall be insulated and vapor sealed for a minimum length of 150 mm (6 inches).
- 3.1.4. Install vapor stops at all insulation terminations on either side of valves, pumps and equipment and particularly in straight lengths of pipe insulation.
- 3.1.5. Construct insulation on parts of equipment such as chilled water pumps and heads of chillers, convertors and heat exchangers that must be opened periodically for maintenance or repair, so insulation can be removed and replaced without damage. Install insulation with bolted 1 mm thick (20 gage) galvanized steel or aluminum covers as complete units, or in sections, with all necessary supports, and split to coincide with flange/split of the equipment.
- 3.1.6. Insulation on hot piping and equipment shall be terminated square at items not to be insulated, access openings and nameplates. Cover all exposed raw insulation with white sealer or jacket material.
- 3.1.7. Protect all insulations outside of buildings with aluminum jacket using lock joint or other approved system for a continuous weather tight system. Access doors and other items requiring maintenance or access shall be removable and sealable.
- 3.1.8. Elbows, flanges and other fittings shall be insulated with the same material as is used on the pipe straights.
- 3.1.9. Hot piping work not to be insulated:
 - 3.1.9.1. Factory pre-insulated components.
 - 3.1.9.2. Over equipment nameplates.
 - 3.1.9.3. Vibration control devices
 - 3.1.9.4. Air chambers, unions, strainers, check valves, flow regulators.
 - 3.1.9.5. Pot feeders, filtration cartridges

3.1.10. Ductwork not to be insulated:

- 3.1.10.1. Indoor return ductwork
- 3.1.10.2. Exhaust air ductwork up to 3 m (10 ft) prior to existing the building

3.1.11. Firestop Pipe insulation:

- 3.1.11.1. Provide firestopping insulation at fire and smoke barriers through penetrations. Fire stopping insulation shall be UL listed.
- 3.1.11.2. Pipe penetrations requiring fire stop insulation including, but not limited to the following:
 - 3.1.11.2.1. Pipe risers through floors
 - 3.1.11.2.2. Pipe chase walls and floors
 - 3.1.11.2.3. Smoke partitions
 - 3.1.11.2.4. Fire partitions
 - 3.1.11.2.5. Freeze protection of above grade outdoor piping (over heat tracing tape): 20 mm (0.75) thick insulation, for all pipe sizes 75 mm(3 inches) and smaller and 25 mm(1inch) thick insulation for larger pipes. Provide metal jackets for all pipes. Provide where indicated on the drawings

3.1.12. Provide vapor barrier jackets over insulation as follows:

- 3.1.12.1. All piping and ductwork exposed to outdoor weather.
- 3.1.12.2. All interior piping and ductwork conveying fluids exposed to outdoor air (i.e. in attics, ventilated (not air conditioned) spaces, etc.

3.1.13. Provide metal jackets over insulation as follows:

- 3.1.13.1. All HVAC piping and ductwork exposed to outdoor weather.

3.2. INSULATION INSTALLATION

3.2.1. Molded Mineral Fiber Pipe and Tubing Covering:

- 3.2.1.1. Fit insulation to pipe, aligning longitudinal joints. Seal longitudinal joint laps and circumferential butt strips by rubbing hard with a nylon sealing tool to assure a positive seal. Staples may be used to assist in securing insulation. Seal all vapor retarder penetrations on cold piping with a generous application of vapor barrier mastic. Provide inserts and install with metal insulation shields at outside pipe supports. Install freeze protection insulation over heating cable.

3.2.2. Flexible Mineral Fiber Blanket - Ductwork:

- 3.2.2.1. Adhere insulation to metal with 75 mm (3 inch) wide strips of insulation bonding adhesive at 200 mm (8 inches) on center all around duct. Additionally secure insulation to bottom of ducts exceeding 600 mm (24 inches) in width with pins welded or adhered on 450 mm (18 inch) centers. Secure washers on pins. Butt insulation edges and seal joints with laps and butt strips. Staples may be used to assist in securing insulation. Seal all vapor retarder penetrations with mastic. Sagging duct insulation will not be acceptable. Install firestop duct insulation where required.
 - 3.2.2.2. Blanket insulation shall be tightly sealed at all joints and seams. Insulation shall be cut longer than ductwork perimeter to allow maximum thickness on all areas and avoid excessive compression. All joints shall be over lapped at least 2" and stapled in place. The stapled seams shall be sealed with a minimum 3" wide pressure sensitive tape designed for use with the duct insulation. All breaks in the vapor barrier facing shall also be sealed with the tape. The underside of ductwork 18" or greater in width, and vertical surfaces 48" or greater shall have the insulation additionally secured with mechanical fasteners and speed clips spaced approximately 12" on center. The protruding ends of the fasteners shall be cut off flush after the speed clips are installed, and then sealed with the same tape as specified above.
 - 3.2.2.3. Finished installation shall provide a continuous and effective vapor barrier.
 - 3.2.2.4. Supply air ductwork to be insulated includes main and branch ducts from AHU discharge to room supply outlets, and the bodies of ceiling outlets to prevent condensation. Insulate sound attenuator units, coil casings and damper frames. To prevent condensation, insulate trapeze type supports and angle iron hangers for flat oval ducts that are in direct contact with metal duct.
- 3.2.3. Rigid Board Mineral Fiber Insulation - Ductwork
- 3.2.3.1. Apply board on pins spaced not more than 300 mm (12 inches) on center each way, and not less than 75 mm (3 inches) from each edge of board. In addition to pins, apply insulation bonding adhesive to entire underside of horizontal metal surfaces. Butt insulation edges tightly and seal all joints with laps and butt strips. After applying speed clips cut pins off flush and apply vapor seal patches over clips.
 - 3.2.3.2. Insulation shall be scored, beveled or mitered to provide tight joints and be secured to equipment with bands spaced 225 mm (9 inches) on center for irregular surfaces or with pins and clips on flat surfaces. Use corner beads to protect edges of insulation.

- 3.2.3.3. For hot equipment: Stretch 25 mm (1 inch) mesh wire, with edges wire laced together, over insulation and finish with insulating and finishing cement applied in one coat, 6 mm (1/4 inch) thick, trowel led to a smooth finish.
- 3.2.3.4. For cold equipment: Apply meshed glass fabric in a tack coat 1.5 to 1.7 square meter per liter (60 to 70 square feet per gallon) of vapor mastic and finish with mastic at 0.3 to 0.4 square meter per liter (12 to 15 square feet per gallon) over the entire fabric surface.
- 3.2.4. Duct Wrap for Kitchen Hood Grease Ducts:
 - 3.2.4.1. Not Applicable.
- 3.2.5. Flexible Elastomeric Cellular Thermal Insulation:
 - 3.2.5.1. Not applicable

3.3. INSULATION JOINTS

All insulation joints should be sealed with pressure-sensitive joint sealing tape to match the insulation facing. Rub hard with a plastic sealing tool to affect a tight bond.

- 3.3.2. Recommended practice: 3" (76mm) wide tape on flat surfaces or where edges are ship-lapped and stapled. Use 5" (102mm) wide tape in lieu of ship-lapping.
- 3.3.3. All sheet metal joints must be sealed prior to insulating.

3.4. INSULATION AT DUCT SUPPORTS

- 3.4.1. Refer to and conform strictly to insulation and protection jacket manufacturers' instructions.
- 3.4.2. To properly insulate through a roof top duct support; lift duct off of support, insulate duct through the support, install protection jacket through the support and add an additional layer of protection jacket 6" wide on the bottom and both sides at the point of contact with the support system.
- 3.4.3. When it is not possible to lift a duct off the rooftop supports, it is necessary to incorporate the support system into the insulation system by encapsulating the supports with insulation. This same system must be used if duct supports are screwed onto the ductwork

Table of Contents

PART 1 - GENERAL.....	3
1.1. GENERAL.....	3
1.2. APPROVED CONTROL SYSTEMS.....	4
1.3. SCOPE OF WORK.....	4
1.4. QUALITY ASSURANCE	5
1.5. CODES AND STANDARDS	5
1.6. APPROVED CONTROL SYSTEM MANUFACTURERS	6
1.7. EQUIPMENT INSTALLED BY OTHERS (WHERE APPLICABLE TO PROJECT).....	6
1.8. SUBMITTALS	6
1.9. PROJECT RECORD DOCUMENTS	9
1.10. WARRANTY	10
1.11. BOARD OWNERSHIP OF PROPRIETARY MATERIAL.....	10
1.12. FACILITIES WITH EXISTING BUILDING AUTOMATION SYSTEM.....	10
1.13. CRITICAL ALARM CONTROL SEQUENCES.....	11
PART 2 - PRODUCTS	12
2.1. CONTROLLERS.....	12
2.2. COMMUNICATION.....	13
2.3. CONNECTION TO THE BOARD SERVER	14
2.4. BOARD CENTRAL SERVER	14
2.5. LOCAL SERVICE PORTS.....	14
2.6. COMMUNICATION.....	15
2.7. INPUT AND OUTPUT INTERFACE	16
2.8. POWER SUPPLIES AND LINE FILTERING	17
2.9. AUXILIARY CONTROL DEVICES.....	18
2.10. FAIL STATE POSITION OF OUTPUTS.....	24
2.11. WIRING AND RACEWAYS.....	24
PART 3 - EXECUTION	25
3.1. EXAMINATION	25

3.2.	PROTECTION	25
3.3.	COORDINATION	25
3.4.	GENERAL WORKMANSHIP	26
3.5.	FIELD QUALITY CONTROL	26
3.6.	EXISTING EQUIPMENT	27
3.7.	WIRING	28
3.8.	COMMUNICATION WIRING	29
3.9.	FIBER OPTIC CABLE	30
3.10.	INSTALLATION OF SENSORS	30
3.11.	FLOW SWITCH INSTALLATION	31
3.12.	ACTUATORS	31
3.13.	WARNING LABELS.....	32
3.14.	IDENTIFICATION OF HARDWARE AND WIRING	32
3.15.	PROGRAMMING	33
3.16.	SEQUENCES OF OPERATION	34
3.17.	EQUIPMENT ENCLOSURES AND LOCATIONS.....	34
3.18.	IDENTIFICATION AND LABELING OF CONTROL EQUIPMENT.....	35
3.19.	SYSTEM HARDWARE COMMISSIONING	36
3.20.	SUBSTANTIAL COMPLETION INSPECTION	38
3.21.	CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE.....	39
3.22.	CLEANING	40
3.23.	TRAINING	40

PART 1 - GENERAL

1.1. GENERAL

- 1.1.1. This section of the specification shall be read in conjunction with and shall be governed by the requirements outlined in Section: 23 05 00 Common Work Results for HVAC.
- 1.1.2. The Building Automation System (BAS) shall be capable of integrating multiple building functions, including equipment supervision and control, alarm management, energy management, and trend data collection. The BAS shall be the latest generation system available from the installation contractor that has been previously reviewed and accepted by the Board.
- 1.1.3. Perform an in-depth review of all existing control components associated with the work scope (e.g. controllers, control valves, control dampers, linkages, actuators, pipe and duct sensors, flow switches, etc.).
- 1.1.4. Immediately report any defective or inoperative components to the Consultant.
- 1.1.5. Co-ordinate and supervise the work of all sub-contractors required to complete the scope of work as specified in the contract documents.
- 1.1.6. The Controls Contractor and all sub-contractors shall employ only certified trades persons to carry out all applicable work.
- 1.1.7. Provide all necessary control wiring and hardware to complete the entire project, including but not limited to, wiring, fittings, connectors, conduits, hangers/supports, box covers, and all other accessories required to ensure complete, safe and fully operational systems.
- 1.1.8. The BAS at minimum, shall incorporate the following integrated features, functions, and services:
 - 1.1.8.1. Operator information, alarm management and control function.
 - 1.1.8.2. As-built drawings in a separate PDF file, to be retrievable by the Operator at any given time using the BAS interface.
 - 1.1.8.3. Control access
 - 1.1.8.4. Information management, including monitoring, transmission, archiving, retrieval and reporting functions
 - 1.1.8.5. Diagnostic monitoring and reporting of BAS functions
 - 1.1.8.6. Offsite monitoring and management access
 - 1.1.8.7. Energy Management

1.2. APPROVED CONTROL SYSTEMS

1.2.1. TAC Controls - Energy Controls

1.3. SCOPE OF WORK

1.3.1. The general outline of the scope of work includes but is not limited to the following:

- 1.3.1.1. Supply and install all the new BAS components (sensors, actuators, valves, operators, wiring, relays, controllers, panels, etc) required to make the new perimeter heating systems operate in accordance with the sequences indicated on the drawings.
- 1.3.1.2. Update existing programming and user interface as required to match the sequence of operation indicated on the drawings; c/w graphical displays on the Board main server to match the new equipment layout and configuration.
- 1.3.1.3. Provide all necessary power wiring and hardware to complete the entire project, including but not limited to, wiring, fittings, connectors, conduits, hangers/supports, box covers, BAS control panels, and all other accessories required to ensure complete, safe and fully operational systems. This shall include the power wiring for all the equipment.
- 1.3.1.4. Make good all surfaces affected by the work.
- 1.3.1.5. Arrange for Electrical Authority inspection of all electrical work done by the Control Sub- Contractor. Submit the Certificate of Inspection and Product Approval Certificate with the as built documentation.
- 1.3.1.6. Provide new wiring.
- 1.3.1.7. Update software and graphical interface as required.
- 1.3.1.8. All line and low voltage wiring shall be run in EMT metal conduit.
- 1.3.1.9. Control wiring installed in exposed areas (common areas, mechanical rooms, outdoors) shall be run in IMC rigid metal conduit
- 1.3.1.10. Control wiring installed in the ceiling space shall be plenum rated and does not require rigid conduit. Any controls wiring in ceiling spaces is to be run in a cable management tray, and transitions from the tray shall neatly follow the building structure and any wall penetrations must be sleeved in conduit with nylon bushings.
- 1.3.1.11. Include all wiring, conduit, piping, installation, materials, supervision and labor including calibration, commissioning software programming and data base generation, and additional work necessary to provide a complete and fully operating system to the approval of the Consultant.
- 1.3.1.12. Controls sub-contractor shall coordinate with the electrical sub-contractor for the location of breakers and junction boxes from which power to the control's

equipment will be provided. The over-all responsibility for providing and coordinating power supply to the controls equipment rests with the mechanical contractor in his capacity as general contractor.

- 1.3.1.13. The BAS shall be completed in all details not necessarily defined or shown on the drawings but as may be reasonably inferred as necessary to complete each system and provide operating service in an acceptable manner.
- 1.3.1.14. Upon completion of the installation, all control equipment supplied under this control shall be adjusted to place the system in complete operating condition subject to the Owner's approval. All adjustments shall be made in co-ordination with the TAB sub-contractor responsible for balancing the air and water systems where required.
- 1.3.1.15. When removing existing equipment, it is the responsibility of the contractor to ensure the integrity of the BAS communication line that must remain intact to ensure the proper function of the remainder of the school BAS system.

1.4. QUALITY ASSURANCE

- 1.4.1. Base bid basis of design products referenced under this Section establish the minimum acceptable standards of product quality, features and performance.
- 1.4.2. Work of this Section shall be provided by a recognized contractor regularly employed in the installation and wiring of BAS and temperature control system and equipment. The Board will provide a list of acceptable Contractors to bid the work (see Boards list of Pre-Qualified contractors).

1.5. CODES AND STANDARDS

- 1.5.1. Work, materials, and equipment shall comply with the most restrictive of local, state, and federal authorities' codes and ordinances or these plans and specifications. As a minimum, the installation shall comply with current editions in effect 30 days prior to receipt of bids of the following codes:
 - 1.5.1.1. National Electric Code (NEC)
 - 1.5.1.2. International Building Code (IBC)
 - 1.5.1.2.1. Section 719 Ducts and Air Transfer Openings
 - 1.5.1.2.2. Section 907 Fire Alarm and Detection Systems
 - 1.5.1.2.3. Section 909 Smoke Control Systems
 - 1.5.1.3. Division 23 Mechanical
 - 1.5.1.4. International Mechanical Code (IMC)
 - 1.5.1.5. ANSI/ASHRAE 135-2004: Data Communication Protocol for Building Automation and Control Systems (BACNET)

1.6. APPROVED CONTROL SYSTEM MANUFACTURERS

1.6.1. Only approved building automation systems will be accepted.

1.7. EQUIPMENT INSTALLED BY OTHERS (WHERE APPLICABLE TO PROJECT)

1.7.1. As required, the following equipment shall be supplied as noted and installed by qualified sub trades as part of this contract:

1.7.2. Supply by Mechanical Contractor/Power wiring by Electrical Contractor/Controls wiring by Controls Contractor:

1.7.2.1. Variable Speed Drives, where not integral part of mechanical equipment

1.7.3. Supply Mechanical Contractor / Install – Mechanical Contractor

1.7.3.1. Automatic control dampers (not supplied with packaged equipment)

1.7.4. Supply Mech. Contractor/ install Control Contractor / wired by Control Contractor (not supplied with packaged equipment)

1.7.4.1. Damper Actuators

1.7.5. Supply by Control Contractor / install by Mech. Contractor/ wired by Control Contractor

1.7.5.1. Automatic Controls Valves & Actuators

1.7.5.2. Space temperature sensors

1.7.6. Supply and wired by Control Contractor/ installed by Mechanical Contractor

1.7.6.1. Temperature Sensing Wells

1.7.7. Supply by Mech. Contractor/ installed by Mech. Contractor/ wired by Control, Contractor

1.7.7.1. Air and Hydronic Flow and Pressure sensors

1.7.8. The final completeness of all required components to make equipment operational as indicated on the sequences of operation including wiring, setting and adjustment remains as the final the responsibility of the mechanical contractor acting as the general contractor.

1.8. SUBMITTALS

1.8.1. Provide three copies of shop drawings and other submittals on hardware, software, and equipment to be installed or furnished. Drawings should be 11" x 17" prints.

- 1.8.2. Provide submittals within 6 weeks of contract award.
- 1.8.3. Begin no work until submittals have been approved for conformity with design intent.
- 1.8.4. Provide drawings using AutoCAD 2007 (or newer) in following formats: original, pdf and print.
- 1.8.5. Submittal approval does not relieve Contractor of responsibility to supply sufficient materials to complete work.
- 1.8.6. Provide submittals on the following:
 - 1.8.6.1. Product Submittals. Clearly indicate applicable data on manufacturer's cut sheets by highlighting or by other means. General catalogs shall not be accepted as cut sheets to fulfill submittal requirements. Select and show submittal quantities appropriate to scope of work.
 - 1.8.6.2. Network Architecture. Riser diagrams showing control network layout, connections to all network devices, communication protocols, network speeds and wire types. Include schematic diagrams of control, communication, and power wiring for central system installation. Show interface wiring to control system.
 - 1.8.6.3. Schematics. Schematic diagram of each controlled system. Label all control points with point names.
 - 1.8.6.4. Wiring diagrams including complete power system, interlocks, control and data communications.
 - 1.8.6.5. Programming code listing for all controllers
 - 1.8.6.6. Manufacturers' data/specification sheets and catalogue cuts for all material and equipment supplied.
 - 1.8.6.7. Floor plan schematic diagrams indicating field sensor and controller locations.
 - 1.8.6.8. Valve Schedule. Indicate system and device designation, product name, manufacturer, and model numbers (both valve and actuator), quantities, sizes, Cv (design and actual), pressure drop, close-off pressure, configuration, ports, and line sizes of each supplied valve and existing control valve.
 - 1.8.6.9. Damper Schedule. Indicate system and device designation, product name, manufacturer, size, and model numbers (both damper and actuator) of each supplied damper/actuator and existing control damper/actuator.
 - 1.8.6.10. Room and Equipment Schedules. Indicate controller type, address, model number, object names, setpoints, and room location.
 - 1.8.6.11. Instrumentation list (Bill of Materials) for each controlled system. List each control system element in a table. Show element name, type of device, manufacturer, model number, and product data sheet number.

- 1.8.6.12. Manufacturer's description and technical data such as performance curves, product specifications, and installation and maintenance instructions for items listed below and for relevant items not listed below:
 - 1.8.6.12.1. Direct digital controllers (controller panels)
 - 1.8.6.12.2. Transducers and transmitters
 - 1.8.6.12.3. Sensors (include accuracy data)
 - 1.8.6.12.4. Actuators
 - 1.8.6.12.5. Valves
 - 1.8.6.12.6. Dampers
 - 1.8.6.12.7. Relays and switches
 - 1.8.6.12.8. Control panels
 - 1.8.6.12.9. Power supplies
 - 1.8.6.12.10. Batteries
 - 1.8.6.12.11. Operator interface equipment
 - 1.8.6.12.12. Wiring
 - 1.8.6.13. Complete description of control system operation including sequences of operation and points-lists for each control system. Include and reference schematic diagram of controlled system. List I/O points and software points specified in this section. Indicate alarmed and trended points.
 - 1.8.6.14. Wiring diagrams and layouts for each control panel. Show termination numbers.
 - 1.8.6.15. Schematic wiring diagram of each controlled system. Label control elements and terminals. Where a control element is also shown on control system schematic, use the same name.
 - 1.8.6.16. BACnet Protocol Implementation Conformance Statement (PICS) for each submitted type of controller and operator interface.
- 1.8.7. Schedules
- 1.8.7.1. Construction Schedule of work provided within one month of contract award, indicating:
 - 1.8.7.1.1. Intended sequence of work items
 - 1.8.7.1.2. Start date of each work item
 - 1.8.7.1.3. Duration of each work item
 - 1.8.7.1.4. Planned delivery dates for ordered material and equipment and expected lead times.
 - 1.8.7.1.5. Milestones indicating possible restraints on work by other trades or situations.
- 1.8.8. Monthly written status reports indicating work completed and revisions to expected delivery dates. Include updated schedule of work.

1.9. PROJECT RECORD DOCUMENTS

1.9.1. Submit three copies of record (as-built) documents upon completion of installation for approval prior to final completion. Submittal shall consist of:

- 1.9.1.1. As-built versions of submittal shop drawings should be 11" x 17" prints. Provide drawings using AutoCAD 2007 (or newer) in following formats: original, pdf and print.
- 1.9.1.2. Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements of this section (Control System Demonstration and Acceptance).
- 1.9.1.3. An Information sheet that contains:
 - 1.9.1.3.1. School name and address
 - 1.9.1.3.2. A brief description of the control details. i.e. total # of points, list of equipment controls and which panels they are connected to.
 - 1.9.1.3.3. Panel's information i.e. part numbers for panels used and their serial numbers and revision # (if applicable)
 - 1.9.1.3.4. Software version
 - 1.9.1.3.5. Modem telephone number
 - 1.9.1.3.6. Warranty start date and duration
 - 1.9.1.3.7. BAS contractor Name, address, and Phone number
- 1.9.1.4. Detailed sequence of operation for each controlled system.
- 1.9.1.5. Control schematics for each system. Including a System Architecture indicating the type and model number for all BAS components, the proposed interconnection and location of all panels, network connection and key peripheral devices (workstations, modems, printers, repeaters, etc)
- 1.9.1.6. BAS Points List indicating the panel ID, panel location, hardware address, point acronym, point description, field device type, point type (i.e. AO/DO/AI/DI), end device fail position, end device manufacture and model number and wire tag ID.
- 1.9.1.7. Floor plan with the location of all field mounted control devices.
- 1.9.1.8. Programming code for all DDC controllers.
- 1.9.1.9. Wiring diagrams including complete power system, interlocks, control and data communications.
- 1.9.1.10. Manufacturers' data/specification sheets and catalogue cuts for all material and equipment supplied. This section shall include a summary sheet that indicates all BAS Device, Manufacturers', model number, and quantity of each used on this job.
- 1.9.1.11. Automatic control valves and dampers where required.
- 1.9.1.12. Commissioning list including the name of the commissioning agent of the BAS Contractor, his signature and the date of commissioning.

- 1.9.1.13. Licensed BAS workstation software.
- 1.9.1.14. BAS programming database stored on a USB memory stick.

1.10. WARRANTY

1.10.1. Warrant work as follows:

- 1.10.1.1. All labour and material (hardware and software) supplied under this contract shall be warranted free from defects for a period of two (2) years after final completion and acceptance. Control system failures during the warranty period shall be adjusted, repaired, or replaced at no additional cost to the Board. The Contractor shall respond to Board request for warranty service within one (1) business day.
- 1.10.1.2. The final completion and substantial performance date shall be the date of the project turnover meeting.
- 1.10.1.3. All work shall have a single warranty date, even when the Board has received beneficial use of part of the system in advance of the final completion date.
- 1.10.1.4. The contractor shall be responsible for correcting any deficiencies, errors or omissions in operating strategies, programming code, system functionality or parameters and operator workstation graphics during the warranty period.

1.11. BOARD OWNERSHIP OF PROPRIETARY MATERIAL

1.11.1. Project-specific software and documentation shall become Board's property. This includes, but is not limited to:

- 1.11.1.1. Record drawings / Documentation
- 1.11.1.2. Database
- 1.11.1.3. Application programming code (Two copies and two licenses of Engineering (Program) Tool)
- 1.11.1.4. All documentation.

1.12. FACILITIES WITH EXISTING BUILDING AUTOMATION SYSTEM

- 1.12.1. Where a facility has an existing BAS that is to be replaced, modified or upgraded, the Controls Contractor shall be responsible for ensuring that the entire system (hardware, programming and system graphics) and all integral parts (new and re-used) are in conformance with all requirements of the specifications outlined herein.
- 1.12.2. Ensure complete interoperability and compatibility between new and existing DDC systems and components. Provide system firmware and/or hardware upgrades to existing DDC panels/modules where required to ensure a complete working system to the satisfaction of the Consultant.

- 1.12.3. Where an existing DDC panel is re-used, ensure that sufficient controller memory is present to provide for all specified control functions. Provide memory and/or panel upgrades where required to meet system memory requirements.
- 1.12.4. Provide new network communication wiring for interconnection between all DDC panels and interfaces.
- 1.12.5. Existing control wiring and conduits may be re-used only where they comply with the requirements of these specifications and where approved by the Consultant.
- 1.12.6. Ensure that all re-used DDC panels/modules are upgraded to the latest version of system firmware and system operating software.
- 1.12.7. Provide complete commissioning and verification of all re-used automation input/output points, end devices and components.
- 1.12.8. Provide new labeling for wiring, devices and equipment where existing labelling does not meet the requirements of these specifications.

1.13. CRITICAL ALARM CONTROL SEQUENCES

- 1.13.1. Critical alarms are displayed on the plant operator's PC. Critical alarms warn the building operators about critical control problems that require immediate attention.
- 1.13.2. Critical alarms shall be activated for the following reasons:
 - 1.13.2.1. a boiler or air handler status has not responded to control by the FMS for more than 5 minutes
 - 1.13.2.2. a VFD status has not responded to control by the FMS for more than 5 minutes
 - 1.13.2.3. a heating pump or boiler pump status has not responded to control by the FMS for more than 10 minutes
 - 1.13.2.4. a boiler flame ignition failed
 - 1.13.2.5. a boiler low water cut off has shut the boiler
 - 1.13.2.6. a boiler high limit temperature has shut the boiler
 - 1.13.2.7. FMS low limit temperature controller has tripped
 - 1.13.2.8. FMS supply fan and return fan status has been OFF
 - 1.13.2.9. a space temperature has read below 16OC for more than 10 minutes
 - 1.13.2.10. the radiation supply water temperature is more than 10OC below the supply water low limit for 1 hour during heating season (as determined by OAT)
 - 1.13.2.11. return water temperature in the radiation and glycol loops has dropped 10OC below the low limit.

1.13.3. The remote alarm shall remain in effect until all of the critical alarm conditions are cleared.

1.13.4. The remote alarm shall be disabled when the outside air temperature is above 100C.

PART 2 - PRODUCTS

2.1. CONTROLLERS

2.1.1. General.

- 2.1.1.1. Provide Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified herein.
- 2.1.1.2. Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L. Unless otherwise specified, hardwired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors.

2.1.2. BACNET.

- 2.1.2.1. Building Controllers (BCs): Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.
- 2.1.2.2. Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.
- 2.1.2.3. Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.
- 2.1.2.4. Smart Actuators (SAs). Each SA shall conform to BACnet Smart Actuator (B-SA) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-SA in the BACnet Testing Laboratories (BTL) Product Listing.
- 2.1.2.5. Smart Sensors (SSs). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.

2.1.3. BACNET Communication.

- 2.1.3.1. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
- 2.1.3.2. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
- 2.1.3.3. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
- 2.1.3.4. Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
- 2.1.3.5. Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
- 2.1.3.6. Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using ARCNET or MS/TP Data Link/Physical layer protocol.

2.2. COMMUNICATION

- 2.2.1. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135-2004, BACnet.
- 2.2.2. Install new wiring and network devices as required to provide a complete and workable control network.
- 2.2.3. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.
- 2.2.4. Internetwork operator interface and value passing shall be transparent to internetwork architecture.
- 2.2.5. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.
- 2.2.6. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies specified in this section. An

authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.

- 2.2.7. Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated controller via the internetwork. If applicable, system shall automatically adjust for daylight saving and standard time.
- 2.2.8. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.

2.3. CONNECTION TO THE BOARD SERVER

- 2.3.1. Advise the Board representative of the proposed location of the system router/gateway panel within the facility. The controls vendor shall provide a communication cable (RJ45) between the BAS Controller and the schools HUB under the Board supervision and comply with the Board standard and he shall connect the BAS to the Board server and WAN and confirm that network access to the BAS has been established.

2.4. BOARD CENTRAL SERVER

- 2.4.1. New site databases shall be installed on the designated central Waterloo central server.
- 2.4.2. Provide written notification to the Waterloo representative prior to installing new site databases to the Waterloo server. Do not install software or make any changes to the server without the written consent of the Waterloo representative.
- 2.4.3. Set up and configure the server software and area routers (where required) to allow for seamless access to the site BAS via the Waterloo WAN.
- 2.4.4. Coordinate all activities related to the central server with the Waterloo representatives. Provide the Waterloo with detailed documentation related to any changes made to the server software, settings or protocols.

