Waterloo Region District School Board

ISSUED FOR CONSTRUCTION

Breslau Public School Renovations; DDC Upgrade, Unit Ventilators, Lockers, Painting

PROJECT NO. 26-7864-RFT

ISSUE DATE: April 7, 2026

The Bidding System will receive ELECTRONIC SUBMISSIONS, no later than **2:00:00 p.m. local time, on April 22, 2026 ("Closing Date and Time")**

00 01 00 Consultant/Professional Seals 7
DIVISION 00 – BIDDING AND CONTRACT DOCUMENTS 8
00 21 13 - Instructions to Bidders 8
00 21 14– General Contractors, Subcontractors, Prequalified Rosters 20
00 21 15 – Scope of Work 22
00 31 34 – Subsurface Investigation Report – Not Applicable 23
Appendix 00 31 34A – Soil Report – Not Applicable 24
Appendix 00 41 13A – Asset and Warranty Card 25
00 56 13 – Definitions Stipulated Price 26
00 72 13 – WRDSB Standard Terms and Condition 28
00 73 00 "The Supplementary Conditions" 65
DIVISION 01 - GENERAL REQUIREMENTS 123
01 14 00 – Work Restrictions 123
01 19 00 – Specifications and Documents 125
01 21 00 – Allowances 127
01 31 00 – Project Managing And Coordination 129
01 32 00 – Construction Progress Documentation 135
01 33 00 – Submittal Procedures 138
01 35 17 – Fire Safety Procedures 143
Appendix 013517-A Contractor Hot Work Permit 151
01 35 23 – Health And Safety 152
01 35 43 –Designated Substances 157
Appendix 01 35 43A Asbestos Audit Report 162
Appendix 01 35 34B– Lead Report – Not Applicable 163
01 42 00 – References 164
01 45 00 – Quality Control 169
01 51 00 – Temporary Utilities 176
01 53 00 – Temporary Construction Facilities 181
01 54 00 – Materials and Equipment 187
01 61 00 – Product Requirements 190
01 70 00 – Examination and Preparation 195
01 73 30 – Execution and Cutting and Patching 198
01 74 00 – Cleaning and Waste Management 202
01 78 10 – Closeout Submittals and Requirements 206
01 78 40 – Maintenance Requirements 212
01 79 00 – Demonstration and Training 215

DIVISION 00 – BIDDING AND CONTRACT DOCUMENTS

DIVISION 02 – EXISTING CONDITIONS
02 41.19.13 Selective Building Demolition

DIVISION 03 – CONCRETE
03 20 00 Concrete and Masonry Reinforcement
03 30 00 Cast in Place Concrete

DIVISION 04 – MASONRY
04 05 00 Masonry Procedures
04 05 13 Masonry Mortar and Grout
04 05 19 Masonry Anchorage and Reinforcement
04 05 22 Concrete Unit Masonry
04 05 23 Masonry Accessories
04 21 00 Clay Unit Masonry

DIVISION 05 – METALS
05 12 00 Structural Steel
05 31 00 Steel Deck

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES
06 10 00 Rough Carpentry
06 20 00 Finish Carpentry
06 41 13 Architectural Casework and Hardware
06 41 19 Plastic Laminate Work

DIVISION 07 – THERMAL AND MOISTURE PROTECTION
07 21 13 Board Insulation and Roofing Accessories
07 21 16 Batt and Blanket Insulation
07 26 00 Sheet Vapour Retarders
07 27 00 Air Barriers
07 51 13.13 Cold Applied Built-up Roofing
07 62 00 Metal Flashing and Trim
07 84 00 Firestopping and Smoke Sealants
07 92 00 Sealants

DIVISION 08 – DOORS AND OPENINGS
Not Used.

DIVISION 09 – FINISHES
09 22 00 Non-Structural Metal Framing
09 29 00 Gypsum Board
09 51 00 Acoustic Ceilings
09 56 00 Resilient Flooring
09 90 00 Painting and Coatings

DIVISION 10 – SPECIALTIES
10 51 13 Metal Lockers
10 90 00 Manufactured Specialties (Coat Racks and Hooks)

DIVISION 11 – EQUIPMENT
Not Used.

DIVISION 12 – FURNISHINGS
Not Used.

DIVISION 13 – SPECIAL CONSTRUCTION
Not Used.

DIVISION 14 –CONVEYING EQUIPMENT
Not Used.

DIVISION 21 – Fire Suppression
Common Contract Requirements for Fire Suppression
21 02 51 Fire Protection General Requirements
21 02 61 Fire Protection Occupancy Requirements
Fire Suppression Sprinkler Systems
21 13 13 Wet Pipe Fire Suppression

Division 22 - Plumbing
Contract Requirements for Plumbing
22 02 51 Plumbing General Requirements
Common Work Results for Plumbing
22 05 11 Plumbing Work Requirements
22 05 21 Plumbing Demolition and Renovation
22 05 34 Plumbing Bases, Hangers, and Supports (Indoor)
Commissioning for Plumbing
22 05 65 Plumbing Contractor Commissioning Requirements
Plumbing Insulation
22 07 19 Plumbing Piping Insulation
Facility Sanitary Sewerage
22 13 16 Sanitary Waste and Vent Piping – Cast Iron and Copper
22 13 17 Sanitary Waste and Vent Piping – Plastic

Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)
Common Contract Requirements for HVAC
23 02 51 HVAC General Requirements
Common Work for HVAC
23 05 21 HVAC Demolition and Renovation
23 05 34 Bases, Hangers and Supports (Indoor)
23 05 35 Bases, Hangers, and Supports (Outdoor)
23 05 49 HVAC Vibration and Noise Control Measures

23 05 53 Identification of HVAC Services
Testing, Adjusting, and Balancing
23 07 11 Testing, Adjusting, and Balancing (TAB) of HVAC Systems
Commissioning for HVAC
23 08 11 HVAC Contractor Commissioning Requirements
HVAC Insulation
23 10 19 HVAC Piping Insulation
Hydronic Piping and Pumps
23 21 11 Hydronic Accessories
23 21 13 Hydronic Piping - Screwed/Welded
Refrigerant Piping
23 23 13 Refrigerant Piping and Specialties
HVAC Water Treatment
23 25 13 Water Treatment for Closed-Loop Hydronic Systems
HVAC Ducts and Casings
23 31 13 Metal Ducts
Air Duct Accessories
23 33 13 Duct Accessories
23 33 18 Operating Dampers
23 33 53 Duct Liners
HVAC Fans
23 34 23 Packaged Exhausters
Air Outlets and Inlets
23 37 13 Diffusers, Registers, and Grilles
23 37 23 Louvres, Intakes, and Exhaust
Decentralized Unitary HVAC Equipment
23 81 26 Split System Air Conditioning
Convection Heating and Cooling Units
23 82 23 Hydronic Unit Ventilators

Division - 25 Integrated Automation
Control Systems
25 40 11 Building Control System

DIVISION 26 – COMMON REQUIREMENTS FOR ELECTRICAL
26 00 11 Electrical Specification Index
Common Contract Requirements for Electrical
26 01 16 Electrical Contract General Requirements
26 01 17 Demolition and Renovation
26 01 21 Electrical Occupancy Requirements
Common Work Results for Electrical
26 05 19 Wires and Cables
26 05 20 Splitters, Junction, and Pull Boxes

26 05 21 Outlet Boxes, Conduit Boxes, and Fittings
26 05 22 Wire and Box Connectors – 0 –1000 V
26 05 33 Conduits, Conduit Fastenings, and Conduit Fittings
26 05 74 Short Circuit/Coordination Study Arc Flash Hazard Analysis
26 05 75 Auxiliary Systems
Low-Voltage Transformers
26 22 13 Dry Type Transformers
Panelboards
26 24 16 Panelboards
26 24 17 Moulded Case Circuit Breakers
Low-Voltage Distribution Equipment
26 27 26 Wiring Devices
Low-Voltage Circuit Protective Devices
26 28 16 Disconnect Switches
Lighting
26 51 13 Lighting Equipment
26 51 16 Digital Occupancy & Daylight Control Systems

DIVISION 27 – COMMUNICATIONS
Not Use.

DIVISION 28 – ELECTRICAL SAFETY AND SECURITY
Fire Detection and Alarm
26 51 16 Fire Alarm System (Renovation)

DIVISION 31 – EARTHWORK
Not Used.

DIVISION 32 – EXTERIOR IMPROVEMENTS
Not Used.

DIVISION 33 – UTILITIES
Not Used.

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



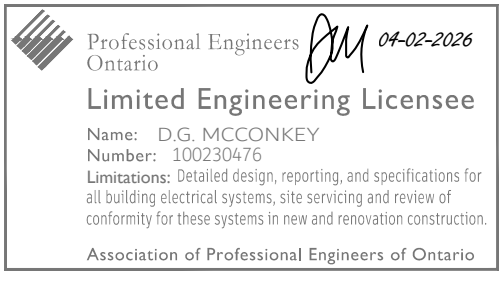
1.1.2 Structural



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: ward99 architects

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 Consultantwill 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	Tuesday, April 7, 2026
Non-Mandatory Pre-Bid Site Examination	Date: Friday, April 10, 2026 Time: 3:00 pm local time School/Site: Breslau Public School Address: 58 Joseph St. Breslau, ON NOB 1M0 Meeting Area: Entry Vestibule
Deadline for Questions	Thursday, April 16, 2026
Closing Date and Time	**Wednesday, April 22, 2026** **2:00:00 pm local time**
Anticipated Contract Start / Work begins	Thursday, July 2, 2026
Substantial Completion Date	Friday, August 21, 2026
Ready for Takeover	Friday, August 28, 2026
Deemed Complete Date	Friday, September 18, 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 stie 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 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.

1.13.3 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.

1.13.4 Unsatisfactory references may result in the Bidder's submission being rejected.

1.13.5 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

The Breslau Public School Renovations project includes the following scope of work:

- Mechanical upgrades including a DDC Upgrade to replace existing obsolete HVAC controls, replacement of unit ventilators at fourteen (14) classrooms, provision for new exhaust and rooftop condensing units, replacement of heating valves and removal of obsolete exhaust ductwork.
- Electrical upgrades including provision for power to new unit ventilators, replacement of existing lighting and controls at classrooms and corridors where ceiling assemblies are replaced.
- Complete renovation to one Seminar Room including, flooring, ceiling and millwork cabinetry replacements, painting work, new electrical light fixtures and devices, and mechanical upgrades and new sprinklers.
- Rectification to existing millwork and new millwork to suit placement of new unit ventilators in classrooms.
- Replacement of ceiling assemblies in classrooms and corridors to suit new mechanical works.
- Painting of corridor and lobby walls.
- Removal of existing lockers and replacement with new lockers in corridors.
- Removal of existing lockers and replacement with new coat racks and hooks in corridors, including wall finishing where required to suit removals and new work.

END OF SECTION

00 31 34 – Subsurface Investigation Report – Not Applicable

1.0 General

1.1. Related Sections

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

1.2. SUBSURFACE INVESTIGATION REPORT

.1 An investigation report with respect to the applicable building site and important immediate affected surroundings, is titled as follows:

.1 Title:

.2 Dated:

.3 Prepared By:

.2 A copy of this detailed investigation report is included as an appendix to this section.

.3 The subsurface investigation report records properties of the soils, subgrade conditions, and offers recommendations for the design of foundations.

.4 The report 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

Appendix 00 41 13A – Asset and Warranty Card

WRDSB PROJECT ASSET & WARRANTY CARD

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		Tech 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:

To be filled out by Consultant				*To be filled out by Contractor*				
IDENTIFIER	ASSET	LOCATION (incl. Rm. No.)	REMOVED (R), OR *NEW (N)*	CONTRACTOR	MANUFACTURER	MODEL	SERIAL NUMBER	WARRANTY END DATE
Boiler 2	*Condensing Boiler*	*Boiler Rm. B005*	*R*	*Bob's Mechanical*	*Viessman*	*Vitocrossal 300 CA3B*	*1234x5678y90*	*Jan. 1, 2025*
HVAC 7	*New RTU*	*Roof D*	*N*	*Bob's Mechanical*	*Daiken*	*DPS020A*	*ABCD1EFGH2IJ*	*Jan. 1, 2025*
n/a	*Gym Partition*	*Gyms 122/123*	*R*	*Extreme Partitions*	*Hufcor*	*933EC*	*n/a*	*Jun. 30, 2028*

WRDSB Project Asset & Warranty Card

Project Name: _____

School / Location: _____

Date: _____

To be filled out by Consultant				*To be filled out by Contractor*				
IDENTIFIER	ASSET	LOCATION (include Room No.)	ASSET REMOVED (R) OR NEW (N)	CONTRACTOR	MANUFACTURER	MODEL	SERIAL NUMBER	WARRANTY END DATE

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 Wok permit may be waived, until such time as either Substantial Completion or Occupancy is granted, whichever comes first.

xiii. On additions to existing buildings, the requirements for Hot Work permits shall remain in place.

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 themself, 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	Amend Article A-1.3 by deleting all of the words after *"Contract Documents"* and replace them with the following" "attain .1 *Substantial Performance of the Work* by the 21st day of August in the year 2026__. .2 (if applicable) *Occupancy* by the 21st day of August in the year 2026, and .3 *Ready-for-Takeover* by the 28th day of August in the year 2026."
SC1.1		

ARTICLE A-3 – CONTRACT DOCUMENTS

SC2.1	A-3.1	Add the following documents to the list of *Contract Documents* 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 • *Drawings* • *Specifications* • Performance Bond (Form 32 -Performance Bond under Section 85.1 of the *Act*) if applicable • Labour and Material Payment Bond (Form 31 – Labour and Material Payment Bond under Section 85.1 of the *Act*), if applicable

ARTICLE A-4 – CONTRACT PRICE

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

ARTICLE A-5 – PAYMENT

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

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

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

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

		cooperate in the presentation of a claim for payment against the *Owner*, directly or through the *Contractor*, where such claim is, in whole or in part, in respect of a disputed claim by the *Subcontractor or Supplier* against the *Contractor*, where the payment to the *Subcontractor or Supplier* by the *Contractor* is agreed to be conditional or contingent on the ability to recover those amounts or a portion thereof from the *Owner*, failing which the *Contractor* shall be saved harmless from all or a portion of those claims. The *Contractor* acknowledges that any such agreement would undermine the required arm's-length relationship and constitute a conflict of interest. For greater certainty, the *Contractor* shall only be entitled to advance claims against the *Owner* for amounts pertaining to *Subcontractor or Supplier* claims where the *Contractor* has actually paid or unconditionally acknowledged liability for those claims or where those claims are the subject of litigation or binding arbitration between the *Subcontractor or Supplier* and the *Contractor* 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 *Contractor*, any of the *Subcontractors*, 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."

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

SC6.1	Article A-10	Add 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 *Contractor* was selected by the *Owner* for this *Contract* is the *Contractor's* representation and covenant that it will attain *Substantial Performance, Occupancy (*if applicable), and *Ready-for-Takeover* within the *Contract Time* stated in Article A-1 of this *Contract*. 10.2 The *Contractor* acknowledges and agrees that it is responsible to marshal its resources and those of its *Subcontractors and Suppliers* in a manner which will permit timely attainment of *Substantial Performance, Occupancy (*if applicable), and *Ready-for-Takeover*. The *Contractor* agrees that time is of the essence of this *Contract*."
SC6.2		

DEFINITIONS

Revisions to Existing Definitions		
SC5.1	Consultant	Amend the definition of "Consultant" by adding the following to the end of the definition: "For the purposes of the *Contract*, the terms "*Consultant"*, "*Architect*" and "*Engineer*" shall be considered synonymous."
SC5.2	Payment Legislation/Construction Act	Delete the Definition of *Payment Legislation* and replace it with "Construction Act" as follows: "**Construction Act** *Construction Act* means the *Construction Act*, 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 *Contract*. For certainty, the first procurement process for the *Project* (*i.e*., the "improvement" as that term is defined in the *Construction Act*) commenced on or after October 1, 2019."
SC5.3	Ready-for-Takeover	Amend the Definition of *Ready-for-Takeover* by deleting all the words after "as verified" and replacing them with "and approved by the *Owner*."
New Definitions		
	Adjudication	Add the following definition: "**Adjudication** *Adjudication* means construction dispute interim adjudication as defined under the *Construction Act*."
	Close-Out Documentation	Add the following new definition: "**Close-Out Documentation** *Close-Out Documentation* has the meaning given to it under GC 5.4.2."
	Confidential Information	Add the following definition: "**Confidential Information** *Confidential Information* means all the information or material of the *Owner* 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 *Contractor* at any time, but *Confidential Information* shall not include information that: .1 is or becomes generally available to the public without fault or breach on the part of the *Contractor*, including without limitation breach of any duty of confidentiality owed by the *Contractor* to the *Owner* or to any third party, but only after that information becomes generally available to the public; .2 the *Contractor* can demonstrate to have been rightfully obtained by the *Contractor* from a third party who had the right to transfer or disclose it to the *Contractor* free of any obligation of confidence;

		.3 the *Contractor* can demonstrate to have been rightfully known to or in the possession of the *Contractor* at the time of disclosure, free of any obligation of confidence; or .4 is independently developed by the *Contractor* without use of any *Confidential Information*."
	Construction Schedule	Add the following definition: "**Construction Schedule** *Construction Schedule* means the schedule for the performance of the *Work* provided by the *Contractor*, and approved by the *Owner*, pursuant to GC 3.4.1, including any amendments to the *Construction Schedule* made pursuant to the *Contract Documents*."
	Construction Schedule Update	Add the following definition: "**Construction Schedule Update** *Construction Schedule Update* means an update to the *Construction Schedule* by the *Contractor* using Microsoft Project (or other approved scheduling software) that accurately depicts the progress of the *Work* relative to the critical path established in the *Construction Schedule* approved in GC 3.5.1 (or any approved successor *Construction Schedule*), aligns with the currently approved date for *Substantial Performance of the Work*, 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 *Work* relative to the last *Construction Schedule Update,* and includes the following minimum deliverables: (a) a record version of the updated *Construction Schedule* in .pdf format; (b) an editable copy of the updated original digital file of the *Construction Schedule* (*e.g.*, .mpp format files for Microsoft Project)."
	Deficiency Holdback	Add 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	Add the following definition: "**Direct Costs** *Direct Costs* 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	Add the following definition: "**EFT** *EFT* has the definition given to it under GC 5.3.2."

	Excess Soil	Add the following definition: "**Excess Soil** *Excess Soil* means "excess soil" as that term is defined under section 3 of the *Excess Soil Regulation*."
	Excess Soil Regulation	Add the following Definition: "**Excess Soil Regulation** *Excess Soil Regulation* means O. Reg. 406/19: On-Site and Excess Soil Management to the *Environmental Protection Act,* R.S.O. 1990, c. E.19."
	Final Pre-Invoice Submission Meeting	Add the following ne definition: "**Final Pre-Invoice Submission Meeting** *Final Pre-Invoice Submission Meeting* has the meaning given to it in GC 5.5.1."
	Force Majeure	Add the following definition: "**Force Majeure** *Force Majeure* means 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 licences, 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)."
	Install	Add the following definition: "**Install** *Install* means install and connect. *Install* has this meaning whether or not the first letter is capitalized."
	Labour Dispute	Add the following definition: "**Labour Dispute** *Labour Dispute* 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 *Work*."
	Notice of Non-Payment	Add the following definition:

		"**Notice of Non-Payment** *Notice of Non-Payment* means a notice of non-payment of holdback (Form 6) or a notice of non-payment (Form 1.1) under the *Act*, as applicable to the circumstances."
	OHSA	Add the following definition: "**OHSA** *OHSA* means the *Occupational Health and Safety Act*, R.S.O. 1990, c. O.1, as amended, including all regulations thereto."
	Overhead	Add the following definition: "**Overhead** *Overhead* 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 *Place of the Work*; 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	Add the following definition: "**Payment Period** *Payment Period* has the definition given to it under GC 5.2.1."
	Pre-Invoice Submission Meeting	Add the following definition: "**Pre-Invoice Submission Meeting** *Pre-Invoice Submission Meeting* has the definition given to it under GC 5.2.1."
	Proper Invoice	Add the following definition: "**Proper Invoice** *Proper Invoice* means a "proper invoice" as that term is defined in Section 6.1 of the *Act*, including the minimum requirements set out in Appendix "1" of the Supplementary Conditions."
	Proper Invoice Submission Date	Add the following definition: "**Proper Invoice Submission Date** *Proper Invoice Submission Date* has the definition given to it under GC 5.2.2.1."
	Request for Information (RFI)	Add the following definition: "**Request for Information (RFI)** *Request for Information* or *RFI* means written documentation sent by the *Contractor* to the *Owner* or to the *Owner's* representative or the *Consultant* requesting written clarification(s) and/or interpretation(s) of the *Drawings* and/or *Specifications*, *Contract* requirements and/or other pertinent information required to complete the *Work* of the *Contract* without applying for a change or changes to the *Work*."

	Restricted Period	Add the following definition: "**Restricted Period** *Restricted Period* 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 *Contract*."

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	Delete GC 1.1.3 in its entirety and replace it with the following: "1.1.3 The *Contractor* shall review the *Contract Documents* and shall report promptly to the *Consultant* any error, inconsistency, or omission the *Contractor* may discover. Such review by the *Contractor* 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 *Contractor* does not assume any responsibility to the *Owner* or to the *Consultant* for the accuracy of the *Contract Documents*. Provided it has exercised the degree of care and skill described in this GC 1.1.3, the *Contractor* shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the *Contract Documents*, which the *Contractor* could not reasonably have discovered through the exercise of the required standard of care."
SC5.2	1.1.4	Delete GC 1.1.4 in its entirety and replace 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 *Contractor* is not responsible for errors, omissions or inconsistencies in the *Contract Documents*. If there are errors, omissions or inconsistencies discovered by or made known to the *Contractor* as part of its review under GC 1.1.3 or at any time during the performance of the *Work*, the *Contractor* shall immediately notify the *Consultant*, and request instructions, a *Supplemental Instruction*, *Change Order*, or *Change Directive*, as the case may require, and shall not proceed with the *Work* affected until the *Contractor* has received corrected or additional information from the *Consultant*. The *Contractor* shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the *Contract Documents*, which the *Contractor* could not reasonably have discovered through the exercise of care and skill described in GC 3.13."
	1.1.5.1	Delete GC 1.1.5.1 and replace 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 *Specifications*

		.6 technical *Specifications;* .7 material and finishing schedules; and .8 the *Drawings*.
	1.1.5.5	Delete GC 1.1.5.5 and replace with the following: ".5 Noted materials and annotations on the *Drawings* shall govern over the graphic representation of the *Drawings.*"
	1.1.5.6 to 1.1.5.8	Add 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 *Drawings.* .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 *Consultant* or its sub-*Consultants* are to remain with each of the applicable drawing disciplines. .8 Should reference standards contained in the *Specifications* conflict with the *Specifications*, the *Specifications* shall govern. Should reference standards and *Specifications* conflict with each other or if certain requirements of the *Specifications* conflict with other requirements of the *Specifications*, the more stringent requirements shall govern."
	1.1.9	Add the following to the end of GC 1.1.9: "The *Specifications* 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 *Contract Documents* will be construed to place responsibility on the *Owner* or the *Consultant* to settle disputes among the *Subcontractors* and *Suppliers* with respect to such divisions. The *Drawings* are, in part, diagrammatic and are intended to convey the scope of the *Work* and indicate general and appropriate locations, arrangements and sizes of fixtures, equipment, outlets and other elements. The *Contractor* shall obtain more accurate information about the locations, arrangements and sizes from study and coordination of the *Drawings,* including *Shop Drawings* and shall become familiar with conditions and spaces affecting those matters before proceeding with the *Work.* Where site conditions require reasonable minor changes where the change requires only the additional labour two hours or less, the *Contractor* shall make such changes at no additional cost to the *Owner.* Similarly, where known conditions or existing conditions interfere with new installation and require relocation, the *Contractor* shall include such relocation in the *Work.* The *Contractor* 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 *Contract Documents*, wherever located and whenever issued, which compile information of similar content and may consist of drawings, tables and/or lists."
	1.1.13	Add new paragraphs 1.1.13 as follows: 1.1.13 The *Contractor* shall keep one copy of the current *Contract Documents*, *Supplemental Instructions*, contemplated *Change Orders*, *Change Orders*, *Change Directives*, cash allowance disbursement authorizations, reviewed *Shop Drawings*, submittals, reports and records of meeting at the *Place of the Work*, in good order and available to the *Owner* and *Consultant*."

GC 1.3 RIGHTS AND REMEDIES

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

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

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

PART 2 ADMINISTRATION OF THE CONTRACT

GC 2.2 ROLE OF THE CONSULTANT

SC11.1	2.2.5	Delete paragraph 2.2.4 and replace it with the following: "2.2.4 Upon receipt of an application for payment that satisfies the requirement of a *Proper Invoice*, based on the *Consultant's* observations and evaluation of the *Contractor's* application for payment, the *Consultant* will determine the amounts owing to the *Contractor* under the *Contract* 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 *Consultant* determines that the amount payable to the *Contractor* differs from the amount stated in a *Proper*

		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."
	2.2.6	In the first sentence of paragraph 2.2.6, delete the words "Except with respect to GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER".
	2.2.12	At paragraph 2.2.12, insert 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	Amend paragraph 2.3.2 by adding the words "and *Owner*" after the words "*Consultant*" in the second and third lines.
	2.3.3	Delete paragraph 2.3.3 in its entirety and replace 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 add 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*", add "or the *Owner*".
	2.3.8	Add 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	Amend 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	Add 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	Delete paragraph 2.4.2 in its entirety and replace it with the following: "2.4.2 The *Contractor* shall promptly pay the *Owner* for costs incurred by the *Owner*, the *Owner's* own forces or the *Owner's* other contractors, for work destroyed or damaged or any alterations necessitated by the *Contractor's* removal, replacement or re-execution of defective work."
	2.4.4	Add new paragraph 2.4.4 as follows: "2.4.4 Neither acceptance of the *Work* by the *Consultant* or the *Owner*, nor any failure by the *Consultant* or the *Owner* to identify, observe or warn of defective *Work* or any deficiency in the *Work* shall relieve the *Contractor* from the sole responsibility for rectifying such defect or deficiency at the *Contractor's* 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 inserting the words "Construction Schedule" after the word "sequences".
SC12.2	3.1.3 & 3.1.4	Add new paragraphs 3.1.3 and 3.1.4 as follows: "3.1.3 Prior to commencing individual procurement, fabrication and construction activities, the *Contractor* shall verify at the *Place of the Work*, all relevant measurements and levels necessary for proper and complete fabrication, assembly and installation of the *Work* and shall further carefully compare such field measurements and conditions with the requirements of the *Contract Documents*. Where dimensions are not included or exact locations are not apparent, the *Contractor* shall immediately notify the *Consultant* in writing and obtain written instructions from the *Consultant* before proceedings with any part of the affected *Work*. 3.1.4 Notwithstanding the provisions of paragraphs 3.1.1 and 3.1.2, the *Owner* 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 *Contractor* to fulfill its contractual obligations."

GC 3.2 CONSTRUCTION BY OWNER OR OTHER CONTRACTORS

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

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 *Consultant*".

GC 3.4 CONSTRUCTION SCHEDULE

SC17.1	3.4.1	Delete GC 3.4.1 in its entirety and replace it with the following: "3.4.1 The *Contractor* shall: 1 within five (5) calendar days of receiving written confirmation of the award of the *Contract*, prepare and submit to the *Owner* and the *Consultant* for their review and approval, a construction schedule in the format indicated below that indicates the timing of the activities of the *Work* and provides sufficient detail of the critical events and their inter-relationship to demonstrate the *Work* will be performed in conformity with the *Contract Time* and in accordance with the *Contract Documents.* Such schedule is to include a delivery schedule for *Products* whose delivery is critical to the schedule for the *Work* or are required by the *Contract* to be included in a *Products* delivery schedule. The *Contractor* shall employ construction scheduling software, being the latest version of "Microsoft Project"*,* that permits the progress of the *Work* to be monitored in relation to the critical path established in the schedule. The *Contractor* 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 *Owner* and the *Consultant*, the construction schedule submitted by the *Contractor* 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 *Construction Schedule* or revised construction schedule accepted by the *Owner* pursuant to GC 3.4 CONSTRUCTION SCHEDULE, which includes without limitation, the *Contractor*'s use of all possible and, if necessary, extraordinary measures, to bring the progress of the *Work* into compliance with the *Construction Schedule*, such as (i) increasing the presence of its own forces at the *Place of the Work*; (ii) directing any *Subcontractors* or *Suppliers* to increase their labour forces and equipment; (iii) working overtime and extra shifts; and (iv) providing any additional supervision and coordination of the *Project*, all at the *Contractor's* 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 *Work* on a weekly basis relative to the baseline *Construction Schedule*, or any revised *Construction Schedule* accepted by the *Owner* pursuant to GC 3.4 CONSTRUCTION SCHEDULE, deliver a *Construction Schedule Update* to the *Consultant* and *Owner* with each application for payment, at a minimum, or as may be reasonably required by the *Consultant* and advise the *Consultant* and the *Owner* 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 *Contractor* forms the opinion that the slippage in schedule reported in paragraph 3.4.1.3

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

GC 3.5 SUPERVISION

SC17.1	3.5.1	Delete GC 3.5.1 and replace it with the following: "3.5.1 The *Contractor* shall employ a competent full-time superintendent, acceptable to the *Owner* and *Consultant*, who shall be in full time attendance at the *Place of the Work* while the *Work* is being performed. The superintendent shall not be changed by the *Contractor* without valid reason which shall be provided in writing and shall not be changed without prior consultation with and agreement by the Owner and the *Consultant*. The *Contractor* shall replace the superintendent within 7 *Working Days* of the *Owner's* written notification, if the superintendent's performance is not acceptable to the *Owner*. The *Contractor* shall provide the *Owner* and the *Consultant* 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	Delete GC 3.5.2 and replace it with the following: "3.5.2 The superintendent, and any project manager appointed by the *Contractor*, shall represent the *Contractor* at the *Place of the Work* and shall have full authority to act on written instructions given by the *Consultant* and/or the *Owner*. Instructions given to the

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

GC 3.6 SUBCONTRACTORS AND SUPPLIERS

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

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

GC 3.7 LABOUR AND PRODUCTS

SC19.1	3.7.1	Amend paragraph 3.7.1 by adding the words, "…, agents, *Subcontractors* and *Suppliers*…" after the word "employees" in the first line.
SC19.2	3.7.2	Delete paragraph 3.7.2 and substitute with the following: "3.7.2 *Products* 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 *Place of the Work*, unless otherwise specified. *Products* which are not specified shall be of a quality consistent with those specified and their use acceptable to the *Consultant*. *Products* brought on to the *Place of the Work* by the *Contractor* shall be deemed to be the property of the *Owner*, but the *Owner* shall be under no liability for loss thereof or damage thereto arising from any cause whatsoever. The said *Products* shall be at the sole risk of the *Contractor*. Workmanship shall be, in every respect, first class and the *Work* shall be performed in accordance with the best modern industry practice."
	3.7.4 to 3.7.8	Add 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 *Notice in Writing* from the *Owner,* the *Contractor* shall immediately remove from the *Place of the Work*, tradesmen and labourers or anyone whose conduct jeopardizes the safety of the *Owner's* operations or who are considered by the *Owner* or the *Consultant* to be unskilled or otherwise objectionable. Immediately upon receipt of the request, the *Contractor* shall make arrangements to appoint an acceptable replacement.

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

GC 3.8 SHOP DRAWINGS

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

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

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

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

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

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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 *Contractor* shall perform the cutting and remedial work required to make the affected parts of the *Work* come together properly. Such cutting and remedial work shall be performed by specialists familiar with the *Products* affected and shall be performed in a manner to neither damage nor endanger the *Work*. 3.10.2 The *Contractor* shall coordinate the *Work* to ensure all cutting and remedial work required is kept to a minimum. 3.10.3 Unless specifically stated otherwise in the *Specifications*, the *Contractor* shall do all cutting and making good necessary for the proper installation and performance of the *Work.* 3.10.4 To avoid unnecessary cutting, the *Contractor* shall lay out its work and advise the *Subcontractors,* when necessary, where to leave holes for installation of pipes and other work."

***NEW* GC 3.11 CLEAN UP**

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

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

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

SC25.1	GC 3.12	Add new GC 3.12 – EXCESS SOIL MANAGEMENT as follows: "**GC 3.12 EXCESS SOIL MANAGEMENT** 3.12.1 The *Contractor* shall be solely responsible for the proper management of all *Excess Soil* at the *Place of the Work* and for performance of the *Work* in compliance with the rules, regulations and practices required by the *Excess Soil Regulation* until such time as *Ready-for-Takeover* is achieved. Without restricting the generality of the previous sentence, the *Contractor*'s responsibility under this GC 3.12 includes the designation, transportation, tracking, temporary and/or final placement, record keeping, and reporting of all *Excess Soil* in connection with the Work all in compliance with the *Excess Soil Regulation*. 3.12.3 The *Contractor* shall indemnify and save harmless the *Owner*, 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 *Contractor*, or those for whom it is responsible at law, under the *Excess Soil Regulation*, 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 *Owner* is not covered by insurance."

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

SC25.1	3.13	Add 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 *Contract*, the *Contractor* 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 *Contractor* acknowledges and agrees that throughout the *Contract,* the performance of the *Contractor's* obligations, duties and responsibilities shall be interpreted in accordance with this standard. The *Contractor* shall exercise the same standard of care, skill and diligence in respect of any *Products*, personnel or procedures which it may recommend to the *Owner* or employ on the *Project*. 3.13.2 The *Contractor* further represents, covenants and warrants to the *Owner* that: .1 the personnel it assigns to the *Project* are appropriately experienced; .2 it has a sufficient staff of qualified and competent personnel to replace any of its appointed representatives, subject to the *Owner's* 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 *Contractor* to perform its work under the *Contract*."

PART 4 ALLOWANCES

GC 4.1 CASH ALLOWANCES

SC27.1	4.1.3	In GC 4.1.3 delete the words "through the *Consultant*" and replace them with "in writing."
	4.1.4	Delete GC 4.1.4 in its entirety and replace it with the following: "4.1.4 Where the actual cost of the *Work* under any cash allowance exceeds the amount of the allowance, any unexpended amounts from other cash allowances shall be reallocated, by the *Consultant* at the *Owner*'s direction, to cover the shortfall, and, in that case, there shall be no additional amount added to the *Contract Price* for overhead and profit. Only where the actual cost of the *Work* under all cash allowances exceeds the total amount of all cash allowances shall the *Contractor* be compensated for the excess incurred and substantiated, plus an amount for overhead and profit on the excess only, as set out in the *Contract Documents.*"
	4.1.7	Delete GC 4.1.7 in its entirety and replace 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 *Contract Price* by *Change Order* without any adjustment for the *Contractor's* overhead and profit on such amount."
	4.1.8 and 4.1.9	Add new GC 4.1.8 and 4.1.9 as follows: "4.1.8 The *Owner* reserves the right to call, or to have the *Contractor* call, for competitive bids for portions of the *Work* to be paid for from cash allowances. 4.1.9 Cash allowances cover the net cost to the *Contractor* of services, *Products*, *Construction Equipment*, freight, unloading, handling, storage, installation, provincial sales tax, and other authorized expenses incurred in performing any *Work* stipulated under the cash allowances but does not include any *Value Added Taxes* payable by the *Owner* and the *Contractor."*

PART 5 PAYMENT

GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER

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

GC 5.2 APPLICATIONS FOR PAYMENT

SC29.1	5.2.1	Delete GC 5.2.1 and replace it with the following: "5.2.1 Upon execution of the *Contract*, and in any event prior to the *Contractor* submitting its first application for payment, the *Owner* shall issue a purchase order to the *Contractor* for the performance of the *Contract*. 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 *Contract* (each a "**Payment Period**"). Within 3 calendar days of the end of each *Payment Period*, the *Contractor* will submit a draft application for payment to the *Owner* and the *Consultant*. Upon receipt of the draft application for payment, and within 7 calendar days, a representative of each of the *Contractor*, *Owner*, and the *Consultant* shall attend a meeting to discuss and review the work completed during the *Payment Period*, including quantities, if applicable (the "**Pre-Invoice Submission Meeting**"). In the event that the scheduled date for the *Pre-Invoice Submission Meeting* is not a *Working Day*, the *Pre-Invoice Submission Meeting* shall occur on the next *Working Day*. The *Contractor* shall bring with it to the *Pre-Invoice Submission Meeting* the following: .1 a copy of the draft application for payment; .2 any documents the *Contractor* is required to bring to the *Pre-Invoice Submission Meeting* as stipulated in the *Contract Documents* or as reasonably requested by the *Owner*; and

		.3 any other documents reasonably requested, in advance, by the *Owner* or the *Consultant*."
SC29.2	5.2.2	Delete GC 5.2.2 in its entirety and replace 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 *Pre-Invoice Submission Meeting*, the *Contractor* shall deliver its application for payment to the *Owner* and to the *Consultant* for *Work* performed during the *Payment Period* ("**Proper Invoice Submission Date**") subject to the following: .1 If the fifth calendar day following the *Pre-Invoice Submission Meeting*, to which an invoice relates falls on a day that is not a *Working Day*, the *Proper Invoice Submission Date* shall be deemed to fall on the next *Working Day*. .2 The application for payment must be delivered to the *Owner* and to the *Consultant* in the same manner as a *Notice in Writing* during the hours of 9:00 am to 4:00pm (EST) on the *Proper Invoice Submission Date*. Delivery to the *Owner* 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 *Proper Invoice Submission Date*, the application for payment will not be considered or reviewed by the *Owner* and *Consultant* until the next *Proper Invoice Submission Date.* Notwithstanding the foregoing, the *Owner* in its sole and absolute discretion may elect to accept an application for payment submitted after 4:00 p.m. on the applicable *Proper Invoice Submission Date*; however, such acceptance shall not be construed as a waiver of any of its rights or waive or release the *Contractor*'s 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 *Owner* prior to the *Proper Invoice Submission Date*. .5 All applications for payment shall include all of the requirements for a *Proper Invoice* prescribed by the *Construction Act* and this *Contract* and be dated the last day of the applicable *Payment Period*;"
SC29.3	5.2.3	Delete GC 5.2.3 and replace it with the following: "5.2.3 The amount claimed shall be for the value, proportionate to the amount of the *Contract*, of *Work* performed and *Products* delivered and incorporated into the *Work* as of the last date of the applicable *Payment Period*. Materials may also be deemed to be supplied to an improvement, for payment purposes, when, in the *Owner's* opinion, they are placed and properly secured on the land on which the improvement is made, or placed upon land designated by the *Owner* or agent of the *Owner*, 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 *Products* delivered to the *Place of the Work* unless the *Products* are free and clear of all security interests, liens, and other claims of third parties."
SC29.4	5.2.4	After the word "*Consultant*" in GC 5.2.4 add the words "and the *Owner*"
SC29.5	5.2.5	After the word "*Consultant*" in GC 5.2.5 add the words "or the *Owner*".
SC29.6	5.2.9	Add new 5.2.9 as follows: "5.2.9 The *Contractor* shall prepare and maintain current as-built drawings which shall consist of the *Drawings* and *Specifications* revised by the *Contractor* during the *Work*, showing changes to the *Drawings* and *Specifications*, which current as-built drawings shall be maintained by the *Contractor* and made available to the *Consultant* for review with each application for progress payment. The *Consultant* shall recommend to the *Owner* that the *Owner* 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	Delete GC 5.3.1 in its entirety, including all subparagraphs thereunder, and replace it with the following: "5.3.1 After receipt by the *Owner* and the *Consultant* of an application for payment submitted by the *Contractor* in accordance with GC 5.2 - APPLICATIONS FOR PAYMENT: .1 the *Consultant* will either: (a) issue to the *Owner* with a copy to the *Contractor*, a progress payment certificate in the amount applied for by the *Contractor* in the *Proper Invoice*, or (b) issue to the *Owner*, with a copy to the *Contractor*, a certificate for payment for an amount determined by the *Consultant* to be properly due to the *Contractor* after applying any credits, withheld amounts, or other set-offs which the *Consultant* has determined that the *Owner* is entitled to notwithstanding any notice of dispute or disagreement that the *Contractor* may have served, along with the *Consultant's* reasons why an amount other than what is claimed in the *Proper Invoice* is properly due to the *Contractor*, which finding the *Owner* may accept or amend prior to the *Owner* issuing a *Notice of Non-Payment*, if any, in accordance with GC 5.3.2; .2 the *Owner* shall make payment to the *Contractor* 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 *Owner's Notice of Non-Payment* issued pursuant to GC 5.3.3,

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

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

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

SC32.1	GC 5.4	Delete GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK in its entirety and replace it with the following: "**GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK** 5.4.1 When the *Contractor* considers that *Substantial Performance of the Work* has been achieved, the *Contractor* shall prepare and submit to the *Consultant* and the *Owner* a comprehensive deficiency list of items to be completed or corrected, including any incomplete *Close-Out Documentation*, and apply for a review by the *Consultant* and the *Owner* to establish *Substantial Performance of the Work*. Failure to include an item on the list does not alter the responsibility of the *Contractor* to complete the *Contract*. 5.4.2 Prior to, or as part of its written application for *Substantial Performance of the Work* the *Contractor* shall submit to the *Consultant* submit to the *Consultant* all closeout documentation required by the *Contract Documents*, 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 *Specifications*; .9 *Shop Drawings*; .10 coordination drawings; .11 testing and balancing results and reports; .12 *Commissioning* and quality assurance documentation; .13 distribution system diagrams;

.14 spare parts;
.15 samples;
.16 existing reports and correspondence from authorities having jurisdiction in the *Place of the Work*;
.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 *Contract.*

5.4.3 The *Consultant* will review the *Work* to verify the validity of the application and shall promptly, and in any event, no later than 30 calendar days after receipt of the *Contractor's* complete deficiency list and application:

.1 prepare a final deficiency list incorporating all items to be completed or corrected, including any incomplete or unsubmitted *Close-Out Documentation*. 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 *Consultant's* draft verification and shall be reviewed with the *Owner* prior to the *Consultant* 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 *Consultant* shall advise the *Contractor* in writing that the *Work* or the designated portion of the *Work* is not substantially performed and give reasons why, or

(b) the *Consultant* shall state the date of *Substantial Performance of the Work* in a certificate and issue a copy of that certificate to each the *Owner* and the *Contractor.*

5.4.4 Following the issuance of the certificate of *Substantial Performance of the Work* referenced in subparagraph 5.4.3.2(b):

.1 The Contractor shall publish, in a construction trade newspaper in the area of the location of the Work, a copy of the certificate of S*ubstantial Performance of the Work* referred to in GC 5.4.2.2(b) within seven (7) calendar days of receiving a copy of the certificate signed by the *Consultant*, and the *Contractor* shall provide suitable evidence of the publication to the *Consultant* and the *Owner*. If the Contractor fails to publish such notice, the Owner shall be at liberty to publish said certificate and back-charge the Contractor its reasonable costs for doing so;

.2 The *Contractor* shall complete the *Work* within forty (40) calendar days of the date certified as the date of *Substantial Performance of the Work*;

.3 Notwithstanding any other provisions of the *Contract,* no payments will be processed between *Substantial Performance of the Work* and *Ready-for-Takeover*;

.4 The *Owner* reserves the right to contract out any or all unfinished *Work* if it has not been completed within forty (40) days of *Substantial Performance of the Work* using, without limitation, the funds retained in accordance with GC 5.8 - DEFICIENCY HOLDBACK, without prejudice to any other right or remedy and without affecting

		the warranty period. The cost to the *Owner* of completing the *Work* including *Owner* and *Consultant* wages and materials shall be deducted from the *Contract Price.* 5.4.5 After publication of the certificate of the *Substantial Performance of the Work*, and provided that the *Contractor* has completed performance of the *Work* within the 40 calendar days following certification of *Substantial Performance of the Work*, the *Contractor* may submit an application for payment of the outstanding *Construction Act* 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 *Contractor* has not received any written notices of lien or any claims for liens from any *Subcontractor* or *Supplier*. 5.4.6 The *Construction Act* holdback amount shall become due and payable the day immediately following the expiration of the holdback period prescribed by the *Construction Act* (in most cases being the 61st calendar day following the publication of the certificate of *Substantial Performance of the Work* 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 *Project* that has not been satisfied, discharged or otherwise provided for in accordance with the *Construction Act*; .2 receipt by the *Owner* of a written notice of lien that has not been satisfied, discharged or otherwise provided for in accordance with the *Construction Act*; or .3 prior to the expiry of 40 calendar days following the publication of the certificate of *Substantial Performance of the Work,* the *Owner* publishes a *Notice of Non-Payment* of holdback in accordance with the *Construction Act* (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 *Work*. 5.4.7 Notwithstanding the *Owner's* obligation to make payment of the holdback amount in accordance with GC 5.4.6, the processing of such payment remains subject to the *Owner's* internal *EFT* timing limitations. The *Owner* covenants, and the *Contractor* agrees, that payment of the holdback shall be made by *EFT* at the first opportunity during the *Owner's* normal processing of *EFTs* upon the holdback becoming due in accordance with GC 5.4.6..

GC 5.5 FINAL PAYMENT

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

to the requirement in GC 5.2.1 (the "***Final Pre-Invoice Submission Meeting***"), the *Contractor* may submit an application for final payment to the *Owner* and to the *Consultant*, 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 *Consultant* or written confirmation from the *Owner* that the deficiencies or incomplete *Work* waived by the *Owner* pursuant to GC 12.1.2 have been fully rectified as of the date of the *Contractor's* application for final payment, and/or (b) written confirmation, signed by the *Owner* and the *Contractor,* that the *Contract Price* has been reduced by a specified amount in exchange for the *Owner* releasing the *Contractor* of its obligation to rectify the certain outstanding deficiencies and/or incomplete *Work* waived by the *Owner* pursuant to GC 12.1.2, as detailed in such written confirmation.

5.5.2 No later than 5 calendar days prior to the *Final Pre-Invoice Submission Meeting*, the *Contractor* will, if not already provided, submit to the *Consultant* all *Close-Out Documentation*.

5.5.3 Delivery of all *Close-Out Documentation* is a requirement for the *Proper Invoice* for final payment.

5.5.4 After receipt by the *Owner* and the *Consultant* of an application for payment submitted by the *Contractor* that is a *Proper Invoice* and by no later than 10 calendar days after the receipt of the *Proper Invoice*:

.1 the *Consultant* will either:

(a) issue to the *Owner* with a copy to the *Contractor*, a progress payment certificate in the amount applied for by the *Contractor* in the *Proper Invoice*, or

(b) deliver a finding to the *Owner* with reasons why an amount other than what is claimed in the *Proper Invoice* is properly due to the *Contractor*, which finding the *Owner* may accept or amend prior to issuing a *Notice of Non-Payment* (Form 1.1), if any, in accordance with GC 5.5.2;

.2 the *Owner* shall make payment to the *Contractor* 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 *Owner's Notice of Non-Payment* issued pursuant to GC 5.5.5,

on the 28th calendar day after receipt of a *Proper Invoice*, unless such 28th calendar day lands on a day that is other than a *Working Day*, in which case payment shall be made on the next *Working Day* after such 28th day.

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

GC 5.6 DEFERRED WORK

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

***NEW* GC 5.8 DEFICIENCY HOLDBACK**

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

		Holdback in the value of 2% shall be applied against the total Contract value and shall be applied to each progress payment. The *Deficiency Holdback* 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 *Close-Out Documentation* not submitted in advance of or as part of the *Contractor's* application for *Substantial Performance of the Work*, 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 *Close-Out Documentation*, as determined by the *Consultant*, until such time as the applicable *Close-Out Documentation* 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 *Place of the Work* issued in accordance with the *Construction Act*, and less any amounts disputed under an *Owner*'s *Notice of Non-Payment* (Form 1.1)."