2.5. LOCAL SERVICE PORTS

- 2.5.1. Every DDC panel shall be provided with a local network access port to connect to laptop computer. A user connected to the local access port shall have the same level of system access and functionality as being connected to the site workstation PC.
- 2.5.2. Where BAS points (4 or more) are located in a mechanical room that does not have a local BAS panel installed, a remote network access port shall be provided. The access port shall be installed in a hinged metal enclosure with key-lock set and lamaroid ID label.

2.6. COMMUNICATION

2.6.1. Service Port

- 2.6.1.1. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.

2.6.2. Signal Management

- 2.6.2.1. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.

2.6.3. Data Sharing

- 2.6.3.1. Each BC and AAC shall share data as required with each networked BC and AAC.

2.6.4. Stand-Alone Operation

- 2.6.4.1. Each piece of equipment specified in this section Appendix A shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.

2.6.5. Environment

- 2.6.5.1. Controller hardware shall be suitable for anticipated ambient conditions.
- 2.6.5.2. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).
- 2.6.5.3. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

2.6.6. Keypad

- 2.6.6.1. Provide a local keypad and display for each BC and AAC. Operator shall be able to use keypad to view and edit data. Keypad and display shall require password to prevent unauthorized use. If the manufacturer does not normally provide a keypad and display for each BC and AAC, provide the software and any interface cabling needed to use a laptop computer as a Portable Operator's Terminal for the system.

2.6.7. Real-Time Clock

- 2.6.7.1. Controllers that perform scheduling shall have a real-time clock

2.6.8. Serviceability

- 2.6.8.1. Controllers shall have diagnostic LEDs for power, communication, and processor.
- 2.6.8.2. Wires shall be connected to a field-removable modular terminal strip or to a termination card connected by a ribbon cable.
- 2.6.8.3. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.

2.6.9. Memory

- 2.6.9.1. Controller memory shall support operating system, database, and programming requirements.
- 2.6.9.2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.
- 2.6.9.3. Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.
- 2.6.9.4. Each controller shall have a min. 25% spare memory to allow for future expansion.
- 2.6.9.5. Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

- 2.6.10. Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

2.7. INPUT AND OUTPUT INTERFACE

- 2.7.1. General. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.
- 2.7.2. Protection. Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with up to 24 V for any duration shall cause no controller damage.
- 2.7.3. Digital Inputs. Digital inputs shall monitor the on and off signal from a remote device. Digital inputs shall provide a wetting current of at least 12 mA and shall be protected

against contact bounce and noise. Digital inputs shall sense dry contact closure without application of power external to the controller.

- 2.7.4. Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall accumulate up to 10 pulses per second.
- 2.7.5. Analog Inputs. Analog inputs shall monitor low-voltage (0-10 Vdc), current (4-20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.
- 2.7.6. Digital Outputs. Digital outputs shall send an on-or-off signal for on and off control. Building Controller Digital outputs shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.
- 2.7.7. Analog Outputs. Analog outputs shall send a modulating 0-10 Vdc or 4-20 mA signal as required to properly control output devices. Analog outputs shall not drift more than 0.4% of range annually.
- 2.7.8. Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.
- 2.7.9. Universal Inputs and Outputs. Inputs and outputs that can be designated as either binary or analog in software shall conform to the provisions of this section that are appropriate for their designated use.

2.8. POWER SUPPLIES AND LINE FILTERING

- 2.8.1. All electronic equipment shall be complete with all necessary devices to safeguard against voltage spikes, fluctuations, or any other power line anomalies, which might damage the equipment.
- 2.8.2. Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.
- 2.8.3. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection

and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.

2.8.4. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.

2.8.5. Line voltage units shall be UL recognized and CSA listed.

2.8.6. Power Line Filtering.

2.8.6.1. Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:

2.8.6.1.1. Dielectric strength of 1000 V minimum

2.8.6.1.2. Response time of 10 nanoseconds or less

2.8.6.1.3. Transverse mode noise attenuation of 65 dB or greater

2.8.6.1.4. Common mode noise attenuation of 150 dB or greater at 40-100 Hz

2.9. AUXILIARY CONTROL DEVICES

2.9.1. Automatic Control Valves

2.9.1.1. Automatic control valves, shall be globe type valves. Valves and actuators shall be ordered as one factory-assembled and tested unit. Control ball valves will not be accepted.

2.9.1.2. Submit to the Consultant for review the following information for each valve:

2.9.1.2.1. Valve type and size

2.9.1.2.2. Connection type

2.9.1.2.3. Line size

2.9.1.2.4. Valve manufacturer and model number

2.9.1.2.5. Valve flow coefficient

2.9.1.2.6. Design flow

2.9.1.2.7. Pressure drop across valve.

2.9.1.2.8. Maximum close-off pressure

2.9.1.2.9. Actuator manufacturer and model number

2.9.1.2.10. Actuator maximum torque

2.9.1.3. Valves 2" (50mm) and smaller shall be constructed of bronze. Valves 2½" (65mm) and larger shall have iron bodies and bronze mountings.

2.9.1.4. All control valves shall have stainless steel stems. The bronze in bodies and bonnets of all bronze valves shall conform to ASTM B62 for valves rated up to 150psig (1035 Kpa) working pressure and to ASTM B61 for valves rated at 200

psig (1380 Kpa) working pressure. The bodies and bonnets of iron body valves shall conform to ASTM A126, Class B.

- 2.9.1.5. Control valve discs and seats shall be of bronze for 100 °C or less fluid temperature and of stainless steel for fluid temperatures above 100 °C.
 - 2.9.1.6. The control valves shall have tight shut-off. Flat disk valves are not acceptable.
 - 2.9.1.7. Control valves 2" (50mm) and smaller shall be complete with screwed ends type, except for bronze valves installed in soldered copper piping which shall be complete with soldering ends. Control valves larger than 2" (50mm) shall be complete with flanged end type and proper flanged adapters to copper shall be provided where flanged valves are installed in copper piping.
 - 2.9.1.8. The water control valves shall be sized for a pressure drop of 6 ft. water column or as indicated on mechanical drawings.
 - 2.9.1.9. Each automatic control valve must provide the design output and flow rates at pressure drops compatible with equipment selected.
 - 2.9.1.10. Each automatic control valve must be suitable for the particular system working pressure.
 - 2.9.1.11. Each automatic control valve shall be fitted with a position indicator.
 - 2.9.1.12. All the same type control valves shall be the products of a single manufacturer and have the manufacturer's name, pressure rating and size clearly marked on the outside of the body.
 - 2.9.1.13. All heating valves: default position shall be fully open to the coil.
 - 2.9.1.14. Valves providing two-position service shall be quick opening. Two-way valves shall have replaceable disc or ball.
 - 2.9.1.15. Close-off (Differential) Pressure Rating. Valve actuator and trim shall provide the following minimum close-off pressure ratings.
 - 2.9.1.16. Two-way: 150% of total system (pump) head.
 - 2.9.1.17. Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.
 - 2.9.1.18. Ports. Valves providing modulating service shall have equal percentage ports.
 - 2.9.1.19. Sizing.
 - 2.9.1.19.1. Two-position service: line size.
 - 2.9.1.19.2. Two-way modulating service: select pressure drop equal to the greatest of twice the pressure drop through heat exchanger (load), 50% of the pressure difference between supply and return mains, or 35 kPa (5 psi).
 - 2.9.1.19.3. Three-way modulating service: select pressure drop equal to the smaller of twice the pressure drop through the coil exchanger (load) or 35 kPa (5 psi).
 - 2.9.1.20. Standard of Acceptance: Belimo
- 2.9.2. Electric Damper and Valve Actuators.

- 2.9.2.1. Stall Protection. Mechanical or electronic stall protection shall prevent actuator damage throughout the actuator's rotation.
 - 2.9.2.2. Spring-return Mechanism. Actuators used for power-failure, heating and safety applications shall have an internal mechanical spring-return mechanism or an uninterruptible power supply (UPS), unless otherwise specified
 - 2.9.2.3. Signal and Range. Proportional actuators shall accept a 0-10 Vdc or a 0-20 mA control signal and shall have a 2-10 Vdc or 4-20 mA operating range. (Floating motor actuators may be substituted for proportional actuators in terminal unit applications as described in paragraph 2.6H.)
 - 2.9.2.4. Wiring. 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring.
 - 2.9.2.5. Manual Positioning. Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 7 N•m (60 in.-lb) torque capacity shall have a manual crank.
 - 2.9.2.6. Standard of Acceptance: Belimo
- 2.9.3. Electronic Temperature Sensors
- 2.9.3.1. All mixed air sensors are 1000 ohm nickel, resistance temperature detector (RTD) type with a twenty-five foot averaging element. Accuracy of the RTD sensor shall be +/-0.6°C over a range of -7°C to 49°C (19°F to 120°F).
 - 2.9.3.2. All supply and return air sensors are 1000 ohm nickel RTD type temperature detectors. The sensor probe has a minimum length of 450mm (18"). The accuracy of the sensor is +/-0.6°C over a range of 4°C to 66°C (39°F to 151°F).
 - 2.9.3.3. All space sensors (unless noted differently on drawings) are 1000 ohm nickel RTD type temperature detectors. All space sensors are provided with vented protective covers, local temperature adjustment of +/-1°C from setpoint, built in occupancy sensor. There shall be no temperature display.
 - 2.9.3.4. Local temperature adjustment is by two cap touch buttons and LED scale (no actual temperature gradients will be accepted). The accuracy of the sensor is +/- 0.6°C over a range of 4°C to 49°C (39°F to 120°F).
 - 2.9.3.5. All space sensors for vestibules, corridors and other high traffic areas shall be nickel RTD stainless steel plate temperature sensor 100 ohm. Equal to Enercorp.
 - 2.9.3.6. All liquid immersed sensors are 1000 ohm nickel RTD type temperature detectors. Each sensor is provided with a stainless steel well, suitable for the working temperature and pressure of the fluid. The accuracy of the sensor is +/- 0.6°C over a range of -7°C to 49°C (19°F to 120°F).
 - 2.9.3.7. Outdoor air sensor is the 1000 ohm nickel RTD type temperature detector. The RTD sensor is mounted in a weatherproof enclosure. The accuracy of the sensor is +/- 0.6°C over a range of -40°C to 40°C (-40°F to 120°F).

- 2.9.3.8. All sensor elements other than those for space sensors shall be housed in a factory-made stainless-steel sheath.
- 2.9.3.9. All sensors shall be calibrated and linearized. Include a written documentation of individual sensors for records.
- 2.9.4. Control Relays
 - 2.9.4.1. Control relays are DPDT for control of electrical starters and equipment where shown on the Point Schedule.
 - 2.9.4.2. Coil voltage matches the Unit Controller. Contacts are rated at 5A at 120 VAC.
- 2.9.5. Time Delay Relays
 - 2.9.5.1. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable $\pm 100\%$ from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.
 - 2.9.5.2. Standard of Acceptance: Enercorp
- 2.9.6. Current Transmitters
 - 2.9.6.1. AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4-20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be $\pm 1\%$ full-scale at 500 ohm maximum burden.
 - 2.9.6.2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.
 - 2.9.6.3. Unit shall be split-core type for clamp-on installation on existing wiring.
- 2.9.7. Current Transformers
 - 2.9.7.1. AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.
 - 2.9.7.2. Transformers shall be available in various current ratios and shall be selected for $\pm 1\%$ accuracy at 5 A full-scale output.
 - 2.9.7.3. Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.
- 2.9.8. Voltage Transmitters
 - 2.9.8.1. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4-20 mA output with zero and span adjustment.

- 2.9.8.2. Adjustable full-scale unit ranges shall be 100-130 Vac, 200-250 Vac, 250-330 Vac, and 400-600 Vac. Unit accuracy shall be $\pm 1\%$ full-scale at 500 ohm maximum burden.
- 2.9.8.3. Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.
- 2.9.9. Voltage Transformers
 - 2.9.9.1. AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.
 - 2.9.9.2. Transformers shall be suitable for ambient temperatures of 4°C-55°C (40°F-130°F) and shall provide $\pm 0.5\%$ accuracy at 24 Vac and 5 VA load.
 - 2.9.9.3. Windings (except for terminals) shall be completely enclosed with metal or plastic.
- 2.9.10. Power Monitors
 - 2.9.10.1. Power monitors shall be three-phase type and shall have three-phase disconnect and shorting switch assembly, UL listed voltage transformers, and UL listed split-core current transformers.
 - 2.9.10.2. Power monitors shall provide selectable output: rate pulse for kWh reading or 4-20 mA for kW reading. Power monitors shall operate with 5 A current inputs and maximum error of $\pm 2\%$ at 1.0 power factor or $\pm 2.5\%$ at 0.5 power factor.
- 2.9.11. Current Switches
 - 2.9.11.1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.
- 2.9.12. Current Sensors (Analog)
 - 2.9.12.1. Current sensors (CT) shall be used for status monitoring of all motor-driven equipment, where specified.
 - 2.9.12.2. Technical Performance – Output should be only 4-20mA only. Voltage output will not be accepted. End-to-end accuracy $\pm 1\%$ of full scale at each range.
 - 2.9.12.3. The current sensors shall be mounted inside the starter cabinets whenever possible. If this is not possible due to space limitation, provide an enclosure to house the sensor.
 - 2.9.12.4. Standard of Acceptance: Enercorp
- 2.9.13. Status Relays (Solid State)

- 2.9.13.1. The status relays shall be mounted inside newly provided enclosures mounted near the respective equipment starter cabinets.
- 2.9.13.2. Standard of Acceptance: Omron Low-Voltage Space Thermostats. Low-voltage space thermostats shall be 24 V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.
- 2.9.14. Fire stopping and Smoke Seal Materials
 - 2.9.14.1. Asbestos-free elastomeric materials tested, listed and labelled by ULC in accordance with CAN4-S115-M85, for installation in U.L.C. designated firestopping and smoke seal Systems. These Systems shall provide a positive fire, water and smoke seal and a fire- resistance rating (flame, smoke hose stream and temperature) not less than the fire resistance rating of surrounding construction.
 - 2.9.14.2. Materials shall form ULC listed or UL classified assemblies and be compatible with abutting dissimilar materials and finishes.
 - 2.9.14.3. Standard of Acceptance:
 - 2.9.14.3.1. 3M Canada Limited
 - 2.9.14.3.2. A/D Fire Protection System Ltd.
 - 2.9.14.3.3. Fire Stop System
- 2.9.15. Wall Opening Covering Plates
 - 2.9.15.1. All hole covering plates used on this project shall be stainless steel 18-8 chrome metal alloy, type 302, non-magnetic type for finished areas and pressed steel for unfinished areas. Finish brush marks shall be run in a vertical direction.
- 2.9.16. Access Doors
 - 2.9.16.1. Access doors installed in unfinished areas shall be constructed of 12 ga prime coated steel and of stainless steel for all areas finished with tile or marble surfaces.
 - 2.9.16.2. Access doors shall be complete with 180° opening door, round safety corners, concealed hinges, screwdriver latches, plaster lock and anchor straps.
 - 2.9.16.3. Access doors shall be 24'x 24' or 12'x 18' as per site condition.
 - 2.9.16.4. Access doors in fire rated construction shall be ULC listed and labeled and of a rating to maintain the fire separation integrity.
 - 2.9.16.5. Standard of Acceptance:
 - 2.9.16.5.1. Zurn Industries Canada Limited
 - 2.9.16.5.2. LeHage Industries Limited

2.9.16.5.3. Acudor Acorn Limited.

2.9.17. Local Control Panels

- 2.9.17.1. Indoor control panels shall be fully enclosed NEMA 1 construction with hinged door key-lock latch and removable sub-panels. A common key shall open each control panel and sub-panel.
- 2.9.17.2. Prewire internal and face-mounted device connections with color-coded stranded conductors tie-wrapped or neatly installed in plastic troughs. Field connection terminals shall be UL listed for 600 V service, individually identified per control and interlock drawings, with adequate clearance for field wiring.
- 2.9.17.3. Each local panel shall have a control power source power switch (on-off) with over current protection.

2.10. FAIL STATE POSITION OF OUTPUTS

2.10.1. Unless specified otherwise, configure BAS output points for the following fail state (e.g. device position upon panel failure):

2.10.1.1.	All Fans	OFF
2.10.1.2.	Heating Valves	Full heat to terminal device
2.10.1.3.	Mixing Dampers	Full recirculation air
2.10.1.4.	Face/Bypass Dampers	Full to face
2.10.1.5.	Zone Dampers	Full heat
2.10.1.6.	Heating Pumps	ON (except boiler belly pumps)
2.10.1.7.	Boiler Belly Pumps	OFF
2.10.1.8.	Variable Frequency Drives	ON, minimum programmed speed
2.10.1.9.	Lighting Relays	Last State
2.10.1.10.	Boilers (1 stage)	ON
2.10.1.11.	Boilers (Multi-stage)	LOW ON, HIGH OFF
2.10.1.12.	Cooling Equipment	OFF
2.10.1.13.	Electric Heating	OFF
2.10.1.14.	Domestic Hot Water Pumps	OFF
2.10.1.15.	Roof-top Gas Burners	OFF

2.11. WIRING AND RACEWAYS

- 2.11.1. General. Provide copper wiring, plenum cable, and raceways as specified in applicable sections of Division 26.
- 2.11.2. Insulated wire shall use copper conductors and shall be UL listed for 90°C (200°F) minimum service.

PART 3 - EXECUTION

3.1. EXAMINATION

- 3.1.1. Thoroughly examine project plans for control device and equipment locations. Report discrepancies, conflicts, or omissions to Consultant for resolution before starting rough-in work.
- 3.1.2. Inspect site to verify that equipment can be installed as shown. Report discrepancies, conflicts, or omissions to Consultant for resolution before starting rough-in work.
- 3.1.3. Examine drawings and specifications for work of others. Report inadequate headroom or space conditions or other discrepancies to Consultant and obtain written instructions for changes necessary to accommodate this Section's work with work of others. Controls Contractor shall perform at his expense necessary changes in specified work caused by failure or neglect to report discrepancies.

3.2. PROTECTION

- 3.2.1. Controls Contractor shall protect against and be liable for damage to work and to material caused by Contractor's work or employees.
- 3.2.2. Controls Contractor shall be responsible for work and equipment until inspected, tested, and accepted. Protect material not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3. COORDINATION

- 3.3.1. Site.
 - 3.3.1.1. Assist in coordinating space conditions to accommodate the work of each trade where work will be installed near or will interfere with work of other trades. If installation without coordination causes interference with work of other trades, Contractor shall correct conditions without extra charge.
 - 3.3.1.2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.
- 3.3.2. Life Safety.
 - 3.3.2.1. Duct smoke detectors required for air handler shutdown are provided under Division 16 and/or are existing. Interlock smoke detectors to air handlers for shutdown.

- 3.3.2.2. Smoke dampers and actuators required for duct smoke isolation are provided under Division 23 and/or are existing. Interlock smoke dampers to air handlers
- 3.3.2.3. Coordination with Other Controls. Integrate with and coordinate controls and control devices furnished or installed by others as follows.
- 3.3.2.4. Communication media and equipment shall be provided as specified herein
- 3.3.2.5. Each supplier of a controls product shall configure, program, start up, and test that product to meet the sequences of operation described herein regardless of where within the contract documents those products are described.
- 3.3.2.6. Coordinate and resolve incompatibility issues that arise between control products provided under this section and those provided under other sections or divisions of this specification.
- 3.3.2.7. The contractor is responsible for providing all controls described in the contract documents regardless of where within the contract documents these controls are described.
- 3.3.2.8. Controls Contractor shall be responsible for integration of control products provided by multiple suppliers regardless of where integration is described within the contract documents.

3.4. GENERAL WORKMANSHIP

- 3.4.1. Install equipment, piping, and wiring or raceway horizontally, vertically, and parallel to walls wherever possible.
- 3.4.2. Provide sufficient slack and flexible connections to allow for piping and equipment vibration isolation.
- 3.4.3. Install equipment in readily accessible locations as defined by National Electrical Code (NEC) Chapter 1 Article 100 Part A.
- 3.4.4. Verify wiring integrity to ensure continuity and freedom from shorts and ground faults.
- 3.4.5. Equipment, installation, and wiring shall comply with industry specifications and standards and local codes for performance, reliability, and compatibility.

3.5. FIELD QUALITY CONTROL

- 3.5.1. Work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes and ordinances as identified in this section (Codes and Standards).
- 3.5.2. Continually monitor field installation for code compliance and workmanship quality.

- 3.5.3. Contractor shall arrange for work inspection by local or state authorities having jurisdiction over the work.

3.6. EXISTING EQUIPMENT

- 3.6.1. Wiring. Interconnecting control wiring shall be removed and shall become Contractor's property unless specifically noted or shown to be reused.
- 3.6.2. Local Control Panels. Remove and deliver existing control panels to Board.
- 3.6.3. Repair. Unless otherwise directed, Contractor is not responsible for repair or replacement of existing energy equipment and systems, valves, dampers, or actuators. Notify Consultant in writing immediately of existing equipment that requires maintenance.
- 3.6.4. Indicator Gauges. Ensure operation of and recalibrate for reasonable accuracy or replace existing gauges.
- 3.6.5. Room Thermostats. Remove and deliver existing room thermostats to Board unless otherwise noted. Patch and finish holes and marks left by removal to match existing walls.
- 3.6.6. Electronic Sensors and Transmitters. Remove and deliver existing sensors and transmitters to Board.
- 3.6.7. Controllers and Auxiliary Electronic Devices. Remove and deliver existing controllers and auxiliary electronic devices to Board.
- 3.6.8. Damper Actuators, Linkages, and Appurtenances: Remove and deliver existing damper actuators, linkages and appurtenances to Board.
- 3.6.9. Control Valves. Replace existing control valves with new. Deliver removed control valves to Board.
- 3.6.10. Existing System Operating Schedule. Existing mechanical system may be disabled during this work.
- 3.6.11. Maintain fan scheduling using existing or temporary time clocks or control systems throughout the control system installation.
- 3.6.12. Modify existing starter control circuits if necessary to provide hand-off-auto control of each controlled starter. Furnish new starters or starter control packages as required.
- 3.6.13. Patch holes and finish to match existing walls.

- 3.6.14. At Board's request, items to be delivered to Board shall instead be properly disposed of. Hazardous materials shall be disposed in accordance with current regulations and applicable by-laws.

3.7. WIRING

- 3.7.1. Control and interlock wiring and installation shall comply with national and local electrical codes, and manufacturer's recommendations.
- 3.7.2. NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway as specified by NEC.
- 3.7.3. All wiring shall be installed in EMT conduit unless specified otherwise. Exposed wiring in finished areas (e.g. corridors, classrooms, gymnasiums, etc.) shall be installed in wiremold (colour to match surrounding area)
- 3.7.4. Wiring from DDC controllers to sensors and actuators and control system network and low voltage wiring running in accessible ceilings may be installed using LVT cable. Where the ceiling is used as a return air plenum, plenum rated cable shall be used in lieu of LVT cable.
- 3.7.5. Install EMT and cable at right angles to building lines, securely fastened, and in accordance with current electrical codes and standards.
- 3.7.6. Power and control wiring shall be copper conductor (RW90). For power wiring, provide #12 AWG (minimum) with a 3% maximum voltage drop in accordance with CEC requirements. Control wiring shall be a minimum of #14 AWG, unless otherwise specified.
- 3.7.7. The wires smaller than 18 gauge shall not be used and will not be accepted on the project except for: wiring between terminal computer devices, wire in standard communication cables, such as printers and short haul modems, wire used in communication networks, i.e. any cable transferring digital data, using twisted shielded pairs.
- 3.7.8. The wiring from panels to devices shall be installed without splices. The use of crimp connectors is not allowed when connecting field wiring to sensor or device leads. The use of wire nuts is acceptable in this application.
- 3.7.9. Power for control system shall not be obtained by tapping into miscellaneous circuits that could be inadvertently switched off. Only dedicated circuit(s) shall power the control system. Provide additional breakers or electrical panels as required.
- 3.7.10. Mount transformers and other peripheral equipment in panels located in serviceable areas. Provide line-side breakers/fuses for each transformer.

- 3.7.11. All 120 VAC power for any controls equipment shall be from dedicated circuits. Provide a breaker lock for each breaker used to supply the control system. Update the panel circuit directory.
- 3.7.12. A dedicated power circuit may be used to power DDC panels and equipment within the same or adjoining mechanical rooms. The use of one power circuit to power DDC panels distributed throughout the building is not acceptable.
- 3.7.13. The controller may be powered from the equipment that it is directly controlling (i.e. heat pump, rooftop unit) only if the controller controls no other equipment and the power supply to the controller remains energized independently of unit operation or status.
- 3.7.14. Provide all required code gauge boxes, connectors and other wiring accessories.
- 3.7.15. For all DC wiring, positive conductors shall be WHITE or RED in colour while negative conductors shall be BLACK in colour.

3.8. COMMUNICATION WIRING

- 3.8.1. Communication wiring shall be low-voltage Class 2 wiring and shall comply with Article 3.7 (Wiring).
- 3.8.2. Install communication wiring in separate raceways and enclosures from other Class 2 wiring.
- 3.8.3. During installation do not exceed maximum cable pulling, tension, or bend radius specified by the cable manufacturer.
- 3.8.4. Verify entire network's integrity following cable installation using appropriate tests for each cable.
- 3.8.5. Install lightning arrestor according to manufacturer's recommendations between cable and ground where a cable enters or exits a building.
- 3.8.6. Each run of communication wiring shall be a continuous length without splices when that length is commercially available. Runs longer than commercially available lengths shall have as few splices as possible using commercially available lengths.
- 3.8.7. Label communication wiring to indicate origination and destination.
- 3.8.8. Ground coaxial cable according to NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

3.8.9. BACnet MS/TP communications wiring shall be installed in accordance with ASHRAE/ANSI Standard 135. This includes but is not limited to:

- 3.8.9.1. The network shall use shielded, twisted-pair cable with characteristic impedance between 100 and 120 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot.)
- 3.8.9.2. The maximum length of an MS/TP segment is 1200 meters (4000 ft) with AWG 18 cable. The use of greater distances and/or different wire gauges shall comply with the electrical specifications of EIA-485.
- 3.8.9.3. The maximum number of nodes per segment shall be 32, as specified in the EIA 485 standard. Additional nodes may be accommodated by the use of repeaters.
- 3.8.9.4. An MS/TP EIA-485 network shall have no T connections.

3.9. FIBER OPTIC CABLE

- 3.9.1. During installation do not exceed maximum pulling tensions specified by cable manufacturer. Post-installation residual cable tension shall be within cable manufacturer's specifications.
- 3.9.2. Install cabling and associated components according to manufacturers' instructions. Do not exceed minimum cable and unjacketed fiber bend radii specified by cable manufacturer.

3.10. INSTALLATION OF SENSORS

- 3.10.1. Install sensors according to manufacturer's recommendations.
- 3.10.2. Mount sensors rigidly and adequately for operating environment.
- 3.10.3. Install room temperature sensors on concealed junction boxes properly supported by wall framing.
- 3.10.4. Air seal wires attached to sensors in their raceways or in the wall to prevent sensor readings from being affected by air transmitted from other areas.
- 3.10.5. Use averaging sensors in mixing plenums and hot and cold decks. Install averaging sensors in a serpentine manner vertically across duct. Support each bend with a capillary clip.
- 3.10.6. Install mixing plenum low-limit sensors in a serpentine manner horizontally across duct. Support each bend with a capillary clip. Provide 3 m (1 ft) of sensing element for each 1 m² (1 ft²) of coil area.

3.10.7. Install pipe-mounted temperature sensors in wells. Install liquid temperature sensors with heat-conducting fluid in thermal wells.

3.10.8. Install outdoor air temperature sensors on north wall at designated location with sun shield complete with metal cover cage.

3.10.9. Differential Air Static Pressure.

3.10.9.1. Supply Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube. Make pressure tap connections according to manufacturer's recommendations.

3.10.9.2. Return Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube. Make pressure tap connections according to manufacturer's recommendations.

3.10.9.3. Building Static Pressure. Pipe pressure sensor's low-pressure port to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe high-pressure port to a location behind a thermostat cover.

3.10.9.4. Piping to pressure transducer pressure ports shall contain a capped test port adjacent to transducer.

3.10.9.5. Pressure transducers, except those controlling VAV boxes, shall be located in control panels, not on monitored equipment or on ductwork. Mount transducers in a vibration-free location accessible for service without use of ladders or special equipment.

3.10.9.6. Mount gauge tees adjacent to air and water differential pressure taps. Install shut-off valves before tee for water gauges.

3.10.9.7. Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status.

3.10.9.8. Install humidity sensors for duct mounted humidifiers at least 3 m (10 ft) downstream of the humidifier. Do not install filters between the humidifier and the sensor.

3.11. FLOW SWITCH INSTALLATION

3.11.1. Use correct paddle for pipe diameter.

3.11.2. Adjust flow switch according to manufacturer's instructions.

3.12. ACTUATORS

3.12.1. General. Mount actuators and adapters according to manufacturer's recommendations.

3.12.2. Electric and Electronic

- 3.12.2.1. Damper Actuators. Mount actuators directly on damper shaft or jackshaft unless shown as a linkage installation. Link actuators according to manufacturer's recommendations.
- 3.12.2.2. For low-leakage dampers with seals, mount actuator with a minimum 5° travel available for damper seal tightening.
- 3.12.2.3. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, then tighten linkage.
- 3.12.2.4. Check operation of damper-actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
- 3.12.2.5. Provide necessary mounting hardware and linkages for actuator installation.
- 3.12.2.6. Valve Actuators. Connect actuators to valves with adapters approved by actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

3.13. WARNING LABELS

- 3.13.1. Affix permanent warning labels to equipment that can be automatically started by the control system.
- 3.13.2. Labels shall use white lettering (12-point type or larger) on a red background.
 - 3.13.2.1. Warning labels shall read as follows.

CAUTION

This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing.

- 3.13.2.2. Affix permanent warning labels to motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.
- 3.13.2.3. Labels shall use white lettering (12-point type or larger) on a red background.
- 3.13.2.4. Warning labels shall read as follows.

CAUTION

This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

3.14. IDENTIFICATION OF HARDWARE AND WIRING

- 3.14.1. Label wiring and cabling, including that within factory-fabricated panels, with control system address or termination number at each end within 5 cm (2 in.) of termination.
- 3.14.2. Label pneumatic tubing at each end within 5 cm (2 in.) of termination with a descriptive identifier.
- 3.14.3. Permanently label or code each point of field terminal strips to show instrument or item served.
- 3.14.4. Label control panels with minimum 1 cm (½ in.) letters on laminated plastic nameplates.
- 3.14.5. Label each control component with a permanent label. Label plug-in components such that label remains stationary during component replacement.
- 3.14.6. Label room sensors related to terminal boxes or valves with nameplates.
- 3.14.7. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.
- 3.14.8. Label identifiers shall match record documents.
- 3.14.9. Controllers
 - 3.14.9.1. Provide a separate controller for each AHU or other HVAC system. A DDC controller may control more than one system provided that all points associated with the system are assigned to the same DDC controller. Points used for control loop reset, such as outside air or space temperature, are exempt from this requirement.
 - 3.14.9.2. Building Controllers and Custom Application Controllers shall be selected to provide the required I/O point capacity required to monitor all of the hardware points listed in Appendix A (Sequences of Operation).

3.15. PROGRAMMING

- 3.15.1. Point Naming. Name points as shown on the equipment points list provided with each sequence of operation. See drawings. If character limitations or space restrictions make it advisable to shorten the name, the abbreviations given in Appendix C may be used. Where multiple points with the same name reside in the same controller, each point name may be customized with its associated Program Object number. For example, "Zone Temp 1" for Zone 1, "Zone Temp 2" for Zone 2.

- 3.15.2. Software Programming. Programming shall provide actions for each possible situation. Graphic- or parameter-based programs shall be documented. Text-based programs shall be modular, structured, and commented to clearly describe each section of the program.
- 3.15.3. Application Programming. Provide application programming that adheres to sequences of operation specified in in this section. Program documentation or comment statements shall reflect language used in sequences of operation.
- 3.15.4. System Programming. Provide system programming necessary for system operation.
- 3.15.5. Operator Interface.
 - 3.15.5.1. Standard Graphics. Provide graphics as specified in this section. Show on each equipment graphic input and output points and relevant calculated points such as indicated on the applicable Points List in this section and on the drawings. Point information on graphics shall dynamically update.
 - 3.15.5.2. Install, initialize, start up, and troubleshoot operator interface software and functions (including operating system software, operator interface database, and third-party software installation and integration required for successful operator interface operation) as described in this section.

3.16. SEQUENCES OF OPERATION

- 3.16.1. As noted on the drawings, together with the list of control points.

3.17. EQUIPMENT ENCLOSURES AND LOCATIONS

- 3.17.1. Provide new enclosures for all field equipment (e.g. DDC panels, transducers, relays, etc.). Enclosures shall be equipped with a hinged door and latch. Provide a BOARD-standard key/lock set for each enclosure.
- 3.17.2. Mount all enclosures in serviceable areas of mechanical rooms, storage rooms or janitor closets. Obtain written approval of the Consultant prior to mounting any enclosure in ceiling spaces or more than 5'-6" above the finished floor.
- 3.17.3. All transformers and power supplies for control equipment shall be installed in new dedicated metal cabinets with hinged, lockable covers located in the proximity of their dedicated controller cabinets.
- 3.17.4. Include within a DDC panel enclosure one 120 VAC duplex receptacle for portable PC power, if the controller cabinet is located further than 5'-0" from the nearest wall receptacle.

3.17.5. Ensure that enclosures are sized to allow for ease of servicing of all equipment contained within. Enclosures containing DDC panels shall be sized to allow for the installation of the maximum allowable number of expansion panels/boards. Do not mount other equipment in a manner that may interfere with the future installation of expansion panels/boards.

3.17.6. For enclosures containing pneumatic transducers or devices, provide one pressure gauge (1½" dial, 0-30psi) for the main air line supply.

3.18. IDENTIFICATION AND LABELING OF CONTROL EQUIPMENT

3.18.1. All panels must have a lamicaid tag (min. 3"x1") affixed to the front face indicating panel designation and function (i.e. "BAS Panel 1" or "Relay Panel 3").

3.18.2. All field sensors or devices must have a lamicaid tag (min. 3"x1") attached with tie-wrap or adhesive indicating the point software name and hardware address (i.e. AHU1-MAT, 2.IP4). Tags must be secured by screws where mounted outside of the building, in unheated spaces, in high humidity areas or where subject to vibration.

3.18.3. Room sensors or other sensors in finished areas must have a lamicaid tag affixed to the front cover. This tag shall be minimum 1"x ½" and indicate the point software name and hardware address.

3.18.4. All devices within a field enclosure shall be identified via a label or tag.

3.18.5. All BAS panel power sources must be identified by a label (min. 3"x1") indicating the source power panel designation and circuit number (i.e. "120vac fed from LP-2A cct #1).

3.18.6. All field control equipment panels fed from more than one power source must have a warning label on the front cover.

3.18.7. All wires shall be identified with the hardware address with a band-type self-adhesive strips or clip-on plastic wire markers at both ends.

3.18.8. All rotating equipment controlled by the BAS shall have a tag or label affixed indicating that the equipment may start without warning.

3.18.9. The location of the phone line manager shall be indicated via a label affixed to the inside cover of the modem enclosure or BAS panel.

3.18.10. All BAS panels will be supplied with a point's list sheet (within a plastic sleeve) attached to the inside door.

3.18.11. The points list shall identify the following for each point:

- 3.18.11.1. Panel number.
- 3.18.11.2. Panel location.
- 3.18.11.3. Hardware address.
- 3.18.11.4. Software name.
- 3.18.11.5. Point description.
- 3.18.11.6. Field device type.
- 3.18.11.7. Point type (i.e. AI or DO).
- 3.18.11.8. Device fail position.
- 3.18.11.9. Device manufacturer.
- 3.18.11.10. Model number or reference.
- 3.18.11.11. Wire tag reference.
- 3.18.12. Provide laminated wiring diagrams for all field mounted relay enclosures. Securely attach to the inside door. Identify power panels and circuit numbers of the equipment being controlled.
- 3.18.13. Provide laminated wiring diagrams or modify existing equipment wiring diagrams wherever the BAS interfaces to other equipment. (e.g. boilers, chillers, etc.). Securely attach to the inside of the respective control cabinet.
- 3.18.14. Provide lamacoid labels indicating the required operating sequences, on the boilers and valves, where the boiler plants have manual or automatic isolating valves. Submit actual wording to the Consultant for approval prior to fabrication and installation.
- 3.18.15. Provide lamacoid or machine labels (as outlined above) for all interposing relays or contactors used in control circuits. The labels shall include the related point software name and hardware address
- 3.18.16. Provide a lamacoid label to identify the location of concealed devices above the ceiling space. Mount the label on the ceiling grid T-bar or a permanent surface adjacent to the devices. The label shall contain the wording "BAS Devices Above".
- 3.18.17. Provide lamacoid labels for all auxiliary HVAC equipment (e.g. force flow cabinets, unit ventilators, unit heater, window AC units, etc.) controlled by the BAS. Mount the labels in the vicinity of the existing thermostat or power switch for the unit. The label shall contain the wording "Under BAS Control".
- 3.18.18. Where directed by the Consultant, provide any and all additional labelling, diagrams, schematics or instructions as may be required to facilitate the correct operation and maintenance of controlled building systems.

3.19. SYSTEM HARDWARE COMMISSIONING

- 3.19.1. This contractor shall be responsible for the “end to end” commissioning, testing, verification and start-up of the complete control system hardware including panels, sensors, transducers, end devices, relays and wiring. Where applicable, this shall include any points from an existing and/or re-used automation system in the building.
- 3.19.2. The contractor shall conduct the hardware commissioning at the facility.
- 3.19.3. When the site hardware installation is 100% completed (including all labeling and documentation), the contractor shall provide written notification to the Board to schedule the hardware commissioning dates for each facility.
- 3.19.4. Board reserves the right, at its sole discretion, to discontinue site commissioning at any time if any part of the site hardware installation is found to be incomplete on the date of commissioning. If this occurs, the Contractor shall assume responsibility for any additional costs related to rescheduling of the site commissioning.
- 3.19.5. The Contractor shall prepare a hardware commissioning report containing the following information and test results:
 - 3.19.5.1. Analog inputs (i.e. temperatures, pressure, etc.) shall be verified with an approved calibration device. All actual temperature readings should be with +/- 1C of the readings observed at the workstation. Record calibration adjustments and settings.
 - 3.19.5.2. Analog outputs shall be verified by manually commanding the output channel from the operator workstation to two or more positions within the 0-100% range and verifying the actual position of the actuator or device. All devices shall operate over their entire 0-100% range from a minimum control range of 10-90%. Record the actual output scale range (channel output voltage versus controller command) for each analogue end device
 - 3.19.5.3. Digital outputs shall be verified by witnessing the actual start/stop operation of the equipment under control.
 - 3.19.5.4. Digital inputs shall be verified by witnessing the status of the input point as the equipment is manually cycled on and off.
 - 3.19.5.5. Identify any existing equipment (valves, dampers, fan starters, etc..) that are inoperative or require maintenance or repair.
 - 3.19.5.6. The BAS field panel power source shall be toggled on and off to ensure reboot functionality and power down memory retention of all parameters. During the power down test, all controlled system outputs shall go to their fail-safe position.
 - 3.19.5.7. The hardware commissioning report must be signed and dated by the Contractor’s technician performing the tests and participating Board representative.

- 3.19.5.8. Include with the hardware commissioning report a site floor plan indicating the location of all equipment installed in concealed or recessed locations (e.g. interposing relays in ceiling spaces).
- 3.19.5.9. Provide testing of all LAN cabling to ensure that 100Mb bandwidth is supported.
- 3.19.5.10. Verify conformance with TIA /EIA TSB-67 - Basic Link Test using a Level 2, bi-directional tester. Provide all equipment necessary to carry out the required tests.
- 3.19.5.11. The Contractor shall prepare a software commissioning report containing the following information and test results:
 - 3.19.6. Alarms and Interlocks.
 - 3.19.6.1. Check each alarm with an appropriate signal at a value that will trip the alarm.
 - 3.19.6.2. Trip interlocks using field contacts to check logic and to ensure that actuators fail in the proper direction.
 - 3.19.6.3. Tests interlock actions by simulating alarm conditions to check initiating value of variable and interlock action.
- 3.19.7. Record all out-of-season or unverified points in the commissioning report as "non-commissioned".
- 3.19.8. Verify PID loop tuning parameters by applying a step change to the current setpoint and observing the response of the controlled device. Setpoint should be reached in an acceptable period of time without excessive cycling or hunting of the controlled device. Provide a graph of the trend response to setpoint change for important controlled devices (e.g. valves 1-inch or larger, dampers on major air handlers, etc.)
- 3.19.9. Provide confirmation that a series of test alarms has been successfully received at a designated remote monitoring workstations.
- 3.19.10. The software commissioning report must be signed and dated by the Contractor's technician performing the tests and participating Board representative.
- 3.19.11. At the completion of site commissioning, submit four (4) copies of each the hardware and software commissioning reports to the Board.

3.20. SUBSTANTIAL COMPLETION INSPECTION

- 3.20.1.1. At the completion of the site hardware inspection, the Contractor shall test and verify that the system programming, graphics and alarm software is operating correctly and is in compliance all requirements of the specifications.

- 3.20.1.2. The Contractor shall provide written notification to the Board that the site is ready for the Substantial Completion Inspection by the Consultant.
- 3.20.1.3. At the conclusion of the Substantial Completion Inspection, the Consultant shall issue a comprehensive site deficiency report to the Contractor for his immediate action.
- 3.20.1.4. The Contractor shall correct all items noted in the site deficiency report within ten (10) business days of receipt.
- 3.20.1.5. The Contractor shall provide written notification to the Board that all items on the Consultant's site deficiency report have been corrected.

3.21. CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

- 3.21.1. Demonstration. Prior to acceptance, perform the following performance tests to demonstrate system operation and compliance with specification after and in addition to tests specified above. Provide Consultant with log documenting completion of Substantial Completion Inspection.
- 3.21.2. Consultant and Board Representative will be present to observe and review system demonstration. Notify Consultant and Board Representative at least 10 days before system demonstration begins.
- 3.21.3. Demonstration shall follow process submitted and approved. Complete approved checklists and forms for each system as part of system demonstration.
- 3.21.4. Demonstrate actual field operation of each sequence of operation as specified herein. Provide at least two persons equipped with two-way communication. Demonstrate calibration and response of any input and output points requested by Consultant. Provide and operate test equipment required to prove proper system operation.
- 3.21.5. Demonstrate compliance with sequences of operation through each operational mode.
- 3.21.6. Demonstrate complete operation of operator interface.
- 3.21.7. Demonstrate each of the following.
 - 3.21.7.1. DDC loop response. Supply graphical trend data output showing each DDC loop's response to a setpoint change representing an actuator position change of at least 25% of full range. Trend sampling rate shall be from 10 seconds to 3 minutes, depending on loop speed. Each sample's trend data shall show setpoint, actuator position, and controlled variable values. Consultant will require further tuning of each loop that displays unreasonably under- or over-damped control.
 - 3.21.7.2. Building fire alarm system interface.

- 3.21.7.3. Trend logs for each system. Trend data shall indicate setpoints, operating points, valve positions, and other data as specified in the points list provided with each sequence of operation. Each log shall cover three 48-hour periods and shall have a sample frequency not less than 10 minutes or as specified on its points list. Logs shall be accessible through system's operator interface and shall be retrievable for use in other software programs.
- 3.21.8. Tests that fail to demonstrate proper system operation shall be repeated after Contractor makes necessary repairs or revisions to hardware or software to successfully complete each test.
- 3.21.9. Acceptance.
 - 3.21.9.1. After tests described in this specification are performed to the satisfaction of both Consultant and Board, Consultant will accept control system as meeting completion requirements. Consultant may exempt tests from completion requirements that cannot be performed due to circumstances beyond Contractor's control. Consultant will provide written statement of each exempted test. Exempted tests shall be performed as part of warranty.
- 3.21.10. System shall not be accepted until completed demonstration forms and checklists are submitted and approved as required.

3.22. CLEANING

- 3.22.1. Each day clean up debris resulting from work. Remove packaging material as soon as its contents have been removed. Collect waste and place in designated location.
- 3.22.2. On completion of work in each area, clean work debris and equipment. Keep areas free from dust, dirt, and debris.
- 3.22.3. On completion of work, check equipment furnished under this section for paint damage. Repair damaged factory-finished paint to match adjacent areas. Replace deformed cabinets and enclosures with new material and repaint to match adjacent areas.

3.23. TRAINING

- 3.23.1. Provide training for a designated staff of Board's representatives. Training shall be provided via self-paced training, web-based or computer-based training, classroom training, or a combination of training methods.
- 3.23.2. Training shall enable students to accomplish the following objectives.

- 3.23.2.1. Proficiently operate system.
 - 3.23.2.2. Understand control system architecture and configuration.
 - 3.23.2.3. Understand DDC system components.
 - 3.23.2.4. Understand system operation, including DDC system control and optimizing routines (algorithms)
 - 3.23.2.5. Operate workstation and peripherals
 - 3.23.2.6. Log on and off system
 - 3.23.2.7. Access graphics, point reports, and logs
 - 3.23.2.8. Adjust and change system set-points, time schedules, and holiday schedules
 - 3.23.2.9. Recognize common HVAC system malfunctions by observing system graphics, trend graphs, and other system tools
 - 3.23.2.10. Understand system drawings and Operation and Maintenance manual
 - 3.23.2.11. Understand job layout and location of control components
 - 3.23.2.12. Access data from DDC controllers
 - 3.23.2.13. Operate portable operator's terminals
 - 3.23.2.14. Create and change system graphics
 - 3.23.2.15. Create, delete, and modify alarms, including configuring alarm reactions
 - 3.23.2.16. Create, delete, and modify point trend logs (graphs) and multi-point trend graphs
 - 3.23.2.17. Configure and run reports
 - 3.23.2.18. Add, remove, and modify system's physical points
 - 3.23.2.19. Create, modify, and delete application programming
 - 3.23.2.20. Add operator interface stations
 - 3.23.2.21. Add a new controller to system
 - 3.23.2.22. Download firmware and advanced applications programming to a controller
 - 3.23.2.23. Configure and calibrate I/O points
 - 3.23.2.24. Maintain software and prepare backups
 - 3.23.2.25. Interface with job-specific, third-party operator software
 - 3.23.2.26. Add new users and understand password security procedures
- 3.23.3. Divide presentation of objectives into three sessions (1-13, 14-23, and 24-26). Participants will attend one or more of sessions, depending on knowledge level required.
- 3.23.3.1. Day-to-day Operators (objectives 1-13)
 - 3.23.3.2. Advanced Operators (objectives 1-13 and 14-23)
 - 3.23.3.3. System Managers and Administrators (objectives 1-13 and 14-26)
 - 3.23.3.4. Provide course outline and materials Provide one copy of training material per student.
 - 3.23.3.5. Instructors shall be factory-trained and experienced in presenting this material.
 - 3.23.3.6. Perform classroom training using a network of working controllers representative of installed hardware.

TABLE OF CONTENTS

PART 1 - GENERAL	3
1.1. DESCRIPTION	3
1.2. RELATED WORK	3
1.3. QUALITY ASSURANCE	3
1.4. SUBMITTALS	3
1.5. APPLICABLE PUBLICATIONS.....	4
1.6. SPARE PARTS.....	5
PART 2 - PRODUCTS	6
2.1. PIPE AND TUBING	6
2.2. FITTINGS FOR COPPER TUBING	6
2.3. FITTINGS FOR STEEL PIPE.....	6
2.4. FITTINGS FOR PLASTIC PIPING	7
2.5. DIELECTRIC FITTINGS	7
2.6. UNION.....	7
2.7. FLANGES	8
2.8. GASKETS AND BOLTS	8
2.9. PLUGS	8
2.10. SCREWED JOINTS.....	8
2.11. VALVES.....	8
2.12. WATER FLOW MEASURING DEVICES.....	11
2.13. STRAINERS	12
2.14. EXPANSION JOINTS.....	12
2.15. GAGES, TEMPERATURE, PRESSURE AND COMPOUND.....	14
2.16. PRESSURE/TEMPERATURE TEST PROVISIONS	14
2.17. FIRESTOPPING MATERIAL.....	14
2.18. ELECTRICAL HEAT TRACING SYSTEMS	14
PART 3 - EXECUTION	15
3.1. GENERAL.....	15

3.2.	PIPE JOINTS	16
3.3.	EXPANSION JOINTS (BELLOWS AND SLIP TYPE).....	17
3.4.	BRAZING	17
3.5.	LEAK TESTING ABOVEGROUND PIPING	17
3.6.	FLUSHING AND CLEANING PIPING SYSTEMS	18
3.7.	ELECTRIC HEAT TRACING	19
3.8.	OPERATING AND PERFORMANCE TEST AND INSTRUCTION.....	19

PART 1 - GENERAL

1.1. DESCRIPTION

1.1.1. Water piping to connect HVAC equipment, including the following:

- 1.1.1.1. Chilled water, condenser water, heating hot water and drain piping.
- 1.1.1.2. Extension of domestic water make up piping.
- 1.1.1.3. Glycol water piping.

1.2. RELATED WORK

1.2.1. Section: 01 33 23 Shop Drawings, Product Data, and Samples.

1.2.2. Section: 23 05 00 Common Work Results for HVAC.

1.3. QUALITY ASSURANCE

1.3.1. Section: 23 05 00 Common Work Results for HVAC, which includes welding qualifications.

1.3.2. Submit prior to welding of steel piping a certificate of Welder's certification. The certificate shall be current and not more than one year old.

1.3.3. All joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer.

1.3.4. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

1.4. SUBMITTALS

1.4.1. Submit in accordance with Section: 01 33 23 Shop Drawings, Product Data, and Samples.

1.4.2. Manufacturer's Literature and Data:

- 1.4.2.1. Pipe and equipment supports.
- 1.4.2.2. Pipe and tubing, with specification, class or type, and schedule.
- 1.4.2.3. Pipe fittings, including miscellaneous adapters and special fittings.
- 1.4.2.4. Flanges, gaskets and bolting.
- 1.4.2.5. Valves of all types.
- 1.4.2.6. Heat Exchangers.
- 1.4.2.7. Strainers.
- 1.4.2.8. Flexible connectors for water service.
- 1.4.2.9. Pipe alignment guides.

- 1.4.2.10. Expansion joints.
- 1.4.2.11. Expansion compensators.
- 1.4.2.12. All specified hydronic system components.
- 1.4.2.13. Water flow measuring devices.
- 1.4.2.14. Gages.
- 1.4.2.15. Thermometers and test wells.
- 1.4.2.16. Electric heat tracing systems.
- 1.4.2.17. Air separators.
- 1.4.2.18. Expansion tanks.
- 1.4.2.19. Submit the welder's qualifications in the form of a current (less than one year old) and formal certificate.
- 1.4.2.20. As Built Piping Diagrams: Provide drawing as follows for chilled water/glycol, condenser water, and heating hot water/glycol system and other piping systems and equipment in electronic Autocad and pdf format.

1.5. APPLICABLE PUBLICATIONS

- 1.5.1. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. American National Standards Institute, Inc.
- 1.5.2. American Society of Mechanical Engineers/American National Standards Institute, Inc. (ASME/ANSI):
 - 1.5.2.1. B1.20.1-83(R2006) Pipe Threads, General Purpose (Inch)
 - 1.5.2.2. B16.4 06 Gray Iron Threaded Fittings
 - 1.5.2.3. B16.18-01 Cast Copper Alloy Solder joint Pressure fittings
 - 1.5.2.4. B16.23-02 Cast Copper Alloy Solder joint Drainage fittings
 - 1.5.2.5. B40.100-05 Pressure Gauges and Gauge Attachments
- 1.5.3. American National Standards Institute, Inc./Fluid Controls Institute (ANSI/FCI):
 - 1.5.3.1. 70-2-2006 Control Valve Seat Leakage
- 1.5.4. American Society of Mechanical Engineers (ASME):
 - 1.5.4.1. B16.1-98 Cast Iron Pipe Flanges and Flanged Fittings
 - 1.5.4.2. B16.3-2006 Malleable Iron Threaded Fittings: Class 150 and 300
 - 1.5.4.3. B16.4 2006 Gray Iron Threaded Fittings: (Class 125 and 250)
 - 1.5.4.4. B16.5-2003 Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch Standard
 - 1.5.4.5. B16.9-07 Factory Made Wrought Butt Welding Fittings

1.5.4.6.	B16.11-05	Forged Fittings, Socket Welding and Threaded
1.5.4.7.	B16.18-01	Cast Copper Alloy Solder Joint Pressure Fittings
1.5.4.8.	B16.22-01	Wrought Copper and Bronze Solder Joint Pressure Fittings.
1.5.4.9.	B16.24 06	Cast Copper Alloy Pipe Flanges and Flanged Fittings
1.5.4.10.	B16.39 06	Malleable Iron Threaded Pipe Unions
1.5.4.11.	B16.42-06	Ductile Iron Pipe Flanges and Flanged Fittings
1.5.4.12.	B31.1 08	Power Piping

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

1.5.5.1.	A47/A47M-99 (2004)	Ferritic Malleable Iron Castings
1.5.5.2.	A53/A53M-07	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
1.5.5.3.	A106/A106M-08	Standard Specification for Seamless Carbon Steel Pipe for High Temperature Service
1.5.5.4.	A126 04	Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
1.5.5.5.	A183 03	Standard Specification for Carbon Steel Track Bolts and Nuts
1.5.5.6.	A216/A216M-08	Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High Temperature Service
1.5.5.7.	A234/A234M-07	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
1.5.5.8.	A307 07	Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
1.5.5.9.	A536 84 (2004)	Standard Specification for Ductile Iron Castings
1.5.5.10.	A615/A615M-08	Deformed and Plain Carbon Steel Bars for Concrete Reinforcement
1.5.5.11.	B32 08	Standard Specification for Solder Metal
1.5.5.12.	B62 02	Standard Specification for Composition Bronze or Ounce Metal Castings
1.5.5.13.	B88 03	Standard Specification for Seamless Copper Water Tube

1.5.6. American Water Works Association (AWWA):

1.5.6.1.	C110-08	Ductile Iron and Grey Iron Fittings for Water
1.5.6.2.	C203-02	Coal Tar Protective Coatings and Linings for Steel Water Pipe Lines Enamel and Tape Hot Applied

1.6. SPARE PARTS

- 1.6.1. For mechanical pressed sealed fittings provide tools required for each pipe size used at the facility.

PART 2 - PRODUCTS

2.1. PIPE AND TUBING

2.1.1. Chilled Water/Glycol Piping, Condenser Water Piping, Heating Hot Water/Glycol Piping as applicable to the project:

2.1.1.1. 50 mm (2") diam and smaller:

2.1.1.1.1. Schedule 40 continuous weld or electric resistance welded black carbon steel conforming to ASTM A53 84a Grade B, with threaded ends.

2.1.1.1.2. Type "L" hard drawn copper tubing conforming to ASTM B88. Type "L" soft annealed copper tubing may be used within convector enclosures.

2.1.1.2. 65 mm (2½") diam and larger

2.1.1.2.1. Schedule 40 continuous weld or electric resistance welded black carbon steel conforming to ASTM A53 84a Grade B, with beveled ends.

2.1.2. Cooling Coil Condensate Drain Piping:

2.1.2.1. From air handling units: Copper water tube, ASTM B88, Type M

2.1.2.2. From fan coil or other terminal units: Copper water tube, ASTM B88, Type L for runouts and Type M for mains.

2.1.3. Chemical Feed Piping for Cooling Tower Water Treatment: Chlorinated polyvinyl chloride (CPVC), Schedule 80, ASTM F441.

2.1.4. Pipe supports, including insulation shields, for above ground piping: Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

2.2. FITTINGS FOR COPPER TUBING

2.2.1. Joints 50 mm (2") and smaller:

2.2.1.1. *Solder Joints:* Joints shall be made up in accordance with recommended practices of the materials applied. Apply 95/5 tin and antimony on all copper piping.

2.2.1.2. *Screwed Joints:* Pipe Thread: ANSI B1.20. Lubricant or Sealant: Oil and graphite or other compound approved for the intended service.

2.2.2. Joints 65 mm (2½") and larger:

2.2.2.1. Bronze Flanges and Flanged Fittings: ASME B16.24.

2.2.2.2. Fittings: ASME B16.18 cast copper or ASME B16.22 solder wrought copper.

2.3. FITTINGS FOR STEEL PIPE

2.3.1. 50 mm (2 inches) and Smaller: Screwed or welded joints.

- 2.3.1.1. Butt welding: ASME B16.9 with same wall thickness as connecting piping.
- 2.3.1.2. Forged steel, socket welding or threaded: ASME B16.11.
- 2.3.1.3. Screwed: 150 pound malleable iron, ASME B16.3. 125 pound cast iron, ASME B16.4, may be used in lieu of malleable iron. Bushing reduction of a single pipe size, or use of close nipples, is not acceptable.

2.3.2. 65 mm (2 1/2 inches) and Larger: Welded or flanged joints.

- 2.3.2.1. Butt welding fittings: ASME B16.9 with same wall thickness as connecting piping. Elbows shall be long radius type, unless otherwise noted.
- 2.3.2.2. Welding flanges and bolting: ASME B16.5:
- 2.3.2.3. Weld neck or slip on, plain face, with 6 mm (1/8 inch) thick full face neoprene gasket suitable for 104 degrees C (220 degrees F).
- 2.3.2.4. Flange bolting: Carbon steel machine bolts or studs and nuts, ASTM A307, Grade B.

2.4. FITTINGS FOR PLASTIC PIPING

2.4.1. Chemical feed piping for condenser water treatment: Chlorinated polyvinyl chloride (CPVC), Schedule 80, ASTM F439.

2.5. DIELECTRIC FITTINGS

- 2.5.1. Provide where copper tubing and ferrous metal pipe are joined.
- 2.5.2. 50 mm (2 inches) and Smaller: Threaded dielectric union, ASME B16.39.
- 2.5.3. 65 mm (2 1/2 inches) and Larger: Flange union with dielectric gasket and bolt sleeves, ASME B16.42.
- 2.5.4. Temperature Rating, 99 degrees C (210 degrees F).

2.6. UNION

- 2.6.1. 50 mm (2") diam and smaller:
 - 2.6.1.1. All brass construction with ground joint and either solder joint or screwed ends as required.
 - 2.6.1.2. Class 150 black malleable iron construction with brass to iron ground joint and screwed ends, conforming to ASTM A197 and ANSI/ASME B1.20.1.
 - 2.6.1.3. Provide dielectric unions or couplings at all connections between copper tubing and ferrous piping or equipment.

2.7. FLANGES

- 2.7.1. Class 150 forged steel slip-on or weld-neck raised face type conforming to ASTM A181 Grade 1 and ANSI/ASME B16.5. Remove raised face where flanges connect to Class 125 cast iron valves.
- 2.7.2. Hinged, two piece, shouldered or keyed cast malleable iron
- 2.7.3. Conforming to ASTM A47 Grade 32510 with elastomeric gasket suitable for service and lock bolt.