PART 6 CHANGES IN THE WORK

GC 6.1 OWNER'S RIGHT TO MAKE CHANGES

SC37.1	6.1.2	Add 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 *Contract Price* and/or *Contract Time* 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 *Work* and no claims that the *Owner* has been unjustly enriched by any alteration or addition to the *Work*, whether in fact there is any such unjust enrichment or not, shall be the basis of a claim for additional payment under this *Contract,* an increase to the *Contract Price*, or a claim for any extension of the *Contract Time*."
	6.1.3 to 6.1.8	Add 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 *Subcontractor and Supplier* coordination are included in the *Contract Price* and the *Contractor* shall be precluded from making any claim for a change in the *Contract Price* as a result of such changes. 6.1.4 Labour costs shall be actual, prevailing rates at the *Place of the Work* paid to workers, plus statutory charges on labour including WSIB, unemployment insurance, Canada pension,

		vacation pay, hospitalization and medical insurance. The *Contractor* shall provide these rates, when requested by the *Consultant*, for review and/or agreement. 6.1.5 Quotations for changes to the *Work* shall only include *Direct Costs* and be accompanied by itemized breakdowns together with detailed, substantiating quotations or cost vouchers from *Subcontractors* and *Suppliers,* submitted in a format acceptable to the *Consultant* and shall include any *Direct Costs* associated with extensions in *Contract Time.* 6.1.6 When both additions and deletions covering related *Work* or substitutions are involved in a change to the *Work*, payment, including *Overhead* and profit, shall be calculated on the basis of the net difference, if any, with respect to that change in the *Work*. 6.1.7 Changes to the contract shall be quoted to permit the work to be executed within the *Contract Time* unless approved by the *Consultant* and the *Owner.* 6.1.8 No extension to the *Contract Time* shall be granted for changes in the *Work* unless the *Contractor* can clearly demonstrate that such changes significantly alter the overall construction schedule submitted at the commencement of the *Work.* Extensions of *Contract Time* and all associated costs, if approved, shall be included in the relevant *Change Order.* 6.1.9 When a change in the *Work* is proposed or required, the *Contractor* shall within 10 calendar days submit to the *Consultant* for review a claim for a change in *Contract Price* and/or *Contract Time.* Should 10 calendar days be insufficient to prepare the submission, the *Contractor* shall within 5 calendar days, advise the *Consultant* 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 add the following: "The adjustment in the *Contract Time* and the *Contract Price* shall include an adjustment, if any, for delay or for the impact that the change in the *Work* has on the *Work* of the *Contractor*, and once such adjustment is made, the *Contractor* shall be precluded from making any further claims for delay or impact with respect to the change in the *Work.*"
	6.2.3 to 6.2.5	Add 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 *Consultant*: .1 by estimate and acceptance of a lump sum; .2 by negotiated unit prices which include the *Contractor's* overhead and profit, or;

		.3 by the actual *Direct Cost* to the *Owner,* 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 *Direct Costs* 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 *Subcontractor* quotations submitted listing items 1 to 4 above and item 6 below. .6 mark-up. 6.2.5 The *Owner* and the *Consultant* will not be responsible for delays to the *Work* resulting from late, incomplete or inadequately broken-down valuations submitted by the *Contractor.*"

GC 6.3 CHANGE DIRECTIVE

SC39.1	6.3.6.1	Amend 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	Delete paragraph 6.3.6.2 and replace it with the following: ".2 If a change in the *Work* results in a net decrease in the *Contract Price*, the amount of the credit shall be the net cost, without deduction for *Overhead* or profit."
	6.3.7.1(4)	Delete GC 6.3.7.1(4).
	6.3.7.7	Amend GC 6.3.7.7 by deleting the words "described in paragraph 6.3.7.1" and replacing them with "approved by the *Owner* in writing and in advance of any such expenses being incurred;"
	6.3.7.9	Amend GC 6.3.7.9 by adding the following to the end of the paragraph: "…when specifically requested by the *Owner* or as directed by the *Consultant*;".

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

GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

SC40.1	6.4.1	Delete paragraph 6.4.1 in its entirety and replace 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 *Contractor* will be considered by the *Owner* or the *Consultant* in connection with conditions which could reasonably have been ascertained by such investigation or other due diligence undertaken prior to the execution of the *Contract*.
	6.4.2	Amend paragraph 6.4.2 by adding a new first sentence as follows: "Having regard to paragraph 6.4.1, if the *Contractor* believes that the conditions of the *Place of the Work* differ materially from those reasonably anticipated, differ materially from those indicated in the *Contract Documents* and were concealed from discovery notwithstanding the conduct of the investigation described in paragraph 6.4.1, it shall provide the *Owner* and the *Consultant* with *Notice in Writing* no later than five (5) *Working Days* after the first observation of such conditions." -and- amend the existing second sentence of paragraph 6.4.2 in the second line, following the word "materially" by adding the words "or were concealed from discovery notwithstanding the conduct of the investigation described in paragraph 6.4.1,".
	6.4.3	Delete paragraph 6.4.3 in its entirety and substitute the following:

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

GC 6.5 DELAYS

SC41.1	6.5.1	In paragraph 6.5.1 delete the words after the word "for" in the fourth line and replace them with the words "…reasonable *Direct Costs* 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	Delete GC 6.5.2 in its entirety and replace it with the following: "6.5.2 If the *Contractor* is delayed in the performance of the *Work* 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 *Owner*, *Other Contractor(s)*, or the *Consultant*, and relating to the *Work* or the *Place of the Work*, then the *Contract Time* shall be extended for such reasonable time as the *Consultant* may determine. The *Contractor* shall be reimbursed by the *Owner* for reasonable *Direct Costs* 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	Delete paragraph 6.5.3 in its entirety and replace with the following: "6.5.3 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 *Contractor* shall agree. The extension of time shall not be less than the time lost as a result of the event causing the delay, unless the parties agree to a shorter extension. Neither party shall be entitled to payment for costs incurred by such delays. Upon reaching agreement on the extension of the *Contract Time* attributable to the *Force Majeure* event, the *Owner* and the *Contractor* shall execute a *Change Order* indicating the length of the extension to the *Contract Time* and confirming that there are no costs payable by the either party for the extension of *Contract Time*. However, if at the time an event of *Force Majeure* arises a party is in default of its obligations under the *Contract* and has received a notice of default 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 *Force Majeure*."

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

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, delete the words "and if the *Consultant* has given a written statement to the *Owner* and *Contractor* which provides the detail of such neglect to perform the *Work* properly or such failure to comply with the requirements of the *Contract* to a substantial degree".
SC43.2	7.1.3.4	Add 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 *Consultant* and the *Owner* wherein the default can be corrected within the balance of the *Contract Time* and shall not cause delay to any other aspect of the *Work* or the work of other contractors, and in no event shall it be deemed to give a right to extend the *Contract Time*."
	7.1.4.1	Delete subparagraph 7.1.4.1 and replace it with the following: ".1 correct such default and deduct the cost, including *Owner's* expenses, thereof from any payment then or thereafter due the *Contractor*."
	7.1.4.2	Delete subparagraph 7.1.4.2 and replace it with the following: ".2 by providing *Notice in Writing* to the *Contractor*, terminate the *Contractor's* right to continue with the *Work* in whole or in part or terminate the *Contract*, and publish a notice of termination (Form 8) in accordance with the *Act*."
	7.1.5.3	In subparagraph 7.1.5.3 delete the words: "however, if such cost of finishing the *Work* is less than the unpaid balance of the *Contract Price*, the *Owner* shall pay the *Contractor* the difference"
	7.1.6 to 7.1.10	Delete GC 7.1.6 and replace 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 *Contract* set out herein, the *Owner* may terminate this *Contract* at any time for any other reason and without cause upon giving the *Contractor* fifteen (15) *Working Days Notice in Writing* to that effect. In such event, the *Contractor* shall be entitled to be paid for all *Work* performed including reasonable profit, for loss sustained upon *Products* and *Construction Equipment*, and such other damages as the *Contractor* may have sustained as a result of the termination of the *Contract*, but in no event shall the *Contractor* be entitled to be compensated for any loss of profit on unperformed portions of the *Work*, or indirect, special, or consequential damages incurred. 7.1.7 The *Owner* may suspend *Work* under this *Contract* at any time for any reason and without cause upon giving the *Contractor Notice in Writing* to that effect. In such event, the *Contractor* shall be entitled to be paid for all *Work* 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 *Products* and *Construction Equipment*, and such other damages as the *Contractor* may have sustained as a result of the suspension of the *Work*, but in no event shall the *Contractor* 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 *Contract* 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 *Contract* or a suspension of the *Work* 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 *Contractor* shall use its best commercial efforts to mitigate the financial consequences to the *Owner* arising out of the termination or suspension, as the case may be.

		7.1.9 Upon the resumption of the *Work* 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 *Contractor* will endeavour to minimize the delay and financial consequences arising out of the suspension. 7.1.10 The *Contractor's* obligations under the *Contract* as to quality, correction, and warranty of the *Work* performed by the *Contractor* up to the time of termination or suspension shall continue after such termination of the *Contract* or suspension of the *Work*."

GC 7.2 CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT

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

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

PART 8 DISPUTE RESOLUTION

GC 8.1 AUTHORITY OF THE CONSULTANT

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

GC 8.2 ADJUDICATION

SC45.2	8.2.2 to 8.2.7	Add 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 *Contractor* has given an undertaking, in accordance with the *Act*, to refer a dispute to *Adjudication*, prior to delivering a notice of *Adjudication* in a form prescribed by the *Act*, the parties agree to first address all disputes with at least one in-person meeting with the *Owner's* representative, the *Consultant's* representative, and the *Contractor's* 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 *Adjudication* proceedings as required by, and in accordance with, the *Construction Act*. 8.2.4 The following procedures shall apply to any *Adjudication* the parties engage in under the *Construction Act*:

.1 any hearings shall be held at a venue within the jurisdiction of the *Place of the Work* or such other venue as the parties may agree and which is acceptable to the adjudicator;

.2 the *Adjudication* shall be conducted in English;

.3 each party may be represented by counsel throughout an *Adjudication*;

.4 there shall not be any oral communications with respect to issues in dispute that are the subject of an *Adjudication* 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 *Adjudication* are confidential and the parties shall not use such documents or information for any purpose other than the *Adjudication* 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 *Contractor* fails to comply with any of the notice requirements set out in the *Contract*, 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 *Contractor* shall have no entitlement whatsoever (including to an increase in the *Contract Price*, or an extension of *Contract Time*) in the context of an *Adjudication* under the *Construction Act* and waives the right to make any such claims or disputes in an *Adjudication*. This GC 8.2.6 shall operate conclusively as an estoppel and bar in the event such claims or disputes are brought in an *Adjudication* and the *Owner* 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 *Owner* to withhold, deduct or retain from monies otherwise owed to the *Contractor* under the *Contract* may be referred to, and included as part of, *Adjudications* under the *Construction Act*;

.2 that disputes related to the termination or abandonment of the *Contract*, as well as any disputes that arise or are advanced following the termination or abandonment of the *Contract*, shall not be referred to *Adjudication* under the *Construction Act*;

.3 that notice(s) of *Adjudication,* with respect to any dispute or claim relating to the *Project,* shall not be given, and no *Adjudication* shall be commenced following *Contract* completion, *Contract* abandonment, or termination of the *Contract*;

.4 that any *Adjudication* between the *Contractor* and a *Subcontractor* or a supplier that relates to an *Adjudication* between the *Owner* and the *Contractor* shall be

		joined together to be adjudicated by a single adjudicator, provided that the adjudicator agrees to do so, and the *Contractor* 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 *Contractor* is obligated to commence an *Adjudication* pursuant to an undertaking under the *Construction Act,* neither the *Owner* nor the *Contractor* shall commence an *Adjudication* during the *Restricted Period*. 8.2.8 The parties acknowledge and agree that no *Adjudication*, arbitration, action, suit or other proceeding may be brought by the *Contractor* against the *Owner* in respect of a claim for an increase to the *Contract Price* as set out in GC 6.6, before the *Consultant* 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 *Proper Invoice* shall not include any amounts pertaining to the *Contractor's* claim for an increase in *Contract Price* unless and until the *Consultant* has issued a written notice to the *Contractor* 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 *Contractor* from commencing an *Adjudicatio*n where, pursuant to the *Construction Act*, the *Contractor* is required to give an undertaking to a *Subcontractor* to commence an *Adjudication* following delivery of a *Notice of Non-Payment*."

GC 8.3 NEGOTIATION, MEDIATION AND ARBITRATION

SC46.1	8.3.1	Amend paragraph 8.3.1 by changing part of the second line from "shall appoint a *Project Mediator*" to "may appoint a *Project Mediator,* except that such an appointment shall only be made if both the *Owner* and the *Contractor* agree."
	8.3.4	Amend paragraph 8.3.4 by changing part of the second line from "the parties shall request the *Project Mediator"* to "and subject to paragraph 8.3.1 the parties may request the *Project Mediator".*
	8.3.6 to 8.3.9	Delete paragraphs 8.3.6, 8.3.7 and 8.3.8 in their entirety and replace 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 *Contractor* and the *Owner* agree. If the *Contractor* and the *Owner* agree to resolve the dispute by arbitration, the arbitration shall be conducted in the jurisdiction of the *Place of the Work*. 8.3.7 Prior to delivering a notice of *Adjudication* in a form prescribed by the *Act*, the parties agree to first address all disputes by attending at least one meeting with the *Owner*'s representative, the *Consultant*'s representative, and the *Contractor*'s representative, prior to commencing an *Adjudication*. 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 *Adjudication* shall provide the other party with 5 *Working Days' Notice in Writing* of its intention to issue a notice of *Adjudication*. 8.3.8 Other than where the *Contractor* is obliged to commence an *Adjudication* pursuant to an undertaking under the *Construction Act*, neither the *Owner* nor the *Contractor* shall commence an *Adjudication* during the *Restricted Period*. 8.3.9 Where either party has delivered a notice of *Adjudication* in a form prescribed by the *Act*, the procedures and rules set out under the *Construction Act* and the regulations thereto shall govern the *Adjudication*."

PART 9 PROTECTION OF PERSONS AND PROPERTY

GC 9.1 PROTECTION OF WORK AND PROPERTY

SC47.1	9.1.1.1	Delete subparagraph 9.1.1.1 in its entirety and substitute the following: ".1 errors in the *Contract Documents* which the *Contractor* could not have discovered applying the standard of care described in paragraph 3.14.1;"
	9.1.2	Delete paragraph 9.1.2 in its entirety and substitute as follows: "9.1.2 Before commencing any *Work*, the *Contractor* shall determine the locations of all underground or hidden utilities and structures indicated in or inferable from the *Contract Documents*, or that are inferable from an inspection of the *Place of the Work* exercising the degree of care and skill described in paragraph 3.14.1."
	9.1.5	Add 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 *Contractor* 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 *Contractor*, without first consulting the *Owner* and receiving written instructions as to the course of action to be followed from either the *Owner* or the *Consultant*. Where, however, there is danger to life, the environment, or public safety, the *Contractor* 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 inserting the following to the end of the paragraph: "For the purposes of GC 9.2 – TOXIC AND HAZARDOUS SUBSTANCES, *Excess Soil* 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	Amend GC 9.2.6 by adding the following words after the word "responsible" in the second line: "or whether any toxic or hazardous substances or materials already at the *Place of the Work* (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the *Contractor* or anyone for whom the *Contractor* is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damages to the property of the *Owner* or others,".

	9.2.8	Amend GC 9.2.8 by adding the following words after the word "responsible" in the second line: "or whether any toxic or hazardous substances or materials already at the *Place of the Work* (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the *Contractor* or anyone for whom the *Contractor* is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damages to the property of the *Owner* or others,".
	9.2.10	Add new paragraph 9.2.10 as follows: "9.2.10 The *Contractor*, *Subcontractors* and *Suppliers* shall not bring on to the *Place of the Work* any toxic or hazardous substances and materials except as required in order to perform the *Work*. 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 *Place of the Work*."

GC 9.4 CONSTRUCTION SAFETY

SC49.1	9.4.1	Delete GC 9.4.1 in its entirety and replace it with the following: "9.4.1 The *Contractor* shall be solely responsible for construction safety at the *Place of the Work* and for compliance with the rules, regulations, and practices required by the *OHSA*, 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 *Work*. The *Contractor*'s health and safety program documentation shall be made available for review by the *Owner* or *Consultant* immediately upon request. Without limiting the foregoing, the *Contractor* shall be solely responsible for construction safety in respect of the *Consultant*, *Subcontractors* and *Suppliers*, the *Owner's* own forces, *Other Contractors*, and all persons attending the *Place of the Work* during the course of the *Project*."
	9.4.2	Amend GC 9.4.2 by adding the following words after "and the *Contractor*": ", *Subcontractors* and *Suppliers*".
	9.4.3	Amend GC 9.4.3 by adding the following words after "and the *Contractor*": ", *Subcontractors* and *Suppliers*".
	9.4.4	Delete GC 9.4.4 and replace it with the following:

		"9.4.4 The *Owner* 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 *Contractor* with respect to occupational health and safety and related matters."
	9.4.5	Delete GC 9.4.5 in its entirety and replace it with the following: "9.4.5 Prior to the commencement of the *Work*, the *Contractor* shall submit to the *Owner*: .1 a current WSIB clearance certificate; .2 copies of the *Contractor*'s insurance policies having application to the *Project* or certificates of insurance, at the option of the *Owner*; .3 documentation setting out the *Contractor*'s in-house safety programs; .4 a copy of the Notice of Project filed with the Ministry of Labour naming itself as "constructor" under the *OHSA*; 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 *Place of the Work*;"
	9.4.6 to 9.4.12	Add 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 *Contractor* shall indemnify and save harmless the *Owner*, 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 *Contractor* under *OHSA* and any other occupational health and safety legislation in force at the *Place of the Work* including the payment of legal fees and disbursements on a solicitor and client basis. Such indemnity shall apply to the extent to which the *Owner* is not covered by insurance. 9.4.7 If the *Owner* is of the reasonable opinion that the *Contractor* has not taken such precautions as are necessary to ensure compliance with the requirements of paragraph 9.4.1, the *Owner* may take any remedial measures which it deems necessary, including stopping the performance of all or any portion of the *Work,* and the *Owner* may use its employees, the *Contractor*, any *Subcontractor* or any other contractors to perform such remedial measures. 9.4.8 The *Contractor* shall file any notices or any similar document required pursuant to the *Contract* or the safety regulations in force at the *Place of the Work*. This duty of the *Contractor* will be considered to be included in the *Work* and no separate payment therefore will be made to the *Contractor*. 9.4.9 Unless otherwise provided in the *Contract Documents*, the *Contractor* shall develop, maintain and supervise for the duration of the *Work* 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 *Owner* and any workers' compensation or occupational health and safety statutes or regulations in force at the *Place of the Work*.

		9.4.10 The *Contractor* shall provide a copy of the safety program described in GC 9.4.9 hereof to the *Consultant* for delivery to the *Owner* prior to the commencement of the *Work*, and shall, ensure, as far as it is reasonably practical to do so, that every employer and worker performing work in respect of the *Project* complies with such program. 9.4.11 The *Contractor* 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 *Place of the Work*, 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 *Contractor* shall promptly report in writing to the *Owner* and the *Consultant* all accidents of any sort arising out of or in connection with the performance of the *Work*, 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 *Contractor* to the *Owner* and the *Consultant* by telephone or messenger in addition to any reporting required under the applicable safety regulations."."

PART 10 GOVERNING REGULATIONS

GC 10.1 TAXES AND DUTIES

SC50.1	10.1.2	Amend paragraph 10.1.2 by adding the following sentence to the end of the paragraph: "For greater certainty, the *Contractor* shall not be entitled to any mark-up for overhead or profit on any increase in such taxes and duties and the *Owner* shall not be entitled to any credit relating to mark-up for overhead or profit on any decrease in such taxes. The *Contractor* shall provide a detailed breakdown of Additional taxes if requested by the *Owner* in a form satisfactory to the *Owner*."
	10.1.3	Add new paragraph 10.1.3 as follows: "10.1.3 Where the *Owner* is entitled to an exemption or a recovery of sales taxes, customs duties, excise taxes or *Value Added Taxes* applicable to the *Contract*, the *Contractor* shall, at the request of the *Owner*, 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 *Owner*. The *Contractor* agrees to endorse over to the *Owner* 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	Amend paragraph 10.2.5 by adding the words "Subject to paragraph 3.4" at the beginning of the paragraph. -and- Add the following to the end of the second sentence:

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

GC 10.4 WORKERS' COMPENSATION

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

GC 11.1 INSURANCE

SC53.1	11.1	Delete entirety of GC 11.1 and replace with the following: "**GC 11.1 INSURANCE** 11.1.1 Without restricting the generality of GC 12 – INDEMNIFICATION, the *Contractor* 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 *Work* until the expiration of the warranty periods set out in the *Contract Documents*. Prior to commencement of the *Work* and upon the placement, renewal, amendment, or extension of all or any part of the insurance, the *Contractor* shall promptly provide the *Owner* 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 amending endorsements. .1 **General Liability Insurance**

General liability insurance shall be in the name of the *Contractor,* with the *Owner* and the *Consultant* named as Additional 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, *Subcontractors* and/or agents. The insurance coverage shall not be less than the insurance required by IBC Form 2100, or its equivalent replacement, 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 *Ready-for-Takeover*, as set out in the certificate of *Ready-for-Takeover,* on an ongoing basis for a period of 6 years following *Ready-for-Takeover*. Where the *Contractor* maintains a single, blanket policy, the Addition of the *Owner* and the *Consultant* is limited to liability arising out of the *Project* and all operations necessary or incidental thereto. 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.

.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 *owned* or leased by the *Contractor*, 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 *Contractor* shall provide the *Owner* with confirmation of automobile insurance coverage for all automobiles registered in the name of the *Contractor.*

.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 *Contractor* with the *Owner* and the *Consultant* named as Additional 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 *Work*, whether owned by the *Contractor* or the owner or owned by others, so long as the property forms part of the *Work*. 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 replacement provided that the IBC Form 4042 shall include the latest Addition of the relevant CCDC endorsement form. The coverage shall be based on a completed value form and shall be maintained continuously until ten (10) days after the date of the final certificate of payment.

(2) Boiler and machinery insurance shall be in the name of the *Contractor*, with the *Owner* and the *Consultant* named as Additional insureds, for not less than the replacement value of the boilers, pressure vessels and other insurable objects forming part of the *Work*. 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 *Work.*

(4) The policies shall provide that, in the case of a loss or damage, payment shall be made to the *Owner* and the *Contractor* as their respective interests may appear. The *Contractor* shall act on behalf of the *Owner* 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 *Contractor* shall proceed to restore the *Work*. Loss or damage shall not affect the rights and obligations of either party under the *Contract* except that the *Contractor* shall be entitled to such reasonable extension of the *Contract Time,* relative to the extent of the loss or damage, as determined by the *Owner*, in its sole discretion.

(5) The *Contractor* shall be entitled to receive from the *Owner*, in Addition to the amount due under the *Contract*, the amount at which the *Owner's* interest in restoration of the *Work* has been appraised, such amount to be paid as the restoration of the *Work* proceeds and as provided in GC 5.2 – APPLICATIONS FOR PROGRESS PAYMENT and GC 5.3 – PROGRESS PAYMENT. In Addition, the *Contractor* shall be entitled to receive from the payments made by the insurer the amount of the *Contractor's* interest in the restoration of the *Work*.

(6) In the case of loss or damage to the *Work* arising from the work of other contractors, or the *Owner's* own forces, the *Owner*, in accordance with the *Owner's* obligations under paragraph 3.2.2.4 of GC 3.2 – CONSTRUCTION BY OWNER OR OTHER CONTRACTORS, shall pay the *Contractor* the cost of restoring the *Work* as the restoration of the *Work* 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 *Contractor* for the performance of the *Work*, excluding boiler insurance, shall be in a form acceptable to the *Owner* and shall not allow subrogation claims by the insurer against the *Owner.* The policies shall be endorsed to provide the *Owner* with not less than 30 days' notice, in writing, in advance of cancellation, change or amendment restricting coverage. Subject to satisfactory proof of financial capability by the *Contractor* for self-insurance of his equipment, the *Owner* agrees to waive the equipment insurance requirement.

11.1.2 The *Contractor* shall be responsible for deductible amounts under the policies except where such amounts may be excluded from the *Contractor's* responsibility by the terms of GC 9.1 - PROTECTION OF WORK AND PROPERTY and GC 9.2 - DAMAGES AND MUTUAL RESPONSIBILITY.

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

***NEW* GC 11.2 CONTRACT SECURITY**

SC52.1	GC 11.2	Add new GC 11.2 – CONTRACT SECURITY as follows: "**GC 11.2 CONTRACT SECURITY** 11.2.1 The *Contractor* shall, prior to the execution of the *Contract*, 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 *Owner* and is permitted under the *Construction Act*, .2 be issued by an insurer licensed under the *Insurance Act* (Ontario) and authorized to transact a business of suretyship in the Province of Ontario; .3 shall be in the form prescribed by the *Construction Act*; .4 have a coverage limit of at least 50 per cent of the *Contract Price*, or such other percentage of the *Contract Price* as stated in the *Contract Documents*; .5 extends protection to *Subcontractors*, *Suppliers,* and any other persons supplying labour or materials to the *Project*; and .6 shall be maintained in good standing until the fulfillment of the *Contract*, including all warranty and maintenance periods set out in the *Contract Documents*.. 11.2.3 It is the intention of the parties that the performance bond shall be applicable to all of the *Contractor's* obligations in the *Contract Document* and, wherever a performance bond is provided with language which conflicts with this intention, it shall be deemed to be amended to comply. The *Contractor* represents and warrants to the *Owner* that it has provided its surety with a copy of the *Contract Documents* 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 *Owner* for and against costs and expenses (including legal and *Consultant* services and court costs) arising out of or as a consequence of any default of the *Contractor* under this *Contract*. 11.2.4 The *Contractor* shall be responsible for notifying the surety company of any changes made to the *Contract* during the course of construction.

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

PART 12 OWNER TAKEOVER

GC 12.1 READY-FOR-TAKEOVER

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

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

GC 12.2 EARLY OCCUPANCY

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

GC 12.3 WARRANTY

SC57.1	12.3.1 12.3.2	Delete from the first line of paragraph 12.3.1 the words "one year" and replace it with the words "two years" Delete from the first line of paragraph 12.3.2 the word "The" and replace it with the words "Subject to GC 1.1.3, the…"
	12.3.7 to 12.3.12	Add new paragraphs 12.3.7 to 12.3.12 as follows: "12.3.7 Where required by the *Contract Documents*, the *Contractor* shall provide a maintenance bond as security for the performance of the *Contractor's* obligations as set out in GC 12.3 WARRANTY. 12.3.8 The *Contractor* shall provide fully and properly completed and signed copies of all warranties and guarantees required by the *Contract Documents*, containing: .1 the proper name of the *Owner*; .2 the proper name and address of the *Project*; .3 the date the warranty commences, which shall be at the "*Ready-for-Takeover*" unless otherwise agreed upon by the *Consultant* in writing. .4 a clear definition of what is being warranted and/or guaranteed as required by the *Contract Documents*; and .5 the signature and seal (if required by the governing law of the *Contract*) of the company issuing the warranty, countersigned by the *Contractor*. 12.3.9 Should any *Work* 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 *Contractor* shall ensure that its *Subcontractors* are bound to the requirements of GC 12.3 – WARRANTY for the *Subcontractor's* portion of the *Work.* 12.3.11 The *Contractor* shall ensure that all warranties, guarantees or other obligations for *Work*, services or *Products* performed or supplied by any *Subcontractor, Supplier* or other person in connection with the *Work* are obtained and available for the direct benefit of the *Owner.* In the alternative, the *Contractor* shall assign to the *Owner* all warranties, guarantees or other obligations for *Work*, services or *Products* performed or supplied by any *Subcontractor, Supplier* or other person in connection with the *Work* 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 *Owner* under the *Contract Documents*. 12.3.12 The *Contractor* shall commence or correct any deficiency within 2 *Working Days* after receiving a *Notice in Writing* from the *Owner* or the *Consultant*, and shall complete the *Work* 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 *Owner* 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 *Contractor* fail to provide this emergency service within 8 hours of a request being made during the

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

PART 13 INDEMNIFICATION AND WAIVER

GC 13.1 INDEMNIFICATION

SC58.1	GC 13.1	Delete GC 13.1 – INDEMNIFICATION in its entirety and replace it with the following: "13.1.1 The *Contractor* shall indemnify and hold harmless the *Owner*, its parent, subsidiaries and affiliates, their respective partners, trustees, officers, directors, agents and employees and the *Consultant* 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 *Owner* 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 *Contractor*, its employees, agents, *Subcontractors*, *Suppliers* 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 *Work*, the *Owner's* property or equipment, the *Contractor's* property or equipment or equipment or property adjacent to the *Place of the Work* or death or injury to the *Contractor's* personnel). 13.1.2 The *Owner* shall indemnify and hold the *Contractor*, its agents and employees harmless from and against claims, demands, losses, costs, damages, actions, suits or proceedings arising out of the *Contractor's* performance of the *Contract* which are attributable to a lack of or defect in title or an alleged lack of or defect in title to the *Place of the Work*. 13.1.3 The provisions of GC 13.1 - INDEMNIFICATION shall survive the termination of the *Contract,* 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 *Work* shall constitute a waiver or release of any of the provisions of GC 13.1 13.1.4 Notwithstanding the provisions of GC1.1 - CONTRACT DOCUMENTS, GC 1.1.6, GC13.1 - INDEMNIFICATION shall govern over the provisions of GC 1.3.1 of GC1.3 – RIGHTS AND REMEDIES."

GC 13.2 WAIVER OF CLAIMS

	13.2.1	In paragraph 13.2.1 in the third line after the word "limitation" add the words "claims for delay pursuant to GC 6.5 DELAYS" -and- add the words "(collectively "**Claims**")" after "*Ready-for-Takeover*" 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	Delete 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 delete the words “in paragraphs 13.2.1.2 and 13.2.1.3” and replace 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	Delete paragraph 13.2.3 in its entirety.
	13.2.4	Delete paragraph 13.2.4 in its entirety.
	13.2.5	Delete 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 *Contractor* -and- change the word “claim” to “Claim” in all instances in the paragraph.
	13.2.9	In paragraph 13.2.9 delete the words “under paragraphs 13.2.1 or 13.2.3” and replace them with “under paragraph 13.2.1” -and- change both instances of the words “the party” to “the *Contractor*”. Change the word “claim” to “Claim” in all instances in the paragraph.

***NEW* PART 14 OTHER PROVISIONS**

SC58.1	14.1	Add new PART 14 – OTHER PROVISIONS as follows: “**PART 14 OTHER PROVISIONS** **GC 14.1 OWNERSHIP OF MATERIALS**

		14.1.1 Unless otherwise specified, all materials existing at the *Place of the Work* at the time of execution of the *Contract* shall remain the property of the *Owner*. All *Work* and *Products* delivered to the *Place of the Work* by the *Contractor* shall be the property of the *Owner.* The *Contractor* shall remove all surplus or rejected materials as its property when notified in writing to do so by the *Consultant*."
	14.2	Add new GC 14.2 – CONSTRUCTION LIENS as follows: **"GC 14.2 LIENS** 14.2.1 Notwithstanding any other provision in the *Contract*, the *Consultant* shall not be obligated to issue a certificate, and the *Owner* shall not be obligated to make payment, subject to the *Owner*'s requirement to issue a *Notice of Non-Payment* (Form 1.1) to the *Contractor*, if at the time such certificate or payment was otherwise due: .1 a claim for lien has been registered against the *Project* lands by a *Subcontractor* or a *Supplier* that has not been vacated or discharged by the *Contractor* in accordance with the requirements of this *Contract*, or .2 if the *Owner* or a mortgagee of the *Project* lands has received a written notice of a lien that has not been resolved by the *Contractor* through the posting of security or otherwise. 14.2.2 In the event a construction lien arising from the performance of the *Work* is registered or preserved against the *Project* lands by a *Subcontractor* or a *Supplier*, or a written notice of a lien is given or a construction lien action is commenced against the *Owner* by a *Subcontractor* or a *Supplier*, then the *Contractor* 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 *Place of the Work*). If the lien is merely vacated, the *Contractor* shall, if requested, undertake the *Owner*'s defence of any subsequent action commenced in respect of the lien, at the *Contractor*'s 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 *Owner* against all costs and expenses arising from same, including legal costs on a full indemnity basis. 14.2.3 In the event that the *Contractor* fails or refuses to comply with its obligations pursuant to paragraph 14.2.2, the *Owner* 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 *Owner's* 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 *Project* lands, and in so doing will be entitled to a full indemnity from the *Contractor* for all legal fees, security,

		disbursements and other costs incurred and will be entitled to deduct same from amounts otherwise owing to the *Contractor*. 14.2.4 In the event that any *Subcontractor* or *Supplier* registers any claim for lien with respect to all or part of the *Place of Work*, the *Owner* 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 *Act*, by paying into court as security the amount withheld. 14.2.5 Nothing in this GC 14.2 serves to preclude the *Contractor* from preserving and perfecting its lien in the event of non-payment by the *Owner*."

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)	$25,000
2	Independent Testing & Inspection (structural steel, painting etc.) (As directed by the Consultant)	$5,000
3	Data cabling installation and network equipment (Including terminations)	$5,000
4	Public Address (PA) systems. (Including all cabling and hardware)	$5,000
5	Exterior and Interior Signage	$10,000
6	Exterior roof guard and parapet rectifications and all associated works	$40,000
	Total of All Allowances:	**$90,000**

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 Wok permit may be waived, until such time as either Substantial Completion or Occupancy is granted, whichever comes first.

.13 On additions to existing buildings, the requirements for Hot Work permits shall remain in place.

1.5. HOT WORK PERMIT

.1 **A sample Hot Work Permit is attached to the specifications – refer to attached Appendix 01 35 17-A**

.2 Each permit is valid for seven (7) days only and must be renewed prior to its expiration date

.3 The contractor must obtain Hot Work Permits from the School Board's representative prior to the start of work.

.4 The contractor must complete the form as required and must keep the form on site.

.5 Return each completed form to the School Board's representative on the date of expiration.

.6 The most current version of the Permit and its requirements shall be used for the purposes of the Work.

1.6. FIRE PROTECTION SYSTEMS

.1 Any Modifications to Fire Alarm system and its devices including service, additions and changes in device location must be performed only by a Certified Fire Alarm Technician as per the Ontario Fire Code section 1.1, subsection 1.1.5.

.2 The Contractor will receive from the Board's contact a contact number for the monitoring service and a school system number.

.3 Bidders are cautioned that the Board will be reimbursed for the cost of false alarms. Refer to Section 01 14 00 Work Restrictions, Para. 1.4.4.

.4 An approved inspection firm shall verify all new fire alarm devices, in accordance with CSA regulations. Certificate of Verification is required before occupancy.

1.7. FIRE ALARM SHUT-DOWN PROCEDURE

.1 Plan the operation such that the required work minimizes system down time to the least amount possible. Do not shut the system down or engage silence mode when the building is occupied by students. Only shut the system down when necessary.

.2 For the purposes of this section, unoccupied shall mean when the school is not occupied by students.

.3 Wherever possible, shut down only the zone needing work,

.4 and schedule down time in unoccupied school hours.

.5 Contractor(s) shall ensure all costs are included in their bid price for work related to the fire alarm system outside of regular hours and/or during unoccupied school hours. This shall include evening and weekend work.

.6 A fire alarm system must remain active when the building is not occupied by school or contractor's forces and should never be offline overnight.

.7 Procedure

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

.1 Inform both the principal and head custodian whenever the fire alarm system is to be disabled prior to any partial or whole system shut down. Where school staff are not available, ensure that the Project Coordinator and/or area supervisor are informed.

.2 Ensure that the school or building administration has advised all staff when the fire alarm system is disabled and/or when it is back online. This will include instructions to call 911 if they detect smoke or a fire.

.3 Immediately prior to alarm system shutdown and upon restoring the fire alarm system, the person supervising the shutdown must:

1.7.7.1.3.1. obtain the school account number, located on a red decal attached to the fire alarm panel. This number will be formatted as 20-9xxx, with the xxx being the school location code,

1.7.7.1.3.2. contact Direct Detect at 519-741-2494 (the fire alarm monitoring company), to inform them of the state of the fire alarm and the approximate amount of time the fire alarm will be offline. They will require the building name and account number, the contact name, the contractor name as well as any other information they request, and

1.7.7.1.3.3. contact Bestell at 519-741-2494 (the current security monitoring company), to inform them of the state of the fire alarm and the approximate amount of time the fire alarm will be offline. They may require the building name and account number as well as any other information they request.

.4 A fire watch, at the Contractor's expense, shall be undertaken by a person with the sole and express purpose of completing the following tasks and in the event of the detection of smoke, fire, or any other emergency, notifying the fire department, and the building occupants. The fire watch patrol shall:

1.7.7.1.4.1. patrol all halls and high-risk areas affected,

1.7.7.1.4.2. have access to a phone and call 911 if they see or detect smoke or fire,

1.7.7.1.4.3. report any other problems they encounter,

1.7.7.1.4.4. notifying the building occupants in the event of an emergency and

1.7.7.1.4.5. remain on patrol until the fire alarm system is reactivated and fully operational.

.5 Contact Direct Detect, Bestell, and school administration to inform them that the fire alarm is back online.

.6 In the event that a fire alarm system is activated, whether by smoke, fire or accidentally, the system must not be reset until authorized by the Fire Department (verbally or in person) and the cause of the alarm has been investigated.

1.8. FIRE PROTECTION EQUIPMENT IMPAIRMENT

.1 Fire Protection Equipment referred to in this section includes sprinkler systems, special fire suppression systems, and kitchen hood suppression systems.

.2 The Contractor will take all precautions including restrict all Hot Work operations and shut down hazardous processes during all Fire protection equipment impairment.

.3 Do not shut the Fire protection equipment down unless necessary. Plan the operation required to reduce system impairment time to the least amount possible.

.4 Wherever possible, shut down only the Fire protection equipment needing Work and schedule this impairment time for unoccupied school hours. Allow for this in your bid pricing.

.5 Discuss the possible down time with the head custodian and principal prior to any partial or whole system impairment.

.6 The school administration shall advise all staff of Fire protection equipment shut down. This will include instructions to call 911 if they see a fire and when system is back online

.7 The Contractor will plan to use temporary protection such as extra extinguishers, charged hose lines and temporary sprinkler protection during all Fire protection equipment impairment.

.8 If the sprinkler system is restorable, either in whole or in part, the Contractor or subcontractor shall assign someone to restore the system promptly in the event of a fire.

.9 A fire patrol may need to be established and will include the following at the Contractor's expense:

- .1 Patrol all halls and high-risk areas affected.
- .2 Fire patrol shall have access to a phone and call 911 if they see a fire.
- .3 Report all other problems they encounter.
- .4 Remain on patrol until the system is back on.

.10 The Contractor shall inform all sub trades that the Board has a Red Tag Permit System and it shall be used for all Fire protection equipment impairment.

.11 For ease of use, a Factory Mutual hanging wall kit has been put in place at all Board Fire protection equipment locations. Supplies of Red Tag Permits are provided there.

1.9. FIRE ALARM MODIFICATIONS AND MAINTENANCE

.1 Very important changes to Ontario Building Code as they relate to the Standard for the Verification of Fire Alarm Systems CAN/ULC-S537-M have taken effect December 24, 1999. (Minister's Ruling 99-BC-01)

.1 Clause 5.1; "Addition of conventional field device(s), or modification(s), to existing input circuit(s) or output circuit(s) shall require re-verification of all devices served by those input circuit(s) or output circuit(s)." If one device is added to a zone, the entire zone or in the case of a single zone panel the entire system is to be verified.

.2 Clause 5.2 "Addition of input circuit(s) or output circuit(s) to an existing fire alarm system shall require verification of the new circuit(s) in accordance with this standard, and shall also require all previously existing circuit(s) to be tested as follows:

.3 TEST: One conventional field device on each circuit shall be operated to confirm activation of all output circuits in accordance with the systems design." Even though no other zones have been touched, one device per input zone is to be tested when the Fire Alarm system is modified.

.4 Clause 5.5 "Where a transponder is added to an existing system, the transponder shall be verified in accordance with subsections 3.2, Wiring; and subsection 3.3 Control Units; and with CAN/ULC-S536, Standard for the Inspection and Testing of Fire Alarm Systems as well as re-verification of existing field devices and verification of new conventional field devices." If a new addressable device is added to a system, the new device is to be tested; as well a test must be conducted on all addressable devices on the loop.

.5 Clause 5.6 "Where an existing fire alarm system control unit is replaced with a new control unit, it shall be verified in accordance with CAN/ULC-S536, Standard for the Inspection and Testing of Fire Alarm Systems. Replacement of any control panel will require the testing of all existing fire alarm devices.

.2 The Contractor and subcontractors shall include in the bid price for the above ULC Standards requirements referenced in the Ontario Building Code.

1.10. INSTALLATION AND/OR REPAIR OF ROOFING

.1 The Contractor will review with the Consultant and the Board's representative of the location of any asphalt kettles and the dates the kettles will be in use. The Contractor, in the course of performing roofing work, will ensure all personnel utilize the following precautions:

.1 Use only kettles equipped with thermometers or gauges in good working order.

.2 Locate kettles in a safe place outside of the building.

.3 Maintain continuous supervision while kettles are in operation and provide metal covers for the kettles to smother any flames in case of fire.

.4 All roofing materials stored in locations no closer than 15 meters to any structures.

1.11. FIRE DEPARTMENT ACCESS

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

1.12. SMOKING PRECAUTIONS

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

1.13. FLAMMABLE LIQUIDS

.1 The handling and storage on site of flammable liquids are to be governed by the current National Fire Code of Canada.

.2 Flammable liquids such as gasoline, kerosene and naphtha may be kept for ready use in quantities not exceeding 10 imperial gallons provided they are stored in approved safety cans bearing the Underwriter's Laboratory of Canada or Factory Mutual seal of approval.

.3 Transfer of flammable liquids is prohibited within buildings.

.4 Transfer of flammable liquids must not be carried out in the vicinity of open flame or any type of heat producing devices.

.5 Flammable liquids having a flashpoint below 100° F (37.7°C) such as naphtha or gasoline must not be used as solvents or cleaning agents.

.6 Flammable waste liquids, for disposal, must be stored in approved containers located in a safe ventilated area. Quantities are to be kept to a minimum.

END OF SECTION

Appendix 013517-A Contractor Hot Work Permit

Waterloo Region District School Board

Appendix - 013517-A

Facility Services

CONTRACTOR HOT WORK PERMIT

STOP!
Avoid hot work or seek an alternative method if possible.

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

Board Supervisor/ Manager/Proj. Coordinator Responsibilities:
i. Verify precautions taken in Section A
ii. Complete and retain Part 1
iii. Complete Section B prior to commencement of Hot Works
iv. Issue Part 2 to Contractor completing Hot Work & Post
v. Obtain Part 2 when Fire Monitoring complete
vi. Return Part 1 and Part 2 to Controller, Facility Services

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

PART 1

Section A Indicate Precautions Taken

☐ Available sprinklers, hose streams, and extinguishers available and in service

Within 35' or 11m of hot work
☐ Flammable liquid, dust, lint and oily deposits removed
☐ Explosive atmosphere in area eliminated
☐ Floors swept clean
☐ All wall and floor openings covered
☐ Combustible floors covered with fire resistant sheets
☐ Protect or shut down ducts that might carry sparks/smoke

Hot work on walls, ceiling or roofs
☐ Construction is noncombustible and without combustible covering or insulation
☐ Combustible materials on other side of walls, ceilings or roofs moved away
☐ Combustible structure wetted down

Hot work on enclosed equipment
☐ Enclosed equipment cleaned of all combustible material
☐ Containers purged of flammable liquid/vapour
☐ Pressurized vessels, piping & equipment removed from service, isolated & vented

Fire watch/hot work and monitoring
☐ Fire watch will be provided during and for 1 hour after work including break
☐ Fire watch is trained and supplied with suitable extinguishers
☐ Fire watch is trained in the use of sounding fire alarm
☐ Fire watch conducted in adjoining areas, above and below the space where appropriate
☐ Monitor hot work area for an additional 2 hours after fire watch
☐ Other precautions taken (please detail):

_____
_____
_____
_____

Section B Authorization Granted

Board Supervisor/Manager/Proj. Coordinator: _____
Print Name Signature

Permit Valid from / to: (max. 7 days) _____ _____
From This Date To This Date

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

Section C Contractor and Location Affected

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

School:

Room/Area: _____

Nature of Job: _____

I verify the above location has been examined each day, the precautions listed in Section A have been taken each day, and permission is authorized for this work.
I further acknowledge that if activity is during school operational hours, that appropriate notification has been given to school administration.

Hot Works Contractor: _____
Signature

School Administrator notified: _____
Print Name

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

Refer to WRDSB Administration Procedure 1200 Hot Works/Fire Watch (Copies Available on Request)

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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.

Breslau Public School

2022 Asbestos Audit Update Report

Project Location:
58 Joseph Street, Breslau, 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

May 30, 2022

MTE File No.: C34532-937

For Tender Purposes

Engineers, Scientists, Surveyors.

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

May 30, 2022
MTE File No.: C34532-937

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

RE: 2022 Asbestos Audit Update – Breslau Public School, Breslau, Ontario

For Tender Purposes

1.0 Introduction

MTE Consultants Inc. (MTE) was authorized by the Waterloo Region District School Board (WRDSB) to conduct the 2022 Asbestos Audit Update for the subject building.

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

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

2.0 Scope of Work

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

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

3.0 Methodology and Assessment Criteria

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

- The following rooms:
  - WRDSB Room 109 and 143
- 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.

For Tender Purposes

4.0 Findings

An inspection of the building was conducted by MTE on May 16, 2022. The one-storey school was constructed in 1950 with additions in 1960, 1962, 1964, 1965, 1967, 2014. 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.

4.2 Removed ACM

It is suspected that during 2021 summer renovations, which were reported by building staff, the windows in the buildings were replaced. Asbestos-containing sealants of windows within the original building, 1960, 1962, 1964, 1965, and 1967 may have been removed, however no documentation or confirmation of abatement was available.

4.3 Discovery of Additional ACM

ACM that was not previously identified includes the following:

Friable Material:

- WRDSB Room 149 - 5 parged pipe fittings

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.

For Tender Purposes

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.

For Tender Purposes

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.