2.8. GASKETS AND BOLTS

2.8.1. Gaskets

- 2.8.1.1. 1.6 mm (1/16") Garlock 3200 with SBR binder or equivalent asbestos free material.

2.8.2. Bolts

- 2.8.2.1. Semi finished hex head machine bolts and semi finished hex nuts, both of carbon steel conforming to ASTM A307 Class A.

2.9. PLUGS

- 2.9.1. 50 mm (2") diam and smaller
- 2.9.2. Class 3000 screwed, square head, machined from solid steel or forging to ASTM A105 Grade 2.

2.10. SCREWED JOINTS

- 2.10.1. Pipe Thread: ANSI B1.20.
- 2.10.2. Lubricant or Sealant: Oil and graphite or other compound approved for the intended service.

2.11. VALVES

- 2.11.1. Asbestos packing is not acceptable.
- 2.11.2. All valves of the same type shall be products of a single manufacturer.
- 2.11.3. Provide chain operators for valves 150 mm (6 inches) and larger when the centerline is located 2400 mm (8 feet) or more above the floor or operating platform.

2.11.4. Standard of Acceptance: Crane, Toyo, Kitz, RWV

2.11.5. Shut-Off Valves

2.11.5.1. Ball Valves (Pipe sizes 50 mm [2"] and smaller): MSS-SP 110, screwed or solder connections, brass or bronze body with chrome-plated ball with full port and Teflon seat at 2760 kPa (400 psig) working pressure rating. Provide stem extension to allow operation without interfering with pipe insulation.

2.11.5.2. Butterfly Valves (Pipe Sizes 65 mm [2-1/2"] and larger): Provide stem extension to allow 50 mm (2 inches) of pipe insulation without interfering with valve operation. MSS SP 67, flange lug type end rated 1205 kPa (175 psig) working pressure at 93 degrees C (200 degrees F). Valves shall be ANSI Leakage Class VI and rated for bubble tight shut-off to full valve pressure rating. Valve shall be rated for dead end service and bi-directional flow capability to full rated pressure. Not permitted for direct buried pipe applications.

2.11.5.2.1. Body: Cast iron, ASTM A126, Class B. Malleable iron, ASTM A47 electro-plated, or ductile iron, ASTM A536, Grade 65 45 12 electro-plated.

2.11.5.2.2. Trim: Bronze, aluminum bronze, or 300 series stainless steel disc, bronze bearings, 316 stainless steel shaft and manufacturer's recommended resilient seat. Resilient seat shall be field replaceable, and fully line the body to completely isolate the body from the product. A phosphate coated steel shaft or stem is acceptable, if the stem is completely isolated from the product.

2.11.5.2.3. Actuators: Field interchangeable. Valves for balancing service shall have adjustable memory stop to limit open position.

2.11.5.2.4. Valves 150 mm (6 inches) and smaller: Lever actuator with minimum of seven locking positions, except where chain wheel is required.

2.11.5.2.5. Valves 200 mm (8 inches) and larger: Enclosed worm gear with handwheel, and where required, chain wheel operator.

2.11.5.3. Globe and Angle Valves

2.11.5.3.1. Globe Valves

- 50 mm (2 inches) and smaller: MSS SP 80, bronze, 1034 kPa (150 lb.) Globe valves shall be union bonnet with metal plug type disc.
- 65 mm (2 1/2 inches) and larger: 861 kPa (125 psig), flanged, iron body, bronze trim, MSS SP 85 for globe valves.

2.11.5.3.2. Angle Valves:

- 50 mm (2 inches) and smaller: MSS SP 80, bronze, 1034 kPa (150 lb.) Angle valves shall be union bonnet with metal plug type disc.
- 65 mm (2 1/2 inches) and larger: 861 kPa (125 psig), flanged, iron body, bronze trim, MSS SP 85 for angle.

2.11.5.3.3. Check Valves

- Swing Check Valves:
- 50 mm (2 inches) and smaller: MSS SP 80, bronze, 1034 kPa (150 lb.), 45 degree swing disc.
- 65 mm (2 1/2 inches) and larger: 861 kPa (125 psig), flanged, iron body, bronze trim, MSS SP 71 for check valves.
- Non Slam or Silent Check Valve: Spring loaded double disc swing check or internally guided flat disc lift type check for bubble tight shut off. Provide where check valves are shown in chilled water and hot water piping. Check valves incorporating a balancing feature may be used.
- Body: MSS-SP 125 cast iron, ASTM A126, Class B, or steel, ASTM A216, Class WCB, or ductile iron, ASTM 536, flanged, grooved, or wafer type.
- Seat, disc and spring: 18 8 stainless steel, or bronze, ASTM B62. Seats may be elastomer material.

2.11.5.3.4. Water Flow Balancing Valves: For flow regulation and shut off. Valves shall be line size rather than reduced to control valve size.

- Standard of Acceptance: Crane, Toyo, Kitz, RWV, Armstrong
- General

Globe style valve.

Provide a readout kit including flow meter, readout probes, hoses, flow charts or calculator, and carrying case.

Standard of Acceptance: Armstrong CBV series, Taco, Tour and Anderson

- Valves ½" to 2" diam:

Valves are to be of the 'Y' pattern, equal percentage globe-style and provide three functions: 1) Precise flow measurement, 2) Precision flow balancing, 3) Positive drip-tight shut-off.

Valve shall provide multi-turn, 360° adjustment with micrometer type indicators located on the valve handwheel. Valves shall have a minimum of five full 360° handwheel turns. 90° 'circuit-setter' style ball valves are not acceptable. Valve handle shall have hidden memory feature, which will provide a means for locking the valve position after the system is balanced.

Valves shall be furnished with precision machined venturi built into the valve body to provide highly accurate flow measurement and flow balancing. The venturi shall have two, ¼" threaded brass metering ports with check valves and gasketed caps located on the inlet side of the valve. Valves shall be furnished with flow smoothing fins downstream of the valve seat and integral to the forged valve body to make the flow

more laminar. The valve body, stem and plug shall be brass. The handwheel shall be high-strength resin.

- Valves 2-1/2" to 12" diam:

Valves are to be of the 'Y' pattern, equal percentage globe-style and provide three functions: 1) Precise flow measurement, 2) Precision flow balancing, 3) Positive drip-tight shut-off.

Valve shall provide multi-turn, 360° adjustment with micrometer type indicators located on the valve handwheel. Valves shall have a minimum of five full 360° handwheel turns. 90° 'circuit-setter' style ball valves are not acceptable. Valve handle shall have hidden memory feature, which will provide a means for locking the valve position after the system is balanced.

Valves shall be furnished with precision machined venturi built into the valve body to provide highly accurate flow measurement and flow balancing. The venturi shall have two, 1/4" threaded brass metering ports with check valves and gasketed caps located on the inlet side of the valve. Valves shall be furnished with flow smoothing fins downstream of the valve seat and integral to the forged valve body to make the flow more laminar. The valve body, stem and plug shall be brass. The handwheel shall be high-strength resin.

2.11.5.3.5. Automatic Balancing Control Valves:

- Use only where specifically approved by the consultant
- Factory calibrated to maintain constant flow (plus or minus five percent) over system pressure fluctuations of at least 10 times the minimum required for control. Provide standard pressure taps and four sets of capacity charts. Valves shall be line size and be one of the following designs:
- Gray iron (ASTM A126) or brass body rated 1205 kPa (175 psig) at 93 degrees C (200 degrees F), with stainless steel piston and spring.
- Brass or ferrous body designed for 2067 kPa (300 psig) service at 121 degrees C (250 degrees F), with corrosion resistant, tamper proof, self cleaning piston/spring assembly that is easily removable for inspection or replacement.
- Provide a readout kit including flow meter, probes, hoses, flow charts and carrying case.
- Standard of Acceptance: Kitz, RWV

2.11.5.3.6. Manual Radiator/Convactor Valves: Brass, packless, with position indicator.

2.12. WATER FLOW MEASURING DEVICES

- 2.12.1. Minimum overall accuracy plus or minus three percent over a range of 70 to 110 percent of design flow. Select devices for not less than 110 percent of design flow rate.
- 2.12.2. Venturi Type: Bronze, steel, or cast iron with bronze throat, with valved pressure sensing taps upstream and at the throat.
- 2.12.3. Wafer Type Circuit Sensor: Cast iron wafer type flow meter equipped with readout valves to facilitate the connecting of a differential pressure meter. Each readout valve shall be fitted with an integral check valve designed to minimize system fluid loss during the monitoring process.
- 2.12.4. Self Averaging Annular Sensor Type: Brass or stainless steel metering tube, shutoff valves and quick coupling pressure connections. Metering tube shall be rotatable so all sensing ports may be pointed down stream when unit is not in use.
- 2.12.5. Flow Measuring Device Identification:
 - 2.12.5.1. Metal tag attached by chain to the device.
 - 2.12.5.2. Include meter or equipment number, manufacturer's name, meter model, flow rate factor and design flow rate in l/m (gpm).
 - 2.12.5.3. Permanently Mounted Water Flow Indicating Meters: Minimum 150 mm (6 inch) diameter, or 450 mm (18 inch) long scale, for 120 percent of design flow rate, direct reading in lps (gpm), with three valve manifold and two shut off valves.

2.13. STRAINERS

- 2.13.1. Basket or Y Type.
 - 2.13.1.1. Screens: Bronze, monel metal or 18 8 stainless steel, free area not less than 2 1/2 times pipe area, with perforations as follows: 1.1 mm (0.045 inch) diameter perforations for 100 mm (4 inches) and larger: 3.2 mm (0.125 inch) diameter perforations.

2.14. EXPANSION JOINTS

- 2.14.1. Factory built devices, inserted in the pipe lines, designed to absorb axial cyclical pipe movement which results from thermal expansion and contraction. This includes factory-built or field-fabricated guides located along the pipe lines to restrain lateral pipe motion and direct the axial pipe movement into the expansion joints.
- 2.14.2. Manufacturing Quality Assurance: Conform to Expansion Joints Manufacturers Association Standards.

2.14.3. Bellows Internally Pressurized Type:

- 2.14.3.1. Multiple corrugations of Type 304 or Type A240-321 stainless steel.
- 2.14.3.2. Internal stainless steel sleeve entire length of bellows.
- 2.14.3.3. External cast iron equalizing rings for services exceeding 340 kPa (50 psig).
- 2.14.3.4. Welded ends.
- 2.14.3.5. Design shall conform to standards of EJMA and ASME B31.1.
- 2.14.3.6. External tie rods designed to withstand pressure thrust force upon anchor failure if one or both anchors for the joint are at change in direction of pipeline.
- 2.14.3.7. Integral external cover.

2.14.4. Bellows Externally Pressurized Type:

- 2.14.4.1. Multiple corrugations of Type 304 stainless steel.
- 2.14.4.2. Internal and external guide integral with joint.
- 2.14.4.3. Design for external pressurization of bellows to eliminate squirm.
- 2.14.4.4. Welded ends.
- 2.14.4.5. Conform to the standards of EJMA and ASME B31.1.
- 2.14.4.6. Threaded connection at bottom, 25 mm (one inch) minimum, for drain or drip point.
- 2.14.4.7. Integral external cover and internal sleeve.

2.14.5. Expansion Compensators:

- 2.14.5.1. Corrugated bellows, externally pressurized, stainless steel or bronze.
- 2.14.5.2. Internal guides and anti torque devices.
- 2.14.5.3. Threaded ends.
- 2.14.5.4. External shroud.
- 2.14.5.5. Conform to standards of EJMA.

2.14.6. Expansion Joint Identification: Provide stamped brass or stainless steel nameplate on each expansion joint listing the manufacturer, the allowable movement, flow direction, design pressure and temperature, date of manufacture, and identifying the expansion joint by the identification number on the contract drawings.

2.14.7. Guides: Provide factory-built guides along the pipe line to permit axial movement only and to restrain lateral and angular movement. Guides must be designed to withstand a minimum of 15 percent of the axial force which will be imposed on the expansion joints and anchors. Field-built guides may be used if detailed on the contract drawings.

- 2.14.8. Supports: Provide saddle supports and frame or hangers for heat exchanger. Mounting height shall be adjusted to facilitate gravity return of steam condensate. Construct supports from steel, weld joints.

2.15. GAGES, TEMPERATURE, PRESSURE AND COMPOUND

- 2.15.1. See Section: 23 05 00 Common Work Results for HVAC.
- 2.15.2. Provide brass lever handle union cock. Provide brass/bronze pressure snubber for gages in water service.
- 2.15.3. Range of Gages: Provide range equal to at least 150 percent of normal operating range.

2.16. PRESSURE/TEMPERATURE TEST PROVISIONS

- 2.16.1. Pete's Plug: 6 mm (1/4 inch) MPT by 75 mm (3 inches) long, brass body and cap, with retained safety cap, nordelfself closing valve cores, permanently installed in piping where shown, or in lieu of pressure gage test connections shown on the drawings.

2.17. FIRESTOPPING MATERIAL

- 2.17.1. Refer to Section: 23 05 00 Common Work Results for HVAC.

2.18. ELECTRICAL HEAT TRACING SYSTEMS

- 2.18.1. Systems shall meet requirements of the National Electrical Code (NEC), Section 427.
- 2.18.2. Provide tracing for outdoor piping subject to freezing temperatures (Below 38 degrees F) as follows:
- 2.18.2.1. Heat tracing shall be provided to the extent shown on the drawings (Floor plans and Elevations). Heat tracing shall extend below grade to below the defined frost line.
 - 2.18.2.2. Heating Cable: Flexible, parallel circuit construction consisting of a continuous self-limiting resistance, conductive inner core material between two parallel copper bus wires, designed for cut to length at the job site and for wrapping around valves and complex fittings. Self-regulation shall prevent overheating and burnouts even where the cable overlaps itself.
 - 2.18.2.3. Provide end seals at ends of circuits. Wire at the ends of the circuits is not to be tied together.
 - 2.18.2.4. Provide sufficient cable, as recommended by the manufacturer, to keep the pipe surface at 2.2 degrees C (36 degrees F) minimum during winter outdoor design temperature, but not less than the following:

- 2.18.2.5. 75 mm (3 inch) pipe and smaller with 25 mm (1 inch) thick insulation: 4 watts per foot of pipe.
- 2.18.2.6. 100 mm (4 inch) pipe and larger 38 mm (1 1/2 inch) thick insulation: 8 watts per feet of pipe.
- 2.18.3. Electrical Heating Tracing Accessories:
 - 2.18.3.1. Power supply connection fitting and stainless steel mounting brackets. Provide stainless steel worm gear clamp to fasten bracket to pipe.
 - 2.18.3.2. 13 mm (1/2 inch) wide fiberglass reinforced pressure sensitive cloth tape to fasten cable to pipe at 300 mm (12 inch) intervals.
 - 2.18.3.3. Pipe surface temperature control thermostat: Cast aluminum, NEMA 4 (watertight) enclosure, 13 mm (1/2 inch) NPT conduit hub, SPST switch rated 20 amps at 480 volts AC, with capillary and copper bulb sensor. Set thermostat to maintain pipe surface temperature at not less than 1.1 degrees C (34 degrees F).
 - 2.18.3.4. Signs: Manufacturer's standard (NEC Code), stamped "ELECTRIC TRACED" located on the insulation jacket at 3000 mm (10 feet) intervals along the pipe on alternating sides.

PART 3 - EXECUTION

3.1. GENERAL

- 3.1.1. The drawings show the general arrangement of pipe and equipment but do not show all required fittings and offsets that may be necessary to connect pipes to equipment, fan-coils, coils, radiators, etc., and to coordinate with other trades. Provide all necessary fittings, offsets and pipe runs based on field measurements and at no additional cost to the government. Coordinate with other trades for space available and relative location of HVAC equipment and accessories to be connected on ceiling grid. Pipe location on the drawings shall be altered by contractor where necessary to avoid interferences and clearance difficulties.
- 3.1.2. Store materials to avoid excessive exposure to weather or foreign materials. Keep inside of piping relatively clean during installation and protect open ends when work is not in progress.
- 3.1.3. Support piping securely. Refer to Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- 3.1.4. Install piping generally parallel to walls and column center lines, unless shown otherwise on the drawings. Space piping, including insulation, to provide 25 mm (one inch) minimum clearance between adjacent piping or other surface. Unless shown otherwise, slope drain

piping down in the direction of flow not less than 25 mm (one inch) in 12 m (40 feet). Provide eccentric reducers to keep bottom of sloped piping flat.

- 3.1.5. Locate and orient valves to permit proper operation and access for maintenance of packing, seat and disc. Generally locate valve stems in overhead piping in horizontal position. Provide a union adjacent to one end of all threaded end valves. Control valves usually require reducers to connect to pipe sizes shown on the drawing. Install butterfly valves with the valve open as recommended by the manufacturer to prevent binding of the disc in the seat.
- 3.1.6. Offset equipment connections to allow valving off for maintenance and repair with minimal removal of piping. Provide flexibility in equipment connections and branch line take offs with 3 elbow swing joints where noted on the drawings.
- 3.1.7. Tee water piping runouts or branches into the side of mains or other branches. Avoid bull-head tees, which are two return lines entering opposite ends of a tee and exiting out the common side.
- 3.1.8. Provide manual or automatic air vent at all piping system high points and drain valves at all low points. Install piping to floor drains from all automatic air vents.
- 3.1.9. Connect piping to equipment as shown on the drawings and as recommended by the manufacturer.
- 3.1.10. Install components furnished by others such as:
 - 3.1.10.1. Water treatment pot feeders and condenser water treatment systems.
 - 3.1.10.2. Flow elements (orifice unions), control valve bodies, flow switches, pressure taps with valve, and wells for sensors.
 - 3.1.10.3. Thermometer Wells: In pipes 65 mm (2 1/2 inches) and smaller increase the pipe size to provide free area equal to the upstream pipe area.
- 3.1.11. Firestopping: Fill openings around uninsulated piping penetrating floors or fire walls, with firestop material. For firestopping insulated piping refer to Section: 23 07 00 HVAC Insulation.
- 3.1.12. Where copper piping is connected to steel piping, provide dielectric connections.

3.2. PIPE JOINTS

- 3.2.1. Welded: Beveling, spacing and other details shall conform to ASME B31.1 and AWS B2.1. See Welder's qualification requirements under "Quality Assurance" in Section 23 05 11, COMMON WORK RESULTS FOR HVAC and STEAM GENERATION.

- 3.2.2. Screwed: Threads shall conform to ASME B1.20; joint compound shall be applied to male threads only and joints made up so no more than three threads show. Coat exposed threads on steel pipe with joint compound, or red lead paint for corrosion protection.
- 3.2.3. 125 Pound Cast Iron Flange (Plain Face): Mating flange shall have raised face, if any, removed to avoid overstressing the cast iron flange.
- 3.2.4. Solvent Welded Joints: As recommended by the manufacturer.

3.3. EXPANSION JOINTS (BELLOWS AND SLIP TYPE)

- 3.3.1. Anchors and Guides: Provide type, quantity and spacing as recommended by manufacturer of expansion joint and as shown. A professional engineer shall verify in writing that anchors and guides are properly designed for forces and moments which will be imposed.
- 3.3.2. Cold Set: Provide setting of joint travel at installation as recommended by the manufacturer for the ambient temperature during the installation.
- 3.3.3. Preparation for Service: Remove all apparatus provided to restrain joint during shipping or installation. Representative of manufacturer shall visit the site and verify that installation is proper.
- 3.3.4. Access: Expansion joints must be located in readily accessible space. Locate joints to permit access without removing piping or other devices. Allow clear space to permit replacement of joints and to permit access to devices for inspection of all surfaces and for adding.

3.4. BRAZING

- 3.4.1. Flux shall not be allowed to penetrate to the inside of the pipe. The outside of the tube and fittings shall be cleaned by washing with hot water in order to remove any residual flux.
- 3.4.2. During the brazing of the pipe connections, except when performing final connections and emergency repairs, the interior of the pipe shall be maintained with a nitrogen atmosphere. This shall be done by purging the pipe a sufficient number of times to remove all air and oxygen and by maintaining a small purge flow to prevent reentry of

3.5. LEAK TESTING ABOVEGROUND PIPING

- 3.5.1. Inspect all joints and connections for leaks and workmanship and make corrections as necessary, to the satisfaction of the Resident Engineer. Tests may be either of those below, or a combination, as approved by the Resident Engineer.
- 3.5.2. An operating test at design pressure, and for hot systems, design maximum temperature.
- 3.5.3. A hydrostatic test at 1.5 times design pressure. For water systems the design maximum pressure would usually be the static head, or expansion tank maximum pressure, plus pump head. Factory tested equipment (convertors, exchangers, coils, etc.) need not be field tested. Isolate equipment where necessary to avoid excessive pressure on mechanical seals and safety devices.

3.6. FLUSHING AND CLEANING PIPING SYSTEMS

- 3.6.1. Initial flushing: Remove loose dirt, mill scale, metal chips, weld beads, rust, and like deleterious substances without damage to any system component. Provide temporary piping or hose to bypass coils, control valves, exchangers and other factory cleaned equipment unless acceptable means of protection are provided and subsequent inspection of hide out areas takes place. Isolate or protect clean system components, including pumps and pressure vessels, and remove any component which may be damaged. Open all valves, drains, vents and strainers at all system levels. Remove plugs, caps, spool pieces, and components to facilitate early debris discharge from system. Sectionalize system to obtain debris carrying velocity of 1.8 m/S (6 feet per second), if possible. Connect dead end supply and return headers as necessary. Flush bottoms of risers. Install temporary strainers where necessary to protect down stream equipment. Supply and remove flushing water and drainage by various type hose, temporary and permanent piping and Contractor's booster pumps. Flush until clean as approved by the Resident Engineer.
- 3.6.2. Cleaning: Using products supplied in Section 23 25 00, HVAC WATER TREATMENT, circulate systems at normal temperature to remove adherent organic soil, hydrocarbons, flux, pipe mill varnish, pipe joint compounds, iron oxide, and like deleterious substances not removed by flushing, without chemical or mechanical damage to any system component. Removal of tightly adherent mill scale is not required. Keep isolated equipment which is "clean" and where dead end debris accumulation cannot occur. Sectionalize system if possible, to circulate at velocities not less than 1.8 m/S (6 feet per second). Circulate each section for not less than four hours. Blow down all strainers, or remove and clean as frequently as necessary. Drain and prepare for final flushing.
- 3.6.3. Final Flushing: Return systems to conditions required by initial flushing after all cleaning solution has been displaced by clean make up. Flush all dead ends and isolated clean

equipment. Gently operate all valves to dislodge any debris in valve body by throttling velocity. Flush for not less than one hour.

3.7. ELECTRIC HEAT TRACING

- 3.7.1. Install tracing as recommended by the manufacturer.
- 3.7.2. Coordinate electrical connections.

3.8. OPERATING AND PERFORMANCE TEST AND INSTRUCTION

- 3.8.1. Refer to PART 3 of Section: 23 05 00 Common Work Results for HVAC.
- 3.8.2. Adjust red set hand on pressure gages to normal working pressure.

TABLE OF CONTENTS

PART 1 - GENERAL..... 2

1.1. DESCRIPTION 2

1.2. RELATED WORK 2

1.3. REFERENCE STANDARDS..... 2

1.4. QUALITY ASSURANCE 2

1.5. SUBMITTALS 2

PART 2 - PRODUCTS 3

2.1. ADJUSTABLE SQUARE CONE DIFFUSERS..... 3

2.2. ALUMINUM LOUVERED RETURN GRILLE..... 4

PART 3 - EXECUTION 6

3.1. GENERAL..... 6

PART 1 - GENERAL

1.1. DESCRIPTION

- 1.1.1. Air Outlets and Inlets: Diffusers, Registers, and Grilles.

1.2. RELATED WORK

- 1.2.1. Section: 01 33 23 Shop Drawings, Product Data, and Samples.
- 1.2.2. Section: 23 05 93 Testing, Adjusting and Balancing For HVAC.

1.3. REFERENCE STANDARDS

- 1.3.1. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- 1.3.2. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- 1.3.3. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1.3.3.1. AMCA 500 Test Method for Louvers, Dampers and Shutters.
 - 1.3.3.2. ANSI/NFPA 90A Installation of Air Conditioning and Ventilating Systems.
 - 1.3.3.3. ARI 890 – Rating of Air Diffusers and Air Diffuser Assemblies.
 - 1.3.3.4. ASHRAE 70 Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
 - 1.3.3.5. SMACNA 1035 - HVAC Duct Construction Standards - Metal and Flexible.

1.4. QUALITY ASSURANCE

- 1.4.1. Test and rate performance of air outlets and inlets in accordance with ASHRAE 70.
- 1.4.2. Test and rate performance of louvers in accordance with AMCA 500.
- 1.4.3. Fire Safety Code: Comply with NFPA 90A.

1.5. SUBMITTALS

- 1.5.1. All air distribution equipment to be the product of the same manufacturer.
- 1.5.2. Submit in accordance with Section: 01 33 23 Shop Drawings, Product Data, and Samples the following:

- 1.5.2.1. Manufacturer's name and model number
- 1.5.2.2. Identification as referenced in the documents
- 1.5.2.3. Capacities/ratings
- 1.5.2.4. Materials of construction
- 1.5.2.5. Sound ratings
- 1.5.2.6. Dimensions
- 1.5.2.7. Finish
- 1.5.2.8. Color selection charts where applicable
- 1.5.2.9. Manufacturer's installation instructions
- 1.5.2.10. Mounting methods and frames

PART 2 - PRODUCTS

2.1. ADJUSTABLE SQUARE CONE DIFFUSERS

2.1.1. General

- 2.1.1.1. The square cone diffuser shall be supplied to deliver a 360 degree radial, horizontal airflow pattern. The cones and backpan shall be one-piece die-formed with smooth, aerodynamically designed surfaces and no corner joints. This contoured design shall protect the ceiling and help to prevent smudging and streaking.

2.1.2. Construction:

- 2.1.2.1. Diffusers shall be aluminum construction, and shall consist of a seamless, one-piece, precision formed backpan that incorporates a round inlet collar of sufficient length for connecting rigid or flexible duct and an outer frame which is recessed from the ceiling plane to allow for field adjustment of the airflow discharge from fully horizontal to fully vertical.
- 2.1.2.2. An inner cone assembly shall consist of 3 cones (300x300 size) or 4 cones (600x600 size) which drop below the ceiling plane to assure optimal VAV air diffusion performance. The inner cone assembly shall be completely removable from the diffuser face to allow for full access to any dampers or other ductwork components located near the diffuser neck.
- 2.1.2.3. Non-protrusive airflow directional tabs shall be provided on the back of the inner cones which may be positioned for either horizontal or vertical discharge.
- 2.1.2.4. The diffuser ceiling module size and neck size shall be as noted on the drawings and equipment schedules.

2.1.3. Paint Specification:

- 2.1.3.1. Paint finish shall be as per the architectural finishing schedule. All components shall have a baked-on powder coat finish.
- 2.1.3.2. The paint finish must demonstrate no degradation when tested in accordance with ASTM D1308 (covered and spot immersion) and ASTM D4752 (MEK double rub) paint durability tests.
- 2.1.3.3. The paint film thickness shall be a minimum of 2.0 mils.
- 2.1.3.4. The finish shall have a hardness of 2H.
- 2.1.3.5. The finish shall withstand a minimum salt spray exposure of 500 hours with no measurable creep in accordance with ASTM D1654, and 1000 hours of exposure with no rusting or blistering as per ASTM D610 and ASTM D714.
- 2.1.3.6. The finish shall have an impact resistance of 80 inch-pounds.
- 2.1.3.7. All components shall have a custom finish in a color to match a customer supplied sample.
- 2.1.4. Mounting Frame:
 - 2.1.4.1. The diffuser mounting frame shall be suitable for lay-in or surface mount applications. Refer to architectural reflected ceiling plan and architectural ceiling construction details.
- 2.1.5. Volume Control Damper:
 - 2.1.5.1. The diffuser shall be supplied with a steel radial damper, diffuser mounted
- 2.1.6. Beaded Extended Neck:
 - 2.1.6.1. The diffuser shall be supplied with a beaded neck extended to a depth of 2-1/2 inches.

2.2. ALUMINUM LOUVERED RETURN GRILLE

- 2.2.1. Construction:
 - 2.2.1.1. Grilles shall be 45 degree deflection fixed louver type, and shall have (as noted on the drawings and equipment schedule)
 - 2.2.1.1.1. One set of blades with 3/4 inch on center blade spacing
 - 2.2.1.1.2. One set of blades with 1/2 inch on center blade spacing
 - 2.2.1.2. The grilles front blade orientation shall be front blades parallel to the long dimension.
 - 2.2.1.3. The blades and border shall be extruded aluminum construction.
 - 2.2.1.4. The minimum grille size shall be 6x4 inches (150x100mm). The maximum one-piece grille size shall be 36 inches x 96 inches (900x2,400 mm)

2.2.2. Paint Specification:

- 2.2.2.1. All components shall have a baked-on powder coat finish; finish color as per architectural finishes schedules.
- 2.2.2.2. The paint finish must demonstrate no degradation when tested in accordance with ASTM D1308 (covered and spot immersion) and ASTM D4752 (MEK double rub) paint durability tests.
- 2.2.2.3. The paint film thickness shall be a minimum of 2.0 mils.
- 2.2.2.4. The finish shall have a hardness of 2H.
- 2.2.2.5. The finish shall withstand a minimum salt spray exposure of 1000 hours with no measurable creep in accordance with ASTM D1654, and 1000 hours of exposure with no rusting or blistering as per ASTM D610 and ASTM D714.
- 2.2.2.6. The finish shall have an impact resistance of 80 inch-pounds.
- 2.2.2.7. All components shall have a custom finish in a color to match a customer supplied sample.

2.2.3. Volume controls:

- 2.2.3.1. The grille shall be supplied with a coated aluminum opposed blade damper.

2.2.4. Border Style:

- 2.2.4.1. To suit installation surface, suitable for sidewall mounting or T-bar lay-in mounting, complete with a suitable border. For details, refer to drawings and schedules. Options shall include:
 - 2.2.4.1.1. 1 inch narrow border.
 - 2.2.4.1.2. Panel mount border for T-bar installation.

2.2.5. Mounting Frames: To suit installation location - refer to drawings and schedules. Options shall include:

- 2.2.5.1. 3/8 inch flat border mounting frame.
- 2.2.5.2. spiral duct mounting frame (round exposed duct installation).

2.2.6. Fastening:

- 2.2.6.1. The grille shall be supplied with: refer to drawings layout:
 - 2.2.6.1.1. countersunk screw holes complete with Philips-head screws (exposed installation, side-wall or dry-wall ceiling).
 - 2.2.6.1.2. no screw holes for T-bar installation.

2.2.7. Standard of Acceptance:

2.2.7.1. E.H.Price 630/635 series, Titus, Ruskin

PART 3 - EXECUTION

3.1. GENERAL

- 3.1.1. All installation shall be in accordance with manufacturer's published recommendations.
- 3.1.2. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, reflected ceiling plans, symmetry, and lighting arrangement. Coordinate location of air distribution equipment with lighting fixtures, fire alarm and PA devices.
- 3.1.3. Install air outlets and inlets to ductwork with airtight connection.
- 3.1.4. Provide balancing dampers on duct take off to diffusers, grilles and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.
- 3.1.5. Provide all specialties and frames for air distribution devices as required for proper installation in ceiling type as indicated on Architectural Drawings. Provide all cutting and patching of T-bars, gypsum board, and other ceiling systems as required for installation of air devices.
- 3.1.6. Where diffusers, registers and grilles cannot be installed to avoid seeing inside duct, paint inside of duct with flat black paint to reduce visibility.

TABLE OF CONTENTS

PART 1 - GENERAL	2
1.1. DESCRIPTION	2
1.2. RELATED WORK	2
1.3. SUBMITTALS	2
1.4. QUALITY ASSURANCE	3
1.5. WARRANTY	3
1.6. DELIVERY, STORAGE, AND HANDLING.....	3
PART 2 - PRODUCTS	3
2.1. WALL FIN CONVECTORS	3
PART 3 - EXECUTION	4
3.1. EXAMINATION AND PREPARATION	4
3.2. INSTALLATION.....	4
3.3. CLEANING AND PROTECTION	6

PART 1 - GENERAL

1.1. DESCRIPTION

- 1.1.1. Air terminal units, air flow control valves.

1.2. RELATED WORK

- 1.2.1. Section: 01 33 23 Shop Drawings, Product Data, and Samples.
- 1.2.2. Section: 23 05 00 Common Work Results for HVAC.
- 1.2.3. Section: 23 05 93 Testing, Adjusting and Balancing For HVAC.

1.3. SUBMITTALS

- 1.3.1. Product Data shall be provided with data indicating configuration, general assembly, and materials used in fabrication, including catalog performance ratings that indicate air flow, static pressure, NC designation, electrical characteristics, and connection requirements.
- 1.3.2. Shop Drawings shall indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and piping connection requirements.
- 1.3.3. Certificates shall be issued to certify that the output capacities, pressure drops, and selection procedures meet or exceed specified requirements or coils are tested and rated in accordance with AHRI 410.
- 1.3.4. Manufacturer's Installation Instructions shall indicate support and hanging details, installation instructions, recommendations, and service clearances required.
- 1.3.5. Project Record Documents shall record actual locations of units and controls components and locations of access doors.
- 1.3.6. Operation and Maintenance Data shall include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant-volume regulators.
- 1.3.7. Manufacturer's warranty shall be submitted and ensure forms have been completed in Owner's name and registered with manufacturer.
- 1.3.8. Maintenance Materials shall be furnished for the Board's use in maintenance of the project.
- 1.3.9. Capacity and performance: as indicated in the equipment schedules.

1.4. QUALITY ASSURANCE

- 1.4.1. Manufacturer Qualifications shall be specified in this section, with minimum ten years of documented experience.

1.5. WARRANTY

- 1.5.1. Provide 12-month manufacturer warranty from date of shipment for air terminal units, integral sound attenuators, integral heating coils, and integral controls.

1.6. DELIVERY, STORAGE, AND HANDLING

- 1.6.1. Mark each terminal unit before shipment to the job site with a unique identifier corresponding to its location and function in the building.

PART 2 - PRODUCTS

2.1. WALL FIN CONVECTORS

- 2.1.1.1. Enclosure lengths are assembled together using concealed joiner strips to give a single unit look in every room.
- 2.1.1.2. Enclosures are made of quality cold rolled steel, 16 gauge, formed and reinforced with top supports, degreased, phosphatized and coated inside and out with a corrosion resistant tan primer. Factory paint enclosures with enamel finish; finish colour shall be selected at the shop drawings review stage (provide available colours for selection).
- 2.1.1.3. Panels are manufactured in lengths of 2'0" to 8'0" by 6" increments. Enclosure complete with components for wall to wall installation, following the contour of the wall, complete with end caps, wall trim, concealed joiners, inside corners, outside corners, access doors and pipe covers as required. Joints and filler pieces to be recessed. Support rigidly top and bottom, on wall mounted brackets. Joints and filler pieces to be clear of cover grilles.
- 2.1.1.4. Elements
- 2.1.1.4.1. Elements are seamless copper tube with aluminum fins. The tubes are expanded within the fins to obtain a permanent thermal bond between the two. These are manufactured in lengths of 1'0" to 10'0" by 6" increments. Both elements can be used on either steam or hot water systems.
- 2.1.1.4.2. The aluminum fins are square 4" x 4", min. 52 fins/linear foot of heating element.
- 2.1.1.4.3. All tubes are manufactured to receive standard sweat fittings. The elements are designed for use at 300 deg.F entry water temperature maximum working conditions.

2.1.1.5. Accessories

- 2.1.1.5.1. End Piece: End pieces are used to close off enclosure ends when cabinets do not terminate on an adjacent wall. The end piece is manufactured with rounded corners and protrudes 1" beyond enclosure to give a neat finished appearance.
- 2.1.1.5.2. Wall Trim: Joiners are manufactured to overlap enclosures and cover the gap between cabinet end and adjacent wall or columns. These are usually supplied in 4", 5", 6" or 8" lengths.
- 2.1.1.5.3. Concealed Joiner (Butt Joint): This piece fits between two enclosure lengths to give a clean hairline joint appearance to the installation.
- 2.1.1.5.4. Inside Corner: Inside corners are manufactured to overlap enclosures and are used when piping runs on two or more inside walls to meet heating requirements. These are usually supplied at 90 deg. angles, however may be modified to meet project conditions.
- 2.1.1.5.5. Outside Corner: Outside corners are manufactured to overlap enclosures and are used when piping runs on two or more outside walls to meet heating requirements. These are usually supplied at 90 deg. angles, however may be modified to meet project conditions.
- 2.1.1.5.6. Access Doors: Access doors are manufactured to permit access to valves or other controls located inside enclosure. Two types are available, factory installed 5" x 7" or field mounted 5" x 7" with frame. They are supplied as standard with a screw lock, however a camlock type is also available. For field mounted access doors, the contractor is required to perforate the enclosure.
- 2.1.1.5.7. Pipe Covers: Pipe covers are used to hide pipes that run around a column. These are supplied in 5", 11" or 17" heights and are 3 3/4" deep.

2.1.1.6. Control Valves

- 2.1.1.6.1. Refer to Section: 23 09 00 Instrumentation and Control for HVAC for details and standards of acceptance.

2.1.1.7. Standard of Acceptance: Engineered Air, Rosemex.

PART 3 - EXECUTION

3.1. EXAMINATION AND PREPARATION

- 3.1.1. Review and examine conditions affecting work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. INSTALLATION

- 3.2.1. Work shall be installed as shown and according to the manufacturer's diagrams and recommendations.

- 3.2.2. Handle and install units in accordance with manufacturer's written instructions.
- 3.2.3. Support units rigidly so they remain stationary at all times. Cross bracing or other means of stiffening shall be provided as necessary. Method of support shall be such that distortion and malfunction of units cannot occur.
- 3.2.4. Install in strict accordance with the manufacturer's instruction and with all fittings indicated on the drawings and schematics. Support finned elements using the manufacturer's supplied brackets; space wall-fin supports in accordance with the manufacturer's instructions.
- 3.2.5. Provide for pipe movement during normal operation
- 3.2.6. Ensure that adequate space is provided within the equipment enclosures for the isolation valves, control valves and strainers. Ensure that access doors are provided to all control elements. Panels shall be constructed in a manner to allow for disassembly and access to hot water piping connections without damaging the radiator panel.
- 3.2.7. Manufacturer to visit the site prior to submission of shop drawings and perform accurate measurements, to ensure that the wall-fin covers match the exact room sizes.
- 3.2.8. Where redundant openings are left above, below or around the new heating equipment, make good wall to match existing. Where necessary, enlarge the existing wall openings as required to fit the new equipment. Make good all surfaces affected by the work and paint to match existing wall finishes.
- 3.2.9. Provide power and wiring to all new forced flow heaters; provide all new thermostats, sensors, control valves and control wiring.
- 3.2.10. Automatic control valves shall be supplied, installed and wired by the Mechanical Contractor.
- 3.2.11. Mechanical contractor shall supply the step-down transformers required to power the control valves. Line voltage to the step-down transformers shall be provided by Division 16. Coordinate the location of junction boxes that will provide the power to the step-down controls transformers.
- 3.2.12. Coordinate with Division 16 the location of junction boxes required.
- 3.2.13. Unit heaters
 - 3.2.13.1. Provide neoprene washers at suspension points, to isolate structure from equipment vibrations.

3.2.14. Radiant Panels

- 3.2.14.1. All interconnecting of radiant panels by the mechanical contractor shall consist of factory supplied 360 deg. interconnecting loops and 180 deg. return U-bends made of soft copper tubing, diameter to match linear panel tubing. Supply first to panel tubing pass closest to perimeter wall. Multiple panels shall be circuited to ensure serpentine flow over complete length of zone. Individual serpentine panel coils connected in series is unacceptable for multiple panel zones.
- 3.2.14.2. All radiant panels shall run continuously from wall-to-wall and shall be field trimmed to length ensuring adequate expansion allowance while maintaining panel end coverage by architectural mouldings. Inactive filler panels will be permitted only where indicated on drawings.
- 3.2.14.3. Ensure ceiling openings and wall mouldings are installed as per radiant panel shop drawings.
- 3.2.14.4. All radiant panels shall be installed by personnel wearing clean white gloves, to avoid soiling of panel face. Hanger wires for safety and seismic restraint shall be installed at 4ft. (1200mm) o.c. or as recommended by the manufacturer.
- 3.2.14.5. All system piping shall be thoroughly cleaned, flushed, drained and refilled before radiant panels are connected into the system.
- 3.2.14.6. Each group or zone of coils shall be given a pressure test in accordance with procedures specified elsewhere.
- 3.2.14.7. No installation of finished radiant panels shall begin until all glazing has been completed and all exterior openings closed in.

3.3. CLEANING AND PROTECTION

- 3.3.1. Protect terminal heating equipment, controllers and valves throughout the entire construction period, until Substantial Completion.

TABLE OF CONTENTS

PART 1 - GENERAL	3
1.1. DESCRIPTION	3
1.2. MINIMUM REQUIREMENTS.....	3
1.3. TEST STANDARDS.....	3
1.4. DEFINITIONS	4
1.5. QUALIFICATIONS (PRODUCTS AND SERVICES)	5
1.6. APPLICABLE PUBLICATIONS, CODES AND STANDARDS	5
1.7. MANUFACTURED PRODUCTS	6
1.8. VARIATIONS FROM CONTRACT REQUIREMENTS	7
1.9. MATERIALS AND EQUIPMENT PROTECTION	7
1.10. WORK PERFORMANCE.....	7
1.11. COORDINATION AND INTERFERENCE DRAWINGS	8
1.12. EQUIPMENT INSTALLATION AND REQUIREMENTS	8
1.13. EQUIPMENT IDENTIFICATION.....	9
1.14. SUBMITTALS	9
1.15. RECORD DRAWINGS	11
1.16. ACCEPTANCE CHECKS AND TESTS	12
1.17. CODES, PERMITS AND INSPECTIONS	12
1.18. WARRANTY	13
1.19. INSTRUCTION.....	13
PART 2 - PRODUCTS	13
2.1. MATERIALS AND EQUIPMENT	13
2.2. EQUIVALENTS AND ALTERNATES.....	14
2.3. MATERIAL SUBSTITUTION	15
2.4. WARNING SIGNS.....	15
2.5. FINISHES.....	15
2.6. CAN/CSA/NEMA RATING	16
PART 3 - EXECUTION	16

3.1.	INSTALLATION.....	16
3.2.	SITE SERVICES	17
3.3.	CONTRACTOR'S SHOP	17
3.4.	TEMPORARY SERVICES	17
3.5.	ACCESS TO ELECTRICAL EQUIPMENT, JUNCTION BOXES AND PULL BOXES.....	17
3.6.	NAMEPLATES	18
3.7.	LOCK OFF TABS	18
3.8.	FIRESTOPPING	18
3.9.	BASES AND SUPPORTS.....	19
3.10.	INSERTS, SLEEVES AND CURBS	19
3.11.	CUT PATCH AND MAKE GOOD.....	20
3.12.	REMOVALS AND DEMOLITION	21
3.13.	REMOVED MATERIAL.....	22
3.14.	NUMBER AND LOCATION OF OUTLETS	22
3.15.	MOUNTING HEIGHTS.....	23
3.16.	MECHANICAL AND ELECTRICAL CO-ORDINATION OF RESPONSIBILITIES	24
3.17.	FLASHING.....	25
3.18.	SYSTEM STARTUP	25
3.19.	CLEANING	26

PART 1 - GENERAL

1.1. DESCRIPTION

- 1.1.1. This section applies to all sections of Division 26 - Electrical.
- 1.1.2. Furnish and install electrical systems, materials, equipment, and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, transformers, conductors and cable, switchboards, switchgear, panelboards, motor control centers, generators, automatic transfer switches, and other items and arrangements for the specified items are shown on the drawings.
- 1.1.3. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company's system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company's system, and obtain electric utility company approval for sizes and settings of these devices.
- 1.1.4. Conductor ampacities specified or shown on the drawings are based on copper conductors, with the conduit and raceways sized per NEC. Aluminum conductors are prohibited.

1.2. MINIMUM REQUIREMENTS

- 1.2.1. Canadian Electrical Safety Code, (CESC), National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL), and National Fire Protection Association (NFPA) codes and standards are the minimum requirements for materials and installation.
- 1.2.2. The drawings and specifications shall govern in those instances where requirements are greater than those stated in the above codes and standards.

1.3. TEST STANDARDS

- 1.3.1. All materials and equipment shall be listed, labeled, or certified by a Nationally Recognized Testing Laboratory (NRTL) to meet Underwriters Laboratories, Inc. (UL), standards where test standards have been established. Materials and equipment which are not covered by UL standards will be accepted, providing that materials and equipment are listed, labeled, certified or otherwise determined to meet the safety requirements of a NRTL. Materials and equipment which no NRTL accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as ANSI, NEMA, and NETA. Evidence of compliance shall include certified test reports and definitive shop drawings.

1.4. DEFINITIONS

- 1.4.1. Listed: Materials and equipment included in a list published by an organization that is acceptable to the Authority Having Jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production or listed materials and equipment or periodic evaluation of services, and whose listing states that the materials and equipment either meets appropriate designated standards or has been tested and found suitable for a specified purpose.
- 1.4.2. Labeled: Materials and equipment to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the Authority Having Jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled materials and equipment, and by who's labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
- 1.4.3. "Concealed" means hidden from normal sight in furred spaces, shafts, ceiling spaces, walls, or partitions. Wiring, raceways, and electrical boxes for all new or relocated devices shall be concealed.
- 1.4.4. "Exposed" means work normally visible to any person standing, sitting, or otherwise using the occupied space, including work in equipment rooms, tunnels, and similar spaces.
- 1.4.5. "Provide" (and all tenses) means supply and install for a complete, operational, and code-compliant system, including all devices/equipment as specified complete with wiring, raceways (conduit), electrical boxes, and all other accessories required for a complete, operational, and code compliant installation.
- 1.4.6. "Install" (and all tenses) means secure in position, connect as specified, test, and verify.
- 1.4.7. "Supply" means to supply all devices/equipment to the responsible trade.
- 1.4.8. "Remove" means to isolate, disconnect, disassemble, remove, and dispose of all devices, equipment, wiring, raceways, and connections to other equipment all the way to the main source. Patch and make good all surfaces affected by the removal. Include for all disposal costs in the tender price.
- 1.4.9. The term "approved", "approval", etc., shall be understood to mean approved by authorities having jurisdiction as conforming to Codes, Standards, By-laws, etc.
- 1.4.10. The term "accessible" shall be understood to mean readily accessible by a person using necessary tools but without cutting or breaking out material.

- 1.4.11. The term "listed" shall be understood to mean that the materials or equipment have been tested in accordance with applicable standards, and have been approved and listed for their intended use by a testing company approved by the Authorities having jurisdiction.
- 1.4.12. The term "listed" shall be understood to mean that the materials or equipment have been tested in accordance with applicable standards, and have been approved and listed for their intended use by a testing company approved by the Authorities having jurisdiction
- 1.4.13. Where used, wordings such as "approved, to approval, as directed, permitted, permission, accepted, acceptance", shall mean: approved, directed, permitted, accepted, by an authorized representative of the Owner. and Install: material, equipment and labor shall be provided as required to make the equipment or system fully operational. Include all required wiring, conduit and other electrical devices as required, whether shown on the drawings, specified herein or not.
- 1.4.14. Certified: Materials and equipment which:
 - 1.4.14.1. Have been tested and found to meet nationally recognized standards or to be safe for use in a specified manner.
 - 1.4.14.2. Bear a label, tag, or other record of certification.

1.5. QUALIFICATIONS (PRODUCTS AND SERVICES)

- 1.5.1. Manufacturer's Qualifications: The manufacturer shall regularly and currently produce, as one of the manufacturer's principal products, the materials and equipment specified for this project, and shall have manufactured the materials and equipment for at least three years.
- 1.5.2. Product Qualification:
 - 1.5.2.1. Manufacturer's materials and equipment shall have been in satisfactory operation, on three installations of similar size and type as this project, for at least three years.
 - 1.5.2.2. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within eight hours of receipt of notification that service is needed. Submit name and address of service organizations.

1.6. APPLICABLE PUBLICATIONS, CODES AND STANDARDS

- 1.6.1. Applicable publications listed in all Sections of Division 26 are the latest issue, unless otherwise noted.

1.6.2. Products specified in all sections of Division 26 shall comply with the applicable publications listed in each section.

1.6.3. Publications:

- 1.6.3.1. CAN/CSA C22.1-015, Canadian Electrical Code Part 1 (23rd Edition), Safety Standard for Electrical Installations.
- 1.6.3.2. Ontario Electrical Safety Code 26th Edition / 2015 or later.
- 1.6.3.3. CAN3-C235-83 (R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000V.
- 1.6.3.4. National Building Code of Canada.
- 1.6.3.5. National Fire Code of Canada.
- 1.6.3.6. Ontario Building Code 2012.
- 1.6.3.7. National Fire Protection Code NFPA-70

1.7. MANUFACTURED PRODUCTS

1.7.1. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, and for which replacement parts shall be available.

1.7.2. When more than one unit of the same class or type of materials and equipment is required, such units shall be the product of a single manufacturer.

1.7.3. Equipment Assemblies and Components:

- 1.7.3.1. Components of an assembled unit need not be products of the same manufacturer.
- 1.7.3.2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.

1.7.4. Components shall be compatible with each other and with the total assembly for the intended service.

1.7.5. Constituent parts which are similar shall be the product of a single manufacturer.

1.7.6. Factory wiring and terminals shall be identified on the equipment being furnished and on all wiring diagrams.

1.7.7. When Factory Testing Is Specified:

- 1.7.7.1. The Board shall have the option of witnessing factory tests. The Contractor shall notify the Board a minimum of 15 working days prior to the manufacturer's performing the factory tests.

- 1.7.7.2. When materials and equipment fail factory tests, and re-testing and re-inspection is required, the Contractor shall be liable for all additional expenses for the Board to witness re-testing.

1.8. VARIATIONS FROM CONTRACT REQUIREMENTS

- 1.8.1. Where the Board or the Contractor requests variations from the contract requirements, the connecting work and related components shall include, but not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.

1.9. MATERIALS AND EQUIPMENT PROTECTION

- 1.9.1. Materials and equipment shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.
- 1.9.2. Store materials and equipment indoors in clean dry space with uniform temperature to prevent condensation.
- 1.9.3. During installation, equipment shall be protected against entry of foreign matter, and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.
- 1.9.4. Damaged equipment shall be repaired or replaced, as determined by the Consultant.
- 1.9.5. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
- 1.9.6. Damaged paint on equipment shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

1.10. WORK PERFORMANCE

- 1.10.1. All electrical work shall comply with the requirements of CESC, NFPA 70 (NEC), NFPA 70B, NFPA 70E, OSHA Part 1910 subpart J – General Environmental Controls, OSHA Part 1910 subpart K – Medical and First Aid, and OSHA Part 1910 subpart S – Electrical, in addition to other references required by contract.
- 1.10.2. Job site safety and worker safety is the responsibility of the Contractor.
- 1.10.3. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished in this manner for the required work, the following requirements are mandatory:

- 1.10.4. Electricians must use full protective equipment (i.e., certified and tested insulating material to cover exposed energized electrical components, certified and tested insulated tools, etc.) while working on energized systems in accordance with NFPA 70E.
- 1.10.5. Work on energized circuits or equipment cannot begin until prior written approval is obtained from the Consultant
- 1.10.6. For work that affects existing electrical systems, arrange, phase and perform work to assure minimal interference with normal functioning of the facility.
- 1.10.7. New work shall be installed and connected to existing work neatly, safely and professionally. Disturbed or damaged work shall be replaced or repaired to its prior conditions.
- 1.10.8. Coordinate location of equipment and conduit with other trades to minimize interference.

1.11. COORDINATION AND INTERFERENCE DRAWINGS

- 1.11.1. Provide information and cooperate with the General/Mechanical Contractor for the preparation of interference and coordination drawings.
- 1.11.2. Interference and coordination drawings to be provided in order to make clear the Work intended or to show how it affects other trades.
- 1.11.3. interference and coordination drawings to be provided for:
 - 1.11.3.1. Mechanical, Electrical, Communications Rooms
 - 1.11.3.2. Service corridors and tunnels
 - 1.11.3.3. Corridor, lobbies and all public spaces
 - 1.11.3.4. Crawl spaces
 - 1.11.3.5. Attic spaces
 - 1.11.3.6. Underground Trenches
 - 1.11.3.7. Raised floor spaces

1.12. EQUIPMENT INSTALLATION AND REQUIREMENTS

- 1.12.1. Equipment location shall be as close as practical to locations shown on the drawings.
- 1.12.2. Working clearances shall not be less than specified in the CEC.
- 1.12.3. Inaccessible Equipment:

- 1.12.3.1. Where the Consultant determines that the Contractor has installed equipment not readily accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Board.
- 1.12.3.2. "Readily accessible" is defined as being capable of being reached quickly for operation, maintenance, or inspections without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.
- 1.12.4. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company's system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company's system, and obtain electric utility company approval for sizes and settings of these devices.

1.13. EQUIPMENT IDENTIFICATION

- 1.13.1. In addition to the requirements of the CEC, install an identification sign which clearly indicates information required for use and maintenance of items such as switchboards and switchgear, panelboards, cabinets, motor controllers, fused and non-fused safety switches, generators, automatic transfer switches, separately enclosed circuit breakers, individual breakers and controllers in switchboards, switchgear and motor control assemblies, control devices and other significant equipment.
- 1.13.2. Identification signs for Normal Power System equipment shall be laminated black phenolic resin with a white core with engraved lettering. Identification signs for Essential Electrical System (EES) equipment, as defined in the NEC, shall be laminated red phenolic resin with a white core with engraved lettering. Lettering shall be a minimum of 12 mm (1/2 inch) high. Identification signs shall indicate equipment designation, rated bus amperage, voltage, number of phases, number of wires, and type of EES power branch as applicable. Secure nameplates with screws.
- 1.13.3. Install adhesive arc flash warning labels on all equipment as required by NFPA 70E. Label shall indicate the arc hazard boundary (inches), working distance (inches), arc flash incident energy at the working distance (calories/cm²), required PPE category and description including the glove rating, voltage rating of the equipment, limited approach distance (inches), restricted approach distance (inches), prohibited approach distance (inches), equipment/bus name, date prepared, and manufacturer name and address.

1.14. SUBMITTALS

- 1.14.1. All submittals shall include copies of adequate descriptive literature, catalog cuts, shop drawings, test reports, certifications, samples, and other data necessary for the Board to ascertain that the proposed materials and equipment comply with drawing and specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify specific materials and equipment being submitted.
- 1.14.2. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.
- 1.14.3. The Consultant's approval shall be obtained for all materials and equipment before delivery to the job site. Delivery, storage or installation of materials and equipment which has not had prior approval will not be permitted.
- 1.14.4. The submittals shall include the following:
 - 1.14.4.1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, manuals, pictures, nameplate data, and test reports as required.
 - 1.14.4.2. Elementary and interconnection wiring diagrams for communication and signal systems, control systems, and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
 - 1.14.4.3. Parts list which shall include information for replacement parts and ordering instructions, as recommended by the equipment manufacturer.
- 1.14.5. Maintenance and Operation Manuals:
 - 1.14.5.1. Submit as required for systems and equipment specified in the technical sections. Furnish in hardcover binders or an approved equivalent.
 - 1.14.5.2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, material, equipment, building, name of Contractor, and contract name and number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the material or equipment.
 - 1.14.5.3. Provide a table of contents and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.

1.14.6. The manuals shall include:

- 1.14.6.1. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
- 1.14.6.2. A control sequence describing start-up, operation, and shutdown.
- 1.14.6.3. Description of the function of each principal item of equipment.
- 1.14.6.4. Installation instructions.
- 1.14.6.5. Safety precautions for operation and maintenance.
- 1.14.6.6. Diagrams and illustrations.
- 1.14.6.7. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers.
- 1.14.6.8. Performance data.
- 1.14.6.9. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare and replacement parts, and name of servicing organization.
- 1.14.6.10. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.
- 1.14.6.11. Approvals will be based on complete submission of shop drawings, manuals, test reports, certifications, and samples as applicable.

1.15. RECORD DRAWINGS

- 1.15.1. The Consultant will provide to the Electrical Contractor one set of AutoCad computer files and one set of white prints of all drawings relating to the work of this contract, for the purpose of preparing record drawings. As the job progresses, mark up the white prints to accurately indicate installed work, i.e. location and elevations, etc. On completion of the work, the Electrical Contractor to transfer the information neatly onto the computer files based on AutoCad 2007 or higher, and submit the electronic files and one set of prints for review and comment. Correct the files as directed by the Consultant and hand these over to the Board, together with a set of white prints, on completion.
- 1.15.2. Record, as the job progresses, all approved changes and deviations made to any work shown on the original contract drawings whether by addenda, requested changes, job instructions, and changes due to job conditions.
- 1.15.3. Indicate on the drawings all conduits, pull boxes, junction boxes, empty conduits, concealed main and sub-feeder conduits and any other equipment not clearly in view, with exact dimensions for future reference. Tie dimensions by measurement to existing topographical features, and include changes in directions as well as at least three points on straight runs of conduits on raceways.

- 1.15.4. All conduits in slabs, under slab and direct buried are to be shown on the Record drawings.
- 1.15.5. Record drawings to be kept up to date and be available for checking at any time by Boards and Consultant. Progress draws will not be reviewed unless the record drawing set is up to date.
- 1.15.6. All equipment schedules, panel schedules, system schedules, riser diagrams, details, etc. to be updated to reflect the as installed condition and included as part of the record drawing submission.
- 1.15.7. Provide a schedule indicating the protective device trip setting of all Air Circuit Breakers and Electronic Solid State Circuit Breakers which are reflected on each of the Power Distribution Single Line Riser Diagram drawings. The protective device trip settings that are to be listed in the schedule are to be those which are based upon the final reviewed and accepted version of the short circuit and protection and coordination as well as the arc flash study.
- 1.15.8. Branch circuiting, lighting zoning, switching, etc. methodology to be the same as that indicated on the electrical contract documents that are issued for construction.
- 1.15.9. Electrical record drawings to be submitted in both AutoCad and PDF format.
- 1.15.10. Record drawings will not be reviewed for acceptance until project substantial completion has been issued.

1.16. ACCEPTANCE CHECKS AND TESTS

- 1.16.1. The Contractor shall furnish the instruments, materials, and labor for tests.
- 1.16.2. Where systems are comprised of components specified in more than one section of Division 26, the Contractor shall coordinate the installation, testing, and adjustment of all components between various manufacturer's representatives and technicians so that a complete, functional, and operational system is delivered to the Board.
- 1.16.3. When test results indicate any defects, the Contractor shall repair or replace the defective materials or equipment, and repeat the tests. Repair, replacement, and retesting shall be accomplished at no additional cost to the Board.

1.17. CODES, PERMITS AND INSPECTIONS

- 1.17.1. All work to meet or exceed the latest requirements of the Codes and Standards as listed in PART 1 of these specifications, supplements, local inspection bulletins and all Authorities Having Jurisdiction.