Jason Scozzafava, B.Sc., C.Tech.
Senior Technologist, Indoor Environments
519-743-6500 ext. 1354
jscozzafava@mte85.com

Paul Semeniuk, B.E.S., C.E.T.
Manager, Indoor Environments
519-743-6500 ext. 1324
psemeniuk@mte85.com

PXS: apm
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For Tender Purposes

Appendix A

Asbestos Management Database

For Tender Purposes

	School Name		**Legend:**				**Notes:**				
	Breslau 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: 1950										
	Addition(s): 1960, 1962, 1964, 1965, 1967, 2014										

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	Not Inspected	Not Inspected	Roofing Materials	NF	Suspect ACM	VC	-	-	-
	Original Building	Windows	Interior Frames	Grey Sealant	-	Non ACM	HM	S21	15-Mar-19	ND
	Original Building	Windows	Interior Panes	Rubber Sealant	-	Non ACM	-	-	-	-
	Original Building	Windows	Exterior Frames	Grey Sealant	-	Non ACM	HM	S19	15-Mar-19	ND
	Original Building	Windows	Exterior Panes	Black Sealant	NF	ACM	HM	S20	15-Mar-19	10 Chrysotile
	Original Building	Doors	Interior Frames	Beige Sealant	-	Non ACM	SL	S24	15-Mar-19	ND
	Original Building	Doors	Exterior Frames	White Sealant	-	Non ACM	SL	S23	15-Mar-19	ND
	Original Building	Mastic	Mastic	Floor Tile Mastic	-	Non ACM	SL	S11	15-Mar-19	ND
	1960 Addition	Structure	Deck	Steel	-	Non ACM	-	-	-	-
	1960 Addition	Structure	Concrete	Concrete	-	Non ACM	-	-	-	-
	1960 Addition	Façade	Brick Veneer	Brick and Mortar	-	Non ACM	-	-	-	-
	1960 Addition	Not Inspected	Not Inspected	Roofing Materials	NF	Suspect ACM	VC	-	-	-
	1960 Addition	Windows	Interior Frames	Grey Sealant	-	Non ACM	HM	S21	15-Mar-19	ND
	1960 Addition	Windows	Interior Panes	Rubber Sealant	-	Non ACM	-	-	-	-
	1960 Addition	Windows	Exterior Frames	Grey Sealant	-	Non ACM	HM	S19	15-Mar-19	ND
	1960 Addition	Windows	Exterior Panes	Black Sealant	NF	ACM	HM	S20	15-Mar-19	10 Chrysotile
	1960 Addition	Doors	Interior Frames	Beige Sealant	-	Non ACM	HM	S22	15-Mar-19	ND
	1960 Addition	Mastic	Mastic	Floor Tile Mastic	NF	ACM	SL	S08	15-Mar-19	10 Chrysotile
	1960 Addition	Mastic	Mastic	1'x1' Ceiling Tile	-	Non ACM	SL	S09	15-Mar-19	ND
	1962 Addition	Structure	Deck	Steel	-	Non ACM	-	-	-	-
	1962 Addition	Structure	Concrete	Concrete	-	Non ACM	-	-	-	-
	1962 Addition	Façade	Brick Veneer	Brick and Mortar	-	Non ACM	-	-	-	-
	1962 Addition	Not Inspected	Not Inspected	Roofing Materials	NF	Suspect ACM	VC	-	-	-
	1962 Addition	Windows	Interior Frames	Grey Sealant	-	Non ACM	SL	S21	15-Mar-19	ND
	1962 Addition	Windows	Interior Panes	Rubber Sealant	-	Non ACM	-	-	-	-
	1962 Addition	Windows	Exterior Frames	Grey Sealant	-	Non ACM	HM	S19	15-Mar-19	ND
	1962 Addition	Windows	Exterior Panes	Black Sealant	NF	ACM	HM	S20	15-Mar-19	10 Chrysotile
	1962 Addition	Doors	Interior Frames	Beige Sealant	-	Non ACM	SL	S22	15-Mar-19	ND
	1962 Addition	Mastic	Mastic	Floor Tile Mastic	NF	ACM	SL	S06	15-Mar-19	7 Chrysotile
	1962 Addition	Mastic	Mastic	1'x1' Ceiling Tile	-	Non ACM	HM	S03	15-Mar-19	ND
	1964 Addition	Structure	Deck	Steel	-	Non ACM	-	-	-	-
	1964 Addition	Structure	Concrete	Concrete	-	Non ACM	-	-	-	-
	1964 Addition	Façade	Brick Veneer	Brick and Mortar	-	Non ACM	-	-	-	-
	1964 Addition	Not Inspected	Not Inspected	Roofing Materials	NF	Suspect ACM	VC	-	-	-
	1964 Addition	Windows	Interior Frames	Grey Sealant	-	Non ACM	HM	S21	15-Mar-19	ND
	1964 Addition	Windows	Exterior Frames	Grey Sealant	-	Non ACM	HM	S19	15-Mar-19	ND
	1964 Addition	Windows	Exterior Panes	Black Sealant	NF	ACM	HM	S20	15-Mar-19	10 Chrysotile
	1964 Addition	Doors	Interior Frames	Beige Sealant	-	Non ACM	HM	S22	15-Mar-19	ND
	1964 Addition	Doors	Exterior Frames	Silicon Sealant	-	Non ACM	-	-	-	-

For Tender Purposes

	School Name	Legend:	Notes:
	Breslau 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: 1950		
	Addition(s): 1960, 1962, 1964, 1965, 1967, 2014		

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
	1964 Addition	Mastic	Mastic	Floor Tile Mastic	-	Non ACM	SL	S13	15-Mar-19	ND
	1965 Addition	Structure	Deck	Steel	-	Non ACM	-	-	-	-
	1965 Addition	Structure	Concrete	Concrete	-	Non ACM	-	-	-	-
	1965 Addition	Façade	Brick Veneer	Brick and Mortar	-	Non ACM	-	-	-	-
	1965 Addition	Not Inspected	Not Inspected	Roofing Materials	NF	Suspect ACM	VC	-	-	-
	1965 Addition	Windows	Interior Frames	Grey Sealant	-	Non ACM	HM	S21	15-Mar-19	ND
	1965 Addition	Windows	Exterior Frames	Grey Sealant	-	Non ACM	HM	S19	15-Mar-19	ND
	1965 Addition	Windows	Exterior Panes	Black Sealant	NF	ACM	HM	S20	15-Mar-19	10 Chrysotile
	1965 Addition	Doors	Interior Frames	Beige Sealant	-	Non ACM	HM	S22	15-Mar-19	ND
	1965 Addition	Mastic	Mastic	Floor Tile Mastic	NF	ACM	SL	S16	15-Mar-19	5 Chrysotile
	1967 Addition	Structure	Deck	Steel	-	Non ACM	-	-	-	-
	1967 Addition	Structure	Concrete	Concrete	-	Non ACM	-	-	-	-
	1967 Addition	Façade	Brick Veneer	Brick and Mortar	-	Non ACM	-	-	-	-
	1967 Addition	Not Inspected	Not Inspected	Roofing Materials	NF	Suspect ACM	VC	-	-	-
	1967 Addition	Windows	Interior Frames	Grey Sealant	NF	ACM	SL	S17	15-Mar-19	2 Chrysotile
	1967 Addition	Windows	Interior Panes	Grey Sealant	NF	ACM	HM	S17	15-Mar-19	2 Chrysotile
	1967 Addition	Windows	Exterior Frames	Grey Sealant	-	Non ACM	HM	S19	15-Mar-19	ND
	1967 Addition	Windows	Exterior Panes	Black Sealant	NF	ACM	HM	S20	15-Mar-19	10 Chrysotile
	1967 Addition	Doors	Interior Frames	Grey Sealant	-	Non ACM	SL	S18	15-Mar-19	ND
	1967 Addition	Doors	Interior Panes	Silicon Sealant	-	Non ACM	-	-	-	-
	1967 Addition	Doors	Exterior Frames	Silicon Sealant	-	Non ACM	-	-	-	-
	1967 Addition	Doors	Exterior Panes	Silicon Sealant	-	Non ACM	-	-	-	-
	1967 Addition	Mastic	Mastic	Floor Tile Mastic	NF	ACM	SL	S02	15-Mar-19	5 Chrysotile
Basement Level										
160	Storage	Floor	Concrete	-	-	Non ACM	-	-	-	-
160	Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
160	Storage	Wall	Transite Panel	Transite	NF	ACM	VC	-	-	-
160	Storage	Deck	Concrete	-	-	Non ACM	-	-	-	-
161	Kiln Room	Floor	Concrete	-	-	Non ACM	-	-	-	-
161	Kiln Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
161	Kiln Room	Ceiling	Concrete	-	-	Non ACM	-	-	-	-
162	Office	Floor	Concrete	-	-	Non ACM	-	-	-	-
162	Office	Wall	Concrete	-	-	Non ACM	-	-	-	-
162	Office	Deck	Concrete	-	-	Non ACM	-	-	-	-
162	Office	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
162	Office	Piping	Pipe Insulation	Air Cell	F	ACM	VC	-	-	-
163	Storage	Floor	Concrete	-	-	Non ACM	-	-	-	-
163	Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
163	Storage	Deck	Concrete	-	-	Non ACM	-	-	-	-
163	Storage	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
901	Stairwell	Floor	Concrete	-	-	Non ACM	-	-	-	-
901	Stairwell	Wall	Concrete	-	-	Non ACM	-	-	-	-
901	Stairwell	Deck	Concrete	-	-	Non ACM	-	-	-	-

For Tender Purposes

	School Name			**Legend:**				**Notes:**			
	Breslau 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: 1950							**Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.**			
	Addition(s): 1960, 1962, 1964, 1965, 1967, 2014										

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
Level 1										
1	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige with Light Brown and White Fleck	-	Non ACM	HM	S07	11-Jan-10	ND
1	Classroom	Wall	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
1	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
1	Classroom	Ceiling	Ceiling Tile 1' x 1'	Medium and Small Pinhole (Cellulose)	-	Non ACM	-	-	-	-
2	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Grey with Black and Red Streak	NF	ACM	HM	S10	11-Jan-10	6.2% Chrysotile
2	Classroom	Wall	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
2	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
2	Classroom	Ceiling	Ceiling Tile 2' x 4'	Random Fissure Random Pinhole (Post 2019)	-	Non ACM	-	-	-	-
2	Classroom	Ceiling	Ceiling Tile 1' x 1'	Medium and Small Pinhole (Cellulose)	-	Non ACM				
3	Classroom	Floor	Vinyl Floor Tile 12"x12"	Beige Dense Fleck (Post 2015)	-	Non ACM	-	-	-	-
3	Classroom	Wall	Plaster	-	-	Non ACM	HM	S15	15-Mar-19	ND
3	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S04	15-Mar-19	ND
3	Classroom	Ceiling	Ceiling Tile 1' x 1'	Medium and Small Pinhole	-	Non ACM	HM	S06	11-Jan-10	ND
3	Classroom	Piping	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
3	Classroom	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
4	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck (Post 2015)	-	Non ACM	-	-	-	-
4	Classroom	Wall	Plaster	-	-	Non ACM	HM	S15	15-Mar-19	ND
4	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	SL	S04	15-Mar-19	ND
4	Classroom	Ceiling	Ceiling Tile 1' x 1'	Medium and Small Pinhole	-	Non ACM	HM	S06	11-Jan-10	ND
4	Classroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
4	Classroom	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
5	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige with Brown and White Fleck	-	Non ACM	HM	S05	11-Jan-10	ND
5	Classroom	Wall	Plaster	-	-	Non ACM	HM	S07	15-Mar-19	ND
5	Classroom	Ceiling	Ceiling Tile 1' x 1'	Medium and Small Pinhole	-	Non ACM	HM	S06	11-Jan-10	ND
5	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
5	Classroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
5	Classroom	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
6	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck (Post 2015)	-	Non ACM	HM	32523-BRES-S07	11-Jan-10	ND
6	Classroom	Wall	Plaster	-	-	Non ACM	SL	S07	15-Mar-19	ND
6	Classroom	Ceiling	Ceiling Tile 1' x 1'	Medium and Small Pinhole	-	Non ACM	HM	S06	11-Jan-10	ND
6	Classroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
6	Classroom	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
7	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige with Brown and White Fleck	-	Non ACM	HM	S05	11-Jan-10	ND
7	Classroom	Wall	Plaster	-	-	Non ACM	SL	S03D	11-Jan-10	ND
7	Classroom	Ceiling	Ceiling Tile 1' x 1'	Medium and Small Pinhole (Cellulose)	-	Non ACM	-	-	-	-
7	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
7	Classroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
7	Classroom	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
8	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Grey Dense Fleck (Post 2019)	-	Non ACM	-	-		
8	Classroom	Wall	Plaster	-	-	Non ACM	HM	S10	15-Mar-19	ND
8	Classroom	Ceiling	Ceiling Tile 1' x 1'	Medium and Small Pinhole (Cellulose)	-	Non ACM	-	-	-	-
8	Classroom	Ceiling	Ceiling Tile 1' x 1'	Paper Backing	-	Non ACM	SL	S01	8-Jul-21	ND

For Tender Purposes

School Name

Breslau Public School

Date Built:

Original: 1950

Addition(s): 1960, 1962, 1964, 1965, 1967, 2014

Legend:

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

Notes:

All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.

Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.

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
8	Classroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
9	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige with Light Brown and White Fleck	-	Non ACM	SL	S07abc	11-Jan-10	ND
9	Classroom	Wall	Plaster	-	NF	ACM	HM	32523-BRES-S01	11-Jan-10	1.8% Chrysotile
9	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	SL	S12	15-Mar-19	ND
9	Classroom	Ceiling	Ceiling Tile 1' x 1'	Large and Small Pinhole (Cellulose)	-	Non ACM	-	-	-	-
9	Classroom	Ceiling	Ceiling Tile 2' x 4'	Random Fissure Random Pinhole (Post 2021)	-	Non ACM	-	-	-	-
10	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige with Brown and White Fleck	-	Non ACM	HM	S05	11-Jan-10	ND
10	Classroom	Wall	Plaster	-	NF	ACM	HM	32523-BRES-S01	11-Jan-10	1.8% Chrysotile
10	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
10	Classroom	Ceiling	Ceiling Tile 1' x 1'	Large and Small Pinhole (Cellulose)	-	Non ACM	-	-	-	-
10	Classroom	Ceiling	Ceiling Tile 2' x 4'	Random Fissure Random Pinhole (Post 2021)	-	Non ACM	-	-	-	-
11	Classroom	Floor	Vinyl Floor Tile 9"x 9"	Grey with Black and White Streak	NF	ACM	HM	S02	11-Jan-10	2.5% Chrysotile
11	Classroom	Wall	Plaster	-	-	Non ACM	HM	S15	15-Mar-19	ND
11	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
11	Classroom	Ceiling	Ceiling Tile 1' x 1'	Medium and Small Pinhole	-	Non ACM	SL	S06abc	11-Jan-10	ND
11	Classroom	Ceiling	Ceiling Tile 2' x 4'	Random Fissure Random Pinhole (Post 2021)	-	Non ACM	-	-	-	-
12	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige with Brown and White Fleck	-	Non ACM	SL	S05abc	11-Jan-10	ND
12	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	SL	S14	15-Mar-19	ND
12	Classroom	Wall	Plaster	-	-	Non ACM	HM	S15	15-Mar-19	ND
12	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
12	Classroom	Ceiling	Ceiling Tile 1' x 1'	Medium and Small Pinhole	-	Non ACM	SL	S06abc	11-Jan-10	ND
13	Classroom	Floor	Vinyl Floor Tile 9"x 9"	Grey with Black and White Streak	NF	ACM	HM	S02	11-Jan-10	2.5% Chrysotile
13	Classroom	Wall	Plaster	-	-	Non ACM	HM	S15	15-Mar-19	ND
13	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
13	Classroom	Ceiling	Ceiling Tile 1' x 1'	Large and Small Pinhole (Cellulose)	-	Non ACM	-	-	-	-
13	Classroom	Ceiling	Ceiling Tile 2' x 4'	Random Fissure Random Pinhole (Post 2021)	-	Non ACM	SL	S03	-	-
14	Classroom	Floor	Vinyl Floor Tile 9"x 9"	Beige with Black Streak	NF	ACM	SL	S04abc	11-Jan-10	3.6% Chrysotile
14	Classroom	Wall	Plaster	-	-	Non ACM	HM	S15	15-Mar-19	ND
14	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
14	Classroom	Ceiling	Ceiling Tile 1' x 1'	Large and Small Pinhole (Cellulose)	-	Non ACM	-	-	-	-
14	Classroom	Ceiling	Ceiling Tile 2' x 4'	Random Fissure Random Pinhole (Post 2021)	-	Non ACM	-	-	-	-
15	Classroom	Floor	Vinyl Floor Tile 9"x 9"	Grey with Black and White Streak	NF	ACM	SL	S02abc	11-Jan-10	2.5% Chrysotile
15	Classroom	Wall	Plaster	-	-	Non ACM	HM	S15	15-Mar-19	ND
15	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
15	Classroom	Ceiling	Ceiling Tile 1' x 1'	Large and Small Pinhole (Cellulose)	-	Non ACM	-	-	-	-
15	Classroom	Ceiling	Ceiling Tile 2' x 4'	Random Fissure Random Pinhole (Post 2021)	-	Non ACM	-	-	-	-
106	Office	Floor	Vinyl Sheet Floor	Grey (Post 2015)	-	Non ACM	-	-	-	-
106	Office	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	32523-BRES-S08	11-Jan-10	ND
106	Office	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
106	Office	Ceiling	Ceiling Tile 1' x 1'	Uniform Pinhole	-	Non ACM	-	-	-	-
109	No Access	-	-	-	-	-	-	-	-	-
110	Washroom	Floor	Ceramic Floor Tile	-	-	Non ACM	-	-	-	-
110	Washroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	32523-BRES-S08	11-Jan-10	ND
110	Washroom	Wall	Concrete Block	-	-	Non ACM	-	-	-	-
110	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-

For Tender Purposes

School Name

Breslau Public School

Date Built:

Original: 1950

Addition(s): 1960, 1962, 1964, 1965, 1967, 2014

Legend:

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

Notes:

All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.

Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.

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
111	Office	Floor	Vinyl Sheet Floor	Grey (Post 2015)	-	Non ACM	-	-	-	-
111	Office	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	32523-BRES-S08	11-Jan-10	ND
111	Office	Wall	Concrete Block	-	-	Non ACM	-	-	-	-
111	Office	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
111	Office	Ceiling	Ceiling Tile 1' x 1'	Uniform Pinhole (Cellulose)	-	Non ACM	-	-	-	-
112	Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
112	Washroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	32523-BRES-S08	11-Jan-10	ND
112	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
113	Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
113	Washroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	32523-BRES-S08	11-Jan-10	ND
113	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
115	Staff Workroom	Floor	Vinyl Sheet Floor	Grey (Post 2015)	-	Non ACM	-	-	-	-
115	Staff Workroom	Wall	Plaster	-	-	Non ACM	HM	S10	15-Mar-19	ND
115	Staff Workroom	Wall	Concrete Block	-	-	Non ACM	-	-	-	-
115	Staff Workroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
115	Staff Workroom	Ceiling	Ceiling Tile 1' x 1'	Medium and Small Pinhole (Cellulose)	-	Non ACM	-	-	-	-
115	Staff Workroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
116	Washroom	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
116	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
116	Washroom	Ceiling	Ceiling Tile 2' x 2'	Random Pinhole	-	Non ACM	HM	S11	11-Jan-10	ND
116	Washroom	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
116	Washroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
116	Washroom	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
117	Washroom	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
117	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
117	Washroom	Ceiling	Ceiling Tile 2' x 2'	Random Pinhole	-	Non ACM	HM	S11	11-Jan-10	ND
117	Washroom	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
117	Washroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
117	Washroom	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
118	Staff Room	Floor	Vinyl Floor Tile 12"x 12"	White with Black Fleck	-	Non ACM	HM	S18	11-Jan-10	ND
118	Staff Room	Wall	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
118	Staff Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
118	Staff Room	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01	15-Mar-19	ND
118	Staff Room	Ceiling	Ceiling Tile 2' x 2'	Random Pinhole	-	Non ACM	HM	S11	11-Jan-10	ND
118	Staff Room	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
119	Staff Room	Floor	Vinyl Floor Tile 12"x 12"	White with Black Fleck	-	Non ACM	SL	S18abc	11-Jan-10	ND
119	Staff Room	Wall	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
119	Staff Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
119	Staff Room	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
119	Staff Room	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
120	Staff Room	Floor	Vinyl Floor Tile 12"x 12"	White with Black Fleck	-	Non ACM	SL	S18abc	11-Jan-10	ND
120	Staff Room	Wall	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
120	Staff Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
120	Staff Room	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
120	Staff Room	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile

For Tender Purposes

School Name	Legend:	Notes:
Breslau 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: 1950 Addition(s): 1960, 1962, 1964, 1965, 1967, 2014		**Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.**

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
121	Staff Room	Floor	Carpet	-	-	Non ACM	-	-	-	-
121	Staff Room	Floor	Vinyl Floor Tile 12"x 12"	Grey with Black and Red Streak	NF	ACM	HM	S10	11-Jan-10	6.2% Chrysotile
121	Staff Room	Wall	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
121	Staff Room	Wall	Drywall	Drywall Joint Compound	-	Non ACM	SL	S01	15-Mar-19	ND
121	Staff Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
121	Staff Room	Ceiling	Ceiling Tile 2' x 2'	Random Pinhole	-	Non ACM	HM	S11	11-Jan-10	ND
121	Staff Room	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
121	Staff Room	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
121	Staff Room	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
122	Storage	Floor	Concrete	-	-	Non ACM	-	-	-	-
122	Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
122	Storage	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
122	Storage	Ceiling	Hard Texture Coat	-	-	Non ACM	HM	32523-BRES-S17	11-Jan-10	ND
122	Storage	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
123	Gym Storage	Floor	Vinyl Floor Tile 12"x 12"	Green with White and Black Streak	NF	ACM	SL	S20abc	11-Jan-10	2.1% Chrysotile
123	Gym Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
123	Gym Storage	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
123	Gym Storage	Ceiling	Hard Texture Coat	-	-	Non ACM	HM	32523-BRES-S17	11-Jan-10	ND
123	Gym Storage	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
124	Stage	Floor	Wood	-	-	Non ACM	-	-	-	-
124	Stage	Wall	Concrete	-	-	Non ACM	-	-	-	-
124	Stage	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
125	Kitchen	Floor	Vinyl Floor Tile 12"x 12"	Blue with Grey and White Fleck	-	Non ACM	HM	S19	11-Jan-10	ND
125	Kitchen	Wall	Concrete	-	-	Non ACM	-	-	-	-
125	Kitchen	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
125	Kitchen	Ceiling	Hard Texture Coat	-	-	Non ACM	HM	32523-BRES-S17	11-Jan-10	ND
126	Storage Room	Floor	Vinyl Floor Tile 12"x 12"	Grey with Black and Red Streak	NF	ACM	HM	S10	11-Jan-10	6.2% Chrysotile
126	Storage Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
126	Storage Room	Ceiling	Ceiling Tile 2' x 2'	Random Pinhole	-	Non ACM	HM	S11	11-Jan-10	ND
126	Storage Room	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
127	Custodial Room	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
127	Custodial Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
127	Custodial Room	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
128	Washroom	Floor	Vinyl Floor Tile 12"x 12"	Beige with Brown and White Fleck	-	Non ACM	HM	S05	11-Jan-10	ND
128	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
128	Washroom	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
129	Change Room	Floor	Vinyl Floor Tile 12"x 12"	Beige with Brown and White Fleck	-	Non ACM	HM	S05	11-Jan-10	ND
129	Change Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
129	Change Room	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
130	Shower	Floor	Vinyl Floor Tile 12"x 12"	Beige with Brown and White Fleck	-	Non ACM	HM	S05	11-Jan-10	ND
130	Shower	Wall	Concrete	-	-	Non ACM	-	-	-	-
130	Shower	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
131	Washroom	Floor	Vinyl Floor Tile 12"x 12"	Grey with Black and Red Streak	NF	ACM	HM	S10	11-Jan-10	6.2% Chrysotile
131	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
131	Washroom	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND

For Tender Purposes

School Name

Breslau Public School

Date Built:

Original: 1950

Addition(s): 1960, 1962, 1964, 1965, 1967, 2014

Legend:

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

Notes:

All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.

Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.

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
131	Washroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
132	Office	Floor	Vinyl Floor Tile 12"x 12"	Grey with Black and Red Streak	NF	ACM	HM	S10	11-Jan-10	6.2% Chrysotile
132	Office	Wall	Concrete	-	-	Non ACM	-	-	-	-
132	Office	Ceiling	Ceiling Tile 2' x 2'	Random Pinhole	-	Non ACM	HM	S11	11-Jan-10	ND
132	Office	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
132	Office	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
133	General Purpose Room	Floor	Vinyl Floor Tile 12"x 12"	Blue with Grey and White Fleck	-	Non ACM	HM	S19	11-Jan-10	ND
133	General Purpose Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
133	General Purpose Room	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
133	General Purpose Room	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
133	General Purpose Room	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
134	General Purpose Room	Floor	Vinyl Floor Tile 12"x 12"	Blue with Grey and White Fleck	-	Non ACM	HM	S19	11-Jan-10	ND
134	General Purpose Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
134	General Purpose Room	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
134	General Purpose Room	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
135	Office	Floor	Vinyl Floor Tile 12"x 12"	Grey with Black and Red Streak	NF	ACM	HM	S10	11-Jan-10	6.2% Chrysotile
135	Office	Wall	Concrete	-	-	Non ACM	-	-	-	-
135	Office	Ceiling	Ceiling Tile 2' x 2'	Random Pinhole	-	Non ACM	HM	S11	11-Jan-10	ND
135	Office	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
135	Office	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
136	Washroom	Floor	Vinyl Floor Tile 12"x 12"	Grey with Black and Red Streak	NF	ACM	HM	S10	11-Jan-10	6.2% Chrysotile
136	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
136	Washroom	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
136	Washroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
137	Shower	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
137	Shower	Wall	Concrete	-	-	Non ACM	-	-	-	-
137	Shower	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
138	Change Room	Floor	Vinyl Floor Tile 12"x 12"	Beige with Brown and White Fleck	-	Non ACM	HM	S05	11-Jan-10	ND
138	Change Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
138	Change Room	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
139	Washroom	Floor	Vinyl Floor Tile 12"x 12"	Beige with Brown and White Fleck	-	Non ACM	HM	S05	11-Jan-10	ND
139	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
139	Washroom	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
143	No Access									
144	Boiler Room	Floor	Concrete	-	-	Non ACM	-	-	-	-
144	Boiler Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
144	Boiler Room	Deck	Concrete	-	-	Non ACM	-	-	-	-
144	Boiler Room	Ceiling	Texture Coat	-	-	Non ACM	SL	S17abc	11-Jan-10	ND
144	Boiler Room	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
144	Boiler Room	Piping	Pipe Fitting	Parged Cement	F	ACM	SL	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
144	Boiler Room	Piping	Pipe Insulation	-	F	ACM	SL	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Amosite
145	Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
145	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
145	Washroom	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	32523-BRES-S08	11-Jan-10	ND
145	Washroom	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	15-Mar-19	ND

For Tender Purposes

School Name	Legend:	Notes:
Breslau 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: 1950 Addition(s): 1960, 1962, 1964, 1965, 1967, 2014		**Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.**

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
145	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
146	Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
146	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
146	Washroom	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	32523-BRES-S08	11-Jan-10	ND
146	Washroom	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	15-Mar-19	ND
146	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
147	Custodial	Floor	Concrete	-	-	Non ACM	-	-	-	-
147	Custodial	Wall	Concrete	-	-	Non ACM	-	-	-	-
147	Custodial	Ceiling	Plaster	-	-	Non ACM	HM	S10	15-Mar-19	ND
147	Custodial	Deck	Steel	-	-	Non ACM	-	-	-	-
148	No Access									
149	Storage	Floor	Vinyl Sheet Flooring	Grey (Post 2015)	-	Non ACM	-	-	-	-
149	Storage	Wall	Plaster	-	-	ACM	HM	32523-BRES-S01	11-Jan-10	1.8% Chrysotile
149	Storage	Deck	Steel	-	-	Non ACM	-	-	-	-
149	Storage	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
151	Library	Floor	Carpet	-	-	Non ACM	-	-	-	-
151	Library	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
151	Library	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	32523-BRES-S08	11-Jan-10	ND
151	Library	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
152	Storage	Floor	Concrete	-	-	Non ACM	-	-	-	-
152	Storage	Wall	Concrete Block	-	-	Non ACM	-	-	-	-
152	Storage	Ceiling	Streel	-	-	Non ACM	-	-	-	-
153	Storage	Floor	Concrete	-	-	Non ACM	-	-	-	-
153	Storage	Wall	Concrete Block	-	-	Non ACM	-	-	-	-
153	Storage	Ceiling	Streel	-	-	Non ACM	-	-	-	-
154	Supplies	Floor	Concrete	-	-	Non ACM	-	-	-	-
154	Supplies	Wall	Concrete Block	-	-	Non ACM	-	-	-	-
154	Supplies	Ceiling	Streel	-	-	Non ACM	-	-	-	-
154	Supplies	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
155	Storage	Floor	Vinyl Floor Tile 12"x 12"	Oatmeal	-	Non ACM	-	-	-	-
155	Storage	Wall	Plaster	-	-	Non ACM	HM	S15	15-Mar-19	ND
155	Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
155	Storage	Ceiling	Plaster	-	-	Non ACM	HM	S15	15-Mar-19	ND
164	Pipe Chase	Floor	Concrete	-	-	Non ACM	-	-	-	-
164	Pipe Chase	Wall	Wood	-	-	Non ACM	-	-	-	-
164	Pipe Chase	Ceiling	Concrete	-	-	Non ACM	-	-	-	-
802	Corridor	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
802	Corridor	Wall	Concrete Block	-	-	Non ACM	-	-	-	-
802	Corridor	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	32523-BRES-S08	11-Jan-10	ND
802	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
803	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
803	Corridor	Wall	Plaster	-	-	Non ACM	SL	S10	15-Mar-19	ND
803	Corridor	Wall	Plaster	-	-	Non ACM	HM	S07	15-Mar-19	ND
803	Corridor	Wall	Plaster	-	-	Non ACM	SL	S15	15-Mar-19	ND
803	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-

For Tender Purposes

School Name

Breslau Public School

Date Built:

Original: 1950

Addition(s): 1960, 1962, 1964, 1965, 1967, 2014

Legend:

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

Notes:

All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.

Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.

WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
803	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
803	Corridor	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	32523-BRES-S08	11-Jan-10	ND
803	Corridor	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	S04	15-Mar-19	ND
804	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
804	Corridor	Floor	Concrete	-	-	Non ACM	-	-	-	-
804	Corridor	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
804	Corridor	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
805	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
805	Corridor	Floor	Concrete	-	-	Non ACM	-	-	-	-
805	Corridor	Ceiling	Ceiling Tile 1' x 1'	Cellulose	-	Non ACM	-	-	-	-
805	Corridor	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
806	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
806	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
806	Corridor	Wall	Plaster	-	-	Non ACM	SL	S05	15-Mar-19	ND
806	Corridor	Ceiling	Ceiling Tile 2' x 2'	Random Pinhole	-	Non ACM	HM	S11	11-Jan-10	ND
806	Corridor	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
806	Corridor	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
807	Corridor	Floor	Vinyl Floor Tile 12"x 12"	White with Black Fleck	-	Non ACM	SL	S18abc	11-Jan-10	ND
807	Corridor	Wall	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
807	Corridor	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01	15-Mar-19	ND
807	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
807	Corridor	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
808	Corridor	Floor	Vinyl Floor Tile 12"x 12"	White with Black Fleck	-	Non ACM	HM	S18	11-Jan-10	ND
808	Corridor	Floor	Vinyl Floor Tile 12"x 12"	Oatmeal (Post 2015)	-	Non ACM	-	-	-	-
808	Corridor	Wall	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
808	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
808	Corridor	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
809	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
809	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
809	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
809	Corridor	Ceiling	Hard Texture Coat	-	NF	ACM		32523-BRES-S01	11-Jan-10	1.8% Chrysotile
810	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
810	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
810	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
810	Corridor	Ceiling	Ceiling Tile 2' x 2'	Random Pinhole	-	Non ACM	HM	S11	11-Jan-10	ND
810	Corridor	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
811	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
811	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
811	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
811	Corridor	Ceiling	Ceiling Tile 2' x 2'	Random Pinhole	-	Non ACM	HM	S11	11-Jan-10	ND
811	Corridor	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
812	Corridor	Floor	Vinyl Floor Tile 12"x 12"	Beige with Brown and White Fleck	-	Non ACM	HM	S05	11-Jan-10	ND
812	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
812	Corridor	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
813	Corridor	Floor	Vinyl Floor Tile 12"x 12"	Beige with Brown and White Fleck	-	Non ACM	HM	S05	11-Jan-10	ND

For Tender Purposes

	School Name	Legend:	Notes:
	Breslau 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: 1950		
	Addition(s): 1960, 1962, 1964, 1965, 1967, 2014		

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
813	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
813	Corridor	Ceiling	Plaster	-	-	Non ACM	HM	32523-BRES-S22	11-Jan-10	ND
814	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
814	Corridor	Wall	Plaster	-	NF	ACM	HM	32523-BRES-S01	11-Jan-10	1.8% Chrysotile
814	Corridor	Wall	Plaster	-	-	Non ACM	HM	S10	15-Mar-19	ND
814	Corridor	Wall	Plaster	-	-	Non ACM	HM	S15	15-Mar-19	ND
814	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
814	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2015)	-	Non ACM	-	-	-	-
814	Corridor	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
814	Corridor	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	32523-BRES-S08	11-Jan-10	ND
814	Corridor	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	15-Mar-19	ND
814	Corridor	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	S14	15-Mar-19	ND
901	Stairwell	Floor	Concrete	-	-	Non ACM	-	-	-	-
901	Stairwell	Wall	Concrete	-	-	Non ACM	-	-	-	-
901	Stairwell	Ceiling	Concrete	-	-	Non ACM	-	-	-	-
Upper Level										
201	Fan Room	Floor	Concrete	-	-	Non ACM	-	-	-	-
201	Fan Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
201	Fan Room	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
201	Fan Room	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
201	Fan Room	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
201	Fan Room	Ducting	Flex Joint	-	NF	ACM	-	-	-	-
202	Fan Room	Floor	Concrete	-	-	Non ACM	-	-	-	-
202	Fan Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
202	Fan Room	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
202	Fan Room	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
202	Fan Room	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1680.078.015 - Pinchin 1990	26-Oct-90	50-75% Chrysotile
202	Fan Room	Ducting	Flex Joint	-	NF	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						

For Tender Purposes

Appendix B

Figures

For Tender Purposes

ABATEMENT AREAS FOR THE PROJECT - IN GREEN.

Original Building - Exterior Window Panes, Black Sealant is ACM
1960 Addition - Exterior Window Panes - Black Sealant is ACM
1960 Addition - Floor Tile Mastic is ACM
1962 Addition - Exterior Window Panes - Black Sealant is ACM
1962 Addition - Floor Tile Mastic is ACM
1964 Addition - Plaster Walls & Ceilings are ACM
1964 Addition - Exterior Window Panes - Black Sealant is ACM
1965 Addition - Exterior Window Panes - Black Sealant is ACM
1965 Addition - Floor Tile Mastic is ACM
1967 Addition - Interior Window Frames - Grey Sealant is ACM
1967 Addition - Interior Window Panes - Grey Sealant is ACM
1967 Addition - Exterior Window Panes - Black Sealant is ACM
1967 Addition - Floor Tile Mastic is ACM

2014 ADDITION

1965 ADDITION

1964 ADDITION

1950 ORIGINAL BUILDING

1967 ADDITION

1962 ADDITION

1960 ADDITION

2014 ADDITION

UPPER PLAN

BASEMENT PLAN

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 2010 Construction

Asbestos-Containing Materials (ACM):

- Floor Tile
- Rolled Flooring
- Ceiling Tile
- Friable Soft Textured Ceiling
- Non-Friable Hard Textured Ceiling
- Spray-On Fire Proofing
- Transite (Asbestos Cement) Paneling
- Duct Insulation
- x2(1) Pipe Fitting Insulation w Quantity (Brackets Indicate # of Damaged Fittings)
- Pipe Insulation (Vertical and Horizontal)
- Transite (Asbestos Cement) Pipe (Vertical and Horizontal)
- x2(1) Duct Expansion Joints w Quantity (Brackets Indicate # of Damaged Joints)
- Friable Debris

MTE
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CLIENT
WATERLOO REGION DISTRICT SCHOOL BOARD

PROJECT
2022 ASBESTOS AUDIT UPDATE

DRAWING
BRESLAU PUBLIC SCHOOL

BASEMENT LEVEL, LEVEL ONE, & UPPER LEVEL

Project Manager: Paul Semeniuk	Date: May 2022
Design By: WRDSB	Project No.: 34532-937
Drawn By: S. Nieboer	Drawing No.: 1.0
Scale: N.T.S.	

Appendix C

Tables

For Tender Purposes

TABLE 3: BULK ASBESTOS SAMPLING SUMMARY						
Sample Number	**WRDSB Fixed Reference Number**	**MTE Functional Space Number**	**Material Description**	**Asbestos Content (%)**	**Fibre Type**	**Is Material ACM**
2010 Asbestos Audit Update						
32523-BRES-S01a	**9**	**1028**	**Plaster - Texture Coat**	**1.8**	**Chrysotile**	**Yes**
32523-BRES-S01b				**NA**	**Chrysotile**	**Yes**
32523-BRES-S01c				**NA**	**Chrysotile**	**Yes**
32523-BRES-S02a	**15**	**1034**	**9"x9" Floor Tile - Grey/ Black & White Streak**	**2.5**	**Chrysotile**	**Yes**
32523-BRES-S02b				**NA**	**Chrysotile**	**Yes**
32523-BRES-S02c				**NA**	**Chrysotile**	**Yes**
32523-BRES-S03a	15	1034	Plaster - Wall Plaster	ND	-	No
32523-BRES-S03b				ND	-	No
32523-BRES-S03c	-	1021		ND	-	No
32523-BRES-S03d	7	1037		ND	-	No
32523-BRES-S03e	3	1039		ND	-	No
32523-BRES-S04a	**14**	**1033**	**9"x9" Floor Tile - Beige / Black Streak**	**3.6**	**Chrysotile**	**Yes**
32523-BRES-S04b				**NA**	**Chrysotile**	**Yes**
32523-BRES-S04c				**NA**	**Chrysotile**	**Yes**
32523-BRES-S05a	12	1032	12"x12" Floor Tile - Beige/ Brown & White Fleck	ND	-	No
32523-BRES-S05b				ND	-	No
32523-BRES-S05c				ND	-	No
32523-BRES-S06a	11	1030	1x1 Ceiling Tile - Medium & Small Pinhole	ND	-	No
32523-BRES-S06b				ND	-	No
32523-BRES-S06c				ND	-	No
32523-BRES-S07a	9	1028	12"x12" Floor Tile - Beige / Light Brown & White Fleck	ND	-	No
32523-BRES-S07b				ND	-	No
32523-BRES-S07c				ND	-	No
32523-BRES-S08a	-	1021	Drywall Joint Compound	ND	-	No
32523-BRES-S08b				ND	-	No
32523-BRES-S08c				ND	-	No
32523-BRES-S09a	**160**	**1064**	**9"x9" Floor Tile - Brown/ White Streak**	**5.2**	**Chrysotile**	**Yes**
32523-BRES-S09b				**NA**	**Chrysotile**	**Yes**
32523-BRES-S09c				**NA**	**Chrysotile**	**Yes**
32523-BRES-S10a	**-**	**1021**	**12"x12" Floor Tile - Grey/ Black & Red Streak**	**6.2**	**Chrysotile**	**Yes**
32523-BRES-S10b				**NA**	**Chrysotile**	**Yes**
32523-BRES-S10c				**NA**	**Chrysotile**	**Yes**
32523-BRES-S11a	-	1020	2x2 Ceiling Tile - Random Pinhole	ND	-	No
32523-BRES-S11b				ND	-	No
32523-BRES-S11c				ND	-	No
32523-BRES-S12a	**-**	**1022**	**12"x12" Floor Tile - Light Brown / Brown & White Streak**	**1.8**	**Chrysotile**	**Yes**
32523-BRES-S12b				**NA**	**Chrysotile**	**Yes**
32523-BRES-S12c				**NA**	**Chrysotile**	**Yes**
32523-BRES-S13a	**115**	**1012**	**12"x12" Floor Tile - Beige/ Brown Streak**	**1.6**	**Chrysotile**	**Yes**
32523-BRES-S13b				**NA**	**Chrysotile**	**Yes**
32523-BRES-S13c				**NA**	**Chrysotile**	**Yes**
32523-BRES-S14a	115	1012	2x4 Ceiling Tile - Deep Fissure Random Pinhole	ND	-	No
32523-BRES-S14b				ND	-	No
32523-BRES-S14c				ND	-	No
32523-BRES-S15a	**3**	**1039**	**9"x9" Floor Tile - Blue with White Streak**	**6.3**	**Chrysotile**	**Yes**
32523-BRES-S15b				**NA**	**Chrysotile**	**Yes**
32523-BRES-S15c				**NA**	**Chrysotile**	**Yes**
32523-BRES-S16a	**3**	**1039**	**9"x9" Floor Tile - Green/ White & Black Streak**	**7.5**	**Chrysotile**	**Yes**
32523-BRES-S16b				**NA**	**Chrysotile**	**Yes**
32523-BRES-S16c				**NA**	**Chrysotile**	**Yes**

For Tender Purposes

TABLE 3: BULK ASBESTOS SAMPLING SUMMARY						
Sample Number	**WRDSB Fixed Reference Number**	**MTE Functional Space Number**	**Material Description**	**Asbestos Content (%)**	**Fibre Type**	**Is Material ACM**
32523-BRES-S17a	144	1040	Plaster - Ceiling Texture Coat	ND	-	No
32523-BRES-S17b				ND	-	No
32523-BRES-S17c				ND	-	No
32523-BRES-S18a	807	1004	12"x12" Floor Tile - White with Black Fleck	ND	-	No
32523-BRES-S18b				ND	-	No
32523-BRES-S18c				ND	-	No
32523-BRES-S19a	-	1044	12"x12" Floor Tile - Blue/ Grey & White Fleck	ND	-	No
32523-BRES-S19b				ND	-	No
32523-BRES-S19c				ND	-	No
32523-BRES-S20a	**123**	**1042**	**12"x12" Floor Tile - Light Green with White and Black Streak**	**2.1**	**Chrysotile**	**Yes**
32523-BRES-S20b				**NA**	**Chrysotile**	**Yes**
32523-BRES-S20c				**NA**	**Chrysotile**	**Yes**
32523-BRES-S21a	810	1053	Firespray - White parging on beams	ND	-	No
32523-BRES-S21b				ND	-	No
32523-BRES-S21c				ND	-	No
2011 Asbestos Audit Update						
34532-BRES-S22a	144	1040	Ceiling Plaster - Grey	ND	-	No
34532-BRES-S22b				ND	-	No
34532-BRES-S22c				ND	-	No
2019 Asbsetos Audit Update						
S01A	118	1002	Drywall Joint Compound (1967)	ND	-	No
S01B				ND	-	No
S01C				ND	-	No
S02A	**2**	**1001**	**Floor Tile Mastic (1967)**	**5**	**Chrysotile**	**Yes**
S02B				**NA**	**Chrysotile**	**Yes**
S02C				**NA**	**Chrysotile**	**Yes**
S03A	4	1009	1'x1' Ceiling Tile Mastic (1962)	ND	-	No
S03B				ND	-	No
S03C				ND	-	No
S04A	4	1009	Drywall Joint Compound (1962)	ND	-	No
S04B				ND	-	No
S04C				ND	-	No
S05A	806	1005	Plaster (1962)	ND	-	No
S05B				ND	-	No
S06A	**4**	**1009**	**Floor Tile Mastic (1962)**	**7**	**Chrysotile**	**Yes**
S06B				**NA**	**Chrysotile**	**Yes**
S06C				**NA**	**Chrysotile**	**Yes**
S07A	6	1010	Plaster (1960)	White: ND	-	No
				Grey: ND	-	No
S07B				White: ND	-	No
				Grey: ND	-	No
S07C				White: ND	-	No
S08A	**6**	**1010**	**Floor Tile Mastic (1960)**	**10**	**Chrysotile**	**Yes**
S08B				**NA**	**Chrysotile**	**Yes**
S08C				**NA**	**Chrysotile**	**Yes**
S09A	6	1010	1'x1' Ceiling Tile Mastic (1960)	ND	-	No
S09B				ND	-	No
S09C				ND	-	No
S10A	803	1008	Plaster (1950)	ND	-	No
S11A	7	1037	Floor Tile Mastic (1950)	ND	-	No
S11B				ND	-	No
S11C				ND	-	No

For Tender Purposes

TABLE 3: BULK ASBESTOS SAMPLING SUMMARY						
Sample Number	**WRDSB Fixed Reference Number**	**MTE Functional Space Number**	**Material Description**	**Asbestos Content (%)**	**Fibre Type**	**Is Material ACM**
S12A	9	1028	Drywall Joint Compound (1964)	ND	-	No
S12B				ND	-	No
S12C				ND	-	No
S13A	9	1028	Floor Tile Mastic (1964)	ND	-	No
S13B				ND	-	No
S13C				ND	-	No
S14A	12	1032	Drywall Joint Compound (1965)	ND	-	No
S14B				ND	-	No
S14C				ND	-	No
S15A	803	1008	Plaster (1965)	ND	-	No
S15B				ND	-	No
S16A	**11**	**1030**	**Floor Tile Mastic (1965)**	**5**	**Chrysotile**	**Yes**
S16B				**NA**	**Chrysotile**	**Yes**
S16C				**NA**	**Chrysotile**	**Yes**
S17A	**-**	**-**	**Grey Interior Window Frame Sealant (1967)**	**2**	**Chrysotile**	**Yes**
S17B				**NA**	**Chrysotile**	**Yes**
S17C				**NA**	**Chrysotile**	**Yes**
S19A	-	-	Grey Exterior Window Frame Sealant (1967)	ND	-	No
S19B				ND	-	No
S19C				ND	-	No
S20A	**-**	**-**	**Black Exterior Window Pane Sealant (1967)**	**10**	**Chrysotile**	**Yes**
S20B				**NA**	**Chrysotile**	**Yes**
S20C				**NA**	**Chrysotile**	**Yes**
S21A	-	-	Grey Interior Window Frame Sealant (1962)	ND	-	No
S21B				ND	-	No
S21C				ND	-	No
S22A	-	-	Beige Interior Door Frame Sealant (1962)	ND	-	No
S22B				ND	-	No
S22C				ND	-	No
S23A	-	-	White Exterior Door Frame Sealant (1950)	ND	-	No
S23B				ND	-	No
S23C				ND	-	No
S24A	-	-	Beige Interior Door Frame Sealant (1950)	ND	-	No
S24B				ND	-	No
S24C				ND	-	No
2021 Asbestos Sampling						
S01A	8	1011	Paper Layer	ND	-	No
S01B	8	1011	Paper Layer	ND	-	No
S01C	8	1011	Paper Layer	ND	-	No
S02A	6	1010	Sealant on Drywall	ND	-	No
S02B	6	1010	Sealant on Drywall	ND	-	No
S02C	6	1010	Sealant on Drywall	ND	-	No

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

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

For Tender Purposes

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

Attention: Jeff Cull, Environmental Officer

Limited Pre-Renovation Designated Substance Survey
Summer 2026 Construction Project - HVAC and Classroom Renovation
Breslau Public School
58 Joseph Street, Breslau, ON

EXP Project Number:
LON-26000267-A0

Prepared By:
EXP Services Inc.
405 Maple Grove Road, Unit 6
Cambridge, Ontario N3E 1B6 Canada

Date Submitted:
January 30, 2026

Executive Summary

EXP Services Inc. (EXP) was retained by the Waterloo Region District School Board to conduct a Limited Pre-Renovation Designated Substances Survey of Breslau Public School located at 58 Joseph Street, Breslau, Ontario (the site), pertaining to the upcoming Summer 2026 Construction Project – HVAC and Classroom Renovations.

The survey was completed by Kinjal Prajapati on January 15, 2026. The survey included only the portion(s) of the building to be renovated (project area). The project area was defined by the client and is represented by the drawings provided in Appendix C.

The following designated substances were identified:

Friable Asbestos-Containing Materials

- Asbestos-containing parging cement was observed on pipe elbows in the Rooms 3, 4, 5, 6, 7, 806, 814 during the survey. Thirty-four (34) fittings were observed in the project area.
- Friable materials may be present inside inaccessible areas of the building (wall voids, pipe chases etc.).

Non-Friable Asbestos-Containing Materials

- Asbestos-containing plaster was identified on walls and ceilings in the 1964 building era during the survey. Approximately one thousand (1,000) square feet of this material was observed.
- Asbestos-containing two-phase plaster was identified on walls in the 1965 building era during the survey. Approximately one thousand two hundred (1,200) square feet of this material was observed.
- Asbestos-containing concrete block filler compound was identified on concrete block walls in the 1965 building era during the survey. Approximately four thousand five hundred (4,500) square feet of this material was observed.
- Non-friable materials may be present inside inaccessible areas of the building (wall voids, pipe chases etc.).

Lead-Containing Materials

- Results indicate that samples 26000267-Pb-01, 02, 03, 04, 05, 06 & 07 have lead concentrations of less than 0.1% and should be considered to have low levels of lead.
- Lead is expected to be present in solder on copper plumbing throughout the building.

Mercury

- Mercury is assumed to be present as a vapour in fluorescent light tubes.

Silica

- Crystalline silica is present in concrete products, mortar, brick, etc. These construction products are typically found throughout building structures.

Mould

- No suspect mould was identified.
- Minor amounts of concealed mould growth may not be identified as part of the survey in the absence of visual indicators.

Recommendations

If identified asbestos-containing materials are to be disturbed as part of upcoming renovations, removal of the asbestos-containing materials must be completed following the precautions and procedures outlined in Ontario Regulation 278/05 as amended.

Limited destructive investigation of wall/ceiling voids was completed as part of this survey. Concealed locations should be investigated immediately prior to project start up. Materials suspected of containing asbestos or other designated substances should be sampled upon discovery.

Any materials suspected of containing asbestos and not addressed within this report must be assumed to be asbestos containing until sampling and analysis proves otherwise.

Refer to Section 6.0 for procedures required when disturbing or removing the hazardous materials identified in this report.

Remedial Recommendations

Based on observations made during the survey the following asbestos-containing materials will require remediation or removal:

- Approximately eight (8) asbestos-containing parging cement fittings were observed in poor condition in Room 814 during the survey.

TABLE OF CONTENTS

1.0 INTRODUCTION 1
2.0 SITE BACKGROUND 1
3.0 SURVEY METHODOLOGY 2
3.1 Asbestos 2
3.2 Lead 4
3.3 Mercury 6
3.4 Silica 6
3.5 Visible Suspect Mould 7
4.0 REGULATORY REQUIREMENTS 7
5.0 RESULTS 8
5.1 Asbestos-Containing Materials (ACM) 8
5.1.1 Sprayed Fireproofing 8
5.1.2 Texture Coat 8
5.1.3 Mechanical Pipe Insulation 8
5.1.4 HVAC System 9
5.1.5 Mechanical Equipment 9
5.1.6 Vermiculite 9
5.1.7 Acoustic Ceiling Tiles 10
5.1.8 Plaster Finishes 13
5.1.9 Drywall Joint Compound 14
5.1.10 Asbestos Cement Products 14
5.1.11 Vinyl Floor Tiles and Mastic Adhesive 14
5.1.12 Vinyl Sheet Flooring 14
5.1.13 Roofing 14
5.1.14 Mastic 14
5.1.15 Caulking 15
5.1.16 Mortars 15
5.1.17 Concrete Block Filler Compounds 16
5.2 Visible Mould 16
5.3 Lead-Containing Materials 16
5.4 Mercury 17
5.5 Silica 17
5.6 Ethylene Oxide 18
5.7 Vinyl Chloride 18
5.8 Benzene 18
5.9 Coke Oven Emissions 18
5.10 Acrylonitrile 18

5.11 Isocyanates 18
5.12 Arsenic 18
6.0 RECOMMENDATIONS 18
6.1 Short Term General Recommendations 18
6.2 Short Term Recommendations Regarding Asbestos 19
6.2.1 Abatement Precautions and Procedures 19
6.2.1.1 Mechanical Insulation 19
6.2.1.2 Plaster 19
6.2.1.3 Concrete Block Filler Compound 19
6.3 Recommendations Regarding Lead During Renovation, Maintenance or Repair 20
6.4 Recommendations Regarding Mercury 20
6.5 Recommendations Regarding Silica 21
7.0 LIMITATIONS AND WARRANTY 21

APPENDICES

APPENDIX A Asbestos Bulk Analysis Results
APPENDIX B Lead Paint Analysis Results
APPENDIX C Drawings

1.0 INTRODUCTION

EXP Services Inc. (EXP) was retained by the Waterloo Region District School Board to conduct a Limited Pre-Renovation Designated Substances Survey of Breslau Public School located at 58 Joseph Street, Breslau, Ontario (the site), pertaining to the upcoming Summer 2026 Construction Project – HVAC and Classroom Renovations.

The survey was completed by Kinjal Prajapati on January 15, 2026. The survey included only the portion(s) of the building to be renovated (project area). The project area was defined by the client and is represented by the drawings provided in Appendix C.

Under Section 30 of the Ontario Occupational Health & Safety Act (OSHA), an owner must determine whether any Designated Substances are present in a building and is required to prepare a list of all Designated Substances that are present prior to tendering any work that may disturb a Designated Substance in the project area. These substances may require special handling precautions or procedures.

The current OHSA regulation lists the following eleven (11) substances as Designated Substances in the workplace: acrylonitrile, arsenic, asbestos, benzene, coke oven emissions, ethylene oxide, isocyanates, lead, mercury, silica, and vinyl chloride. Prior to issuing any project plans the owner or an agent acting on behalf of the owner must provide the Designated Substance report to the constructors. Sequentially, the constructor must provide this report to any sub-contractors who would potentially disturb any Designated Substances identified in the report.