- 1.17.2. Arrange for inspection of all work and pay all fees in this regard. On completion of the work, deliver the final unconditional certificate of approval of the Electrical Safety Authority (ESA).
- 1.17.3. It is hereby agreed that all requirements meet CAN/CSA requirements and a complete installation in accordance with these requirements to be provided.
- 1.17.4. Keep a permanent record of each inspection made by the Electrical Safety Authority showing the date, inspector's name, scope of the inspection and statement of special decisions or permissions granted. Make these records available to the Consultant at any time, and turn them over at completion of the work.

1.18. WARRANTY

- 1.18.1. All work performed and all equipment and material furnished under this Division shall be free from defects and shall remain so for a period of one year from the date of acceptance of the entire installation by the Board's representative.

1.19. INSTRUCTION

- 1.19.1. Instruction to designated Board personnel shall be provided for the particular equipment or system as required in each associated technical specification section.
- 1.19.2. Furnish the services of competent instructors to give full instruction in the adjustment, operation, and maintenance of the specified equipment and system, including pertinent safety requirements. Instructors shall be thoroughly familiar with all aspects of the installation, and shall be trained in operating theory as well as practical operation and maintenance procedures.
- 1.19.3. A training schedule shall be developed and submitted by the Contractor and approved by the Consultant at least 15 days prior to the planned training.

PART 2 - PRODUCTS

2.1. MATERIALS AND EQUIPMENT

- 2.1.1. All materials and equipment to be new and free from defects.
- 2.1.2. All material and equipment to be CAN/CSA certified. Where CAN/CSA certified material and equipment is not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- 2.1.3. Where materials, equipment, apparatus, or other products are specified by the manufacturer, brand name, type or catalogue number, such designation is to establish

the standards of desired quality, style or dimensions and to be the basis of the Bid. Furnish materials so specified under this Contract unless changed by mutual agreement. Where two or more designations are listed, the Electrical Contractor to choose one of those listed.

- 2.1.4. Where the use of equivalent, alternate or substitute equipment alters the design or space requirements indicated on the plans, the Electrical Contractor for this contract to include all items of cost for the revised design and construction, including the cost of all the other trades involved.
- 2.1.5. Acceptance of the proposed equivalents, alternates or substitutions to be subject to the review by the Consultant, and if requested, the Electrical Contractor to submit for inspection, samples of both the specified and the proposed alternate items.
- 2.1.6. In all cases where the use of equivalents, alternates or substitutions is permitted, the Electrical Contractor to bear any extra costs of evaluating the quality of materials and the equipment to be installed.

2.2. EQUIVALENTS AND ALTERNATES

- 2.2.1. Should the Electrical Contractor propose to furnish material and equipment other than those specified, he is to apply in writing to the Consultant for approval of equivalents at least ten working days prior to the closing of Bids, submitting with his request for approval, complete descriptive and technical data on the item or items he proposes to furnish. Approval for changes in the base bid specifications will be considered only upon the individual requests of the Electrical Contractor. No blanket approval for equipment will be given to suppliers, distributors or contractors.
- 2.2.2. Unless requests for changes in base bid specifications are received and approved prior to the opening of the bids, as defined above, the Electrical Contractor will be held to furnish all specified items under his base bid. After the Contract is awarded, changes in specifications will be made only as defined in the Article dealing with Material Substitution.
- 2.2.3. Replace unspecified materials or rejected equivalents and alternates built into the work with specified or accepted materials at no additional cost to the Owner.
- 2.2.4. If any material or equipment being considered for substitution involves additional design, architectural or engineering fees or other costs in checking whether or not the substitute material or equipment is suitable for the project, such fees or costs to be paid for by the Electrical Contractor. A minimum of five hundred dollars (\$500.00) to be applied to each

piece of device or equipment requested for review. There is no guarantee that the reviewed product will be accepted by the Board or the reviewing Consultant.

2.3. MATERIAL SUBSTITUTION

2.3.1. After award of the Contract, requests for substitution of materials of makes other than those specifically named in the Contract Documents may be considered by the Consultant subject to the following:

- 2.3.1.1. The specified material cannot be delivered to the job in time to complete the work in proper sequence to work of other trades, due to conditions beyond the control of the Electrical Contractor.
- 2.3.1.2. Requests for substitutions to be accompanied by documentary proof of equality, difference in price and delivery, if any, in the form of certified quotations from suppliers of both specified and proposed equipment.
- 2.3.1.3. In case of difference in price, the Owner is to receive all benefit of the difference in cost involved in any substitution and the Contract altered by change order to credit the Owner with any savings so obtained.
- 2.3.1.4. Materials and equipment substituted or offered as alternatives to have spare parts and servicing available and to fit into the space allocation shown on the drawings.
- 2.3.1.5. If any material or equipment being considered for substitution involves additional design, architectural or engineering fees or other costs in checking whether or not the substitute material or equipment is suitable for the project, such fees or costs to be paid for by the Electrical Contractor. A minimum of five hundred dollars (\$500.00) to be applied to each piece of device or equipment requested for review. There is no guarantee that the reviewed product will be accepted by the Board or the reviewing Consultant.

2.4. WARNING SIGNS

- 2.4.1. Warning Signs: in accordance with requirements of Authority Having Jurisdiction and Consultants.
- 2.4.2. Comply with Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- 2.4.3. Provide warning labels in both English and French where project requires.

2.5. FINISHES

- 2.5.1. Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and two coats of finish enamel.
- 2.5.2. Paint outdoor electrical distribution equipment green finish to EEMAC Y1-2.
- 2.5.3. Paint indoor normal power distribution equipment enclosures light grey to EEMAC 2Y-1.
- 2.5.4. Paint indoor emergency power "Life Safety" distribution equipment enclosures Red.
- 2.5.5. Paint indoor emergency power "Non-life Safety" distribution equipment enclosures International Orange, RAL #2009.
- 2.5.6. Paint indoor UPS power distribution equipment enclosures Blue, RAL #5017.

2.6. CAN/CSA/NEMA RATING

- 2.6.1. All electrical equipment provided for this project to be CAN/CSA/NEMA Rated only. IEC Rated equipment is not acceptable and will not be accepted.

PART 3 - EXECUTION

3.1. INSTALLATION

- 3.1.1. Comply with all Codes and Standards listed in PART 1 – GENERAL.
- 3.1.2. Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, MSDS, and product datasheets.
- 3.1.3. Protect electrical equipment from dust and dirt. Plug or cap openings of conduits, fixtures and equipment during construction with approved materials for such use.
- 3.1.4. The Electrical Contractor to be responsible for the layout of the work of this contract, and for any damage caused to site or existing building, or other Contracts by improper location or carrying out of this work.
- 3.1.5. Ensure the prompt installation of the work of this contract in advance of concrete pouring or similar work.
- 3.1.6. No conduits for any power or systems to be permitted to be installed within the concrete slabs or concrete walls for this project except in select identified areas as per the drawings and specifications.
- 3.1.7. Furnish items to be "built-in" in ample time and give any necessary information and assistance in connection with the building-in of the same.

- 3.1.8. Manufactured products supplied with instructions for their use to be used in strict accordance with those instructions.
- 3.1.9. Ensure that all equipment and material is ordered in time to meet the building schedule. Provide a schedule of equipment deliveries to the Construction Manager within the time limit stipulated.

3.2. SITE SERVICES

- 3.2.1. Site services: acquire a full working knowledge of the building site, services and any existing conditions thereon that may impact the project implementation. Review and examine the contract drawings and schedules of all trades prior to bid submittal to ensure full knowledge of the contract scope of work is ascertained.
- 3.2.2. The location of equipment indicated or specified is considered approximate. Review proposed locations with Consultant prior to installation.
- 3.2.3. Locate equipment, piping, duct and/or conduit to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

3.3. CONTRACTOR'S SHOP

- 3.3.1. Provide job site office, workshop, tools, scaffolds, material storage, etc., as required to complete the work of this contract and as directed by the Consultant.
- 3.3.2. The electrical contractor's office should as a minimum have the following capabilities, Phone, fax, email, High speed internet connection, router with a spare port and patch cable in order that the consultant can access the internet to deal with project related issues, copier and printer.

3.4. TEMPORARY SERVICES

- 3.4.1. Provide temporary electrical services with all poles, transformer and protection equipment from the locations as coordinated with the Owner. Provide all power panels at various locations on the site required to perform the work and as specified by the Consultant. All temporary services must be coordinated with the Owner. Do not use the permanent service of new or existing building for temporary power for construction unless specific written approval is obtained from the Consultant and coordinated with the Board

3.5. ACCESS TO ELECTRICAL EQUIPMENT, JUNCTION BOXES AND PULL BOXES

- 3.5.1. Clear access of a minimum of 1 meter must be provided for all electrical equipment, junction boxes and pull boxes.
- 3.5.2. All junction boxes and pull boxes to be within 600mm of an access panel or access luminaire and be easily accessed.
- 3.5.3. All electrical boxes that have free sides (IE: no conduits entering or leaving a side) to be kept clear in order to permit installation of conduits at a later date. Hence free sides of all electrical boxes to be clear of other conduits and services.

3.6. NAMEPLATES

- 3.6.1. Ensure manufacturer's nameplates, CAN/CSA labels and identification nameplates are visible and legible after equipment is installed.

3.7. LOCK OFF TABS

- 3.7.1. Provide lock off tabs on all panel boards for circuits that serve:
 - 3.7.1.1. Emergency lighting;
 - 3.7.1.2. Exit lighting;
 - 3.7.1.3. Fire alarm equipment
 - 3.7.1.4. Security equipment.

3.8. FIRESTOPPING

- 3.8.1. Where cables, sleeves or conduits, pass through floors and fire rated walls pack space between wiring and sleeve or opening and seal with Hilti fire stopping system that is appropriate. The fire stopping installation must meet one of the approved details as required to meet the rating of the assembly. Contact the Hilti representative to ensure that the installation meet Hilti requirements.
- 3.8.2. Care must be taken to keep integrity of all assemblies and maintain good finishes of surrounding areas, use tape for finish at edges when apply fire stopping materials. Provide at the end of the project a letter from Hilti indicating that the installation meets all requirements.
- 3.8.3. Meet all requirements of the Codes and fire proofing requirements as specified within the Contract Documents.
- 3.8.4. Provide Shop drawings for the various Fire stopping assemblies that will be utilized on the project to achieve the fire rating for construction assemblies or methods.

- 3.8.5. Refer (where applicable) to architectural drawings for fire separation diagrams. Such drawings may not be issued as part of the electrical documents; it is the electrical contractor's obligation to review all contract documentation of all involved disciplines (drawings and specifications).

3.9. BASES AND SUPPORTS

- 3.9.1. Where conduit and equipment are located on walls or slabs which will not permit the support of equipment, provide suitable supports to the building structure. Supports to be constructed of steel members or of steel pipe and fittings designed to safely support the equipment.
- 3.9.2. All equipment bases to be set on pads of kinetic pre-compressed fiberglass or vibration isolators sized to suit the equipment which they ought to support.

3.10. INSERTS, SLEEVES AND CURBS

- 3.10.1. Provide all inserts, sleeves and curbs required for the work of this contract.
- 3.10.2. Use only factory made threaded or toggle type inserts as required for support and anchors, properly sized for the load to be carried. Place inserts only in portions of the main structure and not in any finishing material.
- 3.10.3. Use factory made expansion shields where inserts cannot be placed, but only where approved by the Structural Engineer and only for loads of 50 kg or less.
- 3.10.4. Do not use powder activated tools unless with written permission of the Board's Representative.
- 3.10.5. Supply and locate all inserts, holes, anchor bolts and sleeves in time when walls, floors and roof are erected.
- 3.10.6. Size sleeves to provide 25 mm clearance all around.
- 3.10.7. Pack all sleeves between the conduit or cable passing through the sleeve and the sleeve and all spare sleeves with loose fiberglass insulation. Seal the annular space both sides as follows:
- 3.10.7.1. For all horizontal sleeves in exposed areas, use a seal of equal or better fire rating than the wall to be sealed.
 - 3.10.7.2. For all horizontal concealed sleeves through fire walls and through walls separating areas of different air pressure, use a permanently resilient silicone base or equal sealing compound.

- 3.10.7.3. For all vertical sleeves through roofs, washrooms, janitor closets, equipment rooms, use permanently resilient silicone base or equal compound, non-flammable and waterproof. Ensure that the seal is compatible with floor and ceiling finishes. Check the room finishes schedules for further information.

3.11. CUT PATCH AND MAKE GOOD

- 3.11.1. All drilling, cutting, patching, concrete curbs, housekeeping pads and similar work required for installation of the specified systems shall be done under this contract.
- 3.11.2. Do not use powder actuated tools using explosives, unless permitted expressly by the Board in writing.
- 3.11.3. All cutting of steel shall be by mechanical cutters or saws. Torches and abrasives will only be permitted if there is no alternative. Prior to using torches or abrasives obtain Hot Work Permit in accordance with the Board's hot work procedure.
- 3.11.4. Scan the walls/floor slabs using ground penetrating radar (GPR) technology prior to making openings to determine the presence and location of embedded conduits or rebar. Clean the floors/walls immediately after core drilling/saw cutting is complete. All core drilling and loud and/or prolonged drilling shall be done after normal working hours (during silent hours) or as permitted by the "hammer drilling" schedule and 48 hour lead notice is to be provided to the building Owner to confirm contractor has met all mandatory conditions.
- 3.11.5. Core drilling through floors and walls shall be done with diamond drills only. The use of pneumatic hammers will not be permitted.
- 3.11.6. Patch and make good all surfaces cut, damaged or disturbed to the Board 's approval. Match existing material, colour, finish and texture.
- 3.11.7. Welding and cutting: conform to Ontario Health and Safety Act O.Reg. 213/91 amended to O.Reg. 628/05 Construction Projects. Obtain a Hot Work Permit from the PM prior to welding and cutting operations. Follow the PM's hot work procedures.
- 3.11.8. Do not dispose of cement, mortar, plaster or other similar materials into drainage system. Contractor shall be liable for all costs associated with cleanup and reinstatement to original condition after doing so.
- 3.11.9. Dispose of sediment-containing liquids such as those resulting from core drilling or concrete cutting into designated drains. Flush drain with sufficient quantity of clean water to ensure that drain is free-flowing and unobstructed. Be liable for all costs associated

with cleanup and reinstatement of drain and piping to original condition if found to be blocked by sediment.

- 3.11.10. Firestop all penetrations through wall and floor assemblies with Hilti Firestop solutions having a fire resistance rating not less than the assembly penetrated, colour: red. Unless otherwise noted, use the following assembly ratings: floors 2-hours; walls except around stairways – 1½ hours; walls around stairways: 2 – hours. Submit to Consultant for approval the proposed system detail sheets bearing the UL/CUL system number. Provide specified firestopping compound on both sides of assembly penetrated regardless of UL/CUL detail requirements.

3.12. REMOVALS AND DEMOLITION

- 3.12.1. The drawings indicate the general scope of electrical removals. Verify on site the exact requirements and extent of removals.
- 3.12.2. Visit the site to determine the extent of all removals.
- 3.12.3. Maintain, retain and make good as required all existing systems, branch wiring and feeders intended to remain operational in areas which are affected by these renovations.
- 3.12.4. Schedule all demolition work with project manager prior to any service interruption in occupied building area.
- 3.12.5. All shutdowns of existing base building systems shall be coordinated with the Board's representative. Pay for any cost incurred. All building services to remain fully operational during construction. Include in tender for off hours to install new breaker in existing panels and connection for feeders.
- 3.12.6. Remove electrical equipment as required complete with wiring up to associated panel. Remove all electrical components to be demolished or to be relocated and make safe all wiring. Hand over removed items to owner if requested. Dispose of the equipment properly which Owner does not wish to retain. Update existing panel directory which is affected.
- 3.12.7. Inform the Consultant and the Board immediately if any contaminated materials are found on site. Remove the items so that they can be packed and removed from the site. Provide assistance and cooperation for the complete removal.
- 3.12.8. The contractor shall be responsible to relocate any existing electrical equipment and/or wiring that will interfere with new construction.

- 3.12.9. The contractor shall be responsible for reconnection of any services that are to remain and have been disconnected during the course of demolition or construction.
- 3.12.10. All systems and components which are affected by the renovation shall remain operational subsequent to project completion. Reinstall immediately any services disrupted during demolition not intended to be removed as part of this contract at no extra cost.
- 3.12.11. Retain continuity of service of the fire alarm system to all occupied areas of the building.
- 3.12.12. The contractor shall advise security in the event that fire alarm system continuity is disrupted such that a fire watch can commence immediately.
- 3.12.13. Repair all damages inside and outside of the renovated areas caused by the demolition/construction without extra cost to the Owner.

3.13. REMOVED MATERIAL

- 3.13.1. All material removed during demolition shall become the property of the Contractor. The contractor shall remove material from the site and dispose of in accordance with provincial regulations. Under no circumstances is the contractor to use the building Owner's refuse containers for disposal.

3.14. NUMBER AND LOCATION OF OUTLETS

- 3.14.1. Provide outlets for power and systems of the number and in the locations shown on the drawings. Locate all outlets accurately with respect to building lines and in centering outlets due allowance to be made for overhead pipes, ducts, equipment and for variations in wall or ceiling finishes, window trim, paneling, etc. When necessary, make adjustments to ensure that all outlets are properly centered.
- 3.14.2. The location of any outlet may be changed without extra cost or credit providing that the new location is within 6 metres (20 feet) of that originally shown on the drawings and that instructions for the change are issued before installation of the outlet.
- 3.14.3. Do not mount outlet boxes in walls and partitions back-to-back and provide a minimum of 150 mm (6 inch) between boxes. Provide acoustic insulating medium in conduits which join boxes on opposite sides of same wall or partition. Acoustic properties of the wall to be matched or exceeded. Where applicable, for acoustically sensitive/critical rooms, more spacing separation and acoustic box seal is required. Refer to acoustic specifications and electrical drawings for detailed requirements.

3.15. MOUNTING HEIGHTS

- 3.15.1. The mounting height of equipment is measured from the finished floor to the centerline of the equipment unless specified or otherwise indicated.
- 3.15.2. If the mounting height of any equipment is not indicated, verify the mounting height before proceeding with the installation.
- 3.15.3. Install electrical equipment at the following mounting heights unless otherwise detailed or indicated. Refer to Architectural reflected ceiling plans, elevations, sections and details for final device location and to confirm all mounting heights.
- 3.15.4. All device mounting heights and orientation to be coordinated and confirmed by the Prime Consultant prior to installation.
 - 3.15.4.1. Local switches and control devices: 1100 mm (42 inch)
 - 3.15.4.2. Wall receptacles:
 - 3.15.4.2.1. General: 400 mm (15 inch)
 - 3.15.4.2.2. Above top of counters or backsplash: 175 mm (7 inch)
 - 3.15.4.2.3. In mechanical rooms: 1400 mm (55 inch)
- 3.15.5. Panelboards:
 - 3.15.5.1. 1800 mm (70 inch) to the top except that the panelboard not to be lower than 150 mm (6 inch) above the floor.
 - 3.15.5.2. Where multiple panelboards are mounted together, align the tops of all the panelboards or trims with the highest panelboard determining the height.
- 3.15.6. Fire alarm system pull stations: 1200 mm (48 inch)
 - 3.15.6.1. Fire alarm system speakers/strobes: 2300 mm (90 inch) and at least 150 mm (6 inch) below the ceiling measured to the top of device, or on ceiling.
 - 3.15.6.2. Fire Alarm System end of line resistors as per code requirements. EOL resistors to be grouped in service spaces.
 - 3.15.6.3. Fire fighter's phone: 1400 mm (55 inch) measured to the centerline of the enclosure.
- 3.15.7. Individual starters:
 - 3.15.7.1. 1500 mm (60 inch) to the top.
 - 3.15.7.2. Where multiple starters are mounted together, align the tops of all the starters or trims with the highest starter determining the height.

3.15.8. Splitters: 100 mm (4 inch) below the lowest equipment connected to the splitter.

3.16. MECHANICAL AND ELECTRICAL CO-ORDINATION OF RESPONSIBILITIES

3.16.1. The following is a list of mechanical and electrical responsibilities for the above mentioned project:

- 3.16.1.1. The Electrical Contractor to provide all starters or combinations starters/disconnects (fused or non-fused, as specified) for Mechanical Motors along with Line and Load side power wiring with the exception of Packaged Mechanical Equipment or Units.
- 3.16.1.2. Where so specified, Packaged Mechanical Equipment to be provided with its own integral disconnect(s), starters(s) or unit mounted VFD(s). With respect to Packaged Mechanical Equipment or Units the Electrical Contractor to provide the Line Side power wiring and connection(s) to the equipment connection point(s).
- 3.16.1.3. The Electrical Contractor to provide equipment isolation disconnect switches for all remote mechanical equipment unless otherwise indicated within the Mechanical Contract Documents or unless equipment is already furnished with a local disconnect. Where applicable, weather-proof enclosures shall be used. Remote definition: not in sight, as per NFPA-70 article 430.102
- 3.16.1.4. All BAS equipment and devices, to be supplied by the BAS vendor and installed by the mechanical Contractor.
- 3.16.1.5. The Mechanical Contractor to provide all control wiring, BAS wiring, and 120 volt control wiring for Mechanical Equipment or Units.
- 3.16.1.6. The Mechanical Contractor to provide all motors.
- 3.16.1.7. The Electrical Contractor to provide all fire alarm interface wiring to the Mechanical Equipment or Units for fire alarm Fan Shut Down, Fan Start-up as and for fire alarm Smoke Control.
- 3.16.1.8. The Electrical Contractor to provide all fire alarm wiring.
- 3.16.1.9. The Electrical Contractor to provide all relays for interface to control wiring for fan shutdown and fan start up for air handling units used as part of the smoke control system(s).
- 3.16.1.10. The Mechanical Contractor to provide all relays as required by the Mechanical Equipment or Units to connect to the various building systems.
- 3.16.1.11. The Mechanical Contractor to provide electric pipe heat tracing which to be based upon the self-limited type and be at 208 volts 1 Phase. The Electrical Contractor to provide 208 volts 1 Phase power connection(s) for the electric pipe heat tracing system(s). The Mechanical Contractor to provide loads requirements of the heat tracing to the Electrical Contractor prior to final power connection.

- 3.16.1.12. The Mechanical Contractor to provide electric heating, associated controls and control wiring. The Electrical Contractor to provide the Line Side power connection to the electric heating. The Mechanical Contractor to provide any framing required for recessed electric heating.
- 3.16.1.13. Separate Variable Frequency Drives (VFDs) to be provided by the Mechanical Contractor. Should the Mechanical Contractor change or modify motor sizes from what is specified within the Bid Documents during any stage of this project the Mechanical Contractor will be responsible to cover all associated electrical costs such as revised motor starter and feeds, etc.

3.17. FLASHING

- 3.17.1. Coordinate with requirements for roofing, waterproofing and flashing with the Roofing Contractor.
- 3.17.2. Flash electrical parts passing through or built into a roof, an outside wall or a waterproof floor.
- 3.17.3. Provide 8-pound sheet lead flashing for cast iron or wrought iron sleeves passing through roof.
- 3.17.4. Flashing shall suit roof angle and shall extend minimum 450 mm (18 inch) on all sides. Leave flashing as directed by the Roofing Contractor for him to build into roofing, rendering a watertight connection.
- 3.17.5. Provide counter flashing on stacks, ducts and pipes passing through roof to fit over flashing or curb.
- 3.17.6. Provide sleeves passing through outside walls with lead or copper flashing as directed.

3.18. SYSTEM STARTUP

- 3.18.1. Inform Consultant and operating personnel in operation, care and maintenance of systems, system equipment and components.
- 3.18.2. Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- 3.18.3. Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

3.19. CLEANING

- 3.19.1. Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- 3.19.2. Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.
- 3.19.3. During the performance of the work and on the completion, remove from the site and premises all debris, rubbish and waste materials caused by the performance of the work for this contract. Remove all tools and surplus materials after completion and acceptance of the work.
- 3.19.4. Vacuum all equipment thoroughly at the time of final acceptance of the work. Clean plastic components and exposed components of luminaires in accordance with the manufacturer's recommendation.

TABLE OF CONTENTS

PART 1 - GENERAL..... 2

1.1. DESCRIPTION 2

1.2. RELATED WORK 2

1.3. FACTORY TESTS..... 2

1.4. SUBMITTALS 2

1.5. APPLICABLE PUBLICATIONS..... 2

PART 2 - PRODUCTS 3

2.1. CONDUCTORS AND CABLES..... 3

2.2. SPLICES..... 4

2.3. CONNECTORS AND TERMINATIONS 4

2.4. CONTROL WIRING..... 5

2.5. WIRE LUBRICATING COMPOUND 5

PART 3 - EXECUTION 5

3.1. GENERAL..... 5

3.2. SPLICE AND TERMINATION INSTALLATION 6

3.3. CONDUCTOR IDENTIFICATION..... 6

3.4. FEEDER CONDUCTOR IDENTIFICATION 6

3.5. EXISTING CONDUCTORS 7

3.6. CONTROL WIRING INSTALLATION 7

3.7. CONTROL WIRING IDENTIFICATION 7

3.8. ACCEPTANCE CHECKS AND TESTS 7

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104

SECTION 26 15 19
PAGE 2
MARCH 2026

PART 1 - GENERAL

1.1. DESCRIPTION

- 1.1.1. This section specifies the furnishing, installation, connection, and testing of the electrical conductors and cables for use in electrical systems rated 600 V and below, indicated as cable(s), conductor(s), wire, or wiring in this section.

1.2. RELATED WORK

- 1.2.1. Section: 26 05 00 Common Work Results for Electrical.
- 1.2.2. Section: 26 05 26 Grounding and Bonding for Electrical Systems.
- 1.2.3. Section: 26 05 33 Raceway and Boxes for Electrical Systems.

1.3. FACTORY TESTS

- 1.3.1. Conductors and cables shall be thoroughly tested at the factory per NEMA to ensure that there are no electrical defects. Factory tests shall be certified.

1.4. SUBMITTALS

1.4.1. Shop Drawings:

- 1.4.1.1. Submit sufficient information to demonstrate compliance with drawings and specifications.
- 1.4.1.2. Submit the following data for approval:
- 1.4.1.3. Electrical ratings and insulation type for each conductor and cable.
- 1.4.1.4. Splicing materials and pulling lubricant.

1.4.2. Certifications: Two weeks prior to final inspection, submit the following.

- 1.4.2.1. Certification by the manufacturer that the conductors and cables conform to the requirements of the drawings and specifications.
- 1.4.2.2. Certification by the Contractor that the conductors and cables have been properly installed, adjusted, and tested.

1.5. APPLICABLE PUBLICATIONS

- 1.5.1. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are reference in the text by designation only.

- 1.5.1.1. CAN/CSA-C22.2 NO.38-10, Thermoset-Insulated Wire and Cables (Tri-national

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104

SECTION 26 15 19
PAGE 3
MARCH 2026

- 1.5.1.2. standard, with UL 44 and ANCE NMX-J-451).
- 1.5.1.3. CAN/CSA C22.2 NO.51-09, Armored Cables.
- 1.5.1.4. CAN/CSA C22.2 NO.75-08, Thermoplastic-Insulated Wires and Cables (Trinational
- 1.5.1.5. standard, with UL 83 and NMX-J-010-ANCE-2008).
- 1.5.1.6. CAN/CSA C22.2 NO.124-04 (R2009), Mineral-Insulated Cable.
- 1.5.1.7. CAN/CSA C22.2 NO.131-07, Type TECK 90 Cable.
- 1.5.1.8. CAN/CSA C22.2 NO. 239-09, Control and Instrumentation Cables.
- 1.5.1.9. American Society of Testing Material (ASTM):
 - 1.5.1.9.1. D2301-10 Standard Specification for Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape
 - 1.5.1.9.2. D2304-10 Test Method for Thermal Endurance of Rigid Electrical Insulating Materials
 - 1.5.1.9.3. D3005-10 Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape
- 1.5.1.10. National Electrical Manufacturers Association (NEMA):
 - 1.5.1.10.1. WC 70-09 Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy
- 1.5.1.11. National Fire Protection Association (NFPA):
 - 1.5.1.11.1. 70-11 National Electrical Code (NEC)
- 1.5.1.12. Underwriters Laboratories, Inc. (UL):
- 1.5.1.13. 44-10 Thermoset-Insulated Wires and Cables
- 1.5.1.14. 83-08 Thermoplastic-Insulated Wires and Cables
- 1.5.1.15. 467-07 Grounding and Bonding Equipment
- 1.5.1.16. 486A-486B-03 Wire Connectors
- 1.5.1.17. 486C-04 Splicing Wire Connectors
- 1.5.1.18. 486D-05 Sealed Wire Connector Systems
- 1.5.1.19. 486E-09 Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors
- 1.5.1.20. 514B-04 Conduit, Tubing, and Cable Fittings

PART 2 - PRODUCTS

2.1. CONDUCTORS AND CABLES

- 2.1.1. Conductors and cables shall be in accordance with NEMA, UL, as specified herein, and as shown on the drawings.
- 2.1.2. All conductors shall be copper.
- 2.1.3. Single Conductor and Cable:

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104

SECTION 26 15 19
PAGE 4
MARCH 2026

- 2.1.3.1. No. 12 AWG: Minimum size, except where smaller sizes are specified herein or shown on the drawings.
- 2.1.3.2. No. 8 AWG and larger: Stranded.
- 2.1.3.3. No. 10 AWG and smaller: Solid; except shall be stranded for final connection to motors, transformers, and vibrating equipment.
- 2.1.4. Insulation: THHN-THWN and XHHW-2. XHHW-2 shall be used for isolated power systems.

2.2. SPLICES

- 2.2.1. Splices shall be in accordance with NEC and UL.
- 2.2.2. Above Ground Splices for No. 10 AWG and Smaller:
 - 2.2.2.1. Solderless, screw on, reusable pressure cable type, with integral insulation, approved for copper and aluminum conductors.
 - 2.2.2.2. The integral insulator shall have a skirt to completely cover the stripped conductors.
 - 2.2.2.3. The number, size, and combination of conductors used with the connector, as listed on the manufacturer's packaging, shall be strictly followed.
- 2.2.3. Above Ground Splices for No. 8 AWG to No. 4/0 AWG:
 - 2.2.3.1. Compression, hex screw, or bolt clamp type of high conductivity and corrosion resistant material, listed for use with copper and aluminum conductors.
 - 2.2.3.2. Insulate with materials approved for the particular use, location, voltage, and temperature. Insulation level shall be not less than the insulation level of the conductors being joined.
 - 2.2.3.3. Splice and insulation shall be product of the same manufacturer.
 - 2.2.3.4. All bolts, nuts, and washers used with splices shall be cadmium-plated.
- 2.2.4. Above Ground Splices for 250 kcmil and Larger:
 - 2.2.4.1. Long barrel "butt-splice" or "sleeve" type compression connectors, with minimum of two compression indents per wire, listed for use with copper and aluminum conductors.
 - 2.2.4.2. Insulate with materials approved for the particular use, location, voltage, and temperature. Insulation level shall be not less than the insulation level of the conductors being joined.
 - 2.2.4.3. Splice and insulation shall be product of the same manufacturer.

2.3. CONNECTORS AND TERMINATIONS

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

**TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104**

**SECTION 26 15 19
PAGE 5
MARCH 2026**

- 2.3.1. Mechanical type of high conductivity and corrosion resistant material, listed for use with copper and aluminum conductors.
- 2.3.2. Long barrel compression type of high conductivity and corrosion resistant material, with minimum of two compression indents per wire, listed for use with copper and aluminum conductors.
- 2.3.3. All bolts, nuts, and washers used to connect connections and terminations to bus bars or other termination points shall be cadmium-plated.

2.4. CONTROL WIRING

- 2.4.1. Unless otherwise specified elsewhere in these specifications, control wiring shall be as specified herein, except that the minimum size shall be not less than No. 14 AWG.
- 2.4.2. Control wiring shall be sized such that the voltage drop under in-rush conditions does not adversely affect operation of the controls.

2.5. WIRE LUBRICATING COMPOUND

- 2.5.1. Lubricating compound shall be suitable for the wire insulation and conduit, and shall not harden or become adhesive.
- 2.5.2. Shall not be used on conductors for isolated power systems.

PART 3 - EXECUTION

3.1. GENERAL

- 3.1.1. Install conductors in accordance with the CSEC, NEC, as specified, and as shown on the drawings.
- 3.1.2. Install all conductors in metallic conduits, unless specified otherwise. Where multiple conduits follow the same routing, provide raceway systems.
- 3.1.3. Splice conductors only in outlet boxes, junction boxes, pullboxes, manholes, or handholes.
- 3.1.4. Conductors of different systems (e.g., 120 V and 347 V) shall not be installed in the same raceway.
- 3.1.5. Install conduit supports for all vertical feeders in accordance with the NEC. Provide split wedge type which firmly clamps each individual cable and tightens due to cable weight.

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

**TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104**

**SECTION 26 15 19
PAGE 6
MARCH 2026**

- 3.1.6. In panelboards, cabinets, wireways, switches, enclosures, and equipment assemblies, neatly form, train, and tie the conductors with non-metallic ties.
- 3.1.7. For connections to motors, transformers, and vibrating equipment, stranded conductors shall be used only from the last fixed point of connection to the motors, transformers, or vibrating equipment.
- 3.1.8. Use expanding foam or non-hardening duct-seal to seal conduits entering a building or where penetrating building walls/floors, after installation of conduits.
- 3.1.9. Conductor and Cable Pulling:
 - 3.1.9.1. Provide installation equipment that will prevent the cutting or abrasion of insulation during pulling. Use lubricants approved for the cable.
 - 3.1.9.2. Use nonmetallic pull ropes.
 - 3.1.9.3. Attach pull ropes by means of either woven basket grips or pulling eyes attached directly to the conductors.
 - 3.1.9.4. All conductors in a single conduit shall be pulled simultaneously.
 - 3.1.9.5. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
 - 3.1.9.6. No more than three branch circuits shall be installed in any one conduit.
 - 3.1.9.7. When stripping stranded conductors, use a tool that does not damage the conductor or remove conductor strands.

3.2. SPLICE AND TERMINATION INSTALLATION

- 3.2.1. Splices and terminations shall be mechanically and electrically secure, and tightened to manufacturer's published torque values using a torque screwdriver or wrench.
- 3.2.2. Where the Consultant determines that unsatisfactory splices or terminations have been installed, replace the splices or terminations at no additional cost to the Board.

3.3. CONDUCTOR IDENTIFICATION

- 3.3.1. When using colored tape to identify phase, neutral, and ground conductors larger than No. 8 AWG, apply tape in half-overlapping turns for a minimum of 75 mm (3 inches) from terminal points, and in junction boxes, pullboxes, and manholes. Apply the last two laps of tape with no tension to prevent possible unwinding. Where cable markings are covered by tape, apply tags to cable, stating size and insulation type.

3.4. FEEDER CONDUCTOR IDENTIFICATION

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104

SECTION 26 15 19
PAGE 7
MARCH 2026

- 3.4.1. In each interior pullbox, install brass tags on all feeder conductors to clearly designate their circuit identification and voltage. The tags shall be the embossed type, 40 mm (1-1/2 inches) in diameter and 40 mils thick. Attach tags with plastic ties.

3.5. EXISTING CONDUCTORS

- 3.5.1. Unless specifically indicated on the plans, existing conductors shall not be reused.

3.6. CONTROL WIRING INSTALLATION

- 3.6.1. Unless otherwise specified in other sections, install control wiring and connect to equipment to perform the required functions as specified or as shown on the drawings.
- 3.6.2. Install a separate power supply circuit for each system, except where otherwise shown on the drawings.

3.7. CONTROL WIRING IDENTIFICATION

- 3.7.1. Install a permanent wire marker on each wire at each termination.
- 3.7.2. Identifying numbers and letters on the wire markers shall correspond to those on the wiring diagrams used for installing the systems.
- 3.7.3. Wire markers shall retain their markings after cleaning.

3.8. ACCEPTANCE CHECKS AND TESTS

- 3.8.1. Perform in accordance with the manufacturer's recommendations. In addition, include the following:
 - 3.8.1.1. Visual Inspection and Tests: Inspect physical condition.
- 3.8.2. Electrical tests:
 - 3.8.2.1. After installation but before connection to utilization devices, such as fixtures, motors, or appliances, test conductors' phase-to-phase and phase-to-ground resistance with an insulation resistance tester. Existing conductors to be reused shall also be tested.
 - 3.8.2.2. Applied voltage shall be 500 V DC for 300 V rated cable, and 1000 V DC for 600 V rated cable. Apply test for one minute or until reading is constant for 15 seconds, whichever is longer. Minimum insulation resistance values shall not be less than 25 megohms for 300 V rated cable and 100 megohms for 600 V rated cable.
 - 3.8.2.3. Perform phase rotation test on all three-phase circuits

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104

SECTION 26 05 26
PAGE 1
MARCH 2026

TABLE OF CONTENTS

PART 1 - GENERAL	2
1.1. DESCRIPTION	2
1.2. RELATED WORK	2
1.3. QUALITY ASSURANCE	2
1.4. SUBMITTALS	2
1.5. APPLICABLE PUBLICATIONS.....	3
PART 2 - PRODUCTS	3
2.1. GROUNDING AND BONDING CONDUCTORS.....	4
2.2. GROUND RODS	4
2.3. CONCRETE ENCASED ELECTRODE.....	5
2.4. GROUND CONNECTIONS	5
2.5. EQUIPMENT RACK AND CABINET GROUND BARS	5
2.6. GROUND TERMINAL BLOCKS.....	5
2.7. GROUNDING BUS BAR	5
PART 3 - EXECUTION	6
3.1. GENERAL.....	6
3.2. INACCESSIBLE GROUNDING CONNECTIONS.....	6
3.3. SECONDARY VOLTAGE EQUIPMENT AND CIRCUITS	6
3.4. RACEWAY.....	7
3.5. OUTDOOR METALLIC FENCES AROUND ELECTRICAL EQUIPMENT	8
3.6. CORROSION INHIBITORS.....	8
3.7. CONDUCTIVE PIPING	9
3.8. MAIN ELECTRICAL ROOM GROUNDING	9
3.9. GROUND RESISTANCE.....	9
3.10. GROUND ROD INSTALLATION.....	9
3.11. ACCEPTANCE CHECKS AND TESTS	9

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104

SECTION 26 05 26
PAGE 2
MARCH 2026

PART 1 - GENERAL

1.1. DESCRIPTION

- 1.1.1. This section specifies the furnishing, installation, connection, and testing of grounding and bonding equipment, indicated as grounding equipment in this section.
- 1.1.2. "Grounding electrode system" refers to grounding electrode conductors and all electrodes required or allowed by CESC and NEC, as well as made, supplementary, and lightning protection system grounding electrodes.
- 1.1.3. The terms "connect" and "bond" are used interchangeably in this section and have the same meaning.

1.2. RELATED WORK

- 1.2.1. Section: 26 05 00 Common Work Results for Electrical.
- 1.2.2. Section: 26 05 19 Low-Voltage Electrical Power Conductors and Cables.
- 1.2.3. Section: 26 05 33 Raceway and Boxes for Electrical Systems.

1.3. QUALITY ASSURANCE

- 1.3.1. Quality Assurance shall be in accordance with Section: 26 05 00 Common Work Results for Electrical.

1.4. SUBMITTALS

- 1.4.1. Submit in accordance with requirements of Section: 26 05 00 Common Work Results for Electrical, and the following requirements:
 - 1.4.1.1. Shop Drawings:
 - 1.4.1.1.1. Submit sufficient information to demonstrate compliance with drawings and specifications.
 - 1.4.1.1.2. Submit plans showing the location of system grounding electrodes and connections, and the routing of aboveground and underground grounding electrode conductors.
 - 1.4.1.2. Test Reports:
 - 1.4.1.2.1. Two weeks prior to the final inspection, submit ground resistance field test reports to the Consultant
 - 1.4.1.3. Certifications:
 - 1.4.1.3.1. Certification by the Contractor that the grounding equipment has been properly installed and tested.

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104

SECTION 26 05 26
PAGE 3
MARCH 2026

1.5. APPLICABLE PUBLICATIONS

1.5.1. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

1.5.2. Canadian Standards Association (CSA)

1.5.2.1. CAN/CSA Standard C22.2 No.0.4-04(R2009) - Bonding of Electrical Equipment.

1.5.2.2. CAN/CSA Standard C22.2 No.41-07 - Grounding and Bonding Equipment (Bi-national standard, with UL 467).

1.5.2.3. Canadian and Ontario Electrical Safety Codes. (Latest Edition).

1.5.3. ANSI/TIA/EIA-607.

1.5.4. (CAN/CSA TS27) Best Practices for Ground and Bonding of Devices in Telecommunication Spaces.

1.5.5. Latest edition of IEEE Standard No. 80.

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

1.5.6.1. B1-13 Standard Specification for Hard-Drawn Copper Wire

1.5.6.2. B3-13 Standard Specification for Soft or Annealed Copper Wire

1.5.6.3. B8-11 Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

1.5.7. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

1.5.7.1. 81-12 IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System Part 1: Normal Measurements

1.5.8. National Fire Protection Association (NFPA):

1.5.8.1. 70-17 National Electrical Code (NEC)

1.5.8.2. 70E-15 National Electrical Safety Code

1.5.9. Underwriters Laboratories, Inc. (UL):

1.5.9.1. 44-14 Thermoset Insulated Wires and Cables

1.5.9.2. 83-14 Thermoplastic Insulated Wires and Cables

1.5.9.3. 467-13 Grounding and Bonding Equipment

PART 2 - PRODUCTS

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104

SECTION 26 05 26
PAGE 4
MARCH 2026

2.1. GROUNDING AND BONDING CONDUCTORS

- 2.1.1. Install a complete, permanent and continuous system for earthing and grounding of networks, circuits and apparatus. The system shall include electrodes, conductor, connectors and required accessories on drawings to satisfy local authorities.
- 2.1.2. Install bonding/grounding connections from exposed non-current carrying metal parts of equipment including, but not necessarily limited to the following:
 - 2.1.2.1. Frames of all motors.
 - 2.1.2.2. All Starters.
 - 2.1.2.3. Main Electrical Switchboards.
 - 2.1.2.4. Medium Voltage Load Interrupter Switches.
 - 2.1.2.5. Panelboards and Distribution Panels.
 - 2.1.2.6. Isolations Switch(es).
 - 2.1.2.7. Exterior mounted cable trays.
 - 2.1.2.8. Raised floor pedestals.
 - 2.1.2.9. Conductive Flooring.
 - 2.1.2.10. Communication Rooms.
 - 2.1.2.11. Transformers.
 - 2.1.2.12. Transfer Switches.
 - 2.1.2.13. Power Raceway System.
 - 2.1.2.14. Generating equipment.
- 2.1.3. Install connectors according to manufacturer's recommendations.
- 2.1.4. Equipment grounding conductors shall be insulated stranded copper, except that sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG and larger shall be identified per NEC.
- 2.1.5. Bonding conductors shall be bare stranded copper, except that sizes No. 10 AWG and smaller shall be bare solid copper. Bonding conductors shall be stranded for final connection to motors, transformers, and vibrating equipment.
- 2.1.6. Conductor sizes shall not be less than shown on the drawings, or not less than required by the NEC, whichever is greater.
- 2.1.7. Insulation: THHN-THWN and XHHW-2. XHHW-2 shall be used for isolated power systems.

2.2. GROUND RODS

- 2.2.1. Copper clad steel, 19 mm (0.75 inch) diameter by 3m (10 feet) long.

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

**TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104**

**SECTION 26 05 26
PAGE 5
MARCH 2026**

2.2.2. Quantity of rods shall be as required to obtain the specified ground resistance.

2.3. CONCRETE ENCASED ELECTRODE

2.3.1. Concrete encased electrode shall be No. 4 AWG bare copper wire, installed per NEC.

2.4. GROUND CONNECTIONS

2.4.1. Below Grade and Inaccessible Locations: Exothermic-welded type connectors.

2.4.2. Above Grade:

2.4.2.1. Bonding Jumpers: Listed for use with copper conductors. For wire sizes No. 8 AWG and larger, use compression-type connectors. For wire sizes smaller than No. 8 AWG, use mechanical type lugs. Connectors or lugs shall use zinc-plated steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.

2.4.2.2. Connection to Building Steel: Exothermic-welded type connectors.

2.4.2.3. Connection to Grounding Bus Bars: Listed for use with aluminum and copper conductors. Use mechanical type lugs, with zinc-plated steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.

2.4.2.4. Connection to Equipment Rack and Cabinet Ground Bars: Listed for use with aluminum and copper conductors. Use mechanical type lugs, with zinc-plated steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.

2.5. EQUIPMENT RACK AND CABINET GROUND BARS

2.5.1. Provide solid copper ground bars designed for mounting on the framework of open or cabinet-enclosed equipment racks. Ground bars shall have minimum dimensions of 6.3 mm (0.25 inch) thick x 19 mm (0.75 inch) wide, with length as required or as shown on the drawings. Provide insulators and mounting brackets.

2.6. GROUND TERMINAL BLOCKS

2.6.1. At any equipment mounting location (e.g., backboards and hinged cover enclosures) where rack-type ground bars cannot be mounted, provide mechanical type lugs, with zinc-plated steel bolts, nuts, and washers. Bolts shall be torqued to the values recommended by the manufacturer.

2.7. GROUNDING BUS BAR

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104

SECTION 26 05 26
PAGE 6
MARCH 2026

- 2.7.1. Pre-drilled rectangular copper bar with stand-off insulators, minimum 6.3 mm (0.25 inch) thick x100 mm (4 inches) high in cross-section, length as shown on the drawings, with hole size, quantity, and spacing per detail shown on the drawings. Provide insulators and mounting brackets.

PART 3 - EXECUTION

3.1. GENERAL

- 3.1.1. Installation shall be in accordance with the CEC, NEC, and manufacturer's instructions.
- 3.1.2. System Grounding:
 - 3.1.2.1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformer.
 - 3.1.2.2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.
 - 3.1.2.3. Equipment Grounding: Metallic piping, building structural steel, electrical enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits, shall be bonded and grounded.

3.2. INACCESSIBLE GROUNDING CONNECTIONS

- 3.2.1. Make grounding connections, which are normally buried or otherwise inaccessible, by exothermic weld.

3.3. SECONDARY VOLTAGE EQUIPMENT AND CIRCUITS

- 3.3.1. Main Bonding Jumper: Bond the secondary service neutral to the ground bus in the service equipment.
- 3.3.2. Metallic Piping, Building Structural Steel, and Supplemental Electrode(s):
 - 3.3.2.1. Provide a grounding electrode conductor sized per CESC and NEC between the service equipment ground bus and all metallic water pipe systems, building structural steel, and supplemental or made electrodes. Provide jumpers across insulating joints in the metallic piping.
 - 3.3.2.2. Provide a supplemental ground electrode to bond to the grounding electrode system.
- 3.3.3. Switchgear, Switchboards, Unit Substations, Panelboards, Motor Control Centers, Engine-Generators, Automatic Transfer Switches, and other electrical equipment:

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104

SECTION 26 05 26
PAGE 7
MARCH 2026

- 3.3.3.1. Connect the equipment grounding conductors to the ground bus.
- 3.3.3.2. Connect metallic conduits by grounding bushings and equipment grounding conductor to the equipment ground bus.

3.3.4. Transformers:

- 3.3.4.1. Exterior: Exterior transformers supplying interior service equipment shall have the neutral grounded at the transformer secondary. Provide a grounding electrode at the transformer.
- 3.3.4.2. Separately derived systems (transformers downstream from service equipment): Ground the secondary neutral at the transformer. Provide a grounding electrode conductor from the transformer to the nearest suitable component of the grounding electrode system.

3.4. RACEWAY

3.4.1. Conduit Systems:

- 3.4.1.1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor.
- 3.4.1.2. Nonmetallic conduit systems, except non-metallic feeder conduits that carry a grounded conductor from exterior transformers to interior or building-mounted service entrance equipment, shall contain an equipment grounding conductor.
- 3.4.1.3. Metallic conduit that only contains a grounding conductor, and is provided for its mechanical protection, shall be bonded to that conductor at the entrance and exit from the conduit.
- 3.4.1.4. Metallic conduits which terminate without mechanical connection to an electrical equipment housing by means of locknut and bushings or adapters, shall be provided with grounding bushings. Connect bushings with a equipment grounding conductor to the equipment ground bus.

3.4.2. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders, and power and lighting branch circuits.

3.4.3. Boxes, Cabinets, Enclosures, and Panelboards:

- 3.4.3.1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes (except for special grounding systems for intensive care units and other critical units shown).
- 3.4.3.2. Provide lugs in each box and enclosure for equipment grounding conductor termination.

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

**TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104**

**SECTION 26 05 26
PAGE 8
MARCH 2026**

3.4.4. Wireway Systems:

- 3.4.4.1. Bond the metallic structures of wireway to provide electrical continuity throughout the wireway system, by connecting a No. 6 AWG bonding jumper at all intermediate metallic enclosures and across all section junctions.
 - 3.4.4.2. Install insulated No. 6 AWG bonding jumpers between the wireway system, bonded as required above, and the closest building ground at each end and approximately every 16 M (50 feet).
 - 3.4.4.3. Use insulated No. 6 AWG bonding jumpers to ground or bond metallic wireway at each end for all intermediate metallic enclosures and across all section junctions.
 - 3.4.4.4. Use insulated No. 6 AWG bonding jumpers to ground cable tray to column-mounted building ground plates (pads) at each end and approximately every 15 M (49 feet).
 - 3.4.4.5. Receptacles shall not be grounded through their mounting screws. Ground receptacles with a jumper from the receptacle green ground terminal to the device box ground screw and a jumper to the branch circuit equipment grounding conductor.
- 3.4.5. Ground lighting fixtures to the equipment grounding conductor of the wiring system. Fixtures connected with flexible conduit shall have a green ground wire included with the power wires from the fixture through the flexible conduit to the first outlet box.
- 3.4.6. Fixed electrical appliances and equipment shall be provided with a ground lug for termination of the equipment grounding conductor.

3.5. OUTDOOR METALLIC FENCES AROUND ELECTRICAL EQUIPMENT

- 3.5.1. Fences shall be grounded with a ground rod at each fixed gate post and at each corner post.
- 3.5.2. Drive ground rods until the top is 300 mm (12 inches) below grade. Attach a No. 4 AWG copper conductor by exothermic weld to the ground rods, and extend underground to the immediate vicinity of fence post. Lace the conductor vertically into 300 mm (12 inches) of fence mesh and fasten by two approved bronze compression fittings, one to bond the wire to post and the other to bond the wire to fence. Each gate section shall be bonded to its gatepost by a 3 mm x 25 mm (0.375 inch x 1 inch) flexible, braided copper strap and ground post clamps. Clamps shall be of the anti-electrolysis type.

3.6. CORROSION INHIBITORS

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

**TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104**

**SECTION 26 05 26
PAGE 9
MARCH 2026**

- 3.6.1. When making grounding and bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.

3.7. CONDUCTIVE PIPING

- 3.7.1. Bond all conductive piping systems, interior and exterior, to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.
- 3.7.2. In operating rooms and at intensive care and coronary care type beds, bond the medical gas piping and medical vacuum piping at the outlets directly to the patient ground bus.

3.8. MAIN ELECTRICAL ROOM GROUNDING

- 3.8.1. Provide ground bus bar and mounting hardware at each main electrical room where incoming feeders are terminated, as shown on the drawings. Connect to pigtail extensions of the building grounding ring, as shown on the drawings.

3.9. GROUND RESISTANCE

- 3.9.1. Grounding system resistance to ground shall not exceed 5 ohms. Make any modifications or additions to the grounding electrode system necessary for compliance without additional cost to the Government. Final tests shall ensure that this requirement is met.
- 3.9.2. Grounding system resistance shall comply with the electric utility company ground resistance requirements.

3.10. GROUND ROD INSTALLATION

- 3.10.1. For outdoor installations, drive each rod vertically in the earth, until top of rod is 610 mm (24 inches) below final grade.
- 3.10.2. For indoor installations, leave 100 mm (4 inches) of each rod exposed.
- 3.10.3. Where buried or permanently concealed ground connections are required, make the connections by the exothermic process, to form solid metal joints. Make accessible ground connections with mechanical pressure-type ground connectors.
- 3.10.4. Where rock or impenetrable soil prevents the driving of vertical ground rods, install angled ground rods or grounding electrodes in horizontal trenches to achieve the specified ground resistance.

3.11. ACCEPTANCE CHECKS AND TESTS

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

**TENDER NO. 26-7855-RFT
CHALMERS P.S. LIBRARY RENO
CAMBRIDGE, ON.
PROJECT NO. 25-104**

**SECTION 26 05 26
PAGE 10
MARCH 2026**

- 3.11.1. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of-potential method as defined in IEEE 81. Ground resistance measurements shall be made before the electrical distribution system is energized or connected to the electric utility company ground system, and shall be made in normally dry conditions not fewer than 48 hours after the last rainfall.
- 3.11.2. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.
- 3.11.3. Below-grade connections shall be visually inspected by the Consultant prior to backfilling. The Contractor shall notify the Consultant 24 hours before the connections are ready for inspection

TABLE OF CONTENTS

PART 1 - GENERAL	2
1.1. DESCRIPTION	2
1.2. RELATED WORK	2
1.3. QUALITY ASSURANCE	2
1.4. SUBMITTALS	2
1.5. APPLICABLE PUBLICATIONS.....	3
PART 2 - PRODUCTS	4
2.1. MATERIAL	4
2.2. CONDUIT FITTINGS	5
PART 3 - EXECUTION	7
3.1. PENETRATIONS	7
3.2. INSTALLATION, GENERAL.....	7
3.3. CONCEALED WORK INSTALLATION.....	9
3.4. EXPOSED WORK INSTALLATION	9
3.5. HAZARDOUS LOCATIONS.....	10
3.6. WET OR DAMP LOCATIONS	10
3.7. MOTORS AND VIBRATING EQUIPMENT	10
3.8. EXPANSION JOINTS.....	11
3.9. CONDUIT SUPPORTS.....	11
3.10. BOX INSTALLATION.....	12

PART 1 - GENERAL

1.1. DESCRIPTION

- 1.1.1. This section specifies the furnishing, installation, and connection of conduit, fittings, and boxes, to form complete, coordinated, grounded raceway systems. Raceways are required for all wiring unless shown or specified otherwise.
- 1.1.2. Definitions: The term conduit, as used in this specification, shall mean any or all of the raceway types specified.

1.2. RELATED WORK

- 1.2.1. Section: 26 05 00 Common Work Results for Electrical.

1.3. QUALITY ASSURANCE

- 1.3.1. Refer to Paragraph, QUALIFICATIONS, in Section: 26 05 00 Common Work Results for Electrical.

1.4. SUBMITTALS

- 1.4.1. Submit in accordance with Section: 26 05 00 Common Work Results for Electrical.

1.4.2. Shop Drawings:

- 1.4.2.1. Size and location of main feeders.
- 1.4.2.2. Size and location of panels and pull-boxes.
- 1.4.2.3. Layout of required conduit penetrations through structural elements.
- 1.4.2.4. Submit the following data for approval:
- 1.4.2.5. Raceway types and sizes.
- 1.4.2.6. Conduit bodies, connectors and fittings.
- 1.4.2.7. Splitter troughs
- 1.4.2.8. Junction and pull boxes, types and sizes.

1.4.3. Certifications: Two weeks prior to final inspection, submit the following:

- 1.4.3.1. Certification by the manufacturer that raceways, conduits, conduit bodies, connectors, fittings, junction and pull boxes, and all related equipment conform to the requirements of the drawings and specifications.
- 1.4.3.2. Certification by the Contractor that raceway, conduits, conduit bodies, connectors, fittings, junction and pull boxes, and all related equipment have been properly installed.

1.5. APPLICABLE PUBLICATIONS

1.5.1. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

1.5.2. Canadian Standards Association (CSA International)

- 1.5.2.1. CAN/CSA C22.2 No. 18.3-12, Conduit, Tubing, and Cable Fittings (Tri-National standard, with ANCE NMX-J-017 and UL 514B).
- 1.5.2.2. CAN/CSA C22.2 No. 18.4-04 (R2009), Hardware for the Support of Conduit, Tubing, and Cable (Bi-National standard, with UL 2239).
- 1.5.2.3. CAN/CSA C22.2 No. 18.5-02 (R2012), Positioning Devices (Bi-National standard, with UL 1565).
- 1.5.2.4. C22.2 NO.45.1-07, Electrical Rigid Metal Conduit – Steel (Tri-national standard, with UL 6 and NMX-J-534-ANCE-2007).
- 1.5.2.5. C22.2 No.56-04 (R2009) Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- 1.5.2.6. C22.2 NO.83-M1985 (R2008), Electrical Metallic Tubing.
- 1.5.2.7. C22.2 No.211.2-06 (R2011) Rigid PVC (Unplasticized) Conduit.
- 1.5.2.8. CAN/CSA C22.2 NO.227.1-06 (R2011), Electrical Nonmetallic Tubing (Bi-National standard, with UL 1653).
- 1.5.2.9. CAN/CSA C22.2 NO.227.2.1-04 (R2009), Liquid-Tight Flexible Nonmetallic Conduit (Bi-National standard, with UL 1660).
- 1.5.2.10. CAN/CSA C22.2 No. 227.3-05 (R2010), Nonmetallic Mechanical Protection Tubing (NMPT), (Bi-national standard, with UL 1696).

1.5.3. American National Standards Institute (ANSI):

- 1.5.3.1. C80.1-05 Electrical Rigid Steel Conduit
- 1.5.3.2. C80.3-05 Steel Electrical Metal Tubing
- 1.5.3.3. C80.6-05 Electrical Intermediate Metal Conduit

1.5.4. National Fire Protection Association (NFPA):

1.5.5. 70-11 National Electrical Code (NEC)

1.5.6. Underwriters Laboratories, Inc. (UL):

- 1.5.6.1. 1-05 Flexible Metal Conduit
- 1.5.6.2. 5-11 Surface Metal Raceway and Fittings
- 1.5.6.3. 6-07 Electrical Rigid Metal Conduit - Steel

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| 1.5.6.4. | 50-95 | Enclosures for Electrical Equipment |
| 1.5.6.5. | 360-13 | Liquid-Tight Flexible Steel Conduit |
| 1.5.6.6. | 467-13 | Grounding and Bonding Equipment |
| 1.5.6.7. | 514A-13 | Metallic Outlet Boxes |
| 1.5.6.8. | 514B-12 | Conduit, Tubing, and Cable Fittings |
| 1.5.6.9. | 514C-07 | Nonmetallic Outlet Boxes, Flush-Device Boxes and Covers |
| 1.5.6.10. | 797-07 | Electrical Metallic Tubing |
| 1.5.6.11. | 1242-06 | Electrical Intermediate Metal Conduit - Steel |
- 1.5.7. National Electrical Manufacturers Association (NEMA):
- | | | |
|----------|-----------|---|
| 1.5.7.1. | FB1-12 | Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable |
| 1.5.7.2. | FB2.10-13 | Selection and Installation Guidelines for Fittings for use with Non-Flexible Conduit or Tubing (Rigid Metal Conduit, Intermediate Metallic Conduit, and Electrical Metallic Tubing) |
| 1.5.7.3. | FB2.20-12 | Selection and Installation Guidelines for Fittings for use with Flexible Electrical Conduit and Cable |

PART 2 - PRODUCTS

2.1. MATERIAL

- 2.1.1. Conduit Size: In accordance with the CEC/NFPA-70, but not less than 13 mm (0.5-inch) unless otherwise shown.
- 2.1.2. Rigid Steel Conduit (RMC): Shall conform to CAN/CSA C22.2 NO.45.1, UL 6 and ANSI C80.1. *Application: for all outdoor installations and other locations where specified or shown on the drawings.*
- 2.1.3. Rigid Intermediate Steel Conduit (IMC): Shall conform to CAN/CSA C22.2 NO.18.3, UL 1242 and ANSI C80.6. *Application: for all outdoor installations and other locations where specified or shown on the drawings.*
- 2.1.4. Electrical Metallic Tubing (EMT): Shall conform to CAN/CSA C22.2 NO.83, UL 797 and ANSI C80.3. Maximum size not to exceed 105 mm (4 inches) and shall be permitted only with cable rated 600 V or less. *Application: for all indoor installations and other locations where specified or shown on the drawings.*
- 2.1.5. Flexible Metal Conduit: Shall conform to CAN/CSA C22.2 NO.56, UL 1. *Application: last 1000 mm (40") before final connections to burners and other locations where specified or shown on the drawings.*

- 2.1.6. Liquid-tight Flexible Metal Conduit: Shall conform to CAN/CSA C22.2 NO.227.2.1, UL 360.
Applications: last 1000 mm (40") before connecting to motors and other vibrating equipment and other locations where specified or shown on the drawings.