Based on the construction date and the reported use of the building, the survey completed by EXP included investigation into the following Designated Substances as listed by the Ministry of Labour, Immigration, Training and Skills Development: Asbestos, Lead, Mercury, and Silica. In addition, EXP included a limited assessment for suspect mould growth.

The survey did not include investigation into Arsenic, Acrylonitrile, Benzene, Coke Oven Emissions, Ethylene Oxide, Isocyanates and Vinyl Chloride as listed by the Ministry of Labour, Immigration, Training and Skills Development. These materials are not found within typical buildings and were not reported to EXP prior to the survey.

2.0 SITE BACKGROUND

The building is a one-storey structure, used as a public school, originally constructed in 1950. Additions to the building were constructed in 1960, 1962, 1964, 1965, 1967 and 2014.

Each building era was treated as a separate structure when determining an appropriate sampling strategy.

The following reports have been previously completed for the building and provided to EXP:

- "2009 Asbestos Audit Update – Breslau Public School,", dated February 27, 2010, 58 Joseph Street, Breslau, ON. MTE File No. 32523-800.
- "2011 Asbestos Audit Update – Breslau Public School,", dated February 25, 2011, 58 Joseph Street, Breslau, ON. MTE File No. 34532-100.
- "2015 Asbestos Audit Update – Breslau Public School,", dated March 25, 2015, 58 Joseph Street, Breslau, ON. MTE File No. 34532-903.
- "2019 Asbestos Audit Update – Breslau Public School,", dated March 22, 2019, 58 Joseph Street, Breslau, ON. MTE File No. C34532-917.
- "2022 Asbestos Audit Update Report – Breslau Public School,", dated January 22, 2026, 58 Joseph Street, Breslau, ON. EXP File No. LON-25016820-A0.

3.0 SURVEY METHODOLOGY

During this assessment the surveyor inspected the building for materials typically suspected of containing designated substances.

Note:

- Repetitive testing was generally not performed. Items, which were visually homogenous to others tested, were considered to be of like material and were not sampled again. However, due to the variable nature of some building materials, several additional samples may have been collected of a potentially identical material as required.
- Our survey was non-invasive in nature. The survey did not include demolition of walls, and ceilings to inspect voids and chases for concealed materials. EXP did not complete repairs of the locations where demolition has occurred. Doors, motors, equipment, and exterior finishes were not disassembled to inspect for concealed asbestos-containing materials.

3.1 *Asbestos*

The surveyor sampled typical friable and non-friable building materials historically suspected to contain asbestos.

Ontario Regulation 278/05 defines an asbestos-containing material (ACM) as a material that contains 0.5% or more asbestos by dry weight. The precautions and procedures regarding the disturbance or removal of the ACM in Ontario Regulation 278/05 are generally based upon what is referred to as the friability of the material and the quantity of the material(s) to be disturbed. A friable material is defined as a material when dry, can be crumbled, pulverized, or powdered by hand pressure. Friable materials are considered more dangerous to human health by nature of the materials ability to generate airborne asbestos fibres. Non-friable products pose no danger of releasing airborne fibres unless cut, broken or

otherwise physically abraded. Once airborne, asbestos fibres tend to be suspended in the air if not controlled and can be inhaled deep in the lungs past the body's natural defenses, causing asbestos related occupational diseases.

The most common friable building products used in construction include but are not limited to spray applied fireproofing, textured coat finishes, decorative or acoustic finishes and mechanical or pipe insulations. Manufactured non-friable materials containing asbestos include but are not limited to vinyl floor tiles, ceiling tiles, drywall joint compound (when painted), mastics, adhesives, asbestos cement products and textiles. In addition, some materials exist between friable and non-friable generalizations due to the nature of their application and the manner in which they behave when disturbed. Plaster exists in its typical state as non-friable material but when disturbed or removed must be treated as a friable product.

Samples were collected in accordance with Table 1 of Ontario Regulation 278/05 including determination of the accessibility and condition of each material. Remedial recommendations were prioritized based on the combination of accessibility and condition. Samples of suspected asbestos-containing materials were not collected if the sampling of the material created a hazard to the surveyor, required extensive demolition of covering materials to identify the material, or would create damage to the integrity of the building envelope. Building materials not sampled and analyzed are considered asbestos containing until proved otherwise as required by Ontario Regulation 278/05.

A number of materials may have been visually examined and identified to be asbestos containing based on historical knowledge including but not limited to, asbestos cement products and duct connectors.

Sample analysis was completed by EMSL Analytical Inc. (EMSL). Bulk asbestos analyses were performed in accordance with the method outlined in Asbestos on Construction Projects and in Buildings and Repair Operations – made under the Occupational Health and Safety Act Ontario Regulation 278/05, (EPA/600/R-93-116). EMSL holds accreditations with The National Laboratory Accreditation Program (NVLAP) for the determination of asbestos in bulk building materials and the interim method for the determination of asbestos in bulk insulation samples.

The analysis of the materials submitted was completed using a method referred to as "stop positive analysis". This method requires one result of greater than 0.5% asbestos to consider a material as asbestos-containing. Conversely, all samples of a sample set are subject to analysis before a material is considered a non-asbestos material. This approach is required by Ontario Regulation 278/05.

Materials comprised of more than one compound are analyzed in different phases to provide a result for each compound.

Where materials are listed as non-asbestos, or results indicate "none detected" it should be understood that this determination is based upon the limitations of analysis performed. Building materials defined as non-asbestos should be considered to contain no detectable concentrations of asbestos fibres.

Materials found to contain less than 0.5% asbestos by dry weight have been labelled as containing trace amounts of asbestos. These materials are considered non-asbestos under Ontario Regulation 278/05.

Asbestos analytical certificates are included in Appendix A.

3.2 *Lead*

Suspected lead-containing paints or coatings present in more than a trivial amount, and/or where the condition was judged to poor were collected as part of the survey. Sample collection included determination of the accessibility and condition of each paint finish. Remedial recommendations were prioritized based on the combination of accessibility and condition. Other suspected lead materials were identified based on visual assessment and historical usage including but not limited to roof flashing, pipe solder and sound attenuation panels.

The EACC Lead Guideline for Construction, Renovation, Maintenance or Repair, dated October 2014 was prepared to aid building owners, constructors, contractors, subcontractors, and workers. The new guideline is intended to promote safe work practices, the appropriate use of or personal protective equipment and worker awareness/training. It was developed through an exhaustive review of pertinent regulatory and guidance documents as well as professional experiences of the abatement industry.

The guideline defines work on lead as operations involving drilling, handling, application, removal, disturbance, or clean-up of any material containing Lead during renovation work. The previous Ministry of Labour, Immigration, Training and Skills Development guideline for the control of lead exposures during the removal of lead on construction projects does not include criteria for categorizing paint as lead-based by concentration (% by weight, ppm, mg/kg, or ug/g). However, the EACC guideline has established a *de minimus* (virtually safe) concentration of lead in paints or coatings where a hazard during normal work would not likely be present in the absence of aggressive disturbance (sanding, grinding, abrading, torching etc.) or heating of the material. The guideline was established based on interpretation and adherence to the following regulations or guidelines:

- *The Surface Coating Materials Regulation (SOR/2005-109) as amended.*
- *Ontario Regulation 490/09 – Designated Substances; and,*
- *The Ministry of Labour, Immigration, Training and Skills Development Guideline – Lead on Construction Projects.*

The Surface Coating Materials Regulation (SOR/2005-109) as amended in October 2010 regulates the amount of lead present in a paint or coating to be 0.009% or less in Canada. Some exceptions have been granted to allow for higher lead concentrations. These exceptions include:

- as an anti-corrosive or an anti-weathering coating applied on the interior or exterior surface of any building or equipment that is used for an agricultural or industrial purpose;

- as an anti-corrosive or an anti-weathering coating applied on any structure, other than a building, that is used for an agricultural, industrial, or public purpose;
- as a touch-up coating for metal surfaces;
- on traffic signs;
- for graphic art on billboards or similar displays;
- for identification marks in industrial buildings; or
- as material for the purposes of arts, crafts, or hobbies, other than material for use by children (SOR/2010-224, s.1).

Ontario Regulation 490/09 applies to every employer and worker at a workplace where lead is present, produced, processed, used, handled, or stored where a worker is likely to be exposed to lead.

The Ministry of Labour, Immigration, Training and Skills Development Guideline (Lead on Construction Projects) is intended to assist people who have duties under the Occupational Health and Safety Act, and its regulations to protect all workers from exposure to inorganic lead. Additionally, all employers are required by Ontario Regulation 833 "Control of Exposure to Biological or Chemical Agents" to limit the exposure of workers to specified hazardous agents in accordance with the values set out within the regulation. This is in conjunction with the requirement of Ontario Regulation 490/09. The current airborne lead exposure limits for the relevant regulations are:

- *Ontario Regulation 490/09 – Designated Substances*
  - 0.05 mg/m^3 - Time Weighted Average (8 Hour Day or 40 Hour Work Week)
- *Ontario Regulation 833*
  - 0.05 mg/m^3 (8 Hour Day or 40 Hour Work Week)

The guideline has established the following recommendations based upon lead concentrations in paints or coatings:

- Paints or surface coatings containing less than or equal to 0.1% lead by weight (1000 µg/g or 1000 mg/kg or 1000 ppm lead) are considered low-level lead paints or surface coatings. If these materials (and the surfaces to which they are applied) are disturbed in a non-aggressive manner, performed using normal dust control procedures and are completed so that the TWA for PNOS is not exceeded, then worker protection from the inhalation of lead is not required. General health and safety precautions must still be implemented, which may include, in part, prohibiting eating, drinking, smoking, and chewing in the work area, implementing dust suppression techniques, and washing facilities for workers to wash hands and face.

- Paints or surface coatings containing greater than 0.1% lead by weight (1000 µg/g, or 1000 mg/kg, or 1000 ppm) but less than 0.5% lead by weight (5000 µg/g, or 5000 mg/kg, or 5000 ppm lead) are considered lead-containing paints or surface coatings. Tasks performed that disturb these materials must be completed in accordance with the Classifications of Work Operations (in Section 7) and corresponding procedures (in Section 8). Alternatively, a hygiene or exposure assessment can be performed to determine procedures that are required.
- Construction operations involving lead-based paints or surface coatings (i.e., concentrations equal to or greater than 0.5% lead by weight (5000 µg/g, or 5000 mg/kg, or 5000 ppm lead) must always be completed in accordance with the procedures listed in the Classifications of Work Operations (in Section 7) and corresponding procedures (in Section 8). Alternatively, a hygiene or exposure assessment can be performed to determine procedures that are required.
- Regardless of lead content in paints or surface coatings, tasks that create an aggressive disturbance of coatings such as torching/welding, abrasive blasting must always be completed in accordance with the procedures listed in the Classifications of Work Operations (in Section 7) and corresponding procedures (in Section 8). Alternatively, a hygiene or exposure assessment can be performed to determine procedures that are required.

This guideline is used for interpretation of all results and any recommendations regarding lead paints or coatings identified during this survey.

A total of seven (7) paint samples were collected from the building components where possible and were submitted to EMSL for analysis of total lead content by EPA Method No. 7000B; by flame atomic absorption spectrophotometry. EMSL holds accreditations with AIHA (American Industrial Hygiene Association).

Lead analytical certificates are included in Appendix B.

3.3 *Mercury*

Suspected mercury-containing materials were identified based on visual assessment and historical usage. Sampling of suspected mercury-containing materials was not completed.

3.4 *Silica*

Suspected silica-containing materials were identified based on visual assessment and historical usage. Sampling of suspected silica-containing materials was not completed.

3.5 *Visible Suspect Mould*

A limited visual assessment for the presence of mould and/or water damage was completed as part of the survey. No samples were collected.

4.0 REGULATORY REQUIREMENTS

"Designated Substance" as defined by the Ontario Occupational Health & Safety Act (OHSA) means "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." Under Section 30 of the OHSA prior to issuing any project plans the owner or an agent acting on behalf of the owner must provide the Designated Substance report to the constructors. Sequentially, the constructor must provide this report to any sub-contractors who would potentially disturb any designated substances identified in this report. Designated Substances are regulated under Ontario Regulation 490/09.

The Ministry of Labour, Immigration, Training and Skills Development (MOL) has issued a regulation (Ontario Regulation 278/05) with respect to the disturbance of asbestos on construction projects and has drafted guidelines for control of lead and silica exposures on construction projects.

Ontario Regulation 278/05 classifies all disturbance of asbestos as Type 1, Type 2, or Type 3, each of which is associated with defined work practices. All asbestos-containing material waste is subject to special handling and disposal practices and must be removed prior to renovation or demolition. Removal of any quantity of friable asbestos of greater than $1m^2$ requires notification of the MOL. Disposal of asbestos waste is subject to waste management regulations under Ontario Regulation 347/90 as amended to Ontario Regulation 102/07.

The MOL guideline for the control of lead exposures during the removal of lead on construction projects does not include criteria for categorizing lead paint. The MOL does not have a standard percentage of lead (by dry weight) or a concentration a material must have to be considered lead based.

The Designated Substance regulation (Ontario Regulation 490/09) specifies occupational exposure limits (OELs) for lead and, where necessary, requires implementation of a control program to ensure compliance with these OELs. The time-weighted average (TWA) OEL for lead (i.e., all lead except tetraethyl lead) is: 0.05 milligrams per cubic metre (mg/m^3) of air. However, under Subsection 3(3) of the Regulation, construction projects are excluded from the OELs and most of the other requirements of the Regulation. This exclusion should not be interpreted as meaning nothing is to be done for construction workers who are exposed to lead. The OELs establish an Ontario standard for worker protection from lead. Procedures that provide an equivalent level of protection should, therefore, be implemented on construction projects where exposure to lead is a hazard. Ensuring such procedures are in place would, in the words of clause 25(2)(h) of the Occupational Health and Safety Act (OHSA), be "taking reasonable precautions to protect the health and safety of workers".

The EACC Lead Guideline for Construction, Renovation, Maintenance or Repair, dated October 2014 was prepared and released to aid building owners, constructors, contractors, subcontractors, workers, and engineering professionals who deal with the occupational environmental hazards. This guideline was written in conjunction with the MOL and was used to determine appropriate recommendations for the disturbance of lead-containing coatings by instituting administrative and engineering controls during the disturbance of lead-containing materials to adhere to the above-mentioned regulations regarding inorganic lead.

5.0 RESULTS

5.1 *Asbestos-Containing Materials (ACM)*

Asbestos is a general name for several varieties of highly fibrous silicate minerals. Commercially popular types of asbestos include Chrysotile, Amosite and Crocidolite. The fibres are valued for their heat and chemical resistance properties. The combination of fibrous structures, low heat conductivity, high electrical resistance, chemical inertness, strength, and flexibility, as well as its effectiveness as a reinforcing or binding agent when combined with cement and/or plastic, made asbestos popular for widespread industrial use.

One measure of the potential hazard of ACM is its friability. The Ontario Ministry of Labour, Immigration, Training and Skills Development asbestos regulation defines a friable material as one when dry can be crumbled, pulverized, or powdered by hand pressure. The friability of ACM is theoretically an indicator of the ease with which fibres may be released into the air. Non-friable products with bound asbestos pose no danger of releasing airborne fibres unless cut, broken up or otherwise physically abraded.

Friable Materials

5.1.1 Sprayed Fireproofing

Spray applied fireproofing was not identified in the project area during the survey.

5.1.2 Texture Coat

Texture coat was not identified in the project area during the survey.

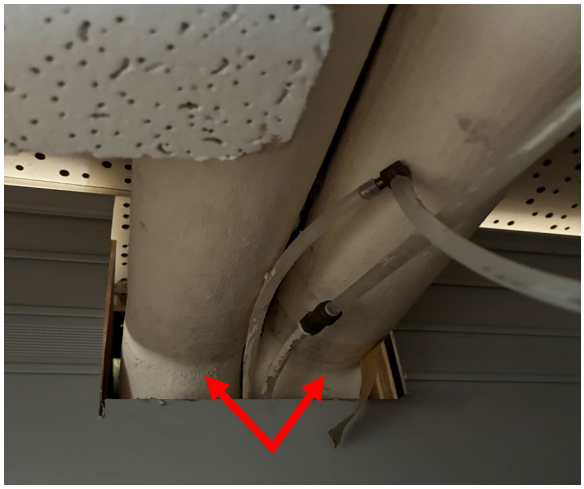
5.1.3 Mechanical Pipe Insulation

Parging cement was previously identified on pipe fittings in Rooms 3, 4, 5, 6, 7, 806, 814. Three (3) samples were previously collected and submitted for analysis (Historic Sample Group 1680.078.015 – Pinchin 1990). The parging cement was found to contain 50-75% Chrysotile asbestos. Approximately twenty-six (26) fittings were observed in good condition and eight (8) fittings in Room 814 were in poor condition during the survey.

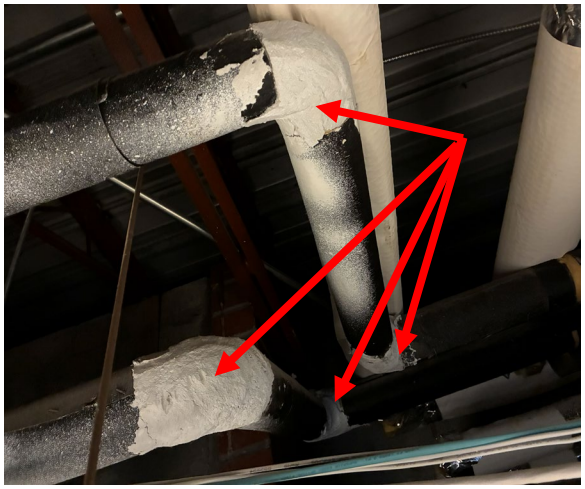
Pipes identified in the project area during the survey are either uninsulated or insulated with fibreglass.

Friable pipe insulations may be present inside inaccessible areas of the building (wall voids, pipe chases etc.).

Representative photographs of the mechanical insulations can be found below:



Photograph No. 1
Asbestos-Containing Parging Cement Fittings (Historic Sample Group 1680.078.015 – Pinchin 1990). Location 07.



Photograph No. 2
Asbestos-Containing Parging Cement Fittings (unwrapped; poor condition) (Historic Sample Group 1680.078.015 – Pinchin 1990). Location 814.

5.1.4 HVAC System

All ducts were identified to be insulated with fibreglass and canvas or fibreglass foil face insulations. No parging cement was identified on the seams or edges of the insulation.

5.1.5 Mechanical Equipment

Mechanical equipment identified in the project area during the survey is either uninsulated or insulated with fibreglass.

5.1.6 Vermiculite

Vermiculite was not identified in the project area during the survey.

Non-Friable Materials

5.1.7 Acoustic Ceiling Tiles

Eight (8) distinct patterns of acoustic ceiling tiles were identified in the project area during the survey. The following table represents our findings:

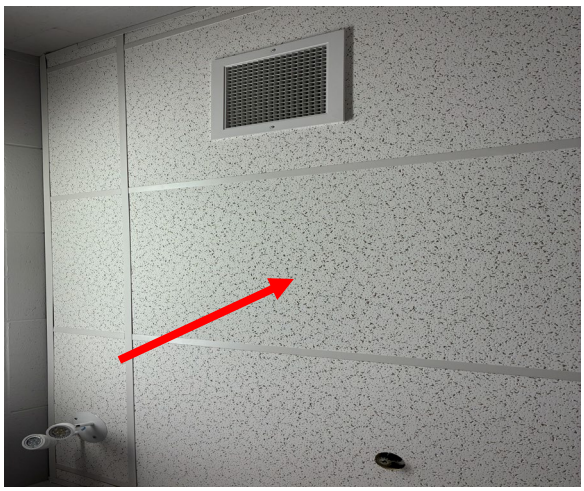
Style of Ceiling Tile	Pattern	Room Name or Number	Sample Group	Asbestos Present	Condition
Lay-in	2'x2' Random Pinhole	Room 804, 806, 810	S11	None	N/A
Lay-in	2'x4' Short Fissure Random Pinhole	Room 3, 4, 5, 6, 7, 111, 112, 113, 802, 803, 814	Post 2015	None	N/A
Glued-on	1'x1' Small and Medium Pinhole	Room 3, 4, 5	Tile: S06 Mastic: 25016820-ASB-10A-C	Tile: None Mastic: None	N/A
Mechanically Fastened	1'x1' Cellulose Small and Medium Pinhole	Room 1, 2, 11	Visually Assessed	None	N/A
Glued-on	1'x1' Cellulose Medium and Large Pinhole	Room 6	Tile: S09 Mastic: 25016820-ASB-09A-C	Tile: None Mastic: None	N/A
Mechanically Fastened	1'x1' Cellulose Medium and Large Pinhole	Room 10, 12, 13, 14, 15	Visually Assessed	None	N/A

Style of Ceiling Tile	Pattern	Room Name or Number	Sample Group	Asbestos Present	Condition
Lay-in	2’x4’ Random Fissure Random Pinhole	Room 1, 2, 9, 10, 12, 13, 14, 15	03/02/2021	None	N/A
Mechanically Fastened	1’x1’ Cellulose Uniform Pinholes	Room 7, 8, 111	Visually Assessed	None	N/A

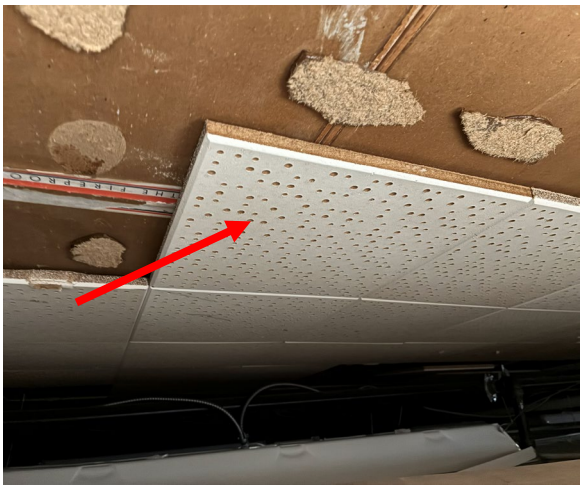
Photographs of the ceiling tiles can be found below:



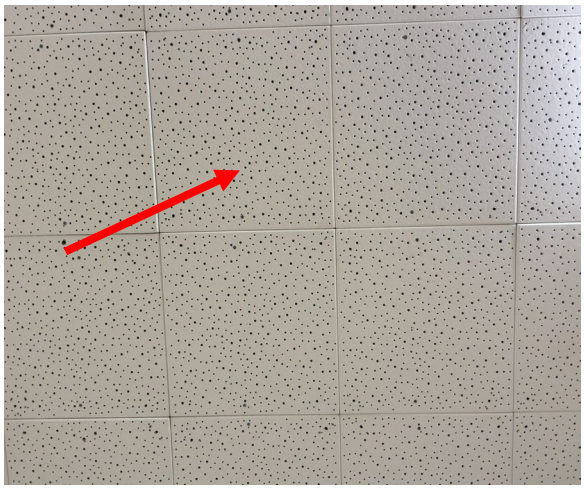
Photograph No. 3
Non-Asbestos 2’x2’ Random Pinhole Ceiling Tile (Historic Sample Group S11). Location 810.



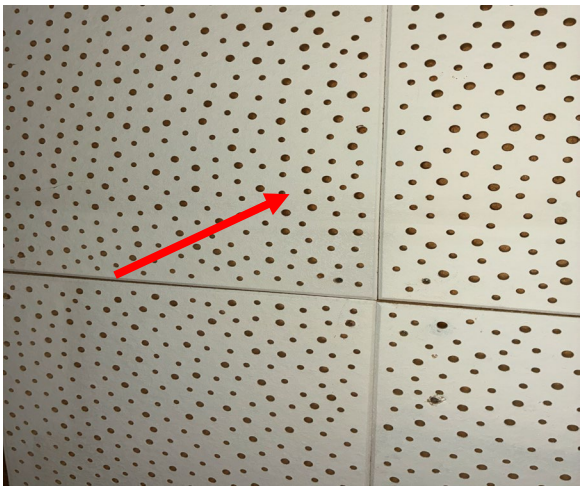
Photograph No. 4
Non-Asbestos 2’x4’ Short Fissure Random Pinhole Ceiling Tile (Dated Post 2015). Location 111.



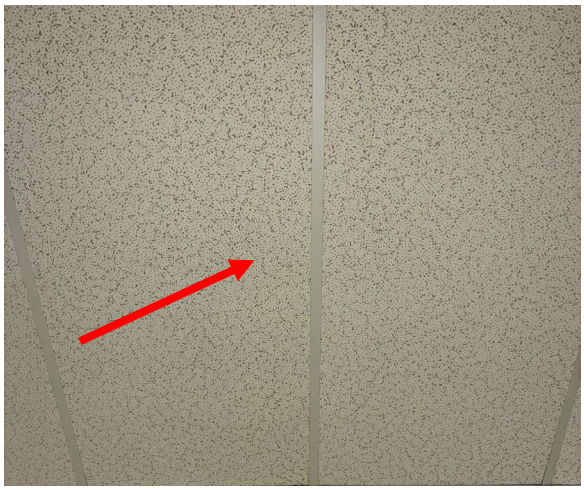
Photograph No. 5
Non-Asbestos 1'x1' Small and Medium Pinhole Ceiling Tile and Non-Asbestos Brown Puck Mastic (Historic Sample Group S06, 25016820-ASB-10A-C). Location 04.



Photograph No. 6
Non-Asbestos 1'x1' Small and Medium Pinhole Ceiling Tile (Visually Assessed). Location 11.



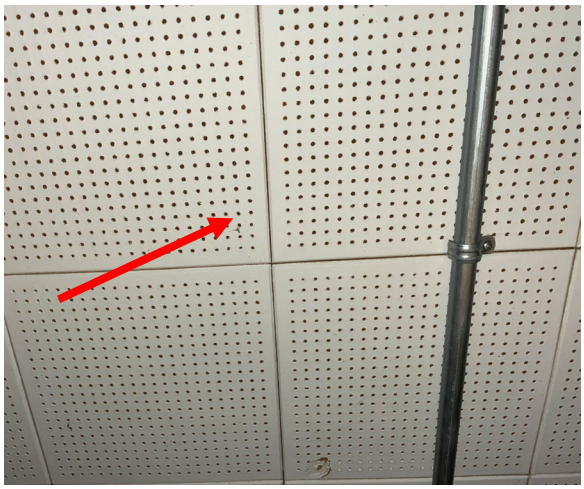
Photograph No. 7
Non-Asbestos 1'x1' Medium and Large Pinhole Ceiling Tile (Visually Assessed – Mechanically Fastened). Location 15.



Photograph No. 8
Non-Asbestos 2'x4' Random Fissure Random Pinhole Ceiling Tile (Dated Post 2019). Location 14.



Photograph No. 9
Non-Asbestos 1'x1' Medium and Large Pinhole Ceiling Tile and Non-Asbestos Brown Puck Mastic (Historic Sample Group S09, 25016820-ASB-09A-C). Location 06.



Photograph No. 10
Non-Asbestos 1'x1' Uniform Pinholes Ceiling Tile (Visually Assessed). Location 112.

5.1.8 Plaster Finishes

Plaster is considered to be non-friable while in general use. If the plaster becomes damaged or requires removal the material is to be considered friable.

Plaster was previously identified on walls and ceilings in the 1964 building era. Three (3) samples were previously collected and submitted for analysis (Historic Sample Group 32523-BRES-S01). The plaster was found to contain 1.8% Chrysotile asbestos. Approximately one thousand (1,000) square feet of this material was observed in good condition during the survey.

Two-phase skim and rough coat plaster was previously identified on walls in the 1965 building era. Three (3) samples were previously collected and submitted for analysis (Historic Sample Group 25016820-ASB-08A-C). This material was found to contain 4% Chrysotile asbestos. Approximately one thousand two hundred (1,200) square feet of this material was observed in good condition during the survey.

Two-phase skim and rough coat plaster was previously identified on walls in the 1960 building era. Three (3) samples of each layer were previously collected and submitted for analysis (Historic Sample Groups S07A-C, 25016820-ASB-07A). No asbestos was identified.

Single phase rough coat plaster was previously identified on ceilings in the 1967 building era. Three (3) samples were previously collected and submitted for analysis (Historic Sample Group 32523-BRES-S22). No asbestos was identified.

5.1.9 Drywall Joint Compound

Drywall joint compound was previously identified on drywall walls and ceilings in the 1962 building era. Three (3) samples were previously collected and submitted for analysis (Historic Sample Groups 32523-BRES-S08, S04). No asbestos was identified.

Drywall joint compound was previously identified on drywall walls in the 1964 building era. Three (3) samples were previously collected and submitted for analysis (Historic Sample Group S12). No asbestos was identified.

Drywall joint compound was previously identified on drywall walls in the 1965 building era. Three (3) samples were previously collected and submitted for analysis (Historic Sample Group S14). No asbestos was identified.

Drywall joint compound was previously identified on drywall walls in the 1967 building era. Three (3) samples were previously collected and submitted for analysis (Historic Sample Group S01). No asbestos was identified.

5.1.10 Asbestos Cement Products

Transite was not identified in the project area during the survey.

5.1.11 Vinyl Floor Tiles and Mastic Adhesive

Vinyl floor tiles were not identified in the project area during the survey.

5.1.12 Vinyl Sheet Flooring

Vinyl sheet flooring was not identified in the project area during the survey.

5.1.13 Roofing

The roofing materials were not sampled as the method of sample collection may affect the integrity of the roof. Roofing materials should be sampled immediately prior to disturbance.

All roofing materials should be assumed to contain asbestos until sampling and analysis proves otherwise.

5.1.14 Mastic

Grey duct mastic was identified on ductwork in Room 112 of the original building era. Three (3) samples were collected and submitted for analysis (Sample Group 26000267-ASB-02A-C). No asbestos was identified.

Puck mastic was previously identified associated with 1’x1’ cellulose ceiling tiles *small and medium pinhole* in the 1960 building era. Three (3) samples were previously collected and submitted for analysis (Historic Sample Group 25016820-ASB-09A-C). No asbestos was identified.

Puck mastic was previously identified associated with 1'x1' cellulose ceiling tiles *small and medium pinhole* in the 1962 building era. Three (3) samples were previously collected and submitted for analysis (Historic Sample Group 25016820-ASB-10A-C). No asbestos was identified.

Photographs of the mastic can be found below:



Photograph No. 11
Non-Asbestos Grey Duct Mastic (Sample Group 26000267-ASB-02A-C). Location 112

5.1.15 Caulking

Caulking was not identified in the project area during the survey.

5.1.16 Mortars

Grey mortar associated with brick walls was identified on the exterior of the 1950 original building era during the survey. Three (3) samples were collected and submitted for analysis (Sample Group 26000267-ASB-03A-C). No asbestos was identified.

Grey mortar associated with concrete block walls was previously identified in the 1965 building era during the survey. Three (3) samples were collected and submitted for analysis (Sample Group 25016820-ASB-01A-C). No asbestos was identified.

Grey mortar associated with concrete block walls was previously identified in the 1950 original building era during the survey. Three (3) samples were collected and submitted for analysis (Sample Group 25016820-ASB-05A-C). No asbestos was identified.

Grey mortar associated with brick walls was previously identified in the 1950 original building era during the survey. Three (3) samples were collected and submitted for analysis (Sample Group 25016820-ASB-06A-C). No asbestos was identified.

Grey mortar associated with concrete block walls was previously identified in the 1962 building era. Three (3) samples were collected and submitted for analysis (Sample Group 25016820-ASB-11A-C). No asbestos was identified.

Grey mortar associated with concrete block walls was previously identified in the 1960 building era. Three (3) samples were collected and submitted for analysis (Sample Group 25016820-ASB-12A-C). No asbestos was identified.

Grey mortar associated with concrete block walls was previously identified in the 1967 building era. Three (3) samples were collected and submitted for analysis (Sample Group 25016820-ASB-13A-C). No asbestos was identified.

5.1.17 Concrete Block Filler Compounds

Concrete block filler compound associated with concrete block walls was previously identified in the 1965 building era. Three (3) samples were collected and submitted for analysis (Sample Group 25016820-ASB-01A-C). The concrete block filler compound was found to contain 2% Chrysotile asbestos. Approximately four thousand five hundred (4,500) square feet of this material was observed in good condition during the survey.

5.2 *Visible Mould*

No visual indicators of suspect mould were identified in the project area during the survey. Visible suspect mould was not observed.

Minor amounts or concealed mould growth may not be identified as part of the survey in the absence of visual indicators.

5.3 *Lead-Containing Materials*

Seven (7) representative paint samples were collected from the project area during the survey. The following table represents our findings:

Sample Number	Description	Condition	Result %	Classification
26000267-Pb-01	Beige Paint on Plaster Wall - Room 814 (1965 Addition)	Good	<0.017	Low-level Lead Coating
26000267-Pb-02	Beige Paint on Plaster Wall - Room 814 (1964 Addition)	Good	0.027	Low-level Lead Coating

26000267-Pb-03	White Paint on Concrete Block Wall - Room 111 (1950 Original Era)	Poor	<0.041	Low-level Lead Coating
26000267-Pb-04	Beige Paint on Plaster Wall - Room 803 (1950 Original Era)	Good	<0.0064	Low-level Lead Coating
26000267-Pb-05	Beige Paint on Plaster Wall - Room 803 (1960 Addition)	Good	<0.0087	Low-level Lead Coating
26000267-Pb-06	Beige Paint on Plaster Wall - Room 803 (1962 Addition)	Good	<0.0064	Low-level Lead Coating
26000267-Pb-07	Beige Paint on Concrete Block Wall - Room 810 (1967 Addition)	Good	<0.0088	Low-level Lead Coating

Results indicate that samples 26000267-Pb-01, 02, 03, 04, 05, 06 and 07 have lead concentrations of less than 0.1% and should be considered to have low levels of lead. In the absence of aggressive disturbance (sanding, torching, grinding) normal dust control measures and should be sufficient in controlling the requirement for respirators during renovation work. General safety precautions should still be adhered to when working in the area including no eating, smoking, chewing, or drinking. Workers shall be provided proper washing facilities to ensure workers wash hands and faces before leaving the work area.

Any paint or coating that will be aggressively disturbed (grinding, sanding, torching, burning, abrasive blasting etc.) must be completed must be in accordance with the Classifications of Work Operations (Section 7) and the corresponding procedures in Section 8 of the EACC Lead Guideline. Alternatively, a project specific exposure assessment can be completed to further delineate the proper precautions and procedures required for the project.

Based on the building age of construction, lead is also expected to be present in solder on copper plumbing fixtures throughout the building.

Lead is present in all emergency back-up battery powered lighting systems.

5.4 *Mercury*

Mercury is assumed to be present in fluorescent light tubes throughout the project area.

5.5 *Silica*

Crystalline silica is present in concrete products, mortar, brick, etc. These construction products are typically found throughout building structures.

5.6 *Ethylene Oxide*

Evidence suggesting the presence of ethylene oxide was not observed at the Site. This product would not be expected to be present in this building.

5.7 *Vinyl Chloride*

Evidence suggesting the presence of vinyl chloride monomer was not observed at the Site. Vinyl chloride would not be expected to be present in this building.

5.8 *Benzene*

Evidence suggesting the presence of benzene was not observed at the Site. Benzene would not be expected to be present in this building.

5.9 *Coke Oven Emissions*

Evidence suggesting the presence of coke oven emissions was not observed at the Site. Coke oven emissions would not be expected to be present in this building.

5.10 *Acrylonitrile*

Evidence suggesting the presence of acrylonitrile was not observed at the Site. Acrylonitrile would not be expected to be present in this building.

5.11 *Isocyanates*

Evidence suggesting the presence of isocyanates was not observed at the Site. Isocyanates would not be expected to be present in this building.

5.12 *Arsenic*

Evidence suggesting the presence of arsenic was not observed at the Site. Arsenic would not be expected to be present in this building.

6.0 RECOMMENDATIONS

6.1 *Short Term General Recommendations*

Prior to issuing any project plans the owner or an agent acting on behalf of the owner must provide this report to the constructor. Sequentially, the constructor must provide this report to any sub-contractors who would potentially disturb any designated substances identified in this report.

6.2 *Short Term Recommendations Regarding Asbestos*

6.2.1 Abatement Precautions and Procedures

6.2.1.1 Mechanical Insulation

Removal or disturbance of friable asbestos-containing mechanical insulation on pipes, ducting and mechanical equipment is governed by the procedures outlined in Ontario Regulation 278/05. The disturbance of less than one (1) square metre of asbestos-containing mechanical insulation on pipes and ducts may be performed following Type 2, or Glove Bag precautions. If removal of greater than one (1) square metre of friable insulation is required, follow Type 3 precautions as outlined in Ontario Regulation 278/05.

Remediation of damaged friable mechanical insulation must be completed using Type 2 precautions as outlined in Ontario Regulation 278/05.

Advance notice of project to the Ministry of Labour, Immigration, Training and Skills Development is required when disturbing greater than one (1) square metre of friable insulation (Glove Bag and Type 3).

6.2.1.2 Plaster

Plaster is considered to be non-friable while in general use. If the plaster becomes damaged or requires removal the material is to be considered friable. As such, removal or disturbance of asbestos-containing plaster is governed by the procedures outlined in Ontario Regulation 278/05. The disturbance of less than one (1) square metre of plaster must be performed using Type 2 precautions. If removal greater than one (1) square metre of plaster must be completed following Type 3 precautions as outlined in Ontario Regulation 278/05.

Advance notice of project to the Ministry of Labour, Immigration, Training and Skills Development is required when disturbing greater than one (1) square metre of plaster (Type 3).

6.2.1.3 Concrete Block Filler Compound

Concrete block filler compound is considered to be non-friable while in general use. If the concrete block filler becomes damaged or requires removal the material is to be considered friable. As such, removal or disturbance of asbestos-containing concrete block filler is governed by the procedures outlined in Ontario Regulation 278/05. The disturbance of less than one (1) square metre of concrete block filler must be performed using Type 2 precautions. If removal greater than one (1) square metre of concrete block filler must be completed following Type 3 precautions as outlined in Ontario Regulation 278/05.

Advance notice of project to the Ministry of Labour, Immigration, Training and Skills Development is required when disturbing greater than one (1) square metre of concrete block filler (Type 3).

6.3 *Recommendations Regarding Lead During Renovation, Maintenance or Repair*

The EACC Lead Guideline for Construction, Renovation, Maintenance or Repair (October 2014) was used for interpretation of all results and any recommendations regarding lead paints or coatings identified during this survey. The application of a physical barrier (e.g., an encapsulate or new coat of paint) to a stabilized lead-containing material, or a paint or surface coating, is not considered a Lead Operation.

Please see below for specific recommendations pertaining to the paint(s) or coating(s) identified within the project area.

Low-level Lead Paint or Coating

Paints and coatings identified to have a lead concentration of less than 0.1% should be considered to contain low levels of lead. In the absence of aggressive disturbance (sanding, torching, grinding) normal dust control measures and should be sufficient in controlling the airborne lead concentrations and the requirement for respirators during work. General safety precautions should still be adhered to when working in the area including no eating, smoking, chewing, or drinking. Workers shall be provided proper washing facilities to ensure workers wash hands and faces before leaving the work area. A lead visual clearance assessment is required after the completion of the Class 1 or Class 2 abatements. The work area(s) or enclosure(s) shall pass the inspection of visually clean. Wipe and/or air sample clearances may be required depending on the scale of the abatement and the building occupants present or returning to the area.

Additional wipe/air sample clearances may be required depending on the scale of the abatement and the building occupants present or returning to the area.

Please refer to The EACC Lead Guideline for Construction, Renovation, Maintenance or Repair (October 2014) for determination of the required precautions or procedures related to this specific project scope of work. EXP will be happy to review your project and the health and safety requirements related to lead.

6.4 *Recommendations Regarding Mercury*

The presence of mercury vapour in fluorescent light tubes poses minimal risk to occupants or workers provided the equipment is handled properly and the mercury is not allowed to escape. Prior to the demolition activities the light tubes should be removed intact to prevent the mercury vapour from escaping. These tubes can be recycled by specialized contractors.

It is good management practice to take precautions to prevent mercury vapour from becoming airborne during building demolition. Exposure to airborne mercury is regulated Ontario Regulation 490/09. The current TWAEV for mercury vapour is 0.025 mg/m^3 (except alkyl compounds).

Mercury waste must be handled and disposed of according to Ontario Regulation 347, as amended by O. Reg. 102/07, and may be subject to Leachate Criteria (Schedule 4) of this regulation.

6.5 *Recommendations Regarding Silica*

Disturbance of materials containing silica will occur during demolition of walls and ceilings, saw cutting floor slabs etc. and is regulated under Ontario Regulation 490/09. The current Time Weighted Average Exposure Value (TWAEV) for amorphous fused silica is 0.1 mg/m^3 and is 0.05 mg/m^3 for crystalline silica (quartz). This can be accomplished through proper work practices such as wetting the surface of the materials to reduce overall dust levels and providing workers with washing facilities and proper respiratory protection.

7.0 LIMITATIONS AND WARRANTY

EXP has prepared this report for the exclusive use of the Waterloo Region District School Board in evaluating the Site at the time of EXP's assessment. EXP will not be responsible for the use of this report by any third party, or reliance on or any decision to be made based on it without the prior written consent of EXP. EXP accepts no responsibility for damages, if any, by any third party because of decisions or actions based on this report.

The findings and conclusions documented in this report have been prepared for specific application to this project and have been developed in a manner consistent with that level of care and skill normally exercised by qualified professionals currently practicing in this area of environmental assessment. No other warranty, expressed or implied, is made.

The findings contained in this report are based upon conditions as they were observed at the time of investigation. No assurance is made regarding changes in conditions subsequent to the time of investigation.

If new information is developed in future work, EXP should be contacted to re-evaluate the conclusions of this report and to provide amendments as required.

Respectfully submitted,

EXP Services Inc.

Written By:



Kelly Bollenbach, M.BEMA, C.Tech.
Project Coordinator
Hazardous Materials
Environmental Division
EXP Services Inc.

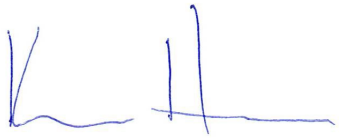


Kinjal Prajapati
Environmental Technologist
Hazardous Materials
Environmental Division
EXP Services Inc.

Reviewed By:



Sarah Kruis, B.Sc., C.E.T.
Project Manager
Hazardous Materials
Environmental Division
EXP Services Inc.



Keith Hill, C.E.T.
Regional Team Lead, SW Ontario
Hazardous Materials
Environmental Division
EXP Services Inc.

APPENDIX A

ASBESTOS BULK ANALYSIS RESULTS

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: (289) 997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 552600945
Customer ID: 55ADEC69
Customer PO: LON-26000267-A0
Project ID:

Attn: Sarah Kruis
EXP Services Inc.
15701 Robin's Hill Rd
London, ON N5V 0A5

Phone: (519) 652-6105
Fax: (519) 652-1709
Collected: 1/15/2026
Received: 1/20/2026
Analyzed: 1/26/2026

Proj: LON-26000267-A0 Breslau Pre-Reno DSS

Summary Test Report for Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05

Client Sample ID: 26000267-AS-01A **Lab Sample ID:** **552600945-0001**
Sample Description: Pink Firestop - Room 12 (Addition 1965)

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	1/21/2026	Pink	5.0%	95.0%	None Detected	

Client Sample ID: 26000267-AS-01B **Lab Sample ID:** **552600945-0002**
Sample Description: Pink Firestop - Room 12 (Addition 1965)

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	1/26/2026	Pink	5.0%	95.0%	None Detected	

Client Sample ID: 26000267-AS-01C **Lab Sample ID:** **552600945-0003**
Sample Description: Pink Firestop - Room 12 (Addition 1965)

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	1/26/2026	Pink	5.0%	95.0%	None Detected	

Client Sample ID: 26000267-AS-02A **Lab Sample ID:** **552600945-0004**
Sample Description: Grey mastic associated with duct - Room 112 (Original Era)

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	1/21/2026	Black	0.0%	100.0%	None Detected	

Client Sample ID: 26000267-AS-02B **Lab Sample ID:** **552600945-0005**
Sample Description: Grey mastic associated with duct - Room 112 (Original Era)

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	1/21/2026	Black	0.0%	100.0%	None Detected	

Client Sample ID: 26000267-AS-02C **Lab Sample ID:** **552600945-0006**
Sample Description: Grey mastic associated with duct - Room 112 (Original Era)

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	1/26/2026	Gray/Black	0.0%	100.0%	None Detected	

Client Sample ID: 26000267-AS-03A **Lab Sample ID:** **552600945-0007**
Sample Description: Mortar associated with brick wall - Exterior (Original Era)

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	1/21/2026	Gray	0.0%	100.0%	None Detected	

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: (289) 997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 552600945
Customer ID: 55ADEC69
Customer PO: LON-26000267-A0
Project ID:

Summary Test Report for Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05

Client Sample ID: 26000267-AS-03B ***Lab Sample ID:*** **552600945-0008**

Sample Description: Mortar associated with brick wall - Exterior (Original Era)

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	1/21/2026	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 26000267-AS-03C ***Lab Sample ID:*** **552600945-0009**

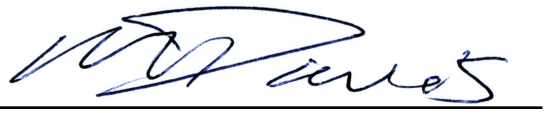
Sample Description: Mortar associated with brick wall - Exterior (Original Era)

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	1/26/2026	Gray	0.0%	100.0%	None Detected	

Analyst(s):

Stephanie Achaiya PLM (3)
Syed Basim Al- Hashmi PLM (6)

Reviewed and approved by:



Matthew Davis or other approved signatory
or Other Approved Signatory

None Detected = <0.1%. EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This is a summary report; official reports are available on LabConnect or upon request and relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method") but augmented with procedures outlined in the 1993 ("final") version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 01/26/202613:37:52

PARACEL LABORATORIES LTD.

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Mississauga, ON, L5N 5M1
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www.paracellabs.com

Certificate of Analysis

MTE Consultants Inc. (Kitchener)

520 Bingemans Centre Dr.
Kitchener, ON N2B 3X9
Attn: Steven Nieboer

Client PO:
Project: 34532-917 - Breslau
Custody:

Report Date: 2-Apr-2019
Order Date: 19-Mar-2019

Order #: 1912351

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1912351-01	S01A
1912351-02	S01B
1912351-03	S01C
1912351-04	S02A
1912351-05	S02B
1912351-06	S02C
1912351-07	S03A
1912351-08	S03B
1912351-09	S03C
1912351-10	S04A
1912351-11	S04B
1912351-12	S04C
1912351-13	S05A
1912351-14	S05B
1912351-15	S06A
1912351-16	S06B
1912351-17	S06C
1912351-18.1	S07A
1912351-18.2	S07A
1912351-19.1	S07B
1912351-19.2	S07B
1912351-20	S07C
1912351-21	S08A
1912351-22	S08B
1912351-23	S08C
1912351-24	S09A

Approved By:



Emma Diaz

Senior Analyst

Any use of these results implies your agreement that our total liabilty in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.