2.2. CONDUIT FITTINGS

2.2.1. Rigid Steel and Intermediate Metallic Conduit Fittings:

- 2.2.1.1. Fittings shall meet the requirements of UL 514B and NEMA FB1.
- 2.2.1.2. Standard threaded couplings, locknuts, bushings, conduit bodies, and elbows: Only steel or malleable iron materials are acceptable. Integral retractable type IMC couplings are also acceptable.
- 2.2.1.3. Locknuts: Bonding type with sharp edges for digging into the metal wall of an enclosure.
- 2.2.1.4. Bushings: Metallic insulating type, consisting of an insulating insert, molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
- 2.2.1.5. Erickson (Union Type) and Set Screw Type Couplings: Approved for use in concrete is permitted for use to complete a conduit run where conduit is installed in concrete. Use set screws of case-hardened steel with hex head and cup point to firmly seat in conduit wall for positive ground. Tightening of set screws with pliers is prohibited.
- 2.2.1.6. Sealing Fittings: Threaded cast iron type. Use continuous drain-type sealing fittings to prevent passage of water vapor. In concealed work, install fittings in flush steel boxes with blank cover plates having the same finishes as that of other electrical plates in the room.

2.2.2. Electrical Metallic Tubing Fittings:

- 2.2.2.1. Fittings and conduit bodies shall meet the requirements of UL 514B, ANSI C80.3, and NEMA FB1.
- 2.2.2.2. Only steel or malleable iron materials are acceptable.
- 2.2.2.3. Both compression and setscrew fittings are allowed, but one choice is to be made for a project. Fittings are to be of uniform type throughout the project.
- 2.2.2.4. Compression Couplings and Connectors: Concrete-tight and rain-tight, with connectors having insulated throats
- 2.2.2.5. Setscrew Couplings and Connectors: Use setscrews of case-hardened steel with hex head and cup point, to firmly seat in wall of conduit for positive grounding
- 2.2.2.6. Indent-type connectors or couplings are prohibited.
- 2.2.2.7. Die-cast or pressure-cast zinc-alloy fittings or fittings made of "pot metal" are prohibited.

2.2.3. Flexible Metal Conduit Fittings:

- 2.2.3.1. Conform to UL 514B. Only steel or malleable iron materials are acceptable.
- 2.2.3.2. Clamp-type, with insulated throat.
- 2.2.3.3. Liquid tight Flexible Metal Conduit Fittings:
- 2.2.3.4. Fittings shall meet the requirements of UL 514B and NEMA FB1.
- 2.2.3.5. Only steel or malleable iron materials are acceptable.
- 2.2.3.6. Fittings must incorporate a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening. Connectors shall have insulated throats.

2.2.4. Surface Metal Raceway Fittings:

- 2.2.4.1. As recommended by the raceway manufacturer. Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, conduit entry fittings, accessories, and other fittings as required for complete system.

2.2.5. Expansion and Deflection Couplings:

- 2.2.5.1. Conform to UL 467 and UL 514B.
- 2.2.5.2. Accommodate a 19 mm (0.75-inch) deflection, expansion, or contraction in any direction, and allow 30 degree angular deflections.
- 2.2.5.3. Include internal flexible metal braid, sized to guarantee conduit ground continuity and a low-impedance path for fault currents, in accordance with UL 467 and the CEC tables for equipment grounding conductors.

2.2.6. Jacket: Flexible, corrosion resistant, watertight, moisture and heat-resistant molded rubber material with stainless steel jacket clamps.

2.2.7. Conduit Supports:

- 2.2.7.1. Parts and Hardware: Zinc coat or provide equivalent corrosion protection.
- 2.2.7.2. Individual Conduit Hangers: Designed for the purpose, having a pre assembled closure bolt and nut, and provisions for receiving a hanger rod.
- 2.2.7.3. Multiple Conduit (Trapeze) Hangers: Not less than 38 mm x 38 mm (1.5 x 1.5 inches), 12-gauge steel, cold-formed, lipped channels; with not less than 9 mm (0.375-inch) diameter steel hanger rods.
- 2.2.7.4. Solid Masonry and Concrete Anchors: Self drilling expansion shields, or machine bolt expansion.

2.2.8. Outlet, Junction, and Pull Boxes:

- 2.2.8.1. Applicable Publications

- 2.2.8.1.1. CAN/CSA C22.2 NO.18.1-04 (R2009), Metallic Outlet Boxes (Tri-National standard with ANCE NMX-J-023/1 and UL 514A).
- 2.2.8.1.2. C22.2 NO.18.2-06, Nonmetallic Outlet Boxes.
- 2.2.8.1.3. CAN/CSA C22.2 NO.18.3-12, Conduit, Tubing and Cable Fittings (Tri-national standard, with ANCE NMX-J-017 and UL 514B).
- 2.2.8.1.4. UL-50 and UL-514A.
- 2.2.8.2. Rustproof cast metal where required by the NEC or shown on drawings.
- 2.2.8.3. Sheet Metal Boxes: Galvanized steel, except where shown on drawings.
- 2.2.9. Metal Wireways: Equip with hinged covers, except as shown on drawings. Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for a complete system.
- 2.2.10. Splitter troughs
 - 2.2.10.1. Sheet metal enclosure with welded edges and hinged shaped cover with locking facility when closed.
 - 2.2.10.2. Copper bus bars c/w terminals corresponding to the number and size of the incoming and outgoing conductors as shown.
 - 2.2.10.3. Unless otherwise indicated the splitters shall have sufficient length to accommodate the layout of the secondary equipment.
 - 2.2.10.4. Supply at least three space terminals for each terminal size in 400 A and less splitters.

PART 3 - EXECUTION

3.1. PENETRATIONS

3.1.1. Cutting or Holes:

- 3.1.1.1. Cut holes in advance where they should be placed in the structural elements, such as ribs or beams.
- 3.1.1.2. Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw.
- 3.1.1.3. Firestop: Where conduits, wireways, and other electrical raceways pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases.
- 3.1.1.4. Verify that roof penetration details are shown on drawings.
- 3.1.1.5. Waterproofing: At floor, exterior wall, and roof conduit penetrations, completely seal the gap around conduit to render it watertight.

3.2. INSTALLATION, GENERAL

- 3.2.1. In accordance with ULC, OESC, CEC, NEC, NEMA, as shown on drawings, and as specified herein.
- 3.2.2. Raceway systems used for Essential Electrical Systems (EES) shall be entirely independent of other raceway systems.
- 3.2.3. Install conduit as follows:
 - 3.2.3.1. In fully completed mechanically and electrically continuous runs before pulling in cables or wires.
 - 3.2.3.2. Unless otherwise indicated on the drawings or specified herein, installation of all conduits shall be concealed within finished walls, floors, and ceilings.
 - 3.2.3.3. Flattened, dented, or deformed conduit is not permitted. Remove and replace the damaged conduits with new conduits.
 - 3.2.3.4. Assure conduit installation does not encroach into the ceiling height head room, walkways, or doorways.
 - 3.2.3.5. Cut conduits square, ream, remove burrs, and draw up tight.
 - 3.2.3.6. Independently support conduit at 2.4 M (8 feet) on centers with specified materials or as shown on drawings.
 - 3.2.3.7. Do not use suspended ceilings, suspended ceiling supporting members, lighting fixtures, other conduits, cable tray, boxes, piping, or ducts to support conduits and conduit runs.
 - 3.2.3.8. Support within 300 mm (12 inches) of changes of direction, and within 300 mm (12 inches) of each enclosure to which connected.
 - 3.2.3.9. Close ends of empty conduits with plugs or caps at the rough in stage until wires are pulled in, to prevent entry of debris.
 - 3.2.3.10. Conduit installations under fume and vent hoods are prohibited.
 - 3.2.3.11. Secure conduits to cabinets, junction boxes, pull-boxes, and outlet boxes with bonding type locknuts. For rigid steel and IMC conduit installations, provide a locknut on the inside of the enclosure, made up wrench tight. Do not make conduit connections to junction box covers.
 - 3.2.3.12. Flashing of penetrations of the roof membrane is shown on the drawing details.
 - 3.2.3.13. Conduit bodies shall only be used for changes in direction, and shall not contain splices.
- 3.2.4. Conduit Bends:
 - 3.2.4.1. Make bends with standard conduit bending machines.
 - 3.2.4.2. Conduit hickey may be used for slight offsets and for straightening stubbed out conduits.
 - 3.2.4.3. Bending of conduits with a pipe tee or vise is prohibited.

3.2.5. Layout and Homeruns:

- 3.2.5.1. Install conduit with wiring, including homeruns, as shown on drawings.
- 3.2.5.2. Deviations: Make only where necessary to avoid interferences.

3.3. CONCEALED WORK INSTALLATION

3.3.1. In Concrete:

- 3.3.1.1. Conduit: Rigid steel, IMC, or EMT. Do not install EMT in concrete slabs that are in contact with soil, gravel, or vapor barriers.
- 3.3.1.2. Align and run conduit in direct lines.
- 3.3.1.3. Install conduit through concrete beams only:
- 3.3.1.4. Where shown on the structural drawings.
- 3.3.1.5. Installation of conduit in concrete that is less than 75 mm (3 inches) thick is prohibited.
- 3.3.1.6. Conduit outside diameter larger than one-third of the slab thickness is prohibited.
- 3.3.1.7. Space between conduits in slabs: Approximately six conduit diameters apart, and one conduit diameter at conduit crossings.
- 3.3.1.8. Install conduits approximately in the center of the slab so that there will be a minimum of 19 mm (0.75-inch) of concrete around the conduits.
- 3.3.1.9. Make couplings and connections watertight. Use thread compounds that are UL approved conductive type to ensure low resistance ground continuity through the conduits. Tightening setscrews with pliers is prohibited.

3.3.2. Above Furred or Suspended Ceilings and in Walls:

- 3.3.2.1. Conduit for Conductors 600 V and Below: EMT.
- 3.3.2.2. Align and run conduit parallel or perpendicular to the building lines.
- 3.3.2.3. Connect recessed lighting fixtures to conduit runs with maximum 1.8 M (6 feet) of flexible metal conduit extending from a junction box to the fixture.
- 3.3.2.4. Tightening set screws with pliers is prohibited.
- 3.3.2.5. For conduits running through metal studs, limit field cut holes to no more than 70% of web depth. Spacing between holes shall be at least 457 mm (18 inches). Cuts or notches in flanges or return lips shall not be permitted.

3.4. EXPOSED WORK INSTALLATION

- 3.4.1. Unless otherwise indicated on drawings, exposed conduit is only permitted in mechanical and electrical rooms.

- 3.4.2. Conduit for Conductors 600 V and Below: Rigid steel or IMC (outdoors), EMT (indoors). Mixing different types of conduits in the system is prohibited.
- 3.4.3. Align and run conduit parallel or perpendicular to the building lines.
- 3.4.4. Install horizontal runs close to the ceiling or beams and secure with conduit straps.
- 3.4.5. Support horizontal or vertical runs at not over 2.4 M (8 feet) intervals.
- 3.4.6. Surface Metal Raceways: Use only where shown on drawings.
- 3.4.7. Painting:
 - 3.4.7.1. Paint exposed conduit as specified

3.5. HAZARDOUS LOCATIONS

- 3.5.1. Use rigid steel conduit only.
- 3.5.2. Install UL approved sealing fittings that prevent passage of explosive vapors in hazardous areas equipped with explosion-proof lighting fixtures, switches, and receptacles, as required by the NEC.

3.6. WET OR DAMP LOCATIONS

- 3.6.1. Use rigid steel or IMC conduits unless as shown on drawings.
- 3.6.2. Provide sealing fittings to prevent passage of water vapor where conduits pass from warm to cold locations, i.e., refrigerated spaces, constant-temperature rooms, air-conditioned spaces, building exterior walls, roofs, or similar spaces.
- 3.6.3. Use rigid steel or IMC conduit within 1.5 M (5 feet) of the exterior and below concrete building slabs in contact with soil, gravel, or vapor barriers, unless as shown on drawings. Conduit shall be half-lapped with 10 mil PVC tape before installation. After installation, completely recoat or retape any damaged areas of coating.
- 3.6.4. Conduits run on roof shall be supported with integral galvanized lipped steel channel, attached to UV-inhibited polycarbonate or polypropylene blocks every 2.4 M (8 feet) with 9 mm (3/8-inch) galvanized threaded rods, square washer and locknut. Conduits shall be attached to steel channel with conduit clamps.

3.7. MOTORS AND VIBRATING EQUIPMENT

- 3.7.1. Use flexible metal conduit for connections to motors and other electrical equipment subject to movement, vibration, misalignment, cramped quarters, or noise transmission.

- 3.7.2. Use liquid tight flexible metal conduit for installation in exterior locations, moisture or humidity laden atmosphere, corrosive atmosphere, water or spray wash down operations, inside airstream of HVAC units, and locations subject to seepage or dripping of oil, grease, or water.
- 3.7.3. Provide a green equipment grounding conductor with flexible and liquid-tight flexible metal conduit.

3.8. EXPANSION JOINTS

- 3.8.1. Conduits 75 mm (3 inch) and larger that are secured to the building structure on opposite sides of a building expansion joint require expansion and deflection couplings. Install the couplings in accordance with the manufacturer's recommendations.
- 3.8.2. Provide conduits smaller than 75 mm (3 inch) with junction boxes on both sides of the expansion joint. Connect flexible metal conduits to junction boxes with sufficient slack to produce a 125 mm (5 inch) vertical drop midway between the ends of the flexible metal conduit. Flexible metal conduit shall have a green insulated copper bonding jumper installed. In lieu of this flexible metal conduit, expansion and deflection couplings as specified above are acceptable.
- 3.8.3. Install expansion and deflection couplings where shown.

3.9. CONDUIT SUPPORTS

- 3.9.1. Safe working load shall not exceed one-quarter of proof test load of fastening devices.
- 3.9.2. Use pipe straps or individual conduit hangers for supporting individual conduits.
- 3.9.3. Support multiple conduit runs with trapeze hangers. Use trapeze hangers that are designed to support a load equal to or greater than the sum of the weights of the conduits, wires, hanger itself, and an additional 90 kg (200 lbs). Attach each conduit with U bolts or other approved fasteners.
- 3.9.4. Support conduit independently of junction boxes, pull-boxes, fixtures, suspended ceiling T bars, angle supports, and similar items.
- 3.9.5. Fasteners and Supports in Solid Masonry and Concrete:
 - 3.9.5.1. New Construction: Use steel or malleable iron concrete inserts set in place prior to placing the concrete.
- 3.9.6. Existing Construction:

- 3.9.6.1. Steel expansion anchors not less than 6 mm (0.25-inch) bolt size and not less than 28 mm (1.125 inch) in embedment.
- 3.9.6.2. Power set fasteners not less than 6 mm (0.25-inch) diameter with depth of penetration not less than 75 mm (3 inch).
- 3.9.6.3. Use vibration and shock-resistant anchors and fasteners for attaching to concrete ceilings.
- 3.9.6.4. Hollow Masonry: Toggle bolts.
- 3.9.6.5. Bolts supported only by plaster or gypsum wallboard are not acceptable.
- 3.9.6.6. Metal Structures: Use machine screw fasteners or other devices specifically designed and approved for the application.
- 3.9.6.7. Attachment by wood plugs, raw plug, plastic, lead or soft metal anchors, or wood blocking and bolts supported only by plaster is prohibited.
- 3.9.6.8. Chain, wire, or perforated strap shall not be used to support or fasten conduit.
- 3.9.6.9. Spring steel type supports or fasteners are prohibited for all uses except horizontal and vertical supports/fasteners within walls.
- 3.9.6.10. Vertical Supports: Vertical conduit runs shall have riser clamps and supports in accordance with the NEC and as shown. Provide supports for cable and wire with fittings that include internal wedges and retaining collars.

3.10. BOX INSTALLATION

3.10.1. Boxes for Concealed Conduits:

- 3.10.1.1. Flush-mounted.
 - 3.10.1.1.1. Provide raised covers for boxes to suit the wall or ceiling, construction, and finish.
 - 3.10.1.1.2. In addition to boxes shown, install additional boxes where needed to prevent damage to cables and wires during pulling-in operations or where more than the equivalent of 4-90 degree bends are necessary.
 - 3.10.1.1.3. Locate pullboxes so that covers are accessible and easily removed. Coordinate locations with piping and ductwork where installed above ceilings.
 - 3.10.1.1.4. Remove only knockouts as required. Plug unused openings. Use threaded plugs for cast metal boxes and snap in metal covers for sheet metal boxes.
 - 3.10.1.1.5. Outlet boxes mounted back to back in the same wall are prohibited. A minimum 600 mm (24 inch) center-to-center lateral spacing shall be maintained between boxes.
- 3.10.1.2. Flush-mounted wall or ceiling boxes shall be installed with raised covers so that the front face of raised cover is flush with the wall. Surface-mounted wall or ceiling boxes shall be installed with surface-style flat or raised covers.

- 3.10.1.3. Minimum size of outlet boxes for ground fault circuit interrupter (GFCI) receptacles is 100 mm (4 inches) square x 55 mm (2.125 inches) deep, with device covers for the wall material and thickness involved.
- 3.10.1.4. Stencil or install phenolic nameplates on covers of the boxes identified on riser diagrams; for example "SIG FA JB No. 1."
- 3.10.1.5. On all branch circuit junction box covers, identify the circuits with black marker.

TABLE OF CONTENTS

PART 1 - GENERAL..... 2

1.1. DESCRIPTION 2

1.2. RELATED WORK 2

1.3. QUALITY ASSURANCE 2

1.4. SUBMITTALS 2

1.5. APPLICABLE PUBLICATIONS..... 3

PART 2 - PRODUCTS 3

2.1. LIGHTING FIXTURES Error! Bookmark not defined.

2.2. LED EXIT LIGHT FIXTURES Error! Bookmark not defined.

2.3. LED LIGHT FIXTURES 3

2.4. LED DOWNLIGHTS 4

PART 3 - EXECUTION 4

3.1. INSTALLATION..... 4

3.2. ACCEPTANCE CHECKS AND TESTS 6

3.3. FOLLOW-UP VERIFICATION 6

PART 1 - GENERAL

1.1. DESCRIPTION

- 1.1.1. This section specifies the furnishing, installation, and connection of the interior lighting systems. The terms "lighting fixture," "fixture," and "luminaire" are used interchangeably.

1.2. RELATED WORK

- 1.2.1. Section: 26 05 00 Common Work Results for Electrical
- 1.2.2. Section: 26 05 19 Low-Voltage Electrical Power Conductors and Cables
- 1.2.3. Section: 26 05 26 Grounding and Bonding for Electrical Systems

1.3. QUALITY ASSURANCE

- 1.3.1. Quality Assurance shall be in accordance with Section: 26 05 00 Common Work Results for Electrical.

1.4. SUBMITTALS

- 1.4.1. Submit the following information for each type of lighting fixture:

- 1.4.1.1. Material and construction details, include information on housing and optics system.
- 1.4.1.2. Physical dimensions and description.
- 1.4.1.3. Wiring schematic and connection diagram.
- 1.4.1.4. Installation details.
- 1.4.1.5. Energy efficiency data.
- 1.4.1.6. Photometric data based on laboratory tests complying with IES Lighting Measurements testing and calculation guides.
- 1.4.1.7. Lamp data including lumen output (initial and mean), color rendition index (CRI), rated life (hours), and color temperature (degrees Kelvin).
- 1.4.1.8. For LED lighting fixtures, IES L70 rated life.

- 1.4.2. Manuals:

- 1.4.2.1. Submit, simultaneously with the shop drawings, complete maintenance and operating manuals, including technical data sheets, wiring diagrams, and information for ordering replacement parts.

- 1.4.2.2. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.

- 1.4.3. Certifications: Two weeks prior to final inspection, submit the following.

- 1.4.3.1. Certification by the Contractor that the interior lighting systems have been properly installed and tested.

1.5. APPLICABLE PUBLICATIONS

- 1.5.1. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

- 1.5.2. American Society for Testing and Materials (ASTM):

- 1.5.2.1. C635/C635M-22 Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

- 1.5.3. Illuminating Engineering Society of North America (IESNA):

- 1.5.3.1. LM-79-19 Electrical and Photometric Measurements of Solid-State Lighting Products
 - 1.5.3.2. LM-80-21 Measuring Lumen Maintenance of LED Light Sources
 - 1.5.3.3. LM-82-19 Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature

- 1.5.4. Institute of Electrical and Electronic Engineers (IEEE):

- 1.5.4.1. C62.41-91(R1995) Surge Voltages in Low Voltage AC Power Circuits

PART 2 - PRODUCTS

2.1. LED LIGHT FIXTURES

- 2.1.1. General:

- 2.1.1.1. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
 - 2.1.1.2. LED drivers shall include the following features unless otherwise indicated:
 - 2.1.1.2.1. Minimum efficiency: 85% at full load.
 - 2.1.1.2.2. Minimum Operating Ambient Temperature: -20° C. (-4° F.)
 - 2.1.1.2.3. Input Voltage: 120 - 277V (±10%) at 60 Hz.

- 2.1.1.2.4. Integral short circuit, open circuit, and overload protection.
- 2.1.1.2.5. Power Factor: ≥ 0.95 .
- 2.1.1.2.6. Total Harmonic Distortion: $\leq 20\%$.
- 2.1.1.2.7. Comply with FCC 47 CFR Part 15.
- 2.1.1.3. LED modules shall include the following features unless otherwise indicated:
 - 2.1.1.3.1. Comply with IES LM-79 and LM-80 requirements.
 - 2.1.1.3.2. Minimum CRI: 80 or higher. Minimum Color Fidelity Index (IES Rf): 80 or higher.
 - 2.1.1.3.3. Color temperature between 3500K - 4000K.
 - 2.1.1.3.4. Minimum Rated Life: 50,000 hours per IES L70.

2.2. LED DOWNLIGHTS

- 2.2.1. Housing, LED driver, and LED module shall be products of the same manufacturer.

PART 3 - EXECUTION

3.1. INSTALLATION

- 3.1.1. Installation shall be in accordance with the NEC, manufacturer's instructions, and as shown on the drawings or specified.
- 3.1.2. Align, mount, and level the lighting fixtures uniformly.
- 3.1.3. Provide two-way and three-way switches as noted on the drawings and as required to operate the new lighting fixtures
- 3.1.4. Wall-mounted fixtures shall be attached to the studs in the walls, or to a 20 gauge metal backing plate that is attached to the studs in the walls. Lighting fixtures shall not be attached directly to gypsum board.
- 3.1.5. Lighting Fixture Supports:
 - 3.1.5.1. Shall provide support for all of the fixtures. Supports may be anchored to channels of the ceiling construction, to the structural slab or to structural members within a partition, or above a suspended ceiling.
 - 3.1.5.2. Shall maintain the fixture positions after cleaning and relamping.
 - 3.1.5.3. Shall support the lighting fixtures without causing the ceiling or partition to deflect.
 - 3.1.5.4. Surface mounted lighting fixtures:
 - 3.1.5.4.1. Fixtures shall be bolted against the ceiling independent of the outlet box at four points spaced near the corners of each unit. The bolts (or stud clips) shall be minimum 6 mm (1/4 inch) bolt, secured to main ceiling runners and/or

secured to cross runners. Non turning studs may be attached to the main ceiling runners and cross runners with special non friction clip devices designed for the purpose, provided they bolt through the runner, or are also secured to the building structure by 12 gauge safety hangers. Studs or bolts securing fixtures weighing in excess of 25 kg (56 pounds) shall be supported directly from the building structure.

3.1.5.4.2. Where ceiling cross runners are installed for support of lighting fixtures, they must have a carrying capacity equal to that of the main ceiling runners and be rigidly secured to the main runners.

3.1.5.4.3. Fixtures less than 6.8 kg (15 pounds) in weight and occupying less than 3715 sq cm (two square feet) of ceiling area may, when designed for the purpose, be supported directly from the outlet box when all the following conditions are met.

- Screws attaching the fixture to the outlet box pass through round holes (not key hole slots) in the fixture body.
- The outlet box is attached to a main ceiling runner (or cross runner) with approved hardware.
- The outlet box is supported vertically from the building structure.

3.1.5.4.4. Fixtures mounted in open construction shall be secured directly to the building structure with approved bolting and clamping devices.

3.1.5.5. Single or double pendant mounted lighting fixtures:

3.1.5.5.1. Each stem shall be supported by an approved outlet box mounted swivel joint and canopy which holds the stem captive and provides spring load (or approved equivalent) dampening of fixture oscillations. Outlet box shall be supported vertically from the building structure.

3.1.5.6. Outlet boxes for support of lighting fixtures (where permitted) shall be secured directly to the building structure with approved devices or supported vertically in a hung ceiling from the building structure with a nine gauge wire hanger, and be secured by an approved device to a main ceiling runner or cross runner to prevent any horizontal movement relative to the ceiling.

3.1.6. Furnish and install the new lamps as specified for all lighting fixtures installed under this project, and for all existing lighting fixtures reused under this project.

3.1.7. The electrical and ceiling trades shall coordinate to ascertain that approved lighting fixtures are furnished in the proper sizes and installed with the proper devices (hangers, clips, trim frames, flanges, etc.), to match the ceiling system being installed.

3.1.8. Bond lighting fixtures to the grounding system as specified in Section: 26 05 26 Grounding and Bonding for Electrical Systems.

3.2. ACCEPTANCE CHECKS AND TESTS

3.2.1. Perform the following:

3.2.1.1. Visual Inspection:

3.2.1.1.1. Verify proper operation by operating the lighting controls.

3.2.1.1.2. Visually inspect for damage to fixtures, lenses, reflectors, diffusers, and louvers. Clean fixtures, lenses, reflectors, diffusers, and louvers that have accumulated dust, dirt, or fingerprints during construction.

3.2.2. Electrical tests:

3.2.2.1. Observe for visually detectable flicker and replace defective components at no cost to the Board.

3.2.2.2. Burn-in all lamps that require specific aging period to operate properly, prior to project hand-over to the Board. Burn-in period to be 40 hours minimum, unless specifically recommended otherwise by the lamp manufacturer.

3.3. FOLLOW-UP VERIFICATION

3.3.1. Upon completion of acceptance checks and tests, the Contractor shall show by demonstration in service that the lighting systems are in good operating condition and properly performing the intended function.

26-7855-RFT - Chalmers Street Public School Library Renovation

Opening Date: April 1, 2026 1:00 PM

Closing Date: April 23, 2026 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	Asperscopeofworkoutlinedin26-7855-RFTChalmersStreetPublicSchoolLibraryRenovation.	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.

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 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. Please confirm that your organization will comply with this Act. YES or NO. If no, please explain.

As per the "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 a) its headquarters or main office in Ontario, or b) at least 250 full-time employees in Ontario at the time of the applicable procurement process. Does your company qualify as an Ontario Business under the BOBI Act? YES or NO

is your company a Canadian business? YES or NO

Is your company a U.S. business, as defined by the Ontario Treasury Board / Management Board of Cabinet (TB/MBC) as a supplier, manufacturer or distributor of any business structure (includes a sole proprietorship, partnership, corporation or other business structure) that: has its headquarters or main office located in the U.S., and has fewer than 250 full-time employees in Canada at the time of the applicable procurement process? Yes or No. (Comments are allowed).

Specifications

Bidder's Contact Information

A Project Manager and Site Supervisor to manage and supervise the Work, must be named in this form. A dedicated Site Supervisor shall be in full-time attendance at the Place of the Work while the Work is being performed. Personnel will be subject to Board approval and may not be changed without prior written approval from the Board.

Note: resumes are required to be uploaded in the document section.

Title	Name	E-mail	Cell Phone Number	
ProjectManager				*
SiteSupervisor				*

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.

- Project Manager * (mandatory)
- Site Supervisor * (mandatory)
- Certificate of Recognition (COR) Certification * (mandatory)

BONDING UPLOAD SECTION

Refer to the Bonding Requirements Section of the Terms and Conditions.

Instructions to Bidders

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 file, please upload it to both fields and indicate one is a copy.

Tender # and Project Title must be included on the Bonds.

Bonding requirements are based on the total base bid amount, inclusive of all applicable taxes.

- 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.		