1912351-25	S09B
1912351-26	S09C
1912351-27	S10A
1912351-28	S11A
1912351-29	S11B
1912351-30	S11C
1912351-31	S12A
1912351-32	S12B
1912351-33	S12C
1912351-34	S13A
1912351-35	S13B
1912351-36	S13C
1912351-37	S14A
1912351-38	S14B
1912351-39	S14C
1912351-40	S15A
1912351-41	S15B
1912351-42	S16A
1912351-43	S16B
1912351-44	S16C
1912351-45	S17A
1912351-46	S17B
1912351-47	S17C
1912351-48	S18A
1912351-49	S18B
1912351-50	S18C
1912351-51	S19A
1912351-52	S19B
1912351-53	S19C
1912351-54	S20A
1912351-55	S20B
1912351-56	S20C
1912351-57	S21A
1912351-58	S21B
1912351-59	S21C
1912351-60	S22A
1912351-61	S22B
1912351-62	S22C
1912351-63	S23A
1912351-64	S23B
1912351-65	S23C
1912351-66	S24A
1912351-67	S24B
1912351-68	S24C

Certificate of Analysis

Client: **MTE Consultants Inc. (Kitchener)**

Client PO:

Report Date: 02-Apr-2019

Order Date: 19-Mar-2019

Project Description: 34532-917 - Breslau

Asbestos, PLM Visual Estimation **MDL - 0.5%**

Paracel ID	Sample Date	Colour	Description	Asbestos Detected	Material Identification	% Content
1912351-01	15-Mar-19	White	Drywall Joint Compound	No	**Client ID: S01A**	
					Non-Fibers	100
1912351-02	15-Mar-19	White	Drywall Joint Compound	No	**Client ID: S01B**	
					Non-Fibers	100
1912351-03	15-Mar-19	White	Drywall Joint Compound	No	**Client ID: S01C**	
					Non-Fibers	100
1912351-04	15-Mar-19	Black	Mastic	**Yes**	**Client ID: S02A**	
					Chrysotile	5
					Non-Fibers	95
1912351-05	15-Mar-19				**Client ID: S02B**	
					not analyzed	
1912351-06	15-Mar-19				**Client ID: S02C**	
					not analyzed	
1912351-07	15-Mar-19	Brown	Mastic	No	**Client ID: S03A**	
					Non-Fibers	100
1912351-08	15-Mar-19	Brown	Mastic	No	**Client ID: S03B**	
					Non-Fibers	100
1912351-09	15-Mar-19	Brown	Mastic	No	**Client ID: S03C**	
					Non-Fibers	100
1912351-10	15-Mar-19	White	Drywall Joint Compound	No	**Client ID: S04A**	
					Non-Fibers	100
1912351-11	15-Mar-19	White	Drywall Joint Compound	No	**Client ID: S04B**	
					Non-Fibers	100
1912351-12	15-Mar-19	White	Drywall Joint Compound	No	**Client ID: S04C**	
					Non-Fibers	100

Certificate of Analysis

Client: MTE Consultants Inc. (Kitchener)

Client PO:

Report Date: 02-Apr-2019

Order Date: 19-Mar-2019

Project Description: 34532-917 - Breslau

Asbestos, PLM Visual Estimation **MDL - 0.5%**

Paracel ID	Sample Date	Colour	Description	Asbestos Detected	Material Identification	% Content
1912351-13	15-Mar-19	Grey	Plaster	No	**Client ID: S05A**	
					Non-Fibers	100
1912351-14	15-Mar-19	Grey	Plaster	No	**Client ID: S05B**	
					Non-Fibers	100
1912351-15	15-Mar-19	Black	Mastic	**Yes**	**Client ID: S06A**	
					Chrysotile	7
					Non-Fibers	93
1912351-16	15-Mar-19				**Client ID: S06B**	
					not analyzed	
1912351-17	15-Mar-19				**Client ID: S06C**	
					not analyzed	
1912351-18.1	15-Mar-19	White	Plaster	No	**Client ID: S07A**	
					Non-Fibers	100
1912351-18.2	15-Mar-19	Grey	Plaster	No	**Client ID: S07A**	
					Non-Fibers	100
1912351-19.1	15-Mar-19	White	Plaster	No	**Client ID: S07B**	
					Non-Fibers	100
1912351-19.2	15-Mar-19	Grey	Plaster	No	**Client ID: S07B**	
					Non-Fibers	100
1912351-20	15-Mar-19	White	Plaster	No	**Client ID: S07C**	
					Non-Fibers	100
1912351-21	15-Mar-19	Black	Mastic	**Yes**	**Client ID: S08A**	
					Chrysotile	10
					Non-Fibers	90

Certificate of Analysis

Client: MTE Consultants Inc. (Kitchener)

Client PO:

Report Date: 02-Apr-2019

Order Date: 19-Mar-2019

Project Description: 34532-917 - Breslau

Asbestos, PLM Visual Estimation **MDL - 0.5%**

Paracel ID	Sample Date	Colour	Description	Asbestos Detected	Material Identification	% Content
1912351-22	15-Mar-19				**Client ID: S08B**	
					not analyzed	
1912351-23	15-Mar-19				**Client ID: S08C**	
					not analyzed	
1912351-24	15-Mar-19	Brown	Mastic	No	**Client ID: S09A**	
					Non-Fibers	100
1912351-25	15-Mar-19	Brown	Mastic	No	**Client ID: S09B**	
					Non-Fibers	100
1912351-26	15-Mar-19	Brown	Mastic	No	**Client ID: S09C**	
					Non-Fibers	100
1912351-27	15-Mar-19	Grey	Plaster	No	**Client ID: S10A**	
					Non-Fibers	100
1912351-28	15-Mar-19	Black	Mastic	No	**Client ID: S11A**	
					Non-Fibers	100
1912351-29	15-Mar-19	Black	Mastic	No	**Client ID: S11B**	
					Non-Fibers	100
1912351-30	15-Mar-19	Black	Mastic	No	**Client ID: S11C**	
					Non-Fibers	100
1912351-31	15-Mar-19	White	Drywall Joint Compound	No	**Client ID: S12A**	
					Non-Fibers	100
1912351-32	15-Mar-19	White	Drywall Joint Compound	No	**Client ID: S12B**	
					Non-Fibers	100
1912351-33	15-Mar-19	White	Drywall Joint Compound	No	**Client ID: S12C**	
					Non-Fibers	100

Certificate of Analysis

Client: MTE Consultants Inc. (Kitchener)

Client PO:

Report Date: 02-Apr-2019

Order Date: 19-Mar-2019

Project Description: 34532-917 - Breslau

Asbestos, PLM Visual Estimation **MDL - 0.5%**

Paracel ID	Sample Date	Colour	Description	Asbestos Detected	Material Identification	% Content
1912351-34	15-Mar-19	Black	Mastic	No	**Client ID: S13A**	
					Non-Fibers	100
1912351-35	15-Mar-19	Black	Mastic	No	**Client ID: S13B**	
					Non-Fibers	100
1912351-36	15-Mar-19	Black	Mastic	No	**Client ID: S13C**	
					Non-Fibers	100
1912351-37	15-Mar-19	Off-white	Drywall Joint Compound	No	**Client ID: S14A**	
					Non-Fibers	100
1912351-38	15-Mar-19	Off-white	Drywall Joint Compound	No	**Client ID: S14B**	
					Non-Fibers	100
1912351-39	15-Mar-19	Off-white	Drywall Joint Compound	No	**Client ID: S14C**	
					Non-Fibers	100
1912351-40	15-Mar-19	White	Plaster	No	**Client ID: S15A**	
					Non-Fibers	100
1912351-41	15-Mar-19	White	Plaster	No	**Client ID: S15B**	
					Non-Fibers	100
1912351-42	15-Mar-19	Black	Mastic	**Yes**	**Client ID: S16A**	
					Chrysotile	5
					Non-Fibers	95
1912351-43	15-Mar-19				**Client ID: S16B**	
					not analyzed	
1912351-44	15-Mar-19				**Client ID: S16C**	
					not analyzed	

Certificate of Analysis

Client: **MTE Consultants Inc. (Kitchener)**

Client PO:

Report Date: 02-Apr-2019

Order Date: 19-Mar-2019

Project Description: 34532-917 - Breslau

Asbestos, PLM Visual Estimation **MDL - 0.5%**

Paracel ID	Sample Date	Colour	Description	Asbestos Detected	Material Identification	% Content
1912351-45	15-Mar-19	Grey	Sealant	**Yes**	**Client ID: S17A**	
					Chrysotile	2
					Non-Fibers	98
1912351-46	15-Mar-19				**Client ID: S17B**	
					not analyzed	
1912351-47	15-Mar-19				**Client ID: S17C**	
					not analyzed	
1912351-48	15-Mar-19				**Client ID: S18A** [Z-01]	
					not analyzed	
1912351-49	15-Mar-19				**Client ID: S18B** [Z-01]	
					not analyzed	
1912351-50	15-Mar-19				**Client ID: S18C** [Z-01]	
					not analyzed	
1912351-51	15-Mar-19	Grey	Sealant	No	**Client ID: S19A**	
					Non-Fibers	100
1912351-52	15-Mar-19	Grey	Sealant	No	**Client ID: S19B**	
					Non-Fibers	100
1912351-53	15-Mar-19	Grey	Sealant	No	**Client ID: S19C**	
					Non-Fibers	100
1912351-54	15-Mar-19	Black	Sealant	**Yes**	**Client ID: S20A**	
					Chrysotile	10
					Non-Fibers	90
1912351-55	15-Mar-19				**Client ID: S20B**	
					not analyzed	

Certificate of Analysis

Client: MTE Consultants Inc. (Kitchener)

Client PO:

Report Date: 02-Apr-2019

Order Date: 19-Mar-2019

Project Description: 34532-917 - Breslau

Asbestos, PLM Visual Estimation **MDL - 0.5%**

Paracel ID	Sample Date	Colour	Description	Asbestos Detected	Material Identification	% Content
1912351-56	15-Mar-19				**Client ID: S20C**	
					not analyzed	
1912351-57	15-Mar-19	Grey	Sealant	No	**Client ID: S21A**	
					Non-Fibers	100
1912351-58	15-Mar-19	Grey	Sealant	No	**Client ID: S21B**	
					Non-Fibers	100
1912351-59	15-Mar-19	Grey	Sealant	No	**Client ID: S21C**	
					Non-Fibers	100
1912351-60	15-Mar-19	Beige	Sealant	No	**Client ID: S22A**	
					Non-Fibers	100
1912351-61	15-Mar-19	Beige	Sealant	No	**Client ID: S22B**	
					Non-Fibers	100
1912351-62	15-Mar-19	Beige	Sealant	No	**Client ID: S22C**	
					Non-Fibers	100
1912351-63	15-Mar-19	White	Sealant	No	**Client ID: S23A**	
					Non-Fibers	100
1912351-64	15-Mar-19	White	Sealant	No	**Client ID: S23B**	
					Non-Fibers	100
1912351-65	15-Mar-19	White	Sealant	No	**Client ID: S23C**	
					Non-Fibers	100
1912351-66	15-Mar-19	Beige	Sealant	No	**Client ID: S24A**	
					Non-Fibers	100
1912351-67	15-Mar-19	Beige	Sealant	No	**Client ID: S24B**	
					Non-Fibers	100

PARACEL LABORATORIES LTD.

Order #: 1912351

Certificate of Analysis

Report Date: 02-Apr-2019

Client: MTE Consultants Inc. (Kitchener)

Order Date: 19-Mar-2019

Client PO:

Project Description: 34532-917 - Breslau

Asbestos, PLM Visual Estimation **MDL - 0.5%**

Paracel ID	Sample Date	Colour	Description	Asbestos Detected	Material Identification	% Content
1912351-68	15-Mar-19	Beige	Sealant	No	**Client ID: S24C**	
					Non-Fibers	100

** Analytes in bold indicate asbestos mineral content.

Analysis Summary Table

Analysis	Method Reference/Description	Lab Location	NVLAP Lab Code *	Analysis Date
Asbestos, PLM Visual Estimation	by EPA 600/R-93/116	1 - Mississauga	200863-0	30-Mar-19

* Reference to the NVLAP term does not permit the user of this report to claim product certification , approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Qualifier Notes

Sample Qualifiers :

Z-01: No Sample

Work Order Revisions | Comments

None

6800 Kitir

Paracel ID: 1912351

PARACEL | TR RE RE

Chain of Custody
(Lab Use Only)

Page 1 of 1

Client Name: MTE Consultants Inc.	Project Reference: 34532-917 - Breslau	**Turnaround Time:**
Contact Name:	Quote #: 19-226 MTE Standing Offer	Immediate 1 Day
Address: 520 Bingemans Centre Drive	PO #: N/A	4HR 2 Day
Kitchener, ON, N2B 3X9	Email Address:	8HR 3 Day
Telephone: 519-743-6500	snieboer@mte85.com, adennett@mte85.com	4 Day
		Date Required:

ASBESTOS & MOLD ANALYSIS

Matrix		Air	X	Bulk		Tape Lift		Swab		Other	Regulatory Guideline	X	ON		QC		AB		SK		Other 278/05
Analyses		Microscopic Mold			Culturable Mold			Bacteria GRAM			PCM Asbestos	X	PLM Asbestos		Chatfield Asbestos			TEM Asbestos			

Paracel Order Number: 1912351

	Sample ID	Sampling Date	Air Volume (L)	Analysis Required	Asbestos - Bulk: Identify Distinct Building Materials to Be Analyzed (if not specified, all materials identified will be analyzed)*	Positive Stop?
1	See attached					
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

*If left blank, all distinct materials identified in the samples will be analyzed and reported separately as per EPA 600/R-93/116. Additional charges may apply.

Comments:

Method of Delivery: FEDEX

Relinquished By (Sign)	Received at Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Steven Nieboer			
Date/Time: 18-Mar-19	Date/Time:	Date/Time: 19-MAR-19 10:30	Date/Time: 20-MAR-19 1730

Paracel ID: 1912351



PARACEL LABORATORIES LTD. ASBESTOS ANALYSIS						
Sample ID	Location	Matrix Description	Sampling Date	Posit (Y/N)	(Y/N)	
S01A	1002	Drywall Joint Compound (1967)	3/15/2019	Y	N	-
S01B	1002	Drywall Joint Compound (1967)	3/15/2019	Y	N	-
S01C	1002	Drywall Joint Compound (1967)	3/15/2019	Y	N	-
S02A	1001	Floor Tile Mastic (1967)	3/15/2019	Y	N	-
S02B	1001	Floor Tile Mastic (1967)	3/15/2019	Y	N	-
S02C	1001	Floor Tile Mastic (1967)	3/15/2019	Y	N	-
S03A	1009	1'x1' Ceiling Tile Mastic (1962)	3/15/2019	Y	N	-
S03B	1009	1'x1' Ceiling Tile Mastic (1962)	3/15/2019	Y	N	-
S03C	1009	1'x1' Ceiling Tile Mastic (1962)	3/15/2019	Y	N	-
S04A	1009	Drywall Joint Compound (1962)	3/15/2019	Y	N	-
S04B	1009	Drywall Joint Compound (1962)	3/15/2019	Y	N	-
S04C	1009	Drywall Joint Compound (1962)	3/15/2019	Y	N	-
S05A	1005	Plaster (1962)	3/15/2019	Y	N	-
S05B	1005	Plaster (1962)	3/15/2019	Y	N	-
S06A	1009	Floor Tile Mastic (1962)	3/15/2019	Y	N	-
S06B	1009	Floor Tile Mastic (1962)	3/15/2019	Y	N	-
S06C	1009	Floor Tile Mastic (1962)	3/15/2019	Y	N	-
S07A	1010	Plaster (1960)	3/15/2019	Y	N	-
S07B	1010	Plaster (1960)	3/15/2019	Y	N	-
S07C	1010	Plaster (1960)	3/15/2019	Y	N	-
S08A	1010	Floor Tile Mastic (1960)	3/15/2019	Y	N	-
S08B	1010	Floor Tile Mastic (1960)	3/15/2019	Y	N	-
S08C	1010	Floor Tile Mastic (1960)	3/15/2019	Y	N	-
S09A	1010	1'x1' Ceiling Tile Mastic (1960)	3/15/2019	Y	N	-
S09B	1010	1'x1' Ceiling Tile Mastic (1960)	3/15/2019	Y	N	-
S09C	1010	1'x1' Ceiling Tile Mastic (1960)	3/15/2019	Y	N	-
S10A	1008	Plaster (1950)	3/15/2019	Y	N	-
S11A	1037	Floor Tile Mastic (1950)	3/15/2019	Y	N	-
S11B	1037	Floor Tile Mastic (1950)	3/15/2019	Y	N	-
S11C	1037	Floor Tile Mastic (1950)	3/15/2019	Y	N	-
S12A	1028	Drywall Joint Compound (1964)	3/15/2019	Y	N	-
S12B	1028	Drywall Joint Compound (1964)	3/15/2019	Y	N	-
S12C	1028	Drywall Joint Compound (1964)	3/15/2019	Y	N	-
S13A	1028	Floor Tile Mastic (1964)	3/15/2019	Y	N	-
S13B	1028	Floor Tile Mastic (1964)	3/15/2019	Y	N	-

Breslau - Sample Log Attachment

Paracel ID: 1912351

PARACEL LABORATORIES LTD. ASBESTOS ANALYSIS						
S13C	1028	Floor Tile Mastic (1964)	3/15/2019			
S14A	1032	Drywall Joint Compound (1965)	3/15/2019	Y	N	-
S14B	1032	Drywall Joint Compound (1965)	3/15/2019	Y	N	-
S14C	1032	Drywall Joint Compound (1965)	3/15/2019	Y	N	-
S15A	1008	Plaster (1965)	3/15/2019	Y	N	-
S15B	1008	Plaster (1965)	3/15/2019	Y	N	-
S16A	1030	Floor Tile Mastic (1965)	3/15/2019	Y	N	-
S16B	1030	Floor Tile Mastic (1965)	3/15/2019	Y	N	-
S16C	1030	Floor Tile Mastic (1965)	3/15/2019	Y	N	-
S17A	-	Grey Interior Window Frame Sealant (1967)	3/15/2019	Y	N	-
S17B	-	Grey Interior Window Frame Sealant (1967)	3/15/2019	Y	N	-
S17C	-	Grey Interior Window Frame Sealant (1967)	3/15/2019	Y	N	-
S18A	-	White Interior Door Frame Sleanat (1967)	3/15/2019	Y	N	-
S18B	-	White Interior Door Frame Sleanat (1967)	3/15/2019	Y	N	-
S18C	-	White Interior Door Frame Sleanat (1967)	3/15/2019	Y	N	-
S19A	-	Grey Exterior Window Frame Sealant (1967)	3/15/2019	Y	N	-
S19B	-	Grey Exterior Window Frame Sealant (1967)	3/15/2019	Y	N	-
S19C	-	Grey Exterior Window Frame Sealant (1967)	3/15/2019	Y	N	-
S20A	-	Black Exterior Window Pane Sealant (1967)	3/15/2019	Y	N	-
S20B	-	Black Exterior Window Pane Sealant (1967)	3/15/2019	Y	N	-
S20C	-	Black Exterior Window Pane Sealant (1967)	3/15/2019	Y	N	-
S21A	-	Grey Interior Window Frame Sealant (1962)	3/15/2019	Y	N	-
S21B	-	Grey Interior Window Frame Sealant (1962)	3/15/2019	Y	N	-
S21C	-	Grey Interior Window Frame Sealant (1962)	3/15/2019	Y	N	-
S22A	-	Beige Interior Door Frame Sealant (1962)	3/15/2019	Y	N	-
S22B	-	Beige Interior Door Frame Sealant (1962)	3/15/2019	Y	N	-
S22C	-	Beige Interior Door Frame Sealant (1962)	3/15/2019	Y	N	-
S23A	-	White Exterior Door Frame Sealant (1950)	3/15/2019	Y	N	-
S23B	-	White Exterior Door Frame Sealant (1950)	3/15/2019	Y	N	-
S23C	-	White Exterior Door Frame Sealant (1950)	3/15/2019	Y	N	-
S24A	-	Beige Interior Door Frame Sealant (1950)	3/15/2019	Y	N	-
S24B	-	Beige Interior Door Frame Sealant (1950)	3/15/2019	Y	N	-
S24C	-	Beige Interior Door Frame Sealant (1950)	3/15/2019	Y	N	-

Breslau - Sample Log Attachment

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 2/23/2011
Project: 34532-200-WRDSB
Project No.: 34532-200

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 4222552 **Description / Location:** Tan Plaster
Client No.: 34532-BRES-S22a Boiler Rm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4222553 **Description / Location:** Tan Plaster
Client No.: 34532-BRES-S22b Boiler Rm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 4222554 **Description / Location:** Tan Plaster
Client No.: 34532-BRES-S22c Boiler Rm

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Method: EPA 600/R-93/116

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Analysis Performed By: J. Haremza

Approved By:

Date: 2/23/2011

Frank E. Ehrenfeld, III
Laboratory Director

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844456 **Description / Location:** White Texture
Client No.: 32523-BRES-S01a Room 1028

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
PC 1.8	Chrysotile	None Detected	None Detected	PC 98.2

Lab No.: 3844457 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S01b

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844458 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S01c

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844459 **Description / Location:** Grey Floor Tile; 9x9
Client No.: 32523-BRES-S02a Room 1034

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
PC 2.5	Chrysotile	None Detected	None Detected	PC 97.5

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Analysis Performed By: R. Caran

Approved By: Frank E. Ehrenfeld, III
Laboratory Director

Date: 1/26/2010

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9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844460 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S02b

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844461 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S02c

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844462 **Description / Location:** White Plaster
Client No.: 32523-BRES-S03a Room 1034; Wall

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844463 **Description / Location:** White Plaster
Client No.: 32523-BRES-S03b Room 1034; Wall

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Performed By: R. Caran

Date: 1/26/2010

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9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
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Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844464 **Description / Location:** White Plaster
Client No.: 32523-BRES-S03c Room 1021; Wall

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844465 **Description / Location:** White Plaster
Client No.: 32523-BRES-S03d Room 1037; Wall

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844466 **Description / Location:** White Plaster
Client No.: 32523-BRES-S03e Room 1039; Wall

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844467 **Description / Location:** Beige Floor Tile; 9x9
Client No.: 32523-BRES-S04a Room 1033

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
PC 3.6	Chrysotile	None Detected	None Detected	PC 96.4

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Performed By: R. Caran

Date: 1/26/2010

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Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844468 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S04b

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844469 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S04c

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844470 **Description / Location:** Beige Floor Tile; 12x12
Client No.: 32523-BRES-S05a Room 1032

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844471 **Description / Location:** Beige Floor Tile; 12x12
Client No.: 32523-BRES-S05b Room 1032

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Performed By: R. Caran

Date: 1/26/2010

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Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

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Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844472 **Description / Location:** Beige Floor Tile; 12x12
Client No.: 32523-BRES-S05c Room 1032

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844473 **Description / Location:** White Ceiling Tile; 1x1
Client No.: 32523-BRES-S06a Room 1030

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	95	Fibrous Glass	5

Lab No.: 3844474 **Description / Location:** White Ceiling Tile; 1x1
Client No.: 32523-BRES-S06b Room 1030

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	95	Fibrous Glass	5

Lab No.: 3844475 **Description / Location:** White Ceiling Tile; 1x1
Client No.: 32523-BRES-S06c Room 1030

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	95	Fibrous Glass	5

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Performed By: R. Caran

Date: 1/26/2010

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9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844476 **Description / Location:** White Floor Tile; 12x12
Client No.: 32523-BRES-S07a Room 1028

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844477 **Description / Location:** White Floor Tile; 12x12
Client No.: 32523-BRES-S07b Room 1028

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844478 **Description / Location:** White Floor Tile; 12x12
Client No.: 32523-BRES-S07c Room 1028

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844479 **Description / Location:** White Joint Compound
Client No.: 32523-BRES-S08a Room 1021

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Performed By: R. Caran

Date: 1/26/2010

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CERTIFICATE OF ANALYSIS

Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844480 **Description / Location:** White Joint Compound
Client No.: 32523-BRES-S08b Room 1021

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844481 **Description / Location:** White Joint Compound
Client No.: 32523-BRES-S08c Room 1021

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844482 **Description / Location:** Brown Floor Tile; 9x9
Client No.: 32523-BRES-S09a Room 1064

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
PC 5.2	Chrysotile	None Detected	None Detected	PC 94.8

Lab No.: 3844483 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S09b

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Performed By: R. Caran

Date: 1/26/2010

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CERTIFICATE OF ANALYSIS

Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844484 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S09c

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844485 **Description / Location:** Brown Floor Tile; 12x12
Client No.: 32523-BRES-S10a Room 1021

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
PC 6.2	Chrysotile	None Detected	None Detected	PC 93.8

Lab No.: 3844486 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S10b

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844487 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S10c

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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CERTIFICATE OF ANALYSIS

Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844488 **Description / Location:** White Ceiling Tile; 2x2
Client No.: 32523-BRES-S11a Room 1020

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	40	Fibrous Glass	10
		50	Cellulose	

Lab No.: 3844489 **Description / Location:** White Ceiling Tile; 2x2
Client No.: 32523-BRES-S11b Room 1020

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	40	Fibrous Glass	10
		50	Cellulose	

Lab No.: 3844490 **Description / Location:** White Ceiling Tile; 2x2
Client No.: 32523-BRES-S11c Room 1020

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	40	Fibrous Glass	10
		50	Cellulose	

Lab No.: 3844491 **Description / Location:** Brown Floor Tile; 12x12
Client No.: 32523-BRES-S12a Room 1022

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
PC 1.8	Chrysotile	None Detected	None Detected	PC 98.2

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Method: EPA 600/R-93/116

Comments: (PC) Indicates Stratified Point Count Method performed. Method not performed unless stated. Quantification at <0.25% by volume is possible with this method. (PC-Trace) represents this limit of quantitation. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed. Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, negative PLM results cannot be guaranteed. Electron Microscopy can be used as a confirming technique. Regulatory Limit is based upon the sample matrix.

Analysis Performed By: R. Caran

Date: 1/26/2010

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844492 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S12b

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844493 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S12c

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844494 **Description / Location:** Brown Floor Tile; 12x12
Client No.: 32523-BRES-S13a Room 1012

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
PC 1.6	Chrysotile	None Detected	None Detected	PC 98.4

Lab No.: 3844495 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S13b

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Method: EPA 600/R-93/116

Comments: (PC) Indicates Stratified Point Count Method performed. Method not performed unless stated. Quantification at <0.25% by volume is possible with this method. (PC–Trace) represents this limit of quantitation. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed. Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, negative PLM results cannot be guaranteed. Electron Microscopy can be used as a confirming technique. Regulatory Limit is based upon the sample matrix.

Analysis Performed By: R. Caran

Date: 1/26/2010

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844496 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S13c

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844497 **Description / Location:** White Ceiling Tile; 2x4
Client No.: 32523-BRES-S14a Room 1012

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	60	Cellulose	10
		30	Fibrous Glass	

Lab No.: 3844498 **Description / Location:** White Ceiling Tile; 2x4
Client No.: 32523-BRES-S14b Room 1012

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	60	Cellulose	10
		30	Fibrous Glass	

Lab No.: 3844499 **Description / Location:** White Ceiling Tile; 2x4
Client No.: 32523-BRES-S14c Room 1012

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	60	Cellulose	10
		30	Fibrous Glass	

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Method: EPA 600/R-93/116

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Analysis Performed By: R. Caran

Date: 1/26/2010

IATL International Asbestos Testing Laboratories

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Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844500 **Description / Location:** Blue Floor Tile; 9x9
Client No.: 32523-BRES-S15a Room 1039

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
PC 6.3	Chrysotile	None Detected	None Detected	PC 93.7

Lab No.: 3844501 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S15b

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844502 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S15c

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844503 **Description / Location:** Green Floor Tile; 9x9
Client No.: 32523-BRES-S16a Room 1039

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
PC 7.5	Chrysotile	None Detected	None Detected	PC 92.5

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Performed By: R. Caran

Date: 1/26/2010

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844504 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S16b

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844505 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S16c

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844506 **Description / Location:** Off-White Plaster
Client No.: 32523-BRES-S17a Room 1040; Ceiling

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844507 **Description / Location:** Off-White Plaster
Client No.: 32523-BRES-S17b Room 1040; Ceiling

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Performed By: R. Caran

Date: 1/26/2010

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Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844508 **Description / Location:** Off-White Plaster
Client No.: 32523-BRES-S17c Room 1040; Ceiling

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844509 **Description / Location:** White Floor Tile; 12x12
Client No.: 32523-BRES-S18a Room 1004

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844510 **Description / Location:** White Floor Tile; 12x12
Client No.: 32523-BRES-S18b Room 1004

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844511 **Description / Location:** White Floor Tile; 12x12
Client No.: 32523-BRES-S18c Room 1004

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Performed By: R. Caran

Date: 1/26/2010

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CERTIFICATE OF ANALYSIS

Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844512 **Description / Location:** Off-White Floor Tile; 12x12
Client No.: 32523-BRES-S19a Room 1044

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844513 **Description / Location:** Off-White Floor Tile; 12x12
Client No.: 32523-BRES-S19b Room 1044

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844514 **Description / Location:** Off-White Floor Tile; 12x12
Client No.: 32523-BRES-S19c Room 1044

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844515 **Description / Location:** Off-White Floor Tile; 12x12
Client No.: 32523-BRES-S20a Room 1042

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
PC 2.1	Chrysotile	None Detected	None Detected	PC 97.9

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Performed By: R. Caran

Date: 1/26/2010

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9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844516 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S20b

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844517 **Description / Location:** Sample Not Analyzed
Client No.: 32523-BRES-S20c

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 3844518 **Description / Location:** White Plaster
Client No.: 32523-BRES-S21a Room 1053; Firespray

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 3844519 **Description / Location:** White Plaster
Client No.: 32523-BRES-S21b Room 1053; Firespray

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Method: EPA 600/R-93/116

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Analysis Performed By: R. Caran

Date: 1/26/2010

IATL International Asbestos Testing Laboratories

9000 Commerce Parkway Suite B Mt. Laurel, NJ 08054
Telephone: 856-231-9449 Fax: 856-231-9818

CERTIFICATE OF ANALYSIS

Client: MTE Consultants
520 Bingemans Centre Dr
Kitchener ON N2B 3X9

Report Date: 1/27/2010
Project: WRDSB Breslau
Project No.: 32523-800

BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 3844520
Client No.: 32523-BRES-S21c

Description / Location: White Plaster
Room 1053; Firespray

% Asbestos	Type	% Non-Asbestos Fibrous Material	Type	% Non-Fibrous Material
None Detected	None Detected	None Detected	None Detected	100

NIST-NVLAP No. 101165-0 **NY-DOH No. 11021** **AIHA Lab No. 100188**

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Analysis Performed By: R. Caran

Date: 1/26/2010

APPENDIX B
LEAD PAINT ANALYSIS RESULTS

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: (289) 997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	552600993
CustomerID:	55ADEC69
CustomerPO:	LON-26000267-A0
ProjectID:	

Attn: **Sarah Kruis**
EXP Services Inc.
15701 Robin's Hill Rd
London, ON N5V 0A5

Phone: (519) 652-6105
Fax: (519) 652-1709
Received: 1/20/2026 09:47 AM
Collected: 1/15/2026

Project: **LON-26000267-A0 Breslau PS DSS**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client SampleDescription	*Collected*	*Analyzed*	*Weight*	*RDL*	*Lead Concentration*
26000267-Pb-01	1/15/2026	1/21/2026	0.0963 g	0.017 % wt	<0.017 % wt
552600993-0001	Site: Beige Wall paint on Plaster - Room 814 (Addition 1965) Insufficient sample to reach reporting limit				
26000267-Pb-02	1/15/2026	1/21/2026	0.2558 g	0.0064 % wt	0.027 % wt
552600993-0002	Site: Beige Wall paint on Plaster - Room 814 (Addition 1964)				
26000267-Pb-03	1/15/2026	1/21/2026	0.0394 g	0.041 % wt	<0.041 % wt
552600993-0003	Site: Grey Paint on Concrete Block Wall - Room 111 (Original Era) Insufficient sample to reach reporting limit				
26000267-Pb-04	1/15/2026	1/21/2026	0.2545 g	0.0064 % wt	<0.0064 % wt
552600993-0004	Site: Beige Wall Paint on plaster - Room 803 (Original Era)				
26000267-Pb-05	1/15/2026	1/21/2026	0.1839 g	0.0087 % wt	<0.0087 % wt
552600993-0005	Site: Beige Wall Paint on Plaster - Room 803 (Addition 1960)				
26000267-Pb-06	1/15/2026	1/21/2026	0.2560 g	0.0064 % wt	<0.0064 % wt
552600993-0006	Site: Beige Wall Paint on Plaster - Room 803 (Additoon 1962)				
26000267-Pb-07	1/15/2026	1/21/2026	0.1823 g	0.0088 % wt	<0.0088 % wt
552600993-0007	Site: Beige Paint on Concrete Block Wall - Room 810 (Additoon 1967)				

Rowena Fanto, Lead Supervisor
or other approved signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. * Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.0064% wt based on the minimum sample weight per our SOP. "<" (less than) result signifies the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. Definitions of modifications are available upon request.

Samples analyzed by EMSL Canada Inc. Mississauga, ON AIHA LAP, LLC-ELLAP Accredited #196142

Initial report from 01/26/2026 09:21:23

APPENDIX C
DRAWINGS



BRESLAU PUBLIC SCHOOL - FIRST FLOOR PLAN - PROJECT AREA

SCALE - NTS

LEGEND

- PROJECT AREA
- NOT IN PROJECT AREA

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EXP Services Inc.
t: +1.519.963.3000 | f: +1.519.963.1152
15701 Robin's Hill Road
London, ON N5V 0A5
Canada
www.exp.com

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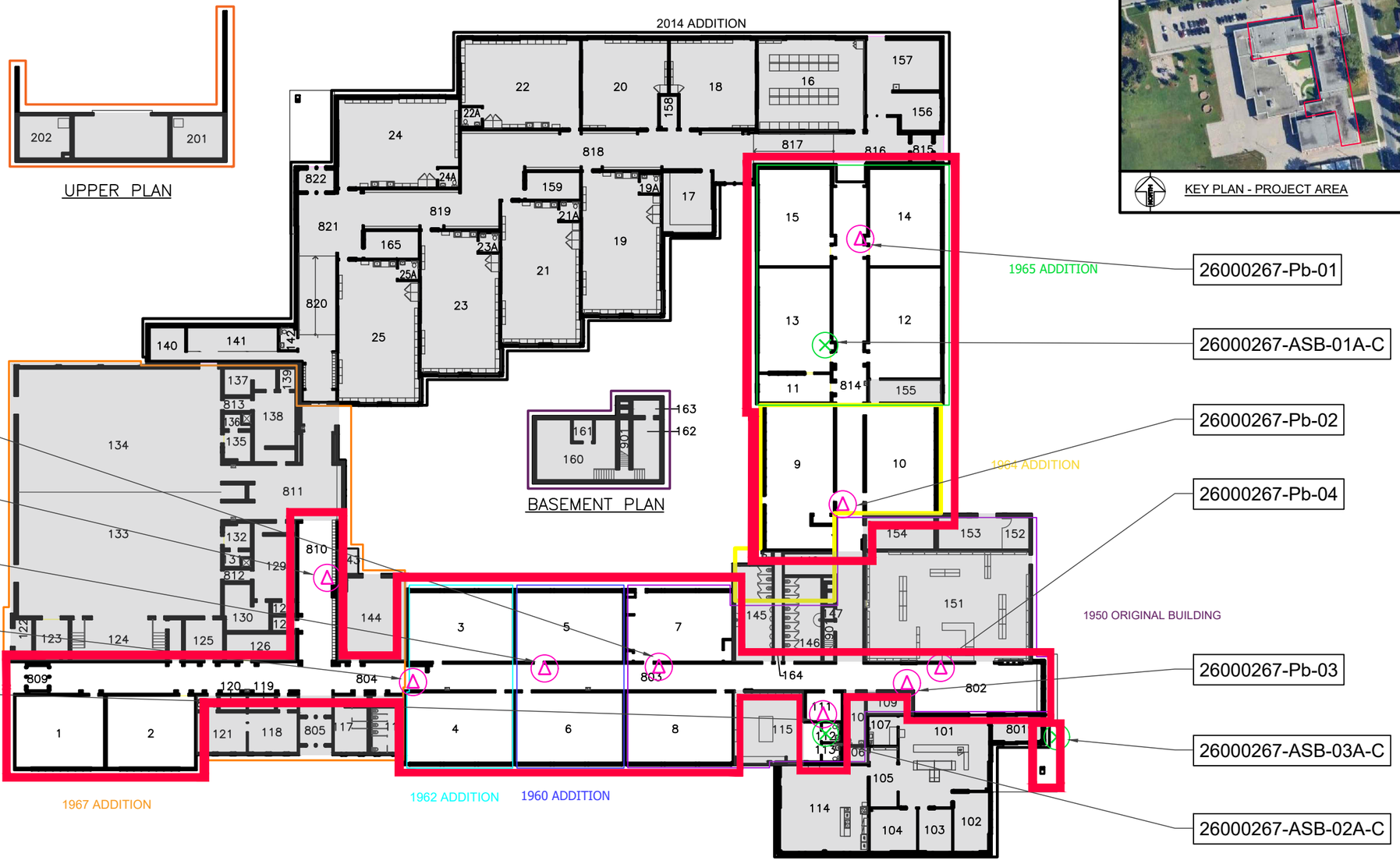
NOTE:
1. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING EXISTING ASSEMBLIES SITE CONDITIONS AND ALL DIMENSIONS.
2. DO NOT SCALE DRAWINGS.
3. ALL DEFICIENCY LOCATIONS SHOWN ON DRAWINGS ARE APPROXIMATE.

CLIENT
Waterloo Region District School Board
51 Ardelt Avenue, Kitchener, Ontario

PROJECT
Designated Substance Survey
Breslau Road Public School
58 Joseph St, Breslau, Ontario

TITLE
Project Area
First Floor Plan

DESIGN	N/A	PROJECT NO.
DRAWN BY	K.B.	LON-26000267-A0
CHECKED	S.K.	DRAWING NO.
DATE	JAN 2026	1.0
SCALE	N/A	





BRESLAU PUBLIC SCHOOL - FIRST FLOOR PLAN - SAMPLE LOCATION PLAN

SCALE - NTS

LEGEND

- SAMPLE LOCATION (ASBESTOS)
- SAMPLE LOCATION (LEAD)
- NOT IN PROJECT AREA

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EXP Services Inc.
t: +1.519.963.3000 | f: +1.519.963.1152
15701 Robin's Hill Road
London, ON N5V 0A5
Canada
www.exp.com

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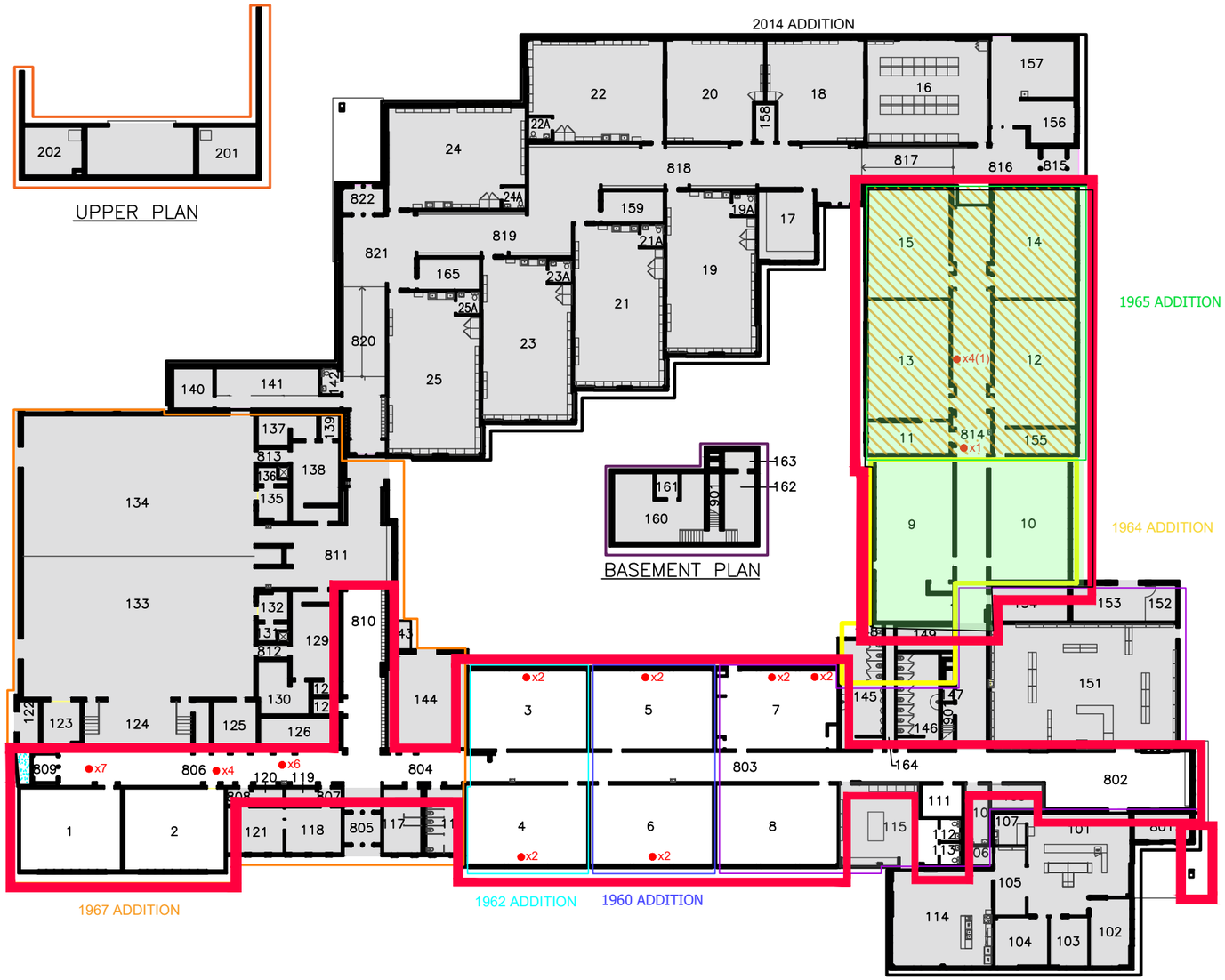
NOTE:
1. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING EXISTING ASSEMBLIES SITE CONDITIONS AND ALL DIMENSIONS.
2. DO NOT SCALE DRAWINGS.
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CLIENT
Waterloo Region District School Board
51 Ardelt Avenue, Kitchener, Ontario

PROJECT
Designated Substance Survey
Breslau Road Public School
58 Joseph St, Breslau, Ontario

TITLE
Sample Location Plan
First Floor Plan

DESIGN	N/A	PROJECT NO.	LON-26000267-A0
DRAWN BY	K.B.		
CHECKED	S.K.	DRAWING NO.	2.0
DATE	JAN 2026		
SCALE	N/A		





KEY PLAN - PROJECT AREA

BRESLAU PUBLIC SCHOOL - FIRST FLOOR PLAN - DISTRIBUTION PLAN

SCALE - NTS

LEGEND

- ASBESTOS-CONTAINING PLASTER
- ASBESTOS-CONTAINING HARD TEXTURED CEILING
- ASBESTOS-CONTAINING CONCRETE BLOCK FILLER COMPOUND
- x2 ASBESTOS-CONTAINING FITTING WITH QUANTITY
- OUTSIDE OF PROJECT AREA

NOTE

FRIABLE AND NON-FRIABLE ASBESTOS - CONTAINING MATERIALS ARE PRESUMED TO BE PRESENT IN CONCEALED LOCATIONS.

FLOORING MATERIALS ARE NOT INCLUDED IN THE PROJECT SCOPE, AND NOT PRESENTED ON THE DRAWING.

THIS DRAWING IS THE PROPERTY OF exp SERVICES INC. ANY REPRODUCTION BY ANY MEANS IS STRICTLY PROHIBITED WITHOUT THE WRITTEN CONSENT OF exp SERVICES INC. THIS DRAWING AND DESIGN INTENT IS FOR THIS PROJECT ONLY.

EXP Services Inc.
t: +1.519.963.3000 | f: +1.519.963.1152
15701 Robin's Hill Road
London, ON N5V 0A5
Canada
www.exp.com

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NOTE:
1. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING EXISTING ASSEMBLIES SITE CONDITIONS AND ALL DIMENSIONS.
2. DO NOT SCALE DRAWINGS.
3. ALL DEFICIENCY LOCATIONS SHOWN ON DRAWINGS ARE APPROXIMATE.

CLIENT
Waterloo Region District School Board
51 Ardelt Avenue, Kitchener, Ontario

PROJECT
Designated Substance Survey
Breslau Road Public School
58 Joseph St, Breslau, Ontario

TITLE
Distribution Plan
First Floor Plan

DESIGN	N/A
DRAWN BY	K.B.
CHECKED	S.K.
DATE	JAN 2026
SCALE	N/A

PROJECT NO.
LON-26000267-A0

DRAWING NO.
3.0

Appendix 01 35 34B– Lead Report – Not Applicable

01 42 00 – References

1.0 GENERAL

1.1. SECTION INCLUDES

.1 References and standards.

.2 Standards producing industry organizations and their addresses.

1.2. RELATED SECTIONS

.1 Section 01 61 00 – Product Requirements.

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

1.3. REFERENCES

.1 For Products or quality specified by association, trade, or other references or consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

.2 Conform to reference standard by Ontario Building Code except where a specific date is established or required by code.

.3 Obtain copies of standards where required by product specification sections.

.4 Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Consultant shall be altered from the Contract Documents by mention or inference otherwise, in any reference document.

1.4. STANDARDS

.1 The following associations and organizations are cited in specification sections. Acronym, name, address, and Internet URL addresses are as follows:

.2 Canadian Organizations:

.1 Street, Suite 616, Ottawa, ON K1P 5G4; URL: http://www.acec.ca.

.2 **AWMAC** - Architectural Woodwork Manufacturers Association of Canada, 516-4 Street West, High River, AB T1V 1B6; URL: http://www.awmac.com.

.3 **Canada Green Building Council**, 330 - 55 rue Murray Street, Ottawa, ON. K1N5M3; Tel: 613-241-1184, Fax: 613-241-5750; URL: http://www.cagbc.org.

.4 **CCA** - Canadian Construction Association, 75 Albert St., Suite 400, Ottawa, ON K1P 5E7; URL: http://www.cca-acc.com.

.5 **CCDC** – Canadian Construction Documents Committee, Refer to ACEC, CCA, CSC or RAIC; URL: http://www.CCDC.org.

.6 **CGA** - Canadian Gas Association, 20 Eglinton Avenue West, Suite 1305, Toronto, ON M4R 1K8; URL: http://www.cga.ca..

.7 **CGSB** - Canadian General Standards Board, Place du Portage, Phase III, 6B1, 11 Laurier Street, Hull, QC K1A 0S5; URL: http://w3.pwgsc.gc.ca/cgsb.

.8 **CISC** - Canadian Institute of Steel Construction, 201 Consumers Road, Suite 300, Willowdale, ON M2J 4G8; URL: http://www.cisc-icca.ca.

.9 **CLA** - Canadian Lumbermen's Association, 27 Goulburn Avenue, Ottawa, ON K1N 8C7; URL: http://www.cla-ca.ca.

.10 **CNLA** - Canadian Nursery Landscape Association, RR #4, Stn. Main,7856 Fifth Street, Milton, ON L9T 2X8; URL: http://www.canadanursery.com.

.11 **CRCA** - Canadian Roofing Contractors Association, 155 Queen Street,Suite 1300, Ottawa, ON K1P 6L1; URL: http://www.roofingcanada.com.

.12 **CSA** - Canadian Standards Association International, 178 Rexdale Blvd., Toronto, ON M9W 1R3; URL: http://www.csa-international.org.

.13 **CSC** - Construction Specifications Canada, 120 Carlton Street, Suite 312, Toronto, ON M5A 4K2; URL: http://www.csc-dcc.ca.

.14 **CSDMA** - Canadian Steel Door Manufacturers Association, One Yonge Street, Suite 1801, Toronto, ON M5E 1W7; URL: http://www.csdma.org.

.15 **CSPI** - Corrugated Steel Pipe Institute, 652 Bishop Street N, Unit 2A, Cambridge, ON N3H 4V6; URL: http://www.cspi.ca.

.16 **CSSBI** - Canadian Sheet Steel Building Institute, 652 Bishop St. N., Unit 2A, Cambridge, ON N3H 4V6; URL: http://www.cssbi.ca.

.17 **CUFCA** - Canadian Urethane Foam Contractor's Association, Box 3214, Winnipeg, MB R3C 4E7; URL: http://www.cufca.ca.

.18 **CWC** - Canadian Wood Council, 1400 Blair Place, Suite 210, Ottawa, ON. K1J 9B8; URL: http://www.cwc.ca.

.19 **EC** - Environment Canada, Conservation and Protection, Inquiry Centre, 351 St. Joseph Blvd, Hull, QC KIA 0H3; URL: http://www.ec.gc.ca.

.20 **EFC** - Electro Federation of Canada, 5800 Explorer Drive, Suite 200, Mississauga, ON L4W 5K9; URL: http://www.electrofed.com.

.21 **MPI** - The Master Painters Institute, 4090 Graveley Street, Burnaby, BC V5C 3T6; URL: http://www.paintinfo.com.

.22 **NABA** - National Air Barrier Association, PO Box 2747, Winnipeg, MB R3C 4E7; URL: http://www.naba.ca.

.23 **NLGA** - National Lumber Grades Authority, 406-First Capital Place, 960 Quayside Drive, New Westminster, BC V3M 6G2; URL: http://www.nlga.org.

.24 **NRC** - National Research Council, Building M-58, 1200 Montreal Road, Ottawa, ON K1A 0R6; URL: http://www.nrc.gc.ca.

.25 **QPL** - Qualification Program List, c/o Canadian General Standards Board, Place du Portage, Phase III, 6B1, 11 Laurier Street, Hull, QC K1A 1G6; URL: http://www.pwgsc.gc.ca/cgsb.

.26 **RAIC** - Royal Architectural Institute of Canada, 55 Murray Street, Suite 330, Ottawa, ON K1N 5M3; URL: http://www.raic.org.

.27 **SCC** - Standards Council of Canada, 270 Albert Street, Suite 2000, Ottawa, ON K1P 6N7; URL: http://www.scc.ca.

.28 **TTMAC** - Terrazzo, Tile and Marble Association of Canada, 30 Capston Gate, Unit 5 Concord, ON L4K 3E8; URL: http://www.ttmac.com.

.29 **ULC** - Underwriters' Laboratories of Canada, 7 Crouse Road, Toronto, ON M1R 3A9; URL: http://www.ulc.ca.

.3 USA Organizations:

.1 **AA** - Aluminum Association, 900 19th Street N.W., Washington, DC 20006; URL: http://www.aluminum.org.

.2 **AASHTO** - American Association of State Highway and Transportation Officials, 444 N Capitol Street N.W., Suite 249, Washington, DC 20001; URL: http://www.aashto.org.

.3 **AHA** - American Hardboard Association, 1210W Northwest Hwy, Palatine, IL 60067; URL: http://www.hardboard.org.

.4 **AITC** - American Institute of Timber Construction, 7012 S. Revere Parkway, Suite 140, Englewood, CO 80112; URL: http://www.aitc-glulam.org.

.5 **AMCA** - Air Movement and Control Association Inc., 30 West University Drive, Arlington Heights, IL 60004-1893; URL: http://www.amca.org.

.6 **ANSI** - American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036; URL: http://www.ansi.org.

.7 **APA** - The Engineered Wood Association, P.O. Box 11700, Tacoma, WA 98411-0700; URL: http://www.apawood.org.

.8 **API** - American Petroleum Institute, 1220 L St. Northwest, Washington, DC 20005-4070; URL: http://www.api.org.

.9 **ARI** - Air Conditioning and Refrigeration Institute, 4100 N Fairfax Drive, Suite 200, Arlington, VA 22203; URL: http://www.ari.org.

.10 **ASHRAE** - American Society of Heating, Refrigeration and Air-Conditioning Engineers, 1791 Tullie Circle NE, Atlanta, GA 30329; URL: http://www.ashrae.org.

.11 **ASME** - American Society of Mechanical Engineers, ASME Headquarters, 3 Park Avenue, New York, NY 10016-5990; URL: http://www.asme.org.

.12 **ASTM International**, 100 Barr Harbor Drive West, Conshohocken, PA 19428-2959; URL: http://www.astm.org.

.13 **AWCI** - Association of the Wall and Ceiling Industries International, 803 West Broad Street, Suite 600 , Falls Church, UA 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 Avenuse, 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 9101Quincy, 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 Subontractor. 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

PART 1 – GENERAL

1.1 SECTIONS INCLUDES

.1 Demolition of portions of exterior walls and roof assemblies to provide for mechanical upgrades.

.2 Removal of surface finishes, suspended ceilings and flooring.

1.2 RELATED SECTIONS

.1 General Requirements Division 01

1.3 STANDARDS

.1 Comply with O. Reg. 213/91, Regulations for Construction Projects, made under the Occupational Health and Safety Act.

1.4 ASBESTOS

.1 Demolition of spray or trowel applied asbestos can be hazardous to health. Should material resembling spray or trowel-applied asbestos be encountered, stop work and notify the Consultant immediately.

.2 Do not proceed until written instructions have been received from the Consultant.

.3 Refer to the Asbestos Audit Report included in the Project Manual in Section 01 35 43 – Designated Substances and accompanying Appendices.

1.5 PROTECTION

.1 Prevent movement, settlement, or other damage to adjacent structures, utilities, and parts of building to remain in place. Provide bracing and shoring as required. Shoring is the responsibility of the Contractor and shall be designed by a Professional Engineer licensed to practice in the Province of Ontario and engaged by the Contractor.

.2 Keep noise, dust, and inconvenience to adjacent building occupants to minimum.

.3 Maintain protected egress and access to exits at all times, for use by construction personnel.

.4 Provide temporary barriers, security devices, covers, railings, supports and other protection as required.

.5 Provide dust screens to limit spread of dust generated during demolition operations.

.6 Prevent debris from blocking surface drainage system, and mechanical and electrical systems which must remain in operation.

.7 Take precautions to support affected construction to remain during demolition of adjacent elements.

.8 Demolition Dust Control:

.1 Designate truck loading points to avoid trucks tracking demolition debris off site. Loading points shall be on a gravel base or paved area. Maintain in a clean condition.

.2 Clean all vehicles leaving the site of dust from demolition debris. Include the washing of tires and sweeping or washing of exteriors and tailgates by a designated laborer. Maintain a daily log of each truck leaving the site, noting when the truck was cleaned and by whom.

.3 Tarp all vehicles leaving the site which are loaded with demolition debris.

.9 Waste Auditing and Reduction:

.1 Demolition and construction waste shall be audited and source-separated as required under the Environmental Protection Act. Materials that shall be source-separated include corrugated cardboard, brick, concrete, steel, wood, and gypsum board.

.2 Comply with O.Reg. 102/94, Waste Audits and Waste Reduction Workplans and O.Reg. 103/94, Industrial, Commercial and Institutional Source Separation Programs.

1.6 SHOP DRAWINGS

.1 Before proceeding with demolition or breaking out of load bearing walls or structure requiring shoring, provide to authority having jurisdiction as may be required, shoring and underpinning drawings showing proposed methods prepared, sealed, and signed by a qualified Professional Engineer, licensed to practice in the Province of Ontario and engaged by the Contractor.

1.7 NOTICE

.1 Notify the Consultant before disrupting building access or services to the existing building. Do not proceed with such disruption until directed to do so by the Consultant.

.2 Cease operations and notify the Consultant immediately if adjacent structures appear to be in danger. Do not resume operations until corrective measures have been taken.

PART 2 - PRODUCTS

Not Used.

PART 3 – EXECUTION

3.1 PREPARATION

.1 Erect and maintain weatherproof closures for exterior openings as specified in Section 01 56 00 - Temporary Barriers and Controls.

.2 Erect and maintain temporary partitions to prevent the spread of dust, fumes, noise, and smoke, as specified in Section 01 56 00 – Temporary Barriers and Controls.

.3 Protect existing items which are not indicated to be altered. Make good any damage caused by alterations.

.4 Disconnect and remove or cap designated utility services in accordance with authorities having jurisdiction. Mark locations of disconnected utilities. Identify and indicate locations on Project Record Documents.

.5 Do not disrupt active or energized utilities designated to remain undisturbed. Post warning signs on lines and equipment that must remain energized during demolition.

.6 Remove existing equipment, services and obstacles where required for re-finishing or making good of existing surfaces, and replace as work progresses.

.7 Natural gas lines shall only be removed by qualified trades people in accordance with the gas utility company's instructions.

3.2 DEMOLITION, SALVAGE AND DISPOSAL

.1 Remove parts of existing building to permit new construction, as indicated. Protect existing foundations, supporting structural members and items designated to remain or to be reused.

.2 Remove materials to be re-installed or retained in a manner to prevent damage. Store and protect in accordance with the requirements of Section 01 60 00 - Product Requirements.

.3 Remove items to be reused or turned over to Owner and store as directed by the Consultant. Items noted on drawings include the following materials and equipment:

.4 Items to be reused, where shown on the Drawings, shall be installed under the appropriate section of the Specifications. The Contractor shall coordinate such work with the Subcontractors affected.

.5 Review schedule of demolition with the Consultant to minimize disruption to the Owner.

.6 At the end of each day's work, leave work in a safe condition so that no part is in danger of toppling or falling.

.7 Protect interiors of parts of building not to be demolished from exterior elements at all times.

.8 Remove and dispose of contaminated or dangerous materials in accordance with Ministry of the Environment regulations and local by-laws. Do not burn materials on site.

.9 Dispose of removed materials, except where specified otherwise, in accordance with the authority having jurisdiction. Except where noted otherwise, immediately remove

demolished materials from the site. Upon completion of work leave areas of work in clean condition.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

.1 All reinforcement for cast-in-place concrete.
.2 Supply of reinforcing bars for masonry.

1.2 RELATED WORK

.1 Concrete Formwork, Section 03 10 00.
.2 Cast in Place Concrete, Section 03 30 00.
.3 Precast Structural Concrete, Section 03 41 00.
.4 Masonry, Division 4.

1.3 REFERENCES

.1 Reinforcing Steel Manual of Standard Practice published by the Reinforcing Steel Institute of Canada.
.2 ACI SP-66, ACI Detailing Manual published by the American Concrete Institute.
.3 CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
.4 CSA-A23.3, Design of Concrete Structures.
.5 ASTM A82, Standard Specification for Steel Wire, Plain, for concrete reinforcement.
.6 ASTM A185, Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
.7 CSA G30.18, Billet-Steel Bars for Concrete Reinforcement.
.8 CAN/CSA G40.21, Structural Quality Steels.
.9 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
.10 ASTM D3963/D3963M, Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.

1.4 SOURCE QUALITY CONTROL

.1 Upon request, provide the Consultant with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis.
.2 Upon request, inform the Consultant of proposed source of material to be supplied.
.3 Upon request, provide the Consultant with a copy of plant certificate by the Concrete Reinforcing Steel Institute for epoxy coating of reinforcement.
.4 Upon request, provide the Consultant with a copy of manufacturer’s instructions for patching factory applied epoxy coating.
.5 Use welding firm certified by the Canadian Welding Bureau under the requirements of CSA W186.

1.5 SHOP DRAWINGS

.1 Submit shop drawings including placing of reinforcement in accordance with Section 01 33 00 - Submittals. This applies to all reinforcement including reinforcing bars for masonry to be installed by the Masonry Trade.

.2 Submit to the Consultant for review before the start of Work, 4 white prints of shop drawings. Leave room on drawings for the stamps of the Consultant and the Structural Engineer. Check and sign before submission. Only 2 copies will be returned to General Contractor.

.3 Allow a minimum of 10 working days for review of each submission of shop drawings in the Structural Engineer's office. Shop drawings received after noon will be date-stamped as received the following working day.

.4 If required, CAD diskettes of the Structural Drawings are available "as-is", and at cost, for use in the preparation of shop drawings provided that the title blocks are removed and provided that the Owner and the Owner's Consultants are not held responsible for any errors or omissions on the drawings. These CAD drawings are not to be scaled.

.5 Submit plans, elevations, sections, and bar lists necessary to show reinforcing and to facilitate review and placing. Show location of construction joints and detail reinforcement at joints. Dimension strips for flat slabs and flat plates. Draw elevations of walls including reinforced masonry walls. Show concrete cover on the diagrams. Draw to scale not smaller than 1:50.

.6 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and splices with identifying code marks to permit correct placement without reference to Structural Drawings.

.7 Conform to CSA A23.1 and the Reinforcing Steel Manual of Standard Practice, unless the Contract Documents contain a more stringent requirement, in which case the latter shall govern. Provide accessories as required by the Standard. Conform to ACI, SP-66 Detailing Manual whenever a detail condition is not covered by any of the above, but is covered by the ACI Manual.

.8 Design and detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated. Provide standard hooks at ends of hooked bars.

.9 Do not release for fabrication reinforcing bars whose length may be affected by field conditions, such as the final elevation of footings, until the governing field dimensions have been ascertained.

.10 Review of shop drawings by the Consultant is on a sampling basis for general conformity with contract documents. It is not a detailed check and must not be construed as relieving the Contractor of responsibility for making the work accurate and in conformity with the Contract Documents.

.11 Design for which the Contractor is responsible under the contract will not be reviewed. Work done prior to the receipt of the reviewed shop drawings will be at the risk of the Contractor. Review comments are not authorization for changes to the contract price.

.12 After review, drawings will be returned to the Contractor stamped to show one of the following:

.1		Reviewed	- Released for fabrication.
.2		Noted	- Released for fabrication after revisions noted are made. Submit revised drawing for Consultant's records.
.3	Resubmit	-	Correct and resubmit for review.

Conform to the requirements of each authority that has reviewed the drawings.

.13 Keep on site at all times a set of reviewed shop drawings and use only these drawings and the Structural Drawings to place reinforcing steel. Neatly mark on the Structural Drawings changes issued during the course of construction.

1.6 TOLERANCES

.1 Conform to CSA A23.1.

.2 Cover to be not less than required for fire rating.

1.7 **SUBSTITUTES**

.1 Substitute different size bars only if permitted in writing by the Consultant.

1.8 **ALLOWANCE**

.1 Include an allowance of five tonnes of additional reinforcing bars in the Contract. Allowance to include all costs including supply, detailing, fabricating and placement of rebars. Provide detailed records of use. Provide credit for unused portion based on unit prices.

PART 2 - MATERIALS

2.1 MATERIALS

.1 Reinforcing steel: billet steel, grade 400 MPa, deformed bars to CSA-G30.18, unless otherwise indicated.
.2 Weldable reinforcing steel: weldable steel, grade 400MPa, deformed bars to CSA G30.18. Required only where welding is indicated.
.3 Cold-drawn annealed steel wire ties: to CSA G30.3.
.4 Welded wire fabric: to CSA G30.5. Provide in flat sheets only.
.5 Epoxy coated reinforcement: Apply fusion bonded epoxy coating conforming to the requirements of ASTM D3963/D3963M. Provide colour which contrasts sharply with reinforcing steel and rust colours. Brown is not acceptable. All bars must be supplied by plants certified by the Concrete Reinforcing Steel Institute for epoxy coated steel. Certified plants include:
    .1 Harris Rebar - Stoney Creek, Ontario
    .2 Teme Rebar Concepts - Fruitland, Ontario
    Provide patching material for areas where the epoxy coated is damaged or omitted in accordance with the coating manufacturer’s written instructions using material supplied by the manufacturer.
.6 Bar supports and side form spacers: to CSA-A23.1. For exposed concrete surfaces and for floor and roof slabs with directly applied ceiling finish: use either plastic bar supports or plastic tipped bar supports for at least the bottom 25mm; use plastic side form spacers; and use plastic with colour to match concrete. For epoxy coated reinforcement, use plastic bar supports, epoxy coated support bars and plastic coated tie wires.
.7 Epoxy coating of existing reinforcement: Amerlock 400 High-Solids Epoxy by Amercoat Canada Inc. or an equivalent material acceptable to the Consultant. Provide colour which contrasts sharply with steel and rust colours.

2.2 **FABRICATION**

.1 Fabricate reinforcing steel in accordance with CSA-A23.1, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
.2 Obtain Consultant's approval for locations of reinforcement splices other than shown on placing drawings.
.3 Where indicated, weld reinforcement in accordance with CSA-W186. Use weldable reinforcing steel.
.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar lists.

PART 3 - EXECUTION

3.1 PLACING REINFORCEMENT

.1 Handle epoxy coated bars in accordance with CSA S413.
.2 Place reinforcing steel in accordance with CSA-A23.1.
.3 Concrete cover to be not less than required for fire rating.
.4 Use only reviewed shop drawings and the Structural Drawings for placing of reinforcement. Report discrepancies to the Consultant before proceeding.
.5 Before placing, remove all loose scale, dirt, oil or other coatings, which would reduce bond.
.6 Turn the ends of tie wire towards the interior of the concrete.
.7 Use bar supports for beams and slabs. Use precast concrete chairs where supports rest on the ground. Where welded wire fabric is used in slabs-on- grade, place precast concrete chairs at 600 mm on centre each way. Use side form spacers for walls and columns.
.8 No splicing of reinforcement is permitted other than shown on the Structural Drawings.
.9 Do not cut reinforcement without written approval of Consultant.
.10 Ensure concrete cover to reinforcement is maintained during concrete pour.

3.2 FIELD BENDING

.1 Do not field bend reinforcement except where indicated or authorized by the Consultant. Do not field bend epoxy coated reinforcement.
.2 When field bending is authorized, bend without heat, applying a slow and steady pressure. Replace bars, which develop cracks or splits.

3.3 FIELD WELDING

.1 Do not field weld reinforcement except where indicated or authorized by the Consultant. Do not weld epoxy coated reinforcement.
.2 Conform to CSA A23.1 and CSA W186.

3.4 PATCHING FACTORY APPLIED EPOXY COATING

.1 If factory applied epoxy coating is damaged or omitted, patch in accordance with coating manufacturer's written instructions using material supplied by manufacturer.

3.5 REVIEW OF CONSTRUCTION

.1 Provide the Consultant with a minimum of 24 hrs notice of intended concrete pours to allow review of reinforcement.
.2 Review of construction by Consultant is to ascertain general conformity with contract documents. It does not relieve the Contractor of his contractual responsibilities. The review is based on representative samples of the work and does not relieve the Contractor from carrying out his own quality control and making the work in conformity with the drawings and specifications.
.3 Reviews are undertaken so that the Owner may be informed in writing as to the quality of the Contractor's performance and for the protection of the Owner.
.4 The Contractor will receive copies of the construction review reports and the results of material tests. He will thereby be informed of any defects or deficiencies found.
.5 Bring to the attention of the Consultant, any defects or deficiencies in the Work, which may occur during construction together with a proposal for remedy. The Consultant will decide what corrective action may be taken and will issue the necessary instructions.

3.6 REINFORCED MASONRY

.1 Supply reinforcing bars required for the construction of masonry lintels, beams, walls, columns and piers. Provide shop drawings. Note that Structural Drawings do not show all openings. Refer to lintel notes on structural drawings.

3.7 **PITS, CURBS, BASES**

.1 Construct all concrete sumps, pits, trenches, curbs and machinery bases forming part of floor construction that are required within the building by other trades.

.2 Unless otherwise shown on drawings, reinforce curbs with 10M @ 400 dowels plus 2 - 10M continuous horizontal.

.3 Unless otherwise shown on drawings, reinforce bases with 10M at 300 each way placed 50 mm below top of concrete.

END OF SECTION

PART 1 – GENERAL

1.1 WORK INCLUDED

.1 All cast-in-place concrete including supply, placing, finishing and curing.
.2 Installing embedment.
.3 Grouting under base plates and bearing plates.
.4 Installing shelf angles/plates and wall plates that bear on or are attached to concrete.

1.2 RELATED WORK

.1	Concrete Formwork	Section 03 10 00
.2	Concrete Reinforcement	Section 03 20 00
.3	Precast Structural Concrete	Section 03 41 00
.4	Structural Steel	Section 05 12 10

1.3 REFERENCES

.1 ASTM C260, Standard Specification for Air-Entraining Admixtures to Concrete.
.2 ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
.1 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.
.2 ASTM D1751, Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
.3 CSA A5, Portland cement.
.4 CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
.5 CSA-A23.2, Methods of Test and Standard Practices for Concrete.
.6 CAN/CSA A3000, Cementitious Materials for Use in Concrete.
.7 CAN/CSA S448.1, Repair of Reinforced Concrete in Buildings.
.8 CSA A283, Qualification Code for Concrete Testing Laboratories.

1.4 QUALITY ASSURANCE

.1 Concrete supplier to have a valid “Certificate of Ready Mixed Concrete Production Facilities” as issued by the Ready Mixed Concrete Association of Ontario.

1.5 PROJECT RECORDS

.1 Batch Logs: Concrete supplier to keep record of each batch delivered to site.

.2 Concrete Delivery Slips: Keep all concrete delivery slips (“driver’s tickets”) on site until building is completed. Record on delivery slip where concrete was placed including time and date.

.3 Record Drawings: Record on a set of Structural Drawings extent of each pour including pour date and falsework removal date. Also record all changes to that shown on drawings including footing elevations.

.4 Keep project records up to date and make available to Consultant at all times.

1.6 SUBMITTALS

.1 Submit to the Consultant for review before the start of Work, 4 white prints of shop drawings. Leave room on drawings for the stamps of the Consultant and the Structural Engineer. Check and sign before submission. Only 2 copies will be returned to General Contractor.

.2 Minimum 2 weeks prior to starting concrete work, submit certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1.

.3 Minimum 2 weeks prior to starting concrete work, submit all concrete mix designs, including pump mixes, and indicate where each concrete mix is to be used. Where Class C1, C2 or F1 mix designs are required, submit test data to confirm that air-void system conforms to CSA A23.1 for each mix design.

.4 Minimum 2 weeks prior to starting concrete work, submit a written confirmation that all admixtures used in concrete will not have any adverse impact on the long term durability and performance of concrete, or any other materials embedded or in contact with concrete. Also provide a written statement that any admixtures used in concrete will not have any adverse effect on human health and the environment.

.5 Minimum submission requirements for each concrete mix design shall include the following:
- .1 minimum specified compressive strength at 28 days.
- .2 maximum aggregate size
- .3 aggregate type (if not normal density)
- .4 alkali-aggregate resistance
- .5 concrete density range, wet and dry (if not normal density)
- .6 CSA exposure class
- .7 cement type (if not type 10)
- .8 maximum water/cement ratio
- .9 plastic air content range air-void system test data
- .10 assumed method of placement of concrete
- .11 slump range
- .12 percentage and type of any supplementary cementing materials
- .13 admixtures (type and name only)
- .14 certificate of compatibility between admixtures unless all admixtures are supplied by same manufacturer

.6 Minimum 2 weeks prior to starting concrete work, submit proposed quality control procedures for Consultant's approval for following items:
- .1 Finishing, curing and protection

.2 Hot weather concreting
.3 Cold weather concreting

.7 Minimum 4 weeks prior to placing any slabs-on-grade, submit drawings showing proposed locations of construction joints and control joints in slabs-on-grade.

PART 2 – MATERIAL

2.1 CONCRETE MIX MATERIALS

.1 Portland cement: to CSA-A5.

.2 Cementitious hydraulic slag: to CSA-A363

.3 Fly ash: to CSA-A23.5, Type CI

.4 Water: to CAN/CSA-A23.1

.5 to CSA-A23.1. Coarse aggregates to be crushed stone or gravel which is suitable for type N concrete as defined by Supplementary Guidelines to OBC 2024, SG-2, . Do not use recycled concrete as aggregate.

.6 To ensure compatibility, all admixtures to be supplied by a single manufacturer or certificate of compatibility to be provided with mix design.

.7 Air entraining admixture: to ASTM C260.

.8 Chemical admixtures: to ASTM C494. Do not use admixtures containing chlorides.

.9 Corrosion inhibiting admixture: Containing calcium nitrite:
.1 DCI by W.R. Grace (use DCI-S with ambient temperatures above 20°C)
.2 Rheocrete CNI by Master Builders (add set retarder with ambient temperatures above 20°C).

.10 Shrinkage reducing admixture: Eclipse Floor for non-air entrained concrete and Eclipse Plus for air entrained concrete by W.R. Grace. Confirm compatibility with superplasticizer if being used.

.11 Plastic fiber additive: fibrillated polypropylene fibers at least 19mm in length:
.1 Fibremesh by Master Builders
.2 ConLoc Fibres by Pro Technologies
.3 Fiberforce by Ampro
.4 Promesh by Canada Cordage

2.2 OTHER MASTERIALS

.1 Grout: Premixed, non-metallic, non-shrink:
.1 Euco NS Grout by Eulicd Admixture Canada
.2 Masterflow 713 by Chemrex (M.B.T.)

.3 V-3 Grout by W.R. Meadows of Canada
.4 Sikagrout 212 by Sika Canada
.5 M-Bed Standard by Sika Canada
.6 CPD Non-Shrink Grout by CPD

.2 Dry pack grout: Use 1:2 mix of Portland cement and concrete sand. Add sufficient water for the mixture to retain its shape when made into a ball by hand. When thickness of grout exceeds 50mm, use 1:1½:2 mix of Portland cement, concrete sand and 10mm pea gravel instead. Compressive strength at 28 days to be 30 MPa.

.3 Liquid curing/sealing compound: to ASTM C309 Type 1, Class B, water based acrylic, compatible with surface hardener where hardener is used:
Sealtight CS 309 by W.R. Meadows of Canada. Apply two (2) coats where exposed concrete floor is called for in Room Finishing Schedule. Apply first coat as soon as concrete sets - Apply second coat just prior to occupancy by Owner.

.4 Premoulded joint fillers: Bituminous impregnated fibre board: to ASTM D1751.

.5 Evaporation reducer: Confilm by Chemrex (M.B.T.).

.6 Bonding agent: synthetic latex:
.1 Surfacrete Concentrate by Sika Canada
.2 Intralok by W.R. Meadows of Canada
.3 Acryl-Set by Chemrex (M.B.T.)
.4 CPD Concentrated Latex Adhesive by CPD

.7 Drilled concrete expansion anchors:
.1 Kwik-Bolt by Hilti
.2 Wedge Anchor by Ucan Fastening Products

.8 Drilled concrete adhesive anchors:
.1 HVA Adhesive Anchor by Hilti
.2 ADH Adhesive Anchor by Ucan Fastening Products

.9 Epoxy for bonding anchors and dowels into predrilled holes in concrete:
.1 HIT -HY-150 by Hilti
.2 Epcon Ceramic 6 by ITW Construction Products
.3 Flo-Rok FR1-22 & FR3-22 by Ucan Fastening Products

.10 Non-slip nosing insert for concrete stairs: Fine aluminum oxide strips, 6mm (¼") wide x 10mm (d") deep.

.11 Vapour barrier for slab on grade:
.1 Refer to DIV.7

.12 Rigid insulation: Extruded polystyrene boards:
.1 Styrofoam SM by Dow Chemical
.2 Styrofoam HI-100 by Dow Chemical

.13 Control joint filler: semi-rigid filler to protect against slab edge breakdown:
.1 For sawcuts and joints in interior slabs:
.1 Rezi-Weld Flex by W. R. Meadows

.2 Loadflex by Sika Canada

.2 For sawcuts and joints in exterior slabs:

.1 Sikaflex 2C NS/SL by Sika Canada

.14 Elastomeric bearing pads: Virgin natural polyisoprene or virgin polychloroprene conforming to CAN/CSA-S6

.15 Sliding bearing assembly: Galvanized top steel plate with a type 304 stainless steel highly polished lower surface and bottom elastomeric pad with a polytetrafluoroethylene (Teflon) upper surface. Static and kinetic coefficients of friction not to exceed 5% under working stress. Assembly to have a working stress capacity of 7 MPa on lower pad. Elastomeric bottom pad to allow a 2% rotation of upper plate and still maintain a substantially uniform bearing pressure between plate and pad. For concrete work, provide two 12 dia. anchor studs for top plate and provide water tight polyethylene wrapping for assembly, except for anchor studs, which can be left in place during construction. Manufactured by:

.1 Fabreeka Canada Ltd.

.2 Goodco Ltd.

.3 Structural Tech Corp. Ltd.

.16 Controlled density concrete fill, f'c = 4 MPa:

.1 K-Crete by Dufferin Concrete Products or equivalent

.17 Prefabricated Seepage Protection System:

.1 Terradrain 200 by Terrafix Geosynthetics Inc.

.2 Weeperwick by Subsurface Systems Inc.

.18 Bentonite Geotextile Waterproofing:

.1 Voltex by CETCO (distributor : DRE Industries)

.19 Crack Filler Epoxy: Capweld 524 by Cappar Ltd.

.20 Base under concrete Slabs on Grade: Clean, crushed stone, 20 to 22mm.

2.3 CONCRETE MIXES

.1 Use ready-mix concrete. Proportion concrete in accordance with CSA A23.1, Use a water-reducing agent in all concrete. Obtain approval of the Consultant for the use of admixtures other than water-reducing and air entraining agents.

.2 Supplementary cementing materials: Conform to the directions of the slag and fly ash manufacturers for the proportioning and mixing of concrete. Except as otherwise required, limit supplementary cementing materials to no more than 25% of total cementitious content and limit the fly ash component to no more than 10% of total cementitious content. The limit on supplementary cementing materials may be increased for Class N exposure concrete provided that the effects of the resulting concrete properties, including finishing, rate of early-age strength gain, curing and protection, are considered by the Contractor and a letter describing these effects and any special construction procedures is submitted for review with the mix design. Do not use supplementary cementing materials in architectural concrete.

.3 For columns less than 300mm in least dimension and for walls less than 200mm thick, reduce nominal size of coarse aggregate to 10mm.

.4 Interior slabs, beams, walls and columns: Provide normal density concrete to give following properties unless otherwise noted:
- .1 Class of exposure N
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 25MPa unless specified otherwise on Structural Drawings
- .4 Nominal size of coarse aggregate: 20mm. See also clause 2.3.3.
- .5 Slump at time and point of discharge: 50mm to 110mm

.5 Footings, piers, and foundation walls : Provide normal density, frost resistant concrete to give following properties:
- .1 Class of exposure F-2
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 25MPa unless specified otherwise on Drawings
- .4 Maximum water/cementing material ratio: 0.55
- .5 Nominal maximum size of coarse aggregate: 20mm. See also clause 2.3.3.
- .6 Slump at time and point of discharge: 50mm to 110mm
- .7 Air content: 4 to 7%

.6 Lean concrete and mud slabs: Provide normal density concrete to give following properties:
- .1 Class of exposure N
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 10MPa
- .4 Nominal maximum size of coarse aggregate:20mm.
- .5 Slump at time and point of discharge: 50mm to 110mm

.7 Exterior, exposed walls and columns exposed to freezing and thawing, but not exposed to chlorides: Provide normal density, frost resistant concrete to give following properties:
- .1 Class of exposure F-2
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 25MPa unless specified otherwise on Structural Drawings
- .4 Maximum water/cementing material ratio: 0.55
- .5 Nominal size of coarse aggregate: 20mm. See also clause 2.3.3.
- .6 Slump at time and point of discharge: 50mm to 110mm
- .7 Air content: 5 to 8%

.8 Structurally reinforced concrete exposed to chlorides, including exterior reinforced slabs: Provide normal density concrete to give following properties:
- .1 Class of exposure C-1
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 35MPa
- .4 Maximum water/cementing material ratio: 0.40
- .5 Nominal size of coarse aggregate: 20mm. See also clause 2.3.3.
- .6 Slump at time and point of discharge: 50mm to 110mm
- .7 Air content: 5 to 8%

.9 Interior slabs-on-grade: Provide normal density concrete to give following properties:
- .1 Class of exposure:N
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 25MPa unless specified otherwise on Structural Drawings
- .4 Maximum water/cementing material ratio: 0.55
- .5 Nominal maximum size of coarse aggregate: 20mm. Increase to 40mm where slab-on- grade thickness exceeds 130mm.
- .6 Slump at time and point of discharge: 50mm to 110mm
- .7 Plastic fiber additive: apply at rate of 0.9 kg/m³. Add sufficient water reducing agent to restore slump loss
- .8 Slump at time and point of discharge, after addition of fibers and plasticizer: 50mm to 110mm
- .9 Provide curing/sealing coat to all slabs-on-grade; two coats where slab exposed-refer to 2.2.3.above.

.10 Interior slabs-on-grade with resilient floor finishes: Provide normal density concrete to give following properties:
- .1 Class of exposure:N
- .2 Cement: Type 10
- .3 Minimum compressive strength 25MPa
- .4 Nominal maximum size of coarse aggregate: 40mm
- .5 Water/cementing material ratio: 0.55
- .6 Slump at time and point of discharge: 50mm to 110mm

.11 Construction Method:
- .1 Place & compact 200mm of clean, crushed stone, 20 to 22mm size.
- .2 Construct slab-on-grade on 15 mil polyolefin sheet vapor barrier placed directly below concrete. Terminate vapor barrier by extending vertically up the abutting concrete walls
- .3 Saw cuts should be done with a dry process (soft-cut on the same day of a pour).
- .4 Curing: Apply 24 hours of wet curing. Start curing immediately after finishing slab. Cover slab-on-grade for at least 72 hours using plastic sheets with joints taped and free edges covered.
- .5 Protection: Protect finished and cured slab from surface water (i.e. rain, snow).
- .6 Refer to Architectural Specifications for acceptable moisture content and testing methods prior to placing floor finishes.

.12 Interior and roof concrete toppings, curbs and bases: Provide normal density concrete to give following properties:
- .1 Class of exposure:N
- .2 Cement: Type 10
- .3 Minimum compressive strength 25MPa
- .4 Nominal size of coarse aggregate for:
  - .1 Toppings between 25 and 35mm thick:10mm
  - .2 Toppings between 35 and 50mm thick:14mm
  - .3 Thick toppings: 20mm
- .5 Slump at time and point of discharge: 20mm to 60mm

Where topping is less than 25mm thick, no coarse aggregate is allowed and a bonding agent shall be provided within the mix and to bond the topping to the substrate.

.13 Exterior unreinforced slabs, driveways, sidewalks, curbs and gutters, parking slabs on grade: Provide normal density, chloride resistant concrete to give following properties:
- .1 Class of exposure C-2
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 32MPa
- .4 Maximum water/cementing material ratio: 0.45
- .5 Nominal maximum size of coarse aggregate: 20mm
- .6 Slump at time and point of discharge: 50mm to 110mm
- .7 Air content: 5 to 8%

.14 Exterior, unreinforced pavements: Provide normal density concrete to give following properties:
- .1 Class of exposure C-2
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 32MPa
- .4 Maximum water/cementing material ratio: 0.45
- .5 Nominal maximum size of coarse aggregate: 20mm
- .6 Slump at time and point of discharge: 40mm to 80mm. Use plasticizer if necessary to increase slump for placement.
- .7 Air content: 5 to 8%

PART 3 – EXECUTION

3.1 CONSTRCUTION REVIEW

.1 Construction reviews are undertaken by the Consultant and the Inspection and Testing Agency so that the Owner may be informed in writing as to the quality of the Contractor's performance and for the protection of the Owner. They will be carried out by examination of representative samples of the Work.

.2 The Contractor will receive copies of the construction review reports and the results of material tests. He will thereby be informed of any defects or deficiencies found.

.3 Bring to the attention of the Consultant, any defects or deficiencies in the Work, which may occur during construction together with a proposal for remedy. The Consultant will decide what corrective action may be taken and will issue the necessary instructions.

3.2 PREPARATION

.1 Obtain written approval of each footing bearing surface by Geotechnical Engineer prior to placing concrete for footings/mud slabs.

.2 Confirm that subgrade and backfill meets specifications and is free of frost and surface water before placing slab-on-grade.

.3 Provide vapor barrier under all slabs placed on the ground including slabs-on-grade and framed slabs.

.4 Grout column base plates and beam bearing plates as soon as steelwork is completed. Do not add load on steelwork until grouting is completed and grout strength has reached at least 20 MPa.

3.3 SLEEVES, OPENINGS AND EMBEDMENTS

.1 Ensure that sleeves and openings do not impair the required strength of the member, and unless shown on the Structural Drawings, are accepted by the Consultant for size, location, and reinforcement before concrete is cast. No trade shall cut holes through existing concrete unless acceptable to the Consultant.

.2 Do not embed in slabs and walls any conduit or pipe whose outside diameter is greater than one- quarter the concrete thickness. Do not space less than 3 diameters on centre. Locate so as not to impair the required strength of the member. Do not install in or below columns, conduit which displaces more than 3 percent of the cross-section.

.3 Cooperate with any trade applying finishes to concrete surfaces to obtain a surface, which will ensure adequate bond. Provide chases, chamfers and reglets where required.

.4 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated on Structural Drawings or approved by the Consultant.

.5 Where approved by Consultant, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Unless indicated on the Structural Drawings, sleeves and openings greater than 100 x 100 mm must be approved by Consultant.

.6 Do not eliminate, cut or displace reinforcement to accommodate openings or hardware. If openings or hardware cannot be located as specified, obtain approval of modifications from Consultant before placing of concrete.

.7 Check locations and sizes of sleeves and openings shown on Structural Drawings with Architectural, Mechanical and Electrical Drawings. Notify Consultant of any discrepancies.

.8 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.9 Anchor bolts: Set anchor bolts using templates under supervision of appropriate trade prior to placing concrete. Locate each anchor bolt group to within 6 mm of required location with no accumulation of tolerances allowed between groups

3.4 PLACING CONCRETE

.1 Notify Consultant 24 hours before placing concrete and 24 hours before closing wall forms.

.2 Do cast-in-place concrete work in accordance with CSA-A23.1.

.3 Remove water and disturbed soil from excavations before placing concrete therein.

.4 Do not overload forms.

.5 Use rubber tipped vibrators for concrete containing epoxy coated reinforcement.

3.5 FINSIHING FLATWORK

.1 Finish flatwork in accordance with CSA-A23.1, and following clauses.

.2 Protect concrete during finishing process in accordance with CSA-A23.1. Also use evaporation reducer during severe drying conditions.

.3 Cast slabs with a top surface that is level or sloping as required by the Drawings. Allow for cambering where required. Set top of slab below finished floor level by the distance required for the type of applied finish.

.4 Provide final finish in accordance with proposed use and as follows:
- .1 Screeded and bull floated for: mud slabs and footings.
- .2 Screeded and bull floated with scratch finish for: base slabs, which receive mortar setting beds or bonded toppings.
- .3 Powered float finish for: roofs and slabs, which receive a membrane.
- .4 Wood float finish with brooming for: exterior exposed slabs.
- .5 Powered steel trowel finish for: interior exposed slabs; slabs which receive resilient flooring, carpet, epoxy-based finishes, thin-set tiles, etc.

.5 Steel trowel exposed interior concrete floors at least twice. Provide final spin trowelling when non-slip finish is required.

.6 Except as noted, conform to finish tolerance Class A for floors and Class B for exterior slabs and base slabs for toppings. For wood flooring, conform to finish tolerance Class C. Compliance will be considered satisfactory if 80% of the measurements, using the straightedge method, are less than or equal to the tolerance and no measurement exceeds the tolerance by more than 25%. When requested by Consultant, make measurements within 3 days of placing concrete and before falsework is removed and submit results to Consultant.

3.6 CURING AND PROTECTION

.1 Cure and protect concrete in accordance with CSA A23.1. In addition to Cold-Weather Protection requirements in A23.1, provide protection so that temperature of concrete surfaces is maintained at not less than 21 degrees C for 3 days after placement, not less than 10 degrees C for the next 2 days and above freezing for the next 2 days. Vent exhaust gases from combustion type heaters to atmosphere outside heated enclosure.

.2 Cure slab surfaces immediately after finishing is completed. Use a curing compound compatible with applied finishes except where bonded topping to be applied. Where curing compound is not used, cover slab surfaces with absorptive mat or fabric and keep continuously wet.

.3 Extend basic curing period until concrete has reached following strength levels for structural safety:
- .1 Framed slabs and beams: 75% of specified 28 day strength.
- .2 Columns, piers and footings: 75% of specified 28 day strength.
- .3 Walls: 50% of specified 28 day strength.

3.7 FINISHING FORMAED SURFACES

.1 Finish formed surfaces in accordance with CSA A23.1. Completely fill holes left by through-bolts with grout.

.2 Do not patch surfaces until instructed in writing by Consultant.

.3 Where honeycombing has cut out in accordance with CSA A23.1. do not patch until reviewed by Consultant.

.4 Provide smooth-form finish for all exposed concrete surfaces.

.5 Provide smooth-rubbed finish to all concrete surfaces exposed to public view. Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.

3.8 BONDED TOPPINGS

.1 Not more than 24 hours prior to applying concrete toppings, clean base slab of dirt, laitance, loose material and grease. Scrub with 10 percent solution of muriatic acid and rinse clean. Four to six hours before laying topping, saturate surface with clean water. Surface shall have reached a damp condition at the time the new concrete is placed. Apply a slurry coat of cement and water to the surface and immediately follow with the topping or apply approved and compatible bonding agent in accordance with manufacturer's instructions.

.2 Do not allow the temperature difference between base slab and new concrete to exceed 6 degrees C when concrete is placed.

.3 Make mix consistency as stiff as can be worked with a sawing motion of the strike-off board. Consolidate concrete by rolling and tamping. Float with a power floating machine weighing at least 90 kg. Finish and cure as specified for floors.

.4 Locate joints in top course directly over joints in base course.

.5 Minimum thickness of topping over cambered base slab shall be 38 mm at high point.

.6 Remove any concrete which seeps through joints of precast units and clean surface before concrete sets

3.9 SLABS ON GRADE

.1 Determine that the compacted granular fill supporting slabs-on-grade has been approved before starting work.

.2 Over compacted granular fill, place & compact 200mm of clean crushed stone, 20 to 22mm size.

.3 Over crushed stone, vapour barrier as per Architectural Specification. Seal all joints and punctures with tape. Repair all tears or holes with layers of sheeting, tapping all seams.

.4 Provide and install joint filler between slab and masonry walls.

.5 See Drawings for thickness of concrete and slab reinforcing.

.6 Provide slab depressions and slopes as indicated on the Architectural Drawings. Slope floors to drain.

.7 Testing & Inspection Company must inspect vapour barrier and reinforcing just prior to placement of concrete and Contractor must rectify any deficiencies noted prior to pour.

3.10 GROUTING UNDER BASE PLATES AND BEARING PLATES

.1 Grout under base plates and bearing plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.

.2 Grout column base plates and beam bearing plates as soon as steelwork is completed. Do not add load on steelwork until grouting is completed and grout strength has reached at least 20 Mpa.

3.11 JOINTS

.1 Slabs-on-grade: Provide joints in both directions. Maximum spacing of construction joints to be 30m with sawcut joints in-between spaced at 30 times slab thickness maximum, but not more than 5m maximum. Locate joints on column centre lines wherever possible and on intermediate lines, which result in approximately square panels. Protect edges of sawcuts from breakage. Clean out sawcuts in exposed slabs and fill with control joint filler after concrete is at least 120 days old. At construction joints in exposed slabs, sawcut top 25 mm for a width of 5 mm and fill with control joint filler after concrete is at least 120 days old. Clean out sawcuts in other slabs and fill with a sand-cement paste one month prior to installing floor coverings.

.2 Construction Joints and Control Joints: See Section 03 10 00.

.3 Expansion Joints: See Structural Drawings for widths, locations and details. Remove all forming and filler material used during construction and provide clear space between structural elements equal to width specified.

.4 Construction Gaps: See Structural Drawings for widths, locations and details. Do not place concrete in gaps in beams and slabs until all concrete at that level is at least 28 days old. Do not fill wall gaps until all adjoining framed slabs, above and below, are at least 28 days old.

.5 Isolation Joints: Provide 10mm thick premoulded joint filler of the same depth as the thickness of the concrete wherever slabs-on-grade abut foundation walls, columns and piers. Omit if slab is chased or dowelled into structure.

3.12 DRILLED ANCHORS

.1 Conform to requirements of manufacturer. Use hammer drill to make holes. Hole diameters must never exceed those required by manufacturer. Tighten all expansion anchors using a torque wrench unless finger-tight is required by the Drawings to allow for movement. Unless otherwise noted on drawings, provide manufacturer's standard embedment length into solid concrete.

.2 Do not cut reinforcement to accommodate anchors. Relocate anchors, at no extra cost to the Contract, when obstructions prevent drilling holes to required depth in locations specified. Obtain Consultant's approval of new location before drilling hole. Fill all abandoned holes with grout.

.3 Arrange for manufacturer's technical representative to be present during installation of first few anchors of each size and type. Submit site reports by manufacturer to Consultant within one week of each visit. Reports to indicate anchor sizes and types installed, locations, and names of those present during installation.

.4 Retain an inspection and testing company to randomly select and pull test 5% of all types and sizes of anchors installed on a weekly basis, but not less than one anchor of each type and size. Pull test to twice the design tension capacity of the anchor given by the manufacturer. Submit reports to Consultant within one week of testing. Reports to indicate each anchor location, test load and mode of failure, if applicable. Notify Consultant immediately if any anchor fails the pull test.

3.13 CRACKS IN SLABS-ON-GRADE

.1 Extensive cracking of slabs-on-grade or cracks in excess of 3 mm in width shall be cause for rejection of slab or portion of slab at the discretion of the Consultant.

.2 Protect edges of cracks in slabs-on-grade from breakage.

.3 Unless slab is rejected, repair cracks that are over 0.4 mm wide in exposed slabs-on-grade in unfinished areas after concrete is at least 120 days old. Repair by filling crack with a sand-cement grout and then, after 7 days, cutting out top 20 mm of crack for a width of 5 mm and filling with control joint filler.

3.14 INSPECTION AND TESTING

.1 Inspection and testing of concrete and concrete materials will be carried out in accordance with A23.1 by a Testing Agency designated by Consultant. Testing agency shall be certified under CSA A283 with category to suit testing provided.

.2 Agency will review all submittals pertaining to concrete mix designs and certification of plant, equipment and materials.

.3 Agency will take additional test cylinders during cold weather concreting. Assist Agency by curing these cylinders for 7 days on site adjacent to the work which they represent and under the same conditions as the concrete which they represent.

.4 Samples will be taken prior to the addition of steel fiber reinforcement or superplasticizers to the mix on site.

.5 Methods for testing concrete will be in accordance with CSA-A23.2.

.6 Inspection or testing by Agency will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

.7 Assist the Agency in its work. Notify Agency as to the concreting schedule and before each pour. Provide concrete samples.

.8 The Agency will report to the Consultant, with copies to the Structural Engineer, Contractor, Concrete Supplier and Municipal Authorities. Reports will include the locations in structure to which tests relate, comments on abnormal results and conditions, and the Supplier's mix design numbers. Test reports shall be provided within five working days.

3.15 PITS, CURBS, BASES

.1 Construct all concrete sumps, pits, trenches, curbs and machinery bases forming part of floor construction that are required within the building by other trades.

.2 Provide isolation joints between machinery bases and slabs-on-grade.

3.16 EXTERIOR SALBS AND SIDEWALKS

.1 Exterior slabs shall be finished with a spin trowel finish followed with a fine broom and the edges shall be rounded with an edging tool. Slab thickness shall be 125mm except as noted on drawings. Reinforce slab with one layer of welded wire mesh in flat sheets or as otherwise noted on drawings and apply one coat of curing sealing compound as soon as the concrete will support a workman without damage to the finish. Saw cut slab into areas as indicated on drawings but not exceeding 9 square meters.

3.17 MUNICIPAL SIDEWALKS

.1 Construction of concrete sidewalks, curbs, gutters, materials and finishes shall be in compliance with OPSS 351 and all other related OPSS. Contractor shall obtain specifications and approvals from the Municipality prior to start of work.

.2 Thickness of sidewalk to be 125mm and 175mm across driveways. The top surface of concrete shall receive a broom finish. Provide dummy joints, contraction joints and expansion joints as specified in OPSS. Sidewalks within the Municipal road allowance shall also comply with the Municipal requirements.

3.18 MECHANICAL AND ELECTRICAL WORK

.1 Construct all concrete underground electrical duct banks, underground water service thrust blocks and supports for underground piping in specified fill. Also construct all concrete pads for pipes passing through foundation walls, manholes and catch basins. See mechanical and electrical drawings and specifications for details and extent of work.

3.19 REJECTED WORK

.1 Do not deliver to the site materials which are known not to meet the requirement of the Specifications. If rejected after delivery, they shall be immediately removed.

.2 Where review reveals materials or workmanship which appear to have failed to meet the specified quality or tolerances, the Consultant shall have the authority to order additional curing; to have tests made of in-situ concrete, concrete cores, reinforcement or other materials; to order a structural analysis of the existing elements; and to load test the structure. All such work will be carried out in order to assist in determining whether the structure may, in the opinion of the Consultant be accepted, with or without strengthening or modification. Testing shall meet the requirements of the Ontario Building Code. All expenses incurred shall be chargeable to the Contractor regardless of the results.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

.1 Procedures for unit masonry work.

.2 Procedures for incorporating products to be built into unit masonry.

1.2 RELATED SECTIONS

.1	General Requirements	Division 01
.2	Cast-in-Place Concrete	Section 03 30 00
.3	Masonry Mortar and Grout	Section 04 05 13
.4	Masonry Anchorage and Reinforcement	Section 04 05 19
.5	Concrete Unit Masonry	Section 04 05 22
.6	Masonry Accessories	Section 04 05 23
.7	Clay Unit Masonry.	Section 04 21 00
.8	Structural Steel	Section 05 10 00
.9	Steel Deck	Section 05 30 00
.10	Metal Fabrications	Section 05 52 00
.11	Board Insulation	Section 07 21 13
.12	Air Barriers	Section 07 27 00
.13	Metal Flashing and Trim	Section 07 62 00
.14	Firestopping and Smoke Seals	Section 07 84 00
.15	Sealants	Section 07 92 00

1.3 REFERENCES

.1	CAN/CSA-A179-04(R2009)	Mortar and Grout for Unit Masonry
.2	CAN/CSA-A371-04(R2009)	Masonry Construction for Buildings

1.4 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 – Submittals.

.2 Submit samples:

- .1 One of each type of masonry unit specified.
- .2 One of each type of masonry accessory specified.
- .3 One of each type of masonry reinforcement, tie and connector proposed for use.
- .4 As required by inspection and testing company for testing purposes.

1.5 TEST REPORTS

.1 Submit laboratory test reports in accordance with Section 01 45 00 – Quality Control.

.2 Submit laboratory test reports certifying compliance of masonry units and mortar ingredients with specification requirements.

.3 For clay units, in addition to requirements set out in referenced CSA and ASTM Standards include data indicating initial rate of absorption.

1.6 QUALITY ASSURANCE AND JOB MOCK-UP

.1 Masonry work shall be carried out by experienced masons under the continuous supervision of a competent foreman with a minimum of 5 years' experience with work of similar size and complexity.

.2 Construct mock-ups in accordance with Section 01 45 00 – Quality Control. Construct mock-up panel stepped-back to expose each material used.

.3 Construct mock-up panel of exterior masonry wall construction 1600mm high by 2400mm wide showing masonry colours and textures, use of reinforcement, ties, through-wall flashing, air barrier membrane, insulation, weep holes, vent holes, jointing, coursing, mortar and workmanship.

.4 Construct mock-up panel where directed by the Consultant.

.5 Allow 48 hours for inspection of mock-up panel by the Consultant before proceeding with work.

.6 Construct 3000mm wide by full height mock-up of interior concrete masonry unit partition with wall opening and complete with masonry lintel. Notify the Consultant 48 hours prior to construction of lintel mock-up. The structural consultant will be present during the mock-up construction to review the methods employed. Construct lintel mock-up where directed by the Consultant.

.7 When accepted, mock-ups will demonstrate minimum standard for this work. The approved mock-up panels may remain as part of the finished work.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to job site in dry condition.

.2 Keep materials dry until use except where wetting of bricks is specified.

.3 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Cold Weather Requirements: Supplement Clause 5.16.2 of CAN/CSA-A371 with following requirements:

.1 Maintain temperature of mortar between 5°C and 50°C until batch is used.
.2 Protect masonry work from cold weather in accordance with clause 5.16.3 of CAN/CSA-A371, but for a minimum of 72 hours after construction.

.2 Hot Weather Requirements: Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.

.3 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.

.4 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

.5 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Masonry materials are specified in related Sections indicated in Article 1.03.

PART 3 – EXECUTION

3.1 INSTALLATION

.1 Do masonry work in accordance with CAN/CSA-A371 except where specified otherwise.

.2 Build masonry plumb, level, and true to line, with vertical joints in alignment.

.3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

.4 Extend walls and partitions to underside of deck or slab unless noted otherwise on Drawings.

.5 Construct portions of walls and partitions above doors, screens, windows and other openings to match adjacent wall and partition construction unless noted otherwise on Drawings.

.6 Refer to Structural Drawing for load-bearing masonry structural requirements.

3.2 CONSTRUCTION

.1 Exposed Masonry: Remove chipped, cracked, and otherwise damaged units in exposed masonry and replace with undamaged units.

.2 Jointing:
- .1 Allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, true to line, compressed, uniformly concave joints unless other jointing is indicated or specified.
- .2 Where raked joints are indicated allow joints to set just enough to remove excess water, then rake joints uniformly to 6mm depth and compress with square tool to provide smooth, compressed, raked joints of uniform depth.
- .3 Strike flush all joints concealed in walls and joints in walls to receive plaster, tile, insulation, or other applied material except paint or similar thin finish coating.
- .4 Wall surfaces and joint treatment for concealed portions of walls above ceilings and behind wall mounted fitments shall match exposed surfaces.

.3 Cutting:
- .1 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.
- .2 Make cuts straight, clean, and free from uneven edges.

.4 Building-In:
- .1 Build in items required to be built into masonry including items supplied under Section 05 52 00 – Metal Fabrications and Section 07 62 00 – Metal Flashing and Trim.
- .2 Prevent displacement of built-in items during construction. Check for plumb, location and alignment frequently, as work progresses.
- .3 Build-in hollow metal frames. Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar. Set frame anchors as specified in Section 08 13 13 – Hollow Metal Doors and Frames.
- .4 Where structural steel members penetrate masonry walls fill-in spaces with neatly cut pieces of masonry units set in event mortar beds with tooled joints. Do not use rubble or broken pieces and mortar combinations as in-fill.

.5 Wetting of Bricks:
- .1 Except in cold weather, wet bricks having an initial rate of absorption exceeding 1g/minute/1000mm², wet to uniform degree of saturation, 3 to 24 hours before laying, and do not lay until surface dry.
- .2 Wet tops of walls built of bricks qualifying for wetting, when recommencing work on such walls.

.6 Support of Loads:
- .1 Use concrete specified in Section 03 30 00 –Cast-in-Place Concrete, where concrete fill is used instead of solid units.
- .2 Use grout to CAN/CSA-A179 where grout is used instead of solid units. Cells with reinforcement shall be grouted.
- .3 Install building paper below voids to be filled with concrete or grout; keep paper 25mm back from faces of units.

.7 Provision for Movement:
- .1 Leave 10mm space below shelf angles.
- .2 Leave 25mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
- .3 Build masonry to tie in with stabilizers, with provision for vertical movement.

.8 Loose Steel Lintels: Install loose steel lintels supplied by Section 05 10 00 – Structural Steel Framing. Centre over opening width.

.9 Bearing Plates and Anchors: Install loose steel bearing plates and anchors supplied by Section 05 10 00 - Structural Steel Framing and Section 05 20 00 – Steel Decking.

.10 Control Joints for Non-loadbearing Masonry Walls:
- .1 Construct continuous full height control joints as indicated.
- .2 Fill void at control joint with 20 MPa concrete grout to form continuous key.
- .3 Locate exterior wall control joints as indicated on elevations.
- .4 Locate interior wall control joints at a maximum spacing of 6000mm, and where non-loadbearing walls meet loadbearing walls.

.11 Provide control joints in loadbearing masonry walls only at locations approved by the structural consultant or where shown on Structural Drawings.

.12 Expansion Joints: Build-in continuous expansion joints as indicated.

3.3 SITE TOLERANCES

.1 Tolerances in notes to Clause 5.3 of CAN/CSA-A371 apply.

3.4 RE-INSTALLATION

.1 Cut openings in existing work as indicated.
.2 Openings in walls to be approved by Consultant.
.3 Make good existing work. Use materials to match existing.

3.5 FIELD QUALITY CONTROL

.1 Inspection and testing of masonry work will be carried out by an inspection and testing company designated by the Consultant.
.2 Cost of masonry inspection and testing will be paid by the Owner.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

.1 Mortar for Unit Masonry

1.2 RELATED SECTIONS

1.	General Requirements	Division 01
2.	Cast in Place Concrete	Section 03 30 00
3.	Masonry Procedures	Section 04 05 13
4.	Masonry Anchorage and Reinforcement	Section 04 05 19
5.	Concrete Unit Masonry	Section 04 05 22
6.	Clay Unit Masonry	Section 04 21 00

1.3 REFERENCE STANDARDS

.1	CAN/CSA A179	Mortar and Grout for Unit Masonry
.2	CAN/CSA A371	Masonry Construction for Buildings
.3	CSA A3000	Cementitious Materials Compendium
.4	ASTM C 780	Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
.5	ASTM C 1357	Standard Test Methods for Evaluating Masonry Bond Strength

1.4 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures

.2 Submit two 75mm size samples of each mortar type and colour.

1.5 QUALITY ASSURANCE

.1 Mortar prepared on-site based on proportion specifications:

- .1 Prior to the commencement of masonry work prepared on-site, under the supervision of the inspection and testing company, mortar mixes for each mortar type specified.
- .2 The inspection and testing company will sample and test the mortar mixes to determine a site aggregate/cement ratio Control Value for each mortar type.
- .3 Once Site Control Values are established these will form the basis of acceptance for all subsequent Sample Ratio Tests conducted during the course of the work.

.2 Mortar prepared off-site based on property specifications:

- .1 Prior to the commencement of masonry work the inspection and testing company will sample and perform laboratory test for each mortar type prepared off-site to verify compliance with the specifications.
- .2 Testing shall consist of the determination of:

.1 Aggregate/cement ratio.
.2 Water retention.
.3 Compressive strength.
.4 Air Content

.3 Once acceptable values are established these will form the basis of acceptance for tests conducted during the course of the work.

.3 Arrange for representative of mortar manufacturer to meet with mason on site prior to commencement of masonry work, to review proper mixing procedures of mortar. Mixing must conform to instructions from supplier of pre-mixed mortar materials.

.4 Submit test data as specified below.

1.6 COLD WEATHER REQUIREMENTS

.1 During cold weather, lower than 5oC, when danger of freezing exists, heat all masonry materials using methods accepted in the industry, in conformance to CSA-A371, and approved by the Consultant.

1.7 SUBMITTALS

.1 Submit three (3) copies of performance data sheet for mortar mixtures. Indicate related standards and mortar properties in terms of compressive strength, water retention and air content. Provide all test certificates required for mortar mixture lots delivered to site.

1.8 TESTING

.1 Testing of mortar materials will be carried out by Testing Laboratory designated by Consultant.

.2 Inspection and testing to be paid by Owner.

.3 Submit samples of sand and water for testing to ensure that mortar will not produce efflorescence.

.4 Test for compliance with the performance requirements for integral mortar water-repellence. Mortar shall be capable of achieving a Class E Rating when evaluated using ASTM E 514 with the test extended to 72 hours, using the rating criteria specified in ASTM E 514.

.5 Perform compressive strength tests on all mortar and grout in accordance with the requirements of CSA S304.1. Compressive strengths must conform to the property specifications of CSA-A179.

.6 Perform tests for flexural bond strength of masonry in accordance CSA S304.1. Flexural bond strengths shall not be less than 0.20MPa, in conformance with CSA-A179.

PART 2 – MATERIAL

2.1 MATERIALS

.1	Sand:	fine grain aggregate, graded in accordance with CSA A179
.2	Water:	potable, free off ice and any contaminants, to CSA A179.
.3	Portland cement:	to CAN/CSA-A5 normal Type 10
.4	Hydrated lime:	type 'S', in accordance with ASTM C207

2.2 MORTER

.1 Mortar:

.1 Betomix Plus by Daubois or bulk preblended silo mix as supplied by Max-Mix, or equal approved by Consultant. Colourants to be premixed with mortar materials. Colour to be selected by Consultant.

.2 Mortars for clay brick and concrete unit masonry to be Portland cement/ hydrated lime/ sand mortars to the property standards of CSA A179. Colour to be selected by consultant to match the selected clay brick.

.3 Mortar for masonry foundations, load bearing walls and partitions to be Type 'S' as per property specifications of CSA A179.

.4 Mortar for non-load bearing walls and partitions to be Type 'N' as per property specifications of CSA A179, unless indicated otherwise on the Structural Drawings.

.5 Compressive strengths of mortars shall conform to the values indicated on Tables 8 and 9, for solid brick and concrete block respectively, of CSA Standard A179. Compressive strength of mortars must not exceed the compressive strength of the masonry units with which they are being used.

.6 Except where specified otherwise, the basis of acceptance for mortar prepared on-site shall be the proportion specifications in CAN/CSA-A179

.7 The basis of acceptance for mortar prepared off-site shall be the property specifications in CAN/CSA-A179

2.3 GROUT

.1 Grout:

.1 Coarse grout to CSA A179, with maximum aggregate size of 12.5mm.
.2 Use fine grout where least dimension of void is less than 50mm.
.3 All grout to CSA A179, with sufficient water to produce pouring consistency without segregation of ingredients, but to retain cohesiveness.

.4 Slump is to be 200mm to 250mm. Minimum compressive strength is to be 20 Mpa. Refer to structural drawings for additional grout requirements at reinforcing steel.

2.4 SOURCES

.1 Use same manufactured brands and sources of mortar materials for entire project, in order to ensure uniformity of mix and coloration.

2.5 PARGING

.1 Cement mortar parging: 1 part cement, 1 part lime to 6 parts sand by volume with sufficient water for a trowelable mix.

PART 3 – EXECUTION

3.1 CONSTRUCTION

.1 Do masonry mortar work in accordance with CAN/CSA-A179 except where specified otherwise.
.2 Apply parging in uniform coating coating not less than 8mm thick, where indicated and where dampproofing is to be applied on masonry walls.
.3 Cove parging at junction of foundation wall with footing.

3.2 FIELD QUALITY CONTROL

.1 As masonry work progresses, the inspection and testing company will test and report on mortar properties as follows:
  .1 Mortar prepared in accordance with proportion specifications: Aggregate/Cement ratio.
  .2 Mortar prepared in accordance with property specifications: compressive strength.
.2 Provide six 50mm by 50mm by 50mm mortar samples taken at random for each test when requested by inspection and testing company.

3.3 MIXING OF MORTARS

.1 Mason to review mixing procedures with mortar manufacturer.

.2 Mix mortar thoroughly, in quantities only as needed for immediate use.

.3 Mix mortar in mechanical mixer operated until homogeneously blended, but not less than 3 minutes after all materials are in mixer.

.4 Obtain manufacturer's approval for any additives.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

.1 Reinforcement for masonry walls and lintels
.2 Connectors for masonry walls

1.2 RELATED SECTIONS

.1	General Requirements	Division 01
.2	Masonry Procedures	Section 04 05 00
.3	Masonry Mortar and Grout	Section 04 05 13
.4	Concrete Unit Masonry	Section 04 05 22
.5	Masonry Accessories	Section 04 05 23
.6	Clay Unit Masonry	Section 04 21 00
.7	Structural Steel	Section 05 10 00

1.3 REFERENCES

.1	ASTM-A153/A153M-95	Standard Specified for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
.2	CAN/CSA-A23.1-04	Concrete Materials and Methods of Concrete Construction.
.3	CAN/CSA-A370-04 (R2009)	Connectors for Masonry
.4	CAN/CSA-A370-04 (R2009)	Masonry Construction for Buildings
.5	CAN/CSA-G30.18-M92 (R2007)	Billet-Steel Bars for Concrete Reinforcement.
.6	CSA-S304.1-04	Design of Masonry Structures
.7	CSA-W186-M1990 (R2007)	Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.4 DESIGN REQUIREMENTS

.1 Seismic Loads: Design size and spacing of masonry reinforcement and masonry veneer connectors to withstand seismic loads in accordance with the Ontario Building Code, Subsection 4.1.8.
.2 Structural Design of masonry reinforcement and masonry veneer connectors shall be by a qualified Professional Engineer licensed to practice in the Province of Ontario

1.5 SUBMITTALS

.1 Submit product data sheets for all reinforcement types proposed for use in this project, in accordance with Section 01 33 00 – Submittal Procedures.

.2 Include a copy of the data sheets in the shop drawing manual at the conclusion of the project.

.3 Submit samples of anchors, ties, and fasteners for approval of Consultant.

1.6 SOURCE QUALITY CONTROL

.1 Upon request, provide the Consultant with a certified copy of mill test report of reinforcement steel and connectors, showing physical and chemical analysis, minimum 5 weeks prior to commencing reinforcement work.

.2 Upon request inform Consultant of proposed source of material to be supplied.

1.7 SHOP DRAWINGS

.1 Submit Shop Drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Shop Drawings shall consist of bar bending details, lists and placing drawings.

.3 On placing Drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.

.4 Shop Drawings shall bear the seal and signature of the Professional engineer providing structural design for reinforcement and connectors.

PART 2 – MATERIAL

2.1 REINFORCEMENT

.1 Bar reinforcement: to CAN/CSA-A371 and CAN/CSA-G30.18.

.2 Wire Joint Reinforcement - Single Wythe Walls: to CAN/CSA-A371, ladder type, 4.76mm diameter wire, size to suit wall thickness.
- .1 Blok-Lok Limited: BL-10 Ladder Reinforcement.
- .2 Dur-O-Wal: DA3200 Single Wythe Ladur.

.3 Wire Joint Reinforcement - Cavity Walls: to CAN/CSA-A371, ladder type, 4.76mm diameter wire, size to suit wall thickness. Blok-Lok Limited: BL-42 Ladder Reinforcement.

.4 Wire Joint Reinforcement - Double Wythe Foundation Walls: to CAN/CSA-A371, ladder type, 4.76mm diameter wire, size to suit wall thickness.
- .1 Blok-Lok Limited: BLll Ladder Reinforcement.
- .2 Dur- O-Wal: DA3200TR Ladur Trirod.

.5 Cavity Wall Connectors: to CAN/CSA-A370. Hot dip galvanized, to ASTM-A153/A153M, Class B2, 458g/ m2 minimum coating.
- .1 Concrete masonry unit backings:
  - .1 Blok-Lok Limited: 4.76mm diameter, System 2000 Tie installed at 400mm on centre vertical spacing and used in conjunction with wire joint

reinforcement specified in subparagraph 2.01.3 for cavity walls and Blok-Lok Limited, Wedge-Lok cavity-wall insulation fasteners.

.2 Fero Corporation: Block Shear Connector complete with V-Tie and insulation supports, installed at 800mm on centre horizontal spacing and 400mm on centre vertical spacing and used in conjunction with wire joint reinforcement as specified in sub-paragraph 2.01.2 installed at 400mm on centre vertical spacing.

.2 Cast-in-Place Concrete Backings:

.1 Install dovetail anchor slots at 800mm on centre spacing and dovetail anchors at 400mm on centre.

.2 Blok- Lok Limited, BL-305 Dovetail Anchor Slot with BL-303 Dovetail Anchors, complete with Blok-Lok Limited, Wedge-Lok cavity wall insulation fasteners.

.3 Steel Stud Backings: Fero Corporation, Stud Shear Connector, 1.6mm thick in appropriate size for wall studs used, complete with four screws for each connector, and 4.76mm diameter V-Tie Lateral Tie-Clip, and cavity wall insulation fasteners. Install at 800mm on centre horizontal spacing and 400mm on centre vertical spacing.

.6 Corrosion Protection for Wire Joint Reinforcement: galvanized to ASTM-A153/A153M.

.1 Exterior Wall: Hot dip galvanized, Class 82, 458g/m 2 minimum coating.

.2 Interior Wall: Mill galvanized.

.3 Foundation Walls: Hot dip galvanized, Class 82, 458g/m2 minimum coating.

2.1 FABRICATION

.1 Fabricate reinforcing in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Ontario.

.2 Fabricate connectors in accordance with CAN/CSAA-370.

.3 Obtain the Consultants approval for locations of reinforcement splices other than those shown on placing drawings.

.4 Upon Consultants approval, weld reinforcement in accordance with CSA-W186.

.5 Ship reinforcement and connectors, clearly identified in accordance with drawings.

PART 3 – EXECUTION

3.1 GENERAL

.1 Do masonry connector and reinforcement work in accordance with CAN/CSA-A370, CAN/CSA-A371, CAN/CSA-A23.1 and CSA-S304.1 unless indicated otherwise.

.2 Accurately place reinforcement, support, and secure against displacement as indicated on structural drawings and in accordance with CAN/CSA-A371

.3 Prior to placing grout, obtain Consultant's approval of placement of reinforcement and connectors.

.4 Do additional reinforcement of masonry as indicated.

.5 Supply dovetail anchor slots for casting into concrete work where required as indicated on the structural drawings and specifications.

3.2 INSTALLATION OF MASONRY ANCHORAGE AND REINFORCEMENT

.1 Refer to Section 04 05 19 for installation of masonry anchorage and reinforcement.

.2 Refer to structural drawings for additional requirements. All reinforcing shall conform to structural requirements as a minimum. Where structural requirements differ from these specifications, the most stringent requirements shall apply.

.3 Note that "solid wall" describes a masonry wall consisting of 1 or more wythes of brick and/or block (which may be solid or hollow core) with mortar joint only between wythes - no air space.

.4 Install reinforcement as indicated above for the materials specified, in conformance with structural drawings and manufacturer's instructions.

.5 For single wythe interior masonry walls, truss type reinforcing is required at every second course for walls 190mm wide or less, and ladder type reinforcing is required at each course at walls wider than 190mm.

.6 Provide and install prefabricated tees and corners at wall corners and intersections.

.7 Install ties in accordance with Ontario Building Code.

.8 Pre-drill for anchors using appropriate type and size of bit. Provide two anchors per tie with minimum embedment of 25mm. Conform to manufacturers specifications.

.9 Test at least two anchors to failure. Test must be carried out by a Professional Engineer and must certify tension load test to anchor failure. Cost of test will be paid by the Owner.

3.3 JOINT REINFORCEMENT

.1 Locations of Joint Reinforcement:
- .1 Concrete masonry unit wythe in cavity walls.
- .2 Single wythe masonry walls and partitions.

.2 Install joint reinforcement horizontally at 400mm on centre vertical spacing, unless indicated otherwise.

.3 Place additional reinforcement extending 600mm beyond jambs in courses 200mm, 400mm and 800mm above and below wall openings.

.4 Lap joint reinforcement 300mm at splices.

.5 Reinforce and grout loadbearing masonry walls as shown on the Structural Drawings.

3.4 BONDING AND TYING

.1 Foundation Walls:
- .1 Bond foundation walls of two or more wythes with the specified wire joint reinforcement.
- .2 Install joint reinforcement at 400mm on centre vertical spacing, unless indicated otherwise.

.2 Bond walls of tow or more wytes using wire joint reinforcement and metal connectors in accordance with the OBC, CSA-S304.1, CAN/CSA-A371 and as indicated.

.3 Tie masonry veneer to backing in accordance with OBC, SCA-S304.1, CAN/SCA-A371 and as indicated.

.4 Install continuous single wire brick joint reinforcement connected to brick ties.

3.5 REINFORCED LINTELS AND BOND BEAMS

.1 Reinforce masonry lintels and bond beams as indicated on Structural Drawings. Make joints in lintels and bond beams to match adjacent walls.

.2 Place and grout reinforcement in accordance with CAN/CSA-A371, and the Structural Drawings.

3.6 GROUTING

.1 Grout masonry in accordance with SCA-S304.1 and as indicated on Structural Drawings.

3.7 METAL ANCHORS

.1 Do metal anchor work as indicated.

3.8 LATERAL SUPPORT AND ANCHORAGE

.1 Do lateral support and anchorage in accordance with SCA-S304.1 and as indicated.
.2 Lateral Support Anchors (for attachment to structural steel): Blok-Lok, Flex-o-Lok.

3.9 CONTROL JOINTS

.1 Terminate reinforcement 25mm short of each side of control joints unless otherwise indicated.

3.10 FIELD BENDING

.1 Do not field bend reinforcement and connectors except where indicated or authorized by the Consultant.

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 Replace bars and connectors which develop cracks or splits.

3.11 FIELD TOUCH-UP

.1 Touch-up damaged and cut ends of epoxy coated or galvanized reinforcement steel and connectors with compatible finish to provide continuous coating.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED WORK

.1	Masonry Mortar and Grout	Section 04 05 13
.2	Masonry Anchorage and Reinforcement	Section 04 05 19

1.2 REFERENCE STANDARDS

.1	CAN/CSA-A165 Series	CSA Standards for Concrete Masonry Units
.2	CAN/CSA-S304.1	Design of Masonry Structures
.3	CAN/CSA-A371	Masonry construction for Buildings
.4	CAN/CSA-A370	
.5	National Concrete Masonry Association	
	1. NCMA TEK 10-2C	Control Joints for Concrete Masonry Walls - Empirical Method
	2. NCMA TEK-3A	Control and Removal of Efflorescence
	3. NCMA TEK-3A	Cleaning Concrete Masonry

1.3 PROTECTION

.1 Protect adjacent surfaces from marking or damage due to masonry work.

PART 2 – MATERIAL

2.1 MATERIALS

.1 Concrete blocks:

- .1 to CAN/CSA-A165 Series, metric modular, Type H/15/A/M in concealed spaces, and H/15/D/M lightweight for exposed walls.
- .2 Provide block of higher compressive strength where indicated on structural drawings.
- .3 Blocks for fire rated partitions to have required percentage of solid material necessary to provide rating.
- .4 Sizes as indicated on drawings.

.2 Curing of lightweight block:

- .1 Autoclave or low-pressure steam curing is acceptable, provided that masonry units comply with linear shrinkage and moisture content requirements of CSA A165.1 for type M units at time of delivery to site.
- .2 Age all units, prior to delivery to site, as follows:
  - .1 Autoclaved units: minimum 7 days.
  - .2 Low pressure steam cured units: minimum 28 days

.3 Special Shapes:

.1 Bond beam, lintel beam, corner and other shapes as required or indicated on drawings.

.2 Provide external corner units as a single unit, with required architectural face appearance on one side and one end.

.4 Metal Anchors: Conforming to Ontario Building Code and Section 04 05 19.

.5 Control Joint Filler: Blok-Lok “Exp-Joint”, closed cell neoprene expansion joint material.

2.2 EXPOSED MASONRY FACES

.1 Notwithstanding visual inspection requirements of CSA standards, masonry units shall be free of surface indentations, surface cracks due to manufacture, or chipping. Units so delivered shall be culled from use for exposed purposes but may be used where concealed.

.2 Concrete masonry units exposed both sides, such as at interior partitions walls, must be visibly uniform in width, so that both faces of the wall are smooth, with all block faces in plane. Total variation in width must not exceed 2mm. Mason shall reject blocks which do not conform to this size requirement.

PART 3 – EXECUTION

3.1 WORKMANSHIP

.1 Build masonry work true-to-line, plumb, square and level, with vertical joints in proper alignment.

.2 Assume complete responsibility for dimensions, plumbs and levels of this work and constantly check same with graduated rod.

.3 Masonry courses to be of uniform height, and both vertical and horizontal joints to be of equal and uniform thickness.

.4 Extend non-loadbearing partitions to underside of floor structure above, providing 25mm deflection clearance. Install lateral support angles, as specified on the structural drawings, and acoustic insulation filler at top of wall.

.5 Carry wall up in uniform manner, no one portion being raised more than 1200mm above another at any time. Build no more than 1500mm of wall measured vertically in any one day.

.6 Buttering corners of units, throwing mortar into joints, deep or excessive furrowing of bed joints not permitted. Do not shift or tap units after mortar has taken initial set. Where adjustments must be made after mortar has started to set, remove mortar and replace with fresh supply.

.7 Where new masonry abuts old or fully set masonry, clean existing surfaces and dampen if necessary to obtain bond.

.8 Evidence of noncompliance with Contract Documents including the following will require replacement and/or repair:

.1 Shrinking
.2 Curling
.3 Spalling
.4 Poor colour blend
.5 Poor texture blend
.6 Discolouration of mortar
.7 Chipping

3.2 BLOCKWORK

.1 Lay concrete block in running bond, except as noted on Drawings, with thicker end of face shell upward. Standard coursing to be modular 200mm for one block and one joint.

.2 Use lightweight concrete blocks for exposed interior surfaces of walls and partitions. Regular concrete blocks may be used for concealed surfaces.

.3 Use special shaped, and finished units where indicated, specified or required. Use bull-nosed units for exposed external corners, window jambs, etc. Exposed open cells not permitted.

.4 Concrete masonry units shall have face shells and their end joints fully filled with mortar, and joints squeezed tight. Also fill webs at cores, to be reinforced and grouted, and strike flush at core taking care to prevent mortar from falling into core.

.5 Tie intersecting non-bearing walls together with masonry reinforcing every second course.

.6 Do not tie intersecting bearing walls together in masonry bond, except at corners.

.7 Exercise special care laying up concrete block in locations where plastic wall coating finish is indicated. Block walls in these locations shall be plumb with joints tooled, concave.

.8 Where resilient base is indicated, tool the joints to within 100mm of the floor. Cut joints flush behind the base.

3.3 MORTAR AND POINTING

.1 Mortar is specified in Section 04 05 13.

.2 Make all joints uniform in thickness, straight, in line, with mortar compressed to form concave joints.

.3 Strike joints flush where walls are to receive insulation, ceramic tile, or similar finishes.

.4 Point faced blockwork by filling holes and cracks in exposed mortar joints. Cut out defective joints, refill solidly with mortar and tool to form neat concave joint.

3.4 BUILDING IN COMPONENTS

.1 Build in door, screen, and window frames, steel lintels, sleeves, anchor bolts, anchors, nailing strips and other items to be built into masonry.

.2 Do not distort metal frames. Bed anchors of frames in mortar and fill frame voids with mortar or grout as wall is erected.

3.5 BEARING POINTS

.1 Fill concrete block solid with 20 MPa concrete grout at the following locations:
- .1 for two courses below bearing points of structural members;
- .2 behind wall-hung mechanical fixtures;
- .3 and elsewhere as indicated on drawings.

.2 Install building paper over wire mesh reinforcing in the beds below solid block section.

.3 Use 100% solid concrete blocks where indicated.

3.6 CONTROL JOINTS

.1 Provide continuous vertical control joints in concrete block and brick partitions and walls at locations indicated, and at maximum 4.0m O.C. Control joints may be at 6.0m O.C. for autoclaved block only.

.2 Control joints are required at changes in wall height, at pilasters and changes in wall thickness, at movement joints in foundations and floors and roofs, at one side of door or window openings under 1.8m wide, on both sides of openings over 1.8m wide, and adjacent to corners.

.3 Confirm all control joint locations with the Consultant prior to wall construction. Provide drawings marked up to show locations of all control joints.

.4 Form control joints as detailed. Stop masonry reinforcing each side of joints; except where structural reinforcing is required, such as at bond beams.

.5 Provide bond breaker at each control joint, of building paper or black polyethylene. Continue bond breaker over lintels at openings.

3.7 HORIZONTAL REINFORCING

.1 Cavity wall and concrete block walls shall be continuously reinforced and tied together with horizontal masonry reinforcing in every second block bed joint.

.2 Additionally, place masonry reinforcing in first and second bed joints above and below openings. Reinforcing in first bed joint shall be continuous. Second bed joint reinforcing shall extend 600 mm beyond each side of opening.

.3 Place continuous reinforcing in second bed joint below top of wall.

.4 Lap reinforcement minimum of 150mm at splices. Supply & install prefabricated sections at corners and intersection of walls to insure continuity of reinforcing.

3.8 FIRE-RATED PARTITIONS

.1 Block shall be of density required to achieve fire rating, in accordance with the Ontario Building Code.

.2 At door openings in fire rated masonry partitions, fill concrete block solid with 20 MPa concrete for a distance of 400mm at each side and 400mm above openings.

3.9 REINFORCED MASONRY WALLS

.1 Construct reinforced masonry walls to conform to the requirements of the Ontario Building Code and CSA-A371, and as indicated on Structural drawings.

.2 Lay units so as to maintain an unobstructed vertical continuity in the cells. All walls and cross webs shall be fully bedded. No over-hanging mortar or debris shall be allowed inside the reinforced cells unless otherwise on the drawings.

.3 Vertical reinforcing shall be provided full length without splicing. It may be installed after the first 1200mm of masonry is erected. Locate rods accurately in the cells as shown on the Drawings. Hold in position top and bottom. Fill cells containing reinforcement solidly with 20 MPa concrete grout, unless noted otherwise on Structural drawings. Consolidate by puddling when placing and again reconsolidate before plasticity is lost. Place concrete grout in lifts not exceeding 1200mm. Stop each lift 38mm below the top of a masonry unit.

.4 Refer to Structural and Architectural drawings for locations and grout strength.

3.10 CUTTING MASONRY

.1 Cutting of masonry units exposed in finished work shall be done with approved type power saw. Where electrical conduit outlet or switch boxes occur, grind and cut units before services installed. Quick saw not permitted for cutting block above grade.

.2 Obtain Consultants approval before cutting any part or area which may impair appearance or strength of work.

.3 Patching of masonry not permitted without Consultants approval.

3.11 BOND BEAMS

.1 Install concrete block bond beams where indicated and where required for bearing of structural members.

.2 Unless more stringent requirements are noted on Structural drawings, make bond beams of special channel blocks with two 15M reinforcing bars placed in bottom, and filled with 20 MPa concrete grout. Extend a minimum length of 200mm, each side of structural member.

3.12 REINFORCED LINTELS

.1 Install reinforced concrete block lintels at openings where steel lintels are not indicated.

.2 Cast and cure lintels on a plank. Set special channel lintel blocks using specified mortar. Place wood stops at each end of lintel to prevent movement.

.3 Refer to Structural drawings for lintel sizes and dimensions. As a minimum, place 25mm of 20 MPa concrete grout in voids, lay in two 15M reinforcing bars and place concrete to level of block sides. Rod and tamp concrete well without disturbing reinforcing. Allow lintels to cure 7 days before loading.

3.13 COORDINATION

.1 Provide openings in masonry walls where required or indicated. Provide reinforced lintels over all openings in both loadbearing and non-loadbearing walls.

.2 Accurately locate chases and openings, and neatly finish to required sizes. Refer to Mechanical and Electrical drawings and co-operate with all trades.

.3 Where masonry encloses conduit or piping, bring to proper level indicated and as directed. Do not cover any pipe or conduit chases or enclosures until advised that work has been inspected and tested.

.4 Build in frames and anchor bolts, and metal brackets for vanities, benches, counters, etc.

3.14 CLEANING

.1 On completion, remove excess mortar and smears using wood paddles or scrapers.

.2 Point or replace defective mortar to match existing, as required or directed.

.3 Clean concrete masonry walls exposed in the finished work in accordance with manufacture’s recommendations and NCMA TEK Bulletin #8-4A.

.4 Remove dirt and stains from masonry walls exposed in the finished work in accordance with manufacturer’s recommendations and NCMA TEK Bulletin #8-2A.

.5 Remove efflorescence from masonry walls exposed in the finished work in accordance with manufacturer's recommendations and NCMA TEK Bulletin #8-3A.

.6 Repeat cleaning operations until work is satisfactory.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

.1 Masonry accessories.
.2 Masonry flashing.

1.2 RELATED SECTIONS

.1	General Requirements	Division 01
.2	Masonry Procedures	Section 04 05 00
.3	Masonry Mortar and Grout	Section 04 05 13
.4	Masonry Anchorage and Reinforcement	Section 04 05 19
.5	Concrete Unit Masonry	Section 04 05 22
.6	Clay Unit Masonry	Section 04 21 00
.7	Air Barriers	Section 07 27 00
.8	Firestopping and Smoke Seals	Section 07 84 00

1.3 REFERENCES

.1 CAN/CSA-A371-04 (R2009), Masonry Construction for Buildings.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Horizontal Control Joint Filler: purpose-made elastomer for minimum compression of 25% of uncompressed size. Emseal Corporation: Greyflex.
.2 Vertical Control Joint Filler: preformed expanding elastomer for minimum compression of 25% of uncompressed size. Emseal Corporation: Greyflex.
.3 Lap Adhesive: recommended by masonry flashing manufacturer.
.4 Weep Hole Vents: purposed-made PVC:
  .1 Clear plastic tube: Dur-O-Wal Limited: DA1005 Weephole Tube.
  .2 Plastic Vent: Goodco Ltd: Goodco Brick Vent: J.V. Building Products: PVC Brick Vent.

.5 Vent Holes: minimum 100mm high.
  .1 Dur-O-Wal Limited: DA 1069 Cell Vent.
  .2 Block-Lok Limited: Wilco Weephole Ventilator.

.6 Compressible Joint Filler at Penetrations and Top of Masonry Partitions:

.1 AD Fire Protection System Inc.: A/D Firebarrier Mineral Wool Firestopping Insulation.
.2 Fibrex Insulations Inc.: Fibrex Safing Insulation.
.3 Roxul Inc.: RXL Safe Fire Stop Batt.

.7 Mechanical Fasteners: stainless steel, self-tapping.

.8 Metal Drip Flashing: Cold drawn and annealed stainless steel, Type 304, 50mm wide by 2400mm long, with 10mm hemmed edge.

.9 Cavity Wall Flashing: 1.0mm minimum thickness SBS modified self-adhesive or adhesive applied membrane.
.1 Henry/Bakor Inc.: Blueskin TWF.
.2 Soprema: Sopraseal Membrane Flashing.
.3 W.R. Grace and Co. of Canada Ltd.: Perm-A-Barrier Wall Flashing.
.4 W.R.Meadows of Canada Ltd.: Sealtight Air-Shield Flashing Membrane.

.10 Flexible Through-Wall Flashing:
.1 Lexsuco Canada Limited.: F-20 membrane with CA-105 adhesive.
.2 W.R. Meadows of Canada Ltd.: Sealtight Flex-Guard PVC Masonry Flashing with Vinyl Flash Adhesive Compound.

.11 Cavity Wall Air Space Filler: compressible, closed cell neoprene.

.12 Mortar Dropping Control Device: Trapezoidal-shaped polyester mesh with integral insect barrier. Mortar Net USA Ltd.: Mortar Net with Insect Barrier.

PART 3 – EXECUTION

3.1 INSTALLATION

.1 Install continuous control joint fillers in control joints at locations indicated and under shelf angles.

.2 Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600mm on centre.

.3 Install vent holes at top of cavities to line-up with weep holes.

.4 Install cavity wall air space filler at corners and as indicated to compartmentalize air space.

.5 Install compressible joint filler at the top of masonry partitions that are not fire separations. Refer to Section 07 84 00 – Firestopping and Smoke Seals for joint treatment and fire separations.

.6 Install compressible joint filler and acoustical sealant at penetrations through walls and partitions between classrooms, both above and below ceilings.

.7 Install one row of mortar dropping control devices above all flashings at base of wall and above wall openings. Install in accordance with the manufacturer's printed instructions.

.8 Prior to applying cavity wall flashing and flexible wall flashing, install metal drip flashing at front edge of steel angles or masonry units. Coat surface of steel angles with bituminous paint prior to setting metal drip flashing. At splices, overlap metal drip sections by 100mm, apply butyl water resistant sealant between spliced pieces, and crimp hemmed edges.

3.2 CONSTRUCTION

.1 Build in flashings in masonry in accordance with CAN/CSA-A371 and as follows:

- .1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. Install flashings under weep hole courses and as indicated.
- .2 In cavity walls and veneered walls, carry flashings, starting 15mm back from front edge of masonry, under outer wythe, then up backing not less than 200mm, and as follows:
  - .1 For masonry backing, bond to wall, using manufacturer's recommended adhesive where required. Overlap flashing with air barrier membrane.
  - .2 For concrete backing, bond to wall, using manufacturer's recommended adhesive where required. Overlap flashing with air barrier membrane.
  - .3 For wood frame backing, staple flashing to walls behind sheathing paper.
  - .4 For gypsum board backing, bond to wall using manufacturer's recommended adhesive where required and overlap with air barrier membrane.

.2 Lap joints 150mm and seal with adhesive.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

.1 Brick unit masonry.
.2 Procedures specific to installing brick.

1.2 RELATED SECTIONS

.1	General Requirements.	Division 01
.2	Masonry Procedures	Section 04 05 00
.3	Masonry Mortar and Grout	Section 04 05 13
.4	Masonry Anchorage and Reinforcement	Section 04 05 19
.5	Concrete Unit Masonry	Section 04 05 22
.6	Masonry Accessories.	Section 04 05 23

1.3 REFERENCES

.1 BIA, Technical Notes on Brick Construction No. 20, Cleaning Brick Masonry, November 1990.
.2 CAN/CSA-A82-06, Fired Masonry Brick Made From Clay or Shale.

PART 2 – PRODUCTS

2.1 MANUFACTURED UNITS

.1 Face Brick: Burned clay brick, to CAN/CSA-A82.
  .1 Grade: EG (Exterior Grade)
  .2 Type: X.
  .3 Size: Refer to schedule below.
  .4 Colour and texture: Refer to schedule below.

2.2 MASONRY UNIT SCHEDULE

.1 Masonry Unit Brick:
  .1 Existing brick salvaged, protected, stored until reinstallation. Cut brick to suit wall assembly and associated structural lintel.

PART 3 – EXECUTION

3.1 INSTALLATION

.1 Bond: To match existing brick wall.

.2 Coursing Height: Existing brick coursing.

.3 Jointing: concave where exposed or where paint or similar thin finish coating is specified unless indicated otherwise.

.4 Mixing and Blending: mix units within each pallet and with other pallets to ensure uniform blend of colour and texture.

.5 Clean unglazed clay unit masonry as work progresses.

3.2 CLEANING

.1 Clean clay unit masonry mock-up panel specified in Section 04 05 00 – Masonry Procedures as directed below and leave for one week.

.2 If no harmful effects appear and after mortar has set and cured, protect windows, sills, doors, trim and other work, and clean brick masonry as follows:

- .1 Remove large particles with wood paddles without damaging surface. Saturate masonry with clean water and flush off loose mortar and dirt.
- .2 Scrub with solution of 25 ML trisodium phosphate and 25 ML household detergent dissolved in 1 L of clean water using stiff fibre brushes, then clean off immediately with clean water using hose. Alternatively, use proprietary compound recommended by brick masonry manufacturer in accordance with manufacturer's directions.
- .3 Repeat cleaning process as often as necessary to remove mortar and other stains.
- .4 Use acid solution treatment for difficult to clean masonry as described in BIA Technical Note No.20.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

.1 Coordinate this work with the work of the steel joist supplier. Provide all necessary dimension and structural steel shop drawings to the steel joist supplier for the completion of their work.

1.2 WORK FURNISHED AND INSTALLED

.1 Separate column base plates
.2 Columns, beams, purlins, and girts
.3 Bracing
.4 Steel framing around roof and floor openings
.5 Diagonal supports at columns for deck or slabs
.6 Stair landing beams and hangers for steel stairs
.7 Structural steel door frames and sill angles
.8 Hoist beams
.9 Weldable reinforcing steel bars attached to structural steel
.10 Field connections to concrete and masonry

1.3 WORK FURNISHED AND NOT INSTALLED

.1 Anchor bolts
.2 Connection assemblies set in concrete
.3 Loose angle lintels that bear on concrete or masonry
.4 Shelf angles/plates and wall plates that bear on or are attached to concrete or masonry

1.4 WORK INSTALLED ONLY

.1 Installation of steel joists and steel bridging

1.5 RELATED WORK SPECIFIED ELSEWHERE

.1	Grouting under base plates,	Section 03 30 00.
.2	Supply of steel joists,	Section 05 21 00.
.3	Steel deck,	Section 05 31 00.
.4	Metal fabrications,	Section 05 50 00.
.5	Cementitious Fireproofing,	Section 07 81 16.

1.6 REFERENCES

.1 CAN/CSA G40.20/G40.21, General Requirements for Rolled or Welded Quality Steel /

Structural Quality Steels.

.2 CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CAN/CSA S16.1, Limit States Design of Steel Structures.

.4 CSA S136, North American Specifications for the Design of Cold Formed Steel Structural Members.

.5 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.6 CSA W48.1, Filler Metals and Allied Materials for Metal Arc Welding.

.7 CSA W59, Welded Steel Construction (Metal Arc Welding).

.8 CAN/CGSB 1.171, Inorganic Zinc Coating.

.9 CAN/CGSB 1.181, Ready Mixed Organic Zinc Coating.

.10 CISC/CPMA 1.73a, A Quick-Drying One-Coat Paint for Use on Structural Steel.

.11 CISC/CPMA 2.75, A Quick-Drying Primer for Use on Structural Steel.

.12 ASTM A53/A53M, Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

.13 ASTM A108, Standard Specification for Steel Bars, Carbon and Alloy, Cold Finished.

.14 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength.

.15 ASTM A325, Standard Specification for Bolts for Steel, Heat Treated 120/105 ksi Minimum Tensile Strength.

.16 ASTM A570/A570, Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.

.17 SSPC, Steel Structures Painting Council.

1.7 QUALITY ASSURANCE

.1 Structural steel fabrication shall be carried out by a firm that has been in structural steel business (for buildings) for at least five years and that is certified by the Canadian Welding Bureau under the requirements of CSA W47.1, Division 1 or 2.

.2 Erection of the structural steel and steel joists shall be carried out by the steel fabricator's own forces, unless written permission to sublet the Work is obtained from the Consultant. Welding shall be carried out by CWB approved welders under the supervision of a CWB approved firm.

.3 Engage a Professional Engineer to be responsible for the design, detailing and installation of all connections related to structural steelwork. Before submitting shop drawings, submit a letter signed and sealed by that Engineer stating that he has been engaged to undertake the responsibility for the above. Also submit a copy of that Engineer’s Certificate of Authorization, and proof of his liability insurance When requested, submit calculations signed and sealed by that Engineer. On completion of erection, submit a letter signed and sealed by that Engineer to certify that Work has been completed in accordance with all shop drawings reviewed by the Consultant and the Structural Engineer.

.4 Before the start of fabrication, supply the independent inspection and testing agency with mill test certificates or producer’s certificates satisfactorily correlated to the materials or products to which they pertain. The onus for ensuring that the materials and products can be properly identified according to grade or specification rests with the Contractor.

.5 Do not splice sections without the prior acceptance of the Consultant and the submission of pertinent shop drawings. Accepted splices will be required to develop the section. Each splice shall be given a non-destructive test by an independent inspection company acceptable to the Consultant. Testing shall be at the Contractor's expense. Evaluate results in accordance with CSA W59 and report to the Consultant.

1.8 TOLERANCES

.1 Conform to the fabrication and erection tolerances of CAN/CSA S16.

.2 In addition if more stringent tolerances are specified elsewhere to suit interfacing materials, the latter shall govern in such cases.

1.9 SHOP DRAWINGS

.1 Refer to Section 01 33 00 - Submittals. "Shop drawings" means erection diagrams and shop details. Shop drawings received after noon will be date-stamped as received the following working day.

.2 Submit to the Consultant for review before fabrication, 4 white prints of erection diagrams. Leave room on drawings for the stamps of the Consultant and the Structural Engineer. Check and sign before submission. Only 2 copies will be returned to General Contractor. The first submission of the erection diagrams to include a complete materials list indicating steel grades, paints, etc.

.3 Show orientation of bearing plates on erection drawings.

.4 In addition to beam designation marks, show beam sizes on erection drawings.

.5 Submit to the Consultant for review before the start of Work, 4 white prints of shop drawings. Leave room on drawings for the stamps of the Consultant and the Structural Engineer. Check and sign before submission. Only 2 copies will be returned to General Contractor.

.6 All shop drawings shall bear the seal and signature of the Professional Engineer responsible for designing the connections.

.7 The Professional Engineer designing the connections shall hold a Certificate of Authorization, and shall carry min. $1,000,000.00 in liability insurance.

.8 It is advisable to submit erection diagrams for review before preparing shop details. Include details of special conditions. Make erection diagrams. Copies of section details developed by VX Engineering Inc. will not be accepted as erection diagrams. If required, structural plans will be available “as-is” for use in the preparation of shop drawings provided that the title blocks are removed and provided that the Owner and the Owner’s

Consultants are not held responsible for any errors or omissions on the drawings. CAD files of the structural sections, elevations and schedules will not be made available for the preparation of shop drawings.

.9 Show the sizes, spacing and the locations of structural steel, connections, attachments, reinforcing and anchorage. Include all necessary plans, elevation and details. Indicate size and type of fasteners. For welded connections use welding symbols in compliance with CISC and indicate clearly the length of weld. Prepare shop drawings using metric sizes and units. All documents shall carry the seal of a Registered Professional Engineer licensed to practice in the Province of Ontario, who shall be responsible for the design of connections and details, and the fabrication, temporary shoring and erection of all structural steel. Show also vent holes required for galvanizing process.

.10 Review of shop drawings by the Consultant and Structural Engineer is a precaution against oversight or error and solely to review conformance with general design intent. It is not a detailed check and must not be construed as relieving the Contractor of responsibility for making the Work accurate and in conformity with the Contract Documents. Design for which the Contractor is responsible under the Contract will not be reviewed. Work done prior to the receipt of the reviewed drawings will be at the risk of the Contractor. Review comments are not authorization for changes to the Contract price.

.11 Provide the office preparing shop drawings with a complete set of Contract Drawings and Specifications plus all Addenda and Change Orders.

.12 Do not release column shop details for fabrication before establishing on site the final elevations of the tops of supporting piers.

.13 Make corrections required by previous review before resubmitting drawings. Clearly indicate all changes and additions to previous submission. Do not add new details to drawings which have been stamped as reviewed or noted.

.14 After review, erection diagrams will be returned to the Contractor stamped to show one of the following:

.1 Reviewe - Reviewed with no comments.
.2 Note - Reviewed with comments noted on drawing. Submit two final record prints as soon as corrections are made.
.3 Resubmit - Reviewed with comments noted on drawing. Correct and resubmit for review.

Conform to the requirements of each authority that has reviewed the drawings.

.15 Allow a minimum of 15 working days for review of each submission of shop drawings in the Structural Engineer's office. Allow more time when large quantities of shop drawings are submitted. Submit in general conformity with the sequence of construction intended. Co- ordinate with the Consultant. Shop drawings received after noon will be date-stamped as received the following working day.

.16 Keep on site at all times a set of shop drawings bearing the review stamps of the Consultant and the Structural Engineer and use only these drawings and the Structural Drawings to erect structural steel. Neatly mark on the Structural Drawings changes issued during the course of construction.

.17 Show details by which steel assemblies, which are set in concrete, are to be connected to the formwork.

.18 If additional instructions are required from the Consultant, allow a minimum of five working days for the Structural Engineer to review and respond to the request for instruction.

1.10 SUBSITUTIONS

.1 Submit all proposals for substitutions to the Consultant in writing in advance of shop drawings. Identify each item clearly. Do not proceed with a proposed change unless it is accepted in writing

.2 Substitution of alternative sections will be allowed provided the new members have equal or greater capacity and stiffness and are of dimensions acceptable at proposed locations.

1.11 SITE CONDITIONS

.1 Determine any potential interference with existing services and protect from disruption and damage.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Rolled shapes and plates.
- .1 Wide flange sections: CAN/CSA G40.21, Grade 350W.
- .2 Hollow structural sections: CAN/CSA G40.21, Grade 350W, Class C.
- .3 Channels, angles and plates: CAN/CSA G40.21, Grade 300W
- .4 Cold formed shapes: ASTM A570/A570M Grade 50, Fy=345MPa
- .5 Standard S beams: ASTM A992, A572, Grade 50, Fy=345 MPa
- .6 Structural pipe: ASTM A53, Grade B, Fy=241 MPa

.2 Welded wide flange shapes: CAN/CSA G40.21, Grade 350W.

.3 Weldable reinforcing steel: weldable steel, grade 400W, deformed bars to CSA G30.18.

.4 Arc welding electrodes and equipment: CSA W48.1. Electrode Classification Number: E480XX.

.5 High-strength bolts: ASTM A325M and CAN/CSA S16. Bolts shall be identifiable by their head markings and galvanized whenever used to connect members which are galvanized or painted with zinc-rich paint.

.6 Machine bolts: ASTM A307.

.7 Anchor bolts: CAN/CSA G40.21, Grade 300W

.8 Stud anchors, headed: ASTM A108, Grades 1010 through 1020, Fy=345 MPa (50 ksi). Lengths of studs given on drawings are the lengths after welding.

.9 Load indicating washers: Coronet - Cooper + Turner

.10 Cast-in-place concrete anchor with threaded bolt: Structural Connection Insert Type EC-2FW - Acrow - Richmond.

.11 Drilled concrete anchor:

.1 Kwik-Bolt 3 – Hilti Carbon steel anchors to be used unless otherwise noted.

.12 Drilled masonry anchor:

.1 Hilti HIT HY20 with threaded HIT-A Rods and screen tube (for hollow masonry).
.2 Hilti HIT HY150 with HAS –E Standard rods (for solid of grouted masonry).

.13 Joint filler for exposed steelwork: Epoxy resin.

.14 Shop primer paint for steel receiving finish coat of paint on site: CISC/CPMA 2-75 except no lead- based paints allowed.

.15 Shop primer paint for steel receiving intumescent paint on site: Primer compatible with intumescent paint to be used. See Section 07800 (Fireproofing).

.16 Shop paint for steel without finish coat: CISC/CPMA 1-73a except no lead-based paints allowed.

.17 Zinc-rich primer and touch-up paint:

.1 inorganic: CGSB 1-GP-171M, or
.2 organic, ready mixed: CAN/CGSB 1.181-92.

.18 Ensure compatibility with specified topcoat.

.19 Galvanizing: CAN/CSA G164

.20 Grating: Galvanized safety grating. Minimum thickness of material 2mm. Banded ends. Bolted connections. Capacity 4.8 kPa unless noted otherwise on drawings. Maximum deflection 1/180th of span. Provide:

.1 Type W/F by Borden Products (Canada) Ltd.
.2 Type 19-2 by Fisher and Ludlow

.21 Checker plate: CAN/CSA G40.21, Grade 300W. Plate with rolled-in embossments to provide non- slip surface.

.22 Sliding bearing assembly: Galvanized top steel plate with a type 304 stainless steel highly polished lower surface and bottom elastomeric pad with a polytetrafluoroethylene (Teflon) upper surface. Static and kinetic coefficients of friction not to exceed 5% under 7MPa to 14MPa working stress. Assembly to have a working stress capacity of 7 MPa)

on lower pad. Elastomeric bottom pad to allow a 2% rotation of upper plate and still maintain a substantially uniform bearing pressure between plate and pad. . Manufactured by:

.1 Fabreeka Canada Ltd.
.2 Goodco Ltd.
.3 Structural Tech Corp. Ltd.

.23 Elastomeric bearing pad: Structural grade 50 durometer neoprene.

.24 Zinc-Rich Shop Primer Paint: CAN/CGSB-1.132.

2.2 CONNECTIONS

.1 Design connections to conform to CAN/CSA S16. Conform also to the CISC Handbook of Steel Construction, except as otherwise required by the specifications.

.2 Retain a Professional Engineer to be responsible for the design of all connections.

.3 In general, make shop and field connections with high-strength bolts or by welding. Use machine bolts only for secondary connections and at slotted holes with finger-tight bolts that are intended to accommodate movement.

.4 Pretension all high-strength bolts used in:

.1 wind bracing connections;
.2 connections where bolts are subject to tensile loadings;
.3 connections using oversized or slotted holes unless finger-tight bolts are required to accommodate movement; and
.4 connections required by CAN/CSA S16 to be pretensioned.

.5 Design non-composite beam connections for an end reaction due to the uniformly distributed load capacity of the member unless a greater reaction is noted on the Drawings.

.6 Use double angle headers or end connection plates whenever possible. Do not use single angle headers for beams greater than 530mm deep. Make minimum depth of headers and end plates one-half the beam depth. Provide seated beam connections with top clip angles. Cantilevered plate connections will only be accepted for secondary members carrying minor loads. Provide all eccentrically loaded spandrel beams with top and bottom flange connections for torsional restraint.

.7 Provide connections designed for a pass-through force equal to the smaller axial force where axial forces occur in beams framing in on opposite sides of a supporting member. Axial force is centred in smaller beam if beam sizes differ.

.8 Install web and flange stiffener plates at moment connections as required by connection design and detail but in every case when indicated on the drawings. If the shear generated in column web exceeds its shear capacity, reinforce the web.

.9 Provide at least one stiffener plate each side of web of beams continuous over columns unless another type of stiffener is shown on the Drawings.

.10 Design gusset plates at compression members for the force equivalent to twice the specified compression member force, or provide stiffeners to prevent gusset plate buckling.

.11 Provide moment connections at splices to maintain continuity of cranked beams. Provide stiffener plates to resist unbalanced flange forces at splices.

.12 Provide all wall supporting members (shelf angles, hangers, stubs, back braces, etc) which are attached to floor beams with adjustable connections capable to compensate for the deflection of the floor beams due to self-weight of concrete slabs. Anticipate beam deflection to be 20 mm. Alternatively, fabricate based on actual deflected shape of the beams as measured after concrete slabs are installed.

.13 Complete welded shop connections prior to galvanizing.

.14 Where slotted holes are required to accommodate deflection, provide slotted holes long enough to allow for deflection indicated plus construction tolerance assuming bolts are in centre of slots. Use A307 bolts. Bolts are to be finger-tight with burred threads to allow for movement during life of structure without bolts loosening.

.15 Where indicated on the drawings, connect to concrete using cast-in weld plates with headed stud anchors. Design and supply assemblies. Determine capacity of each anchor group considering edge distance, spacing and embedment.

.16 Connect new steel members to masonry or concrete using drilled anchors. Design, supply and install anchors. Determine the capacity of each anchor group considering edge distances, spacing, and a factor of safety of 4 minimum against failure. Activate wedge type anchors by applying pre-determined torque recommended by the manufacturer. Do not use epoxy anchors unless approved by Consultant. Do not field weld at connections with epoxy anchors.

.17 Where drilled anchors are shown on the drawings, but the embedment length is not shown, provide manufacturer's standard embedment length.

2.3 FABRICATION

.1 Conform to CAN/CSA S16 and CSA W59.

.2 Orientate straight beams, which have cambers within allowable mill tolerances so that the resulting beam camber is up.

.3 Install stud anchors in the shop with end welds in accordance with the recommendations of the stud manufacturer. Lengths of studs given on drawings are the lengths after welding. Replace studs that crack in the weld or shank.

.4 Increase thickness of curved sections at no extra cost where necessary to fabricate and galvanize the required curvature or fabricate curved sections from plates at no extra cost where necessary to accommodate the required curvature.

.5 Reinforce holes through webs of beams as indicated on drawings or in accordance with design procedure set forth in the CISC Handbook of Steel Construction provided calculations are submitted as part of the shop drawings.

.6 Provide 16 mm diameter weep holes in base plates at all HSS columns, which are not made watertight or that are to be exposed to temperature changes.

.7 Provide vent holes in HSS sections where required for galvanizing process. Holes are not to exceed 16 mm diameter and are to be located so that any water inside HSS will drain away when HSS is in its final position. After galvanizing, fill vent holes with weld material, grind smooth and touch-up with two coats of zinc-rich paint.

.8 Where shop inspection is required, do not ship material to the site before it has been inspected.

2.4 LINTELS

.1 Structural Drawings do not show all lintels required. Refer to lintel notes and Typical Details on the Drawings.

.2 Provide lintels with a minimum of 150 mm bearing at each end but not less than the length of any specified bearing plate.

.3 .Weld or bolt together multiple member lintels. Provide spacers if separated. If angle seats are at different elevations provide steel packing.

.4 .Connect ends of suspended lintels to the structure and/or build into masonry to provide adequate restraint.

.5 .Connect ends of steel lintels to columns where openings are adjacent to columns.

2.5 PLATES AND ANCHORS

.1 Provide beams bearing on walls with bearing plates and wall anchors as specified.

.2 Weld steel members to bearing plates as required.

.3 Where bearing plate sizes are not noted on the Drawings, design bearing plates for a maximum factored bearing pressure of 1.65 MPa (240 psi) on masonry and 7.5 MPa (1100 psi) on concrete.

.4 Set beam bearing plates 12 mm back from edge of support.

.5 Extend beams for full length of bearing plates.

2.6 SUPPORTS AT COLUMNS

.1 Provide cap plates at tops of columns where required for support of deck, slab, joists or beams.

.2 Provide diagonal or cantilevered angles at sides of columns where required for support of deck or slab.

.3 Provide seat angles for support of masonry lintels above openings adjacent to columns. Unless otherwise noted on the Drawings, provide 76 x 76 x 9.5 steel angles attached to sides of columns. Length of seat to equal width of lintel minus 25 mm.

.4 Provide additional angle welded to column for support of precast or deck interrupted by column.

2.7 PAINTING AND GALVANIZING

.1 Clean steelwork prior to application of paint. Refer to CAN/CSA S16.

.2 Surface preparation in shop for paints shall be as follows:
- .1 Shop paint CISC/CPMA 1-73a: Clean off all grease and oil to SSPC SP1 and remove all loose rust, loose scale, dirt, weld flux, etc. by any suitable method.
- .2 Shop primer paint CISC/CPMA 2-75: Clean off all grease and oil to SSPC SP1. Clean steel to SSPC SP7 Brush-Off Blast Cleaning.
- .3 Zinc-rich primer paint and intumescent paint: Clean off all grease and oil to SSPC SP1. Clean steel to SSPC-SP6 Commercial Blast Cleaning, to an average surface profile of 0.04 mm (1.5 mils) or more.

.3 Apply paint under cover. Steel shall be dry when painted and paint shall be dry before loading for shipment.

.4 Apply zinc-rich primer paint not more than 24 hours after blast cleaning, but prior to any visible rust occurring on the surfaces. Do not apply when relative humidity exceeds 80%. Apply to achieve a dry film thickness of 0.08 mm (3 mils).

.5 Apply one coat of shop paint CISC/CPMA 1-73a to steelwork in the shop with the exception of:
- .1 Members to receive a finish coat of paint on site for which a CISC/CPMA 2-75 shop primer is required
- .2 Members to receive intumescent paint on site for which a compatible shop primer is required
- .3 Members for which zinc-rich paint is specified
- .4 Galvanized members
- .5 Surfaces encased in or in contact with cast-in-place concrete including top flanges of beams supporting slabs
- .6 Surfaces and edges to be field welded for a distance of 50 mm from the joint.
- .7 Contact surfaces of slip-resistant type joints assembled with high-strength bolts.
- .8 Surfaces to receive spray fireproofing

.6 Unless otherwise noted, apply one coat of primer paint (CISC/CPMA 2-75) in the shop for steel to receive a finish coat of paint on site.

.7 Unless otherwise noted, apply one coat of compatible primer paint in the shop for steel to receive intumescent paint on site.

.8 Only paints tested to ASTM E736 and approved by the spray fireproofing supplier may be used for steel which will receive spray fireproofing.

.9 Apply galvanizing to:
- .1 Shelf angles and hangers in exterior walls
- .2 Lintels in exterior walls
- .3 Exposed exterior steel members
- .4 Other steel noted on the Drawings

.10 When welding after galvanizing is in place, grind away galvanizing at areas to be welded. Touch up with two coats of zinc-rich paint.

.11 Apply primer paint to architecturally exposed surfaces without runs or sags. Sand down and repaint areas not acceptable to the Consultant.

.12 Apply touch-up paint after erection to all areas which have been missed, field welded, scraped or chipped using the same paint as the shop coat or primer.

.13 Clean surfaces down to bare metal and apply two coats of zinc-rich touch-up paint to any galvanized surface, which has been damaged or field welded, and which is accepted by the Consultant as being capable of repair without galvanizing.

.14 Clean and prepare surfaces of bolts, which will receive a finished coat of paint in the same manner as the connected steelwork.

.15 At exposed exterior structural steel framing members which are to receive a fire-resistant coating, as specified in Section 09 96 43, apply one coat of zinc-rich primer paint, compatible with specified coating. Over zinc-rich primer, apply "Carboguard 888" primer supplied under Section 09 96 43. Comply with product manufacturer's printed instructions for preparation of steel, application of product (over zinc-rich primer), and handling after application.

2.8 EXPOSED STEEL

.1 Conform to the requirements of the A.I.S.C. Specification for Architecturally Exposed Structural Steel and to the additional requirements given below when fabricating and erecting steel members which will remain permanently exposed to view.

.2 Remove all imperfections which are unsightly from members permanently exposed to view. Remove mill and shop marks.

.3 Provide continuous welding at exposed joints or fill between welds with an approved epoxy resin filler finished to the same profile as the adjacent weld. Joint shall be weathertight and suitable for painting.

.4 Exposed welds shall be smooth. Hide bolts in bolted connections. Where exposed bolted connections are permitted, adjacent bolt heads shall be on same side and extensions of shank beyond nuts shall be uniform and not exceed 20 mm.

.5 Do not mark surface with marks that are visible after painting.

PART 3 – EXEXUTION

3.1 CONSTRUCTION REVIEW

.1 General Review during Construction by the Consultant and Structural Engineer and the services of the independent inspection and testing agencies appointed by the Owner are undertaken so that the Owner may be informed as to the quality of the Contractor's performance and for the protection of the Owner. They will be carried out by examination of representative samples of the Work.

.2 The Contractor will receive copies of the construction review reports and the results of material tests. He will thereby be informed of any defects or deficiencies found. The provision of this information does not relieve the Contractor of his responsibility for the performance of the Contract and he shall implement his own supervisory and quality control procedures.

.3 Bring to the attention of the Consultant and Structural Engineer any defects or deficiencies in the Work, which may occur during construction together with a proposal for remedy. The Structural Engineer will decide what corrective action may be taken. The Consultant will issue the necessary instructions.

3.2 COOPERATION

.1 Cooperate with all engaged on the Project. Exchange with related trades shop drawings and other data required to coordinate and schedule Work. Deliver material for installation by other trades when required.

.2 Provide where shown or required, holes and copings for connection and clearance of the Work of other trades. Show on shop drawings before submitting for review. Holes in members shall not cause any appreciable reduction in strength.

.3 Do not cut holes in the field unless sizes and locations are accepted by the Consultant in each case. Accepted field cutting and welding shall be undertaken by this Trade.

.4 Supply and install framing around openings in steel roof and steel floor decks in accordance with Typical Details and Drawing Notes.

.5 Maintain horizontal bracing and its connections below the underside of the deck so as not to interfere with the seating of the latter.

3.3 EXAMINATION OF WORK

.1 Do not begin operations before making a thorough examination of existing conditions and the Work of related trades. Report inconsistencies before proceeding.

3.4 INSPECTION AND TESTING

.1 The Consultant will appoint an independent inspection and testing agency. Notify the Consultant two weeks in advance of the date when the first Work will be ready for inspection.

.2 Pay for the cost of inspection from the Cash Allowance.

.3 Assist the agency in its work. Do not commence fabrication until details of inspection have been worked out with the inspection agency.

.4 Work will be inspected when erected. Items to be cast into concrete will be inspected on site before being installed.

.5 The inspection agency will submit reports to the Consultant, Structural Engineer, Contractor and Municipal Authorities covering the Work inspected and provide details of errors or deficiencies observed.

.6 Inspection will include:

.1 Checking that the mill test certificates or producer’s certificates are satisfactorily correlated to materials and products supplied for the project or that legible

markings were made on the material and products by the producers in accordance with the applicable material or product standards. Where this is not possible, notify the Structural Engineer and carry out sample tests as described below when required by the Structural Engineer.

.2 Confirming that all materials meet specifications.
.3 Sampling fabrication and erection procedures for general conformity with the requirements of the Contract.
.4 Checking welders' CWB Certification.
.5 Checking fabricated members against specified member shapes.
.6 Checking fabricated members against allowable sweep and camber.
.7 Checking fabricated members against specified camber.
.8 Visual inspection of all welded connections including spot checking of joint preparation and fit up.
.9 Sample checking bolted joints.
.10 Sample checking stud anchors.
.11 Sample checking of drilled concrete and masonry anchors.
.12 Sample checking that tolerances are not exceeded during erection including fit-up of field welded joints.
.13 Inspection of field cutting.
.14 Shop paint, including surface preparation, and field touch-up.
.15 Galvanizing and field touch-up.
.16 Grouting under base plates and bearing plates.

.7 Arrange for the inspector to be present during the welding of 25% of moment connections and 25% of butt welds in direct tension.

.8 Sample testing: When required, test coupons will be taken and tested in accordance with CSA G40.20 to establish identification. Cut samples from member locations selected by Structural Engineer and provide to inspection and testing agency. Make good the locations if requested, at no extra cost, by adding new plates and welds acceptable to the Structural Engineer. The agency will have the samples tested for mechanical properties and for chemical composition and will classify the steel as to specification.

.9 Arrange for the inspector to start field inspection as soon as each section of the Work is completed, plumbed, bolts tightened and field welding finished.

.10 The inspector will check high-strength bolts in a representative 10% of bolted connections by torque testing each bolt. He will torque test 10% of the remaining bolts at random, but not less than 2 bolts in each connection. He will remove nuts from 1% of all bearing bolts and check that thread is excluded from the shear planes.

.11 The inspector will randomly select and pull test 5% of all types and sizes of drilled in anchors installed on a weekly basis, but not less than one anchor of each type and size. Pull test to twice the design tension capacity of the anchor given by the manufacturer. Submit reports to Consultant within one week of testing. Reports to indicate each anchor location, test load and mode of failure, if applicable. Notify Consultant immediately if any anchor fails the pull test.

.12 The inspector will visually check all the adjustable connections at wall supporting members to ensure the connections have been finalized after the concrete is poured.

3.5 FILED MEASUREMENTS

.1 Make field measurements necessary to ensure the proper fit of members.

.2 Identify on shop drawings dimensions, which have been obtained by field measurement.

3.6 ERECTION

.1 Comply with the requirements of CAN/CSA S16.

.2 Submit a description of proposed erection methods and sequence to the Consultant for his records if requested.

.3 Make adequate provision for all loads acting on the structure during erection. Provide erection bracing to keep the structure stable, plumb and in true alignment until the completion of masonry Work and the completion of floor and roof decks which together provide the permanent bracing. Prepare erection bracing drawings signed and sealed by a professional engineer and keep these drawings on site until erection bracing is no longer required.

.4 Set column base plates with levelling screws to the proper elevation ready for grouting. Lift base plates for inspection when so directed.

.5 Column base plates and beam bearing plates shall be grouted as soon as steelwork is completed. Do not add load on steelwork until grouting is completed and grout strength has reached at least 20 MPa.

.6 Do not make permanent connections until as much of the structure as will be stiffened thereby has been properly aligned.

.7 Adjust and finalize connections at wall supporting elements affected by floor beam deflections after concrete is poured.

.8 Report ill-fitting connections to the Consultant before taking corrective measures.

.9 Do not weld in an ambient temperature below -17°C. Preheat material adjacent to welding areas when ambient temperature is between -17°C and +4oc.

.10 Remove slag from all completed welds so that they may be visually inspected.

3.7 DRILLED ANCHORS

.1 Conform to requirements of manufacturer. Use hammer drill to make holes. Turn off hammer when drilling masonry with voids. Hole diameters must never exceed those required by manufacturer. Tighten all expansion anchors using a torque wrench unless finger-tight is required by the Drawings to allow for movement. Unless otherwise noted on drawings, provide manufacturer’s standard embedment length into solid concrete.

.2 Do not cut reinforcement to accommodate anchors. Relocate anchors, at no extra cost to the Contract, when obstructions prevent drilling holes to required depth in locations specified. Obtain Consultant's approval of new location before drilling hole. Fill all abandoned holes with grout.

.3 Arrange for manufacturer's technical representative to be present during installation of first few anchors of each size and type. Submit site reports by manufacturer to Consultant within one week of each visit. Reports to indicate anchor sizes and types installed, locations, and names of those present during installation.

3.8 SUSPENDED LOADS

.1 Do not overstress members supporting suspended loads. Hanger loads shall not exceed one kN (220 pounds). Loads from mechanical and heavy electrical services suspended from the steelwork shall not exceed the load allowance provided for such services and shall be distributed uniformly. Prevent torsion from hangers connected to beams by alternating their positions on either side of members. Do not apply twisting loads to joists and make attachment using U-bolts with double hangers or other devices that will centre the hanger load on the joist. Loads shall only be suspended directly at the panel points of joists, unless the chords of the joists have been specifically designed to support the concentrated loads.

.2 Steel Beams: Vertical loads must be applied so that they do not cause twisting of the beams or excessive bending of the flanges. Lateral loads are not to be applied to beams unless approved in writing by the Consultant's structural engineer.

3.9 REJECTED WORK

.1 Do not deliver to the site materials, which are known not to meet the requirements of the Specifications. If rejected after delivery, remove immediately from site.

.2 Where review reveals materials or workmanship which appear to have failed to meet the specified quality or tolerances, the Consultant shall have the authority to order tests made of materials; to order detailed field surveys and measurements; to order a structural analysis of the existing elements and to load test the structure. All such Work will be carried out in order to assist in determining whether the structure may, in the opinion of the Consultant, be accepted, with or without strengthening or modification. Testing shall meet the requirements of the Ontario Building Code. All expense incurred shall be chargeable to the Contractor regardless of the results.

END OF SECTION

PART 1 - GENERAL

1.1 WORK FURNISHED AND INSTALLED

.1 Steel roof deck
.2 Acoustic steel roof deck
.3 Steel floor deck
.4 Holes for other trades
.5 Hole and edge reinforcing fastened to deck
.6 Closures and cover plates
.7 Sheet metal edge forms for concrete
.8 Other sheet metal items noted on the structural drawings to be provided by this Section.

1.2 WORK FURNISHED BUT NOT INSTALLED

.1 Glass fiber batts for acoustic deck

1.3 RELATED WORK SPECIFIED ELSEWHERE

.1 Structural Steel, Section 05 12 10.
.2 Steel Joists, Section 05 21 00.

1.4 REFERENCES

.1 CSA S136, North American Specifications for the Design of Cold Formed Steel Structural Members.
.2 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
.3 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.
.4 CSA W59, Welded Steel Construction (Metal Arc Welding).
.5 ASTM A108, Standard Specification for Steel Bars, Carbon and Alloy, Cold Finished.
.6 ASTM A653/A653M, Specification for Sheet Steel, Zinc-Coated (Galvanized) Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.7 ASTM A792/A792M, Standard Specification for Steel, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
.8 CSSBI 10M, Standard for Steel Roof Deck.
.9 CSSBI 12M, Standard for Composite Steel Deck
.10 CSSBI B13, Design of Steel Deck Diaphragms
.11 Factory Mutual Loss Prevention Data 1-28, Wind Loads to Roof Systems And Roof Deck Securement.

1.5 QUALITY ASSURANCE

.1 Welding shall be performed by a firm certified by the Canadian Welding Bureau under the requirements of CSA W47.1. Welders shall be qualified for deck welding by the Canadian Welding Bureau.
.2 Before the start of fabrication, supply the Consultant and the independent inspection agency with mill test reports properly correlated to the materials. The onus for proving the properties of the steel supplied rests with the Contractor.

1.6 **SHOP DRAWINGS**

.1 Refer to Section 01 33 00 – Submittals. "Shop drawings" means erection diagrams. Shop drawings received after noon will be date-stamped as received the following working day.

.2 Submit to the Consultant for review before the start of Work, 4 white prints of shop drawings. Leave room on drawings for the stamps of the Consultant and the Structural Engineer. Check and sign before submission. Only 2 copies will be returned to General Contractor.

.3 Submit copies of manufacturer's data sheets for each deck type.

.4 If required, structural plans will be available “as-is” for use in the preparation of shop drawings provided that the title blocks are removed and provided that the Owner and the Owner’s Consultants are not held responsible for any errors or omissions on the drawings. CAD files of the structural sections, elevations and schedules will not be made available for the preparation of shop drawings.

.5 Show on drawings: material specifications, sheet lengths, inverted deck locations, thicknesses, local reinforcement, field fastening.

.6 All shop drawings shall be signed and sealed by a professional engineer registered in Ontario.

.7 Review of shop drawings by the Consultant and the Structural Engineer is a precaution against oversight or error and solely to review conformance with general design intent. It is not a detailed check and must not be construed as relieving the Contractor of responsibility for making the Work accurate and in conformity with the Contract Documents. Design for which the Contractor is responsible under the Contract will not be reviewed. Work done prior to receipt of the reviewed drawings will be at the risk of the Contractor. Review comments are not authorization for changes to the Contract price.

.8 Provide the office preparing shop drawings with a complete set of Contract Drawings and Specifications plus all Addenda and Change Orders.

.9 Make corrections required by previous review before resubmitting drawings. Do not add new details to drawings which have been reviewed.

.10 After review, drawings will be returned to the Contractor stamped to show one of the following:

.1	Reviewed	Released for fabrication.
.2	Noted -	Released for fabrication after revisions noted are made. Submit final record print as soon as corrections are made.
.3	Resubmit	Correct and resubmit for review prior to fabrication.

Conform to the requirements of each authority that has reviewed the drawings.

.11 Allow a minimum of 10 working days for review of each submission of shop drawings in the Structural Engineer’s office. Allow more time when large quantities of shop drawings are submitted. Submit in general conformity with the sequence of construction intended. Co-ordinate with the Consultant. Shop drawings received after noon will be date-stamped as received the following working day.

.12 Keep on site at all times a set of shop drawings bearing the review stamps of the Consultant and the Structural Engineer and use only these drawings and the Structural Drawings to erect steel deck. Neatly mark on the Structural Drawings changes issued during the course of construction.

PART 2 - PRODUCTS

2.1 **MATERIALS**

.1 Deck: ASTM A653/A653M, Grade 230, Zinc-Iron Alloy Coating ZF75, or ASTM A792/A792M, Grade 230, Aluminum-Zinc Alloy Coating AZ150.

.2 Powder-actuated fasteners: Hilti Decking Fastening System.

.3 Zinc-rich paint - organic, ready mixed:

.1 Galvafroid by W. R. Meadows Ltd.

.2 Glid-Zinc 100 by Glidden Company (Canada) Ltd.

.4 Glass fiber insulation: Density 17 kg per cubic meter (1.1 pounds per cubic foot), shaped to profiles of flutes.

.5 Galvanized Deck (see drawing for locations): ASTM A653/A653M, Grade 230 Zinc coating Z275, or ASTM A792/A792M, Grade 230, Aluminum-Zinc Alloy Coating AZ150.

.6 Coated Fasteners for galvanized deck and prefinished deck; Buildex Division, Canada ITW Ltd. Climaseal coating, encapsulated EPDM washer, self-drilling screw. 12-24 x 7/8" Hex Washer Head Traxx/4 (total thickness 6mm). 12-24 x 1/4" Hex Washer Head Traxx/5(total thickness 12mm).

2.2 **DESIGN**

.1 Conform to requirements on drawings and in specifications and to Factory Mutual FM Class 90 approval rating requirements.

.2 Conform to CSSBI 10M and 12M where applicable unless otherwise required by drawings and specifications.

.3 Design deck profiles for indicated loads in accordance with CSA S136. Section depths and minimum steel thicknesses are shown on the Drawings. Deck to have interlocking male and female side laps.

.4 Design deck for indicated diaphragm action, including deck thickness, anchorage and side laps, in accordance with CSSBI “Design of Steel Deck Diaphragms” and Hilti Product Technical Guide (for Powder Actuated Fasteners). If no diaphragm shear is indicated on drawings, design deck for shear of 5.0 kN/m.

.5 Roof deck: Rib spacing, centre to centre, shall be 150 mm for 38 mm roof deck and 150 mm or 200mm for 76mm roof deck, unless otherwise noted.

.6 Floor deck: Rib spacing, centre to centre, shall be 150 mm for 38 mm floor deck and 300 mm for 76 floor deck unless otherwise noted. All floor deck shall be composite.

.7 Deck profiles and welding shall, in addition to the requirements of this Section, satisfy the requirements of any Fire Rated Assembly Design specified for the Project.

.8 Limit deflection of roof deck under total load to 1/240th of span. Also limit deflection to that required by Factory Mutual for a person walking on the roof.

.9 Limit deflection of floor deck under live load to 1/360th of span.

.10 Limit long-term deflection of composite deck to 1/480th of span.

.11 Make sections continuous over 3 spans or increase thickness of material to give the equivalent stiffness and strength of a 3-span deck.

.12 Design anchorage of roof deck to supports to resist net factored uplift forces of 3 kPa on cantilevers and at all roof corners (6m x 6m areas) and 2 kPa elsewhere on 3m wide strip around perimeter of all roof areas, but not less than that shown on the drawings or required by Factory Mutual. Increase minimum welding specified under Erection if necessary.

.13 Provide side lap connections, which distribute vertical loads between panels and also horizontal loads when acting as a diaphragm.

2.3 **FABRICATION**

.1 Conform to CSA S136 and CSA W59.
.2 Fabricate sections from steel sheets by rolling. Form integral ribs which will bear on supports and form interlocking male and female side laps.
.3 Cellular units: Spot weld together upper and lower elements assembled into a cellular unit so as to develop the full horizontal shear along the length of the interface.

2.4 **ACCESSORIES**

.1 Provide all required edge stiffeners, closures, reinforcing sheet steel plates and flashing.
.2 Reinforce edge of free spanning deck with channel shaped closure fitted to edge and fastened to deck.
.3 Provide flashing at columns and points of discontinuity to prevent leakage of mortar when concrete is placed over deck.
.4 Provide edge forming for concrete slabs over deck. Fasten to deck.

2.5 **CLOSURES**

.1 Provide fitted steel closures to fill hollow spaces between webs immediately above beams, partitions and walls transverse to deck when a ceiling is not specified. Where deck is continuous over support provide closures on each side and pack between closures with glass fibre insulation. Where deck span is parallel to walls and partitions, install steel flashings to provide a neat juncture.
.2 Provide both interior and exterior fitted steel closures where deck cantilevers over exterior walls. Pack between closures with glass fibre insulation.
.3 Provide fitted steel closures to fill hollow spaces between webs below all roof top sleepers or mechanical unit or skylight supports.

2.6 **OPENINGS**

.1 Structural Drawings do not show all openings required. Refer also to Architectural, Mechanical, and Electrical Drawings.
.2 Cut all required openings in steel deck and reinforce openings larger than 150mm.
.3 Openings up to 150 mm wide across the flutes require no reinforcing. Minimum clear distance between unreinforced openings shall be 600 mm.
.4 Reinforce roof openings 150 to 300 mm wide across the flutes. Use 55 x 55 x 6 mm angle under the flutes at each end of the opening. Extend across at least three flutes on each side. For openings over 300 to 400 mm across the flutes, provide suitable reinforcement based on a structural analysis of the loads involved. Roof openings larger than 400 mm wide across the flutes will be framed by the Structural Steel Trade.
.5 Reinforce openings through floor deck as specified for roofs but the maximum size of reinforced openings shall be 300 mm x 300 mm. Larger openings will be framed by the Structural Steel Trade.

2.7 **ACOUSTIC DECK**

.1 Provide 3 mm diameter holes on 10 mm staggered centers in a continuous band on all vertical ribs. Provide a noise reduction coefficient of 0.7.

.2 Supply preformed glass fiber insulation for installation by the Roofing trade. Insulation shall fill flutes in the top of the deck.

.3 Acoustic deck shall be pre-painted to color selected by the Architect.

2.8 **COMPOSITE DECK**

.1 Provide data to substantiate the load capacity of composite deck when requested. Design shall have been undertaken by a Professional Engineer and load testing certified by an independent inspection agency.

.2 Form sections to produce section moduli and moments of inertia not less than those in the published data of the manufacturer. Embossments shall ensure a composite unit of steel and concrete acting together to provide the required strength and stiffness.

.3 Design deck as a form in accordance with CSSBI 12M**.**

PART 3 - EXECUTION

3.1 **CONSTRUCTION REVIEW**

.1 General Review during Construction by the Consultant and Structural Engineer are undertaken so that the Owner may be informed as to the quality of the Contractor's performance and for the protection of the Owner. It will be carried out by examination of representative samples of the Work.

.2 The Contractor will receive copies of the construction review reports. He will thereby be informed of any defects or deficiencies found. The provision of this information does not relieve the Contractor of his responsibility for the performance of the Contract and he shall implement his own supervisory and quality control procedures.

.3 Bring to the attention of the Consultant and Structural Engineer any defects or deficiencies in the Work, which may occur during construction together with a proposal for remedy. The Structural Engineer will decide what corrective action may be taken. The Consultant will issue the necessary instructions.

3.2 **COOPERATION**

.1 Cooperate with all engaged on the Project. Exchange with related trades shop drawings and other data required to coordinate and schedule the Work.

.2 Cut and reinforce openings required by other trades.

.3 Do not hang concentrated loads from the steel deck. Attach hangers, which support services to the steelwork.

3.3 **EXAMINATION OF WORK**

.1 Do not begin operations before making a thorough examination of existing conditions and the Work of related trades. Report inconsistencies before proceeding.

3.4 **INSPECTION AND TESTING**

.1 The Consultant will appoint an independent inspection and testing agency. Notify the Consultant two weeks in advance of the date when the first Work will be ready for inspection. Assist the agency in its Work.

.2 Pay for cost of inspection from the Cash Allowance.
.3 Work will be inspected when erected.
.4 The agency will submit reports to the Consultant, Structural Engineer, and Contractor covering the Work inspected and provide details of defects or deficiencies observed.
.5 Inspection will include:
.1 Checking that mill test reports are properly correlated to materials
.2 Checking welders' CWB certification
.3 Checking deck types and gauge thicknesses
.4 Checking all welding, fastening and button punching
.5 Checking of all reinforcement required at holes cut in deck
.6 Checking installation of sheet metal strips and edge reinforcing

3.5 **FIELD MEASUREMENTS**

.1 Make field measurements necessary to ensure the proper fit of members.
.2 Identify on shop drawings dimensions, which have been obtained by field measurement.

3.6 **ERECTION**

.1 Carry out erection using only the forces of the steel deck fabricator unless written permission is obtained from the Consultant prior to the close of Bids to sublet the erection.
.2 Align deck end to end for accurate fit with corresponding sections. Ensure that sections are parallel, even and straight.
.3 Protect members supporting deck from damage when deck is being welded in place. Report damage to the trade that has provided the member and establish with that trade a procedure for repair or replacement. Obtain the acceptance of the Consultant before starting remedial measures.
.4 Weld deck to supports to resist uplift and lateral forces but not less than using at all bearing points with 20 mm diameter fusion welds in alternate flutes, unless otherwise noted on drawings. Stagger welds along flanges of supporting members to the maximum obtainable by the width of the flange. Place one weld each side of side lap, in each flute where side lap is made. Increase weld size and spacing as required.
.5 Provide min. 45mm bearing on all supporting members
Locate a rib of deck directly over steel beams and perimeter angles spanning parallel to deck and at same elevation as deck support. Weld deck to beam or angle at 450 mm centres.
.6 Make end laps over supports lapping not less than 50 mm and not more than 100mm.
.7 Provide adequate connection to withstand all forces, including uplift, acting on the deck during erection.
.8 Prefinished metal deck shall be fastened through the low rib to all supporting members with Hilti direct fasteners (Type X-ENP-19-L15). Fasteners shall be placed in outside rib on both sides of deck unit and in every rib in between to supporting member transverse to the rib and at 450 mm max. To supporting members parallel to the rib. Side laps to be mechanically fastened at 610mm max.
.9 Field welding to conform to requirements of CSA - W59.

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.10 For exposed deck end laps, ensure that lower deck sheets do not extend past the face of the supports.
.11 Connect male and female side laps by welding or mechanically interlocking with a button punch at 600 mm on center maximum including at supports. Reduce spacing as required for diaphragm action or if the ULC Fire Rated Assembly design specified requires a closer spacing..

.12 Increase deck welding specified elsewhere if necessary to satisfy the requirements of any Fire Rated Assembly Design specified for the Project.

.13 Inspect all surfaces of deck after erection and touch-up with zinc-rich paint where protective coating has been scratched or damaged. Minimum thickness 0.06 mm (2.5 mils).

3.7 **REJECTED WORK**

.1 Do not deliver to the site materials which are known not to meet the requirements of the Specifications. If rejected after delivery, remove immediately from site.

.2 Where review reveals materials or workmanship which appear to have failed to meet the specified quality or tolerances, the Consultant shall have the authority to order tests made of materials; to order detailed field surveys and measurements; to order a structural analysis of the existing elements and to load test the structure. All such Work will be carried out in order to assist in determining whether the structure may, in the opinion of the Consultant, be accepted, with or without strengthening or modification. Testing shall meet the requirements of the Ontario Building Code. All expense incurred shall be chargeable to the Contractor regardless of the results.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK

.1	Painting and Coating	Section 09 90 00
.2	Electrical	Division 26, 27, 28

1.2 REFERENCES

.1	CAN/CSA O80-Series	Standards for Wood Preservation
.2	CSA O121	Douglas Fir Plywood
.3	CSA O141	Softwood Lumber
.4	CSA O151	Canadian Softwood Plywood
.5	CSA B111	Wire Nails, Spikes and Staples.
.6	National Lumber Grading Authority (NGLA), Standard Grading Rules for Canadian Lumber	

1.3 DELIVERY AND STORAGE

.1 Do not deliver materials until they are required for incorporation into the work.

.2 Protect materials, under weatherproof cover, both in transit and on site.

.3 All exterior and interior finish materials shall, upon delivery, be neatly stored in a dry place and shall be protected from damage due to weather, water, or any other cause.

1.4 PROTECTION

.1 Protect fire-retardant materials against high humidity and moisture.

.2 Protect cabinets with 6 mm plywood or other suitable sheet material.

.3 Protect installed hardware from damage and blemishes.

PART 2 – MATERIALS

2.1 MATERIALS

.1 Wood materials: straight, sawn square, true, dressed four sides, properly sized and shaped to correct dimensions from nominal sizes indicated or specified.

.2 Lumber grade and moisture content:

.1 Comply with the official grading rules of NLGA for the particular lumber and grade, and structurally complying with the latest requirements of the Ontario Building Code.

.2 Comply with CSA Standard O141 Softwood Lumber. Use only grade marked lumber.

.3 All wood materials:

.1 well-seasoned NLGA, free from defects which impair strength and durability.
.2 Moisture content limit:
.1 S-GRN: Unseasoned
.2 S-DRY: Maximum 19% moisture content
.3 KD: Maximum 15% moisture content

.4 Pressure Treated Lumber to CSA O80.

.5 Blocking, cant strips, grounds, nailing strips:
.1 NLGA No. 2 Ontario White Pine, No. 2 Red Pine, all complying with the grading rules of the NLGA for Construction,
.2 Douglas Fir dense complying with COFI standard grading and dressing rules.

.6 Douglas Fir plywood:
.1 comply with CSA Standard O121, COFI Exterior.
.2 Western softwood plywood - comply with CSA Standard O151, COFI Waterproof glue WSP. Exposed two sides shall be grade G2S, and exposed one side shall be grade G1S.

.7 Wood preservative
.1 Pentox Green preservative and Osmose Cut End preservative, as manufactured by Osmose Pentox Inc.; Pentox Conservator Clear for painted wood.
.2 For painted surfaces use clear type and for concealed surfaces use green tinted type.

.8 Fire Retardant Treatment: To ULC S102; flame spread rating 25 or less.

.9 Rough hardware:
.1 nails, screws, bolts, lag screws anchors, special fastening devices and supports as required for the erection of all carpentry items.
.2 For preservative treated wood, use only stainless steel hardware, with the following exception:
.1 where galvanized steel items, such as gates, flashings, etc., are being attached to wood, galvanized steel fasteners shall be used.
.3 Do not mix stainless steel with galvanized steel; contact of these dissimilar metals can cause galvanic corrosion.
.4 Stainless steel hardware to be type 317.
.5 Galvanized hardware must be hot-dipped galvanized as follows:
.1 fasteners meeting CAN/CSA-G164 minimum zinc coating of 600 g/m2 (ASTMA153 Class A or B1 G 185)
.2 connectors meeting CAN/CSA-G164 minimum zinc coating of 600 g/m2 (ASTM A653 Class G-185 sheet) or better.
.3 Electroplated galvanized hardware is not permitted.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Examine surfaces to receive the work of this Section and proceed only when conditions are satisfactory for a proper installation.

.2 Lay out work carefully and to accommodate work of other trades. Accurately cut and fit; erect in proper position true to dimensions; align, level, square, plumb, adequately brace, and secure permanently in place. Join work only over solid backing.

3.2 INSTALLATION – GENERAL

.1 Provide running members of the longest lengths obtainable.

.2 Slowly feed machine-dressed members using sharp cutters. Provide finished members free from drag, feathers, slivers or roughness of any kind. Remove machine marks by sanding.

.3 Machine sand surfaces exposed in the finished work and hand sand to an even smooth surface free of scratches.

.4 Properly frame material with tight joints and rigidly secure in place. Use glue-blocks were necessary.

.5 Design construction methods for expansion and contraction of the materials.

.6 Conceal joints and connections wherever possible. Locate prominent joints only where directed.

.7 Match joints made on the site with joints made in the shop.

.8 Unless otherwise specified glue and blind screw or nail all work. Set and fill and plug surface screws using matching wood plugs.

.9 Accurately scribe, cope and mitre members where required to produce hairline joints.

.10 Erect work plumb, level, square and to the required lines.

.11 Do not regard blocking, strapping and other rough carpentry indicated as complete or exact. Provide rough carpentry items required for the installation of the Work of other Sections.

.12 The use of pressure treated wood is required for the following:

- .1 Wood in direct contact with the ground or framed into concrete below ground level.
- .2 Structural wood elements within 150mm of ground.
- .3 In termite areas, for all structural wood elements within 450mm of ground.
- .4 Wood framing members without a dampproof membrane separating the wood framing member from concrete in contact with the ground.
- .5 Building components where moisture may accumulate.

.13 Aluminum must not be in direct contact with pressure treated wood. Provide minimum 6mm spacing between aluminum products and treated wood, with10mil polyethylene barrier and polyethylene or nylon spacers.

3.3 INSTALLATION - ROUGH CARPENTRY

.1 Blocking and Grounds: Fasten wood nailers, blocking, bucks, grounds 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 Trades.

.2 Framing: Do all wood framing in accordance with the Ontario Building Code -latest version, and to CAN 3 086 as applicable.

.3 Wood Cants, Copings: Fasten wood cant blocking to structure with 19 mm. dia. bolts 760mm o.c. Fasten curbs as indicated. Wood cants, curbs and copings to be preservative treated. Plywood to be exterior grade.

.4 Preservative:

.1 Apply preservative to concealed wood members in contact with exterior walls and roof before fixing in place.
.2 Apply preservative to all cut ends of pressure treated wood.
.3 Preserve all other wood indicated to be preserved. Use clear preservative for items to be painted.
.4 Preserve wood by immersing in preservative for at least one hour.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

.1 All finished wood items and trim, other than custom cabinetry, shown on drawings.
.2 End panels at sides of coat rack and hook assemblies.
.3 Installation of shop fabricated casework, including wood trim pieces and solid millwork trim.
.4 Site fabricated fitments.

1.2 RELATED WORK

.1	Rough Carpentry	Section 06 10 00
.2	Architectural Wood Casework	Section 06 41 13
.3	Plastic Laminate Work	Section 06 41 16
.4	Paintings and Coatings	Section 09 90 00 Section 08 21 10

1.3 REFERENCES

.1 ANSI-A208.1-1993, Particleboard, Mat-Formed Wood.
.2 AWI/AWMAC - 2005, Architectural Woodwork Quality Standards.
.3 CSA-B35.4, Wood Screws.
.4 CSA-B111-1974, Wire Nails, Spikes and Staples.
.5 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
.6 CSA-O115-M1982, Hardwood and Decorative Plywood.
.7 CSA-O121-M1978, Douglas Fir Plywood.
.8 CAN/CSA-O132.2 Series-90 (R1996), Wood Flush Doors.
.9 CAN/CSA-O141-91, Softwood Lumber.
.10 CSA-O151-M1978, Canadian Softwood Plywood.
.11 CSA-O153-M1980, Poplar Plywood.
.12 CAN3-O188.1-M78, Interior Mat-Formed Wood Particleboard.
.13 NHLA, Rules for the Measurement and Inspection of Hardwood and Cypress, January 1986.
.14 NLGA, Standard Grading Rules for Canadian Lumber, 1994.

1.4 SUBMITTALS

.1 Submit samples in accordance with Section 01 33 00 - Submittals.
.2 Samples: sample size shall be 300mm by 300mm or 300mm long unless specified otherwise of each wood species which is to receive finishing at the job site; finished samples of each panel material which has a factory applied finish; PVC edge strip.
.3 Submit Shop Drawings in accordance with Section 01 33 42 - Submittals.
.4 Indicate details of construction, profiles, jointing, fastening and other related details.
.5 Indicate all materials, thicknesses, finishes and hardware.

1.5 DELIVERY AND STORAGE

.1 Protect materials against high humidity and moisture at all times.
.2 Store materials in ventilated areas, protected from extreme changes of temperature or humidity.
.3 Wood door delivery, storage and handling shall be in accordance with AWI/AWMAC Quality Standards.
.4 Delivered materials, which are damaged in any way will be rejected by the Consultant and shall be removed from the site and replaced with acceptable materials.

PART 2 – MATERIALS

2.1 MATERIALS AND ACCESSORIES

.1 Wood materials - straight, sawn square, true, dressed four sides, properly sized and shaped to correct dimensions from nominal sizes indicated or specified.
.2 Lumber grade and moisture content - comply with the official grading rules of NLGA 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. Use only grade marked lumber.
.3 All wood materials unless noted otherwise - well seasoned NLGA, free from defects which impair strength and durability. Moisture content limit: S-GRN: Unseasoned; S-DRY: Maximum 19% moisture content: KD: Maximum 15% moisture content.
.4 Hardwood Lumber: Select white birch moisture content of 7% or in accordance with:
  .1 National Hardwood Lumber Association NHLA
  .2 AWI / AWMAC custom grade moisture content as specified.
.5 Douglas Fir plywood - comply with CSA Standard O121, COFI Exterior. Exposed two sides shall be grade G2S, and exposed one side shall be grade G1S
.6 Canadian Softwood Plywood - comply with CSA Standard O151, COFI Waterproof glue WSP. Exposed two sides shall be grade S2S and exposed one side shall be grade S1S.
.7 Hardwood plywood - conforming to CSA O115 and AWMAC. Face veneer: plain sliced, bookmatched, Select White Maple, veneer facing with solid core of interior mat-formed wood particleboard to CAN3-O188.1.
.8 Solid Wood Gables at Cubbies and Solid Core Wood Doors: to CSA-O132.2, Plain Sliced, bookmatched, Select White Maple, veneer facing with solid core of interior mat-formed wood particleboard to CAN3-O188.1.
.9 Particleboard: medium density, M-3 grade to ANSI-A208.1.
.10 Poplar Plywood (PP): to CSA-O153, standard construction.
.11 Fasteners:
  .1 Wood screws: electroplated, to CSA-B35.4.
  .2 Nails and Staples: to CSA-B111.
  .3 Splines: metal.
  .4 Adhesives: as recommended by manufacturer.
.12 Melamine Panels:
  .1 Melamine overlay, thermofused under heat and pressure to particleboard core. Colour will be selected by the Consultant.
  .2 Overlay shall be bonded to both faces where exposed on two sides, and when the panel material requires a finished surface on one side only, the reverse side shall be overlaid with a plain buff balancing sheet.

.3 Edge finishing: matching 3.2mm PVC edge strip, colour and pattern through full thickness of material.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Examine surfaces to receive the work of this Section and proceed only when conditions are satisfactory for a proper installation.

3.2 INSTALLATION – GENERAL

.1 Provide running members of the longest lengths obtainable.
.2 Slowly feed machine-dressed members using sharp cutters. Provide finished members free from drag, feathers, slivers or roughness of any kind. Remove machine marks by sanding.
.3 Machine sand surfaces exposed in the finished work and hand sand to an even smooth surface free of scratches.
.4 Properly frame material with tight joints and rigidly secure in place. Use glue-blocks where necessary. Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.
.5 Design construction methods for expansion and contraction of the materials. Form joints to conceal shrinkage.
.6 Conceal joints and connections wherever possible. Locate prominent joints only where directed.
.7 Match joints made on the site with joints made in the shop.
.8 Unless otherwise specified glue and blind screw or nail all work. Set and fill and plug surface screws using matching wood plugs.
.9 Accurately scribe, cope and mitre members where required to produce hairline joints.
.10 Erect work plumb, level, square and to the required lines.
.11 Install shop fabricated casework and millwork. Refer to Section 06 41 13 - Architectural Casework.
.12 Install site fabricated fitments as shown on Drawings.
.13 Install wood doors. Refer to Section 08 21 00 - Wood Doors.
.14 Install hollow metal doors. Refer to Section 08 11 13 – Hollow Metal Doors and Frames.
.15 Install door hardware. Refer to Section 08 71 00 - Door Hardware.
.16 Install miscellaneous cabinetry hardware. Refer to Section 06 41 13 – Architectural Casework and Hardware.

3.3 CONSTRUCTION

.1 Provide Fastening:
  .1 Position items of finished carpentry work accurately, level, plumb, true and fasten anchor securely.
  .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturers.
  .3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round cleanly cut hole and plug with wood plug to match material being secured.

.4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

.2 Shelving: Install shelving on ledgers or shelf brackets, as indicated.

.3 Fabricated Items:

.1 Corridor End Gables at Coat Rack and Hook Assemblies:

.1 To AWI/AWMAC standards for custom quality.

.2 Wood: Solid White Maple with clear transparent finish.

.2 Wood Trim with clear transparent finish:

.1 Fabricate fascias and trims as indicated.

.2 Wood Trim: Select White Maple veneer core plywood with solid White Maple edging for fascia and trim.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

.1 Provide all casework indicated on drawings. Casework shall have melamine finish at both exposed panels and concealed interior faces and edges.

1.2 RELATED WORK

1.	Rough Carpentry	Section 06 10 00
2.	Resilient Base	Section 09 65 00
3.	Painting and Coating	Section 09 90 00
4.	Electrical Work	Division 26, 27, 28

1.3 QUALIFICATIONS

.1 All Work to conform to minimum standard for premium Grade Work as specified in Quality Standards for Architectural Woodwork prepared by Architectural Woodwork Manufacturers Association of Canada.

1.4 INTENT

.1 The intent of this Section is that the 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. Touch up finish immediately prior to completion of the Work and leave in perfect condition.

.2 It is also the intent of this Section that all casework be manufactured with low or no VOC products, to minimize VOC emissions in the finished products.

1.5 SUBMITTALS

.1 Submit Shop Drawings of all finish carpentry and in accordance with Section 01 30 00.

.2 Draw Shop Drawings in related and/or dimensional positions with sections. Scale minimum 1:10.

.3 Shop Drawings shall show fabrication details, materials, jointing, description of anchorage and hardware. Dimensions shall be based on actual measurements taken at the Site. Provide details and dimensions for all fittings and the like for mechanical and electrical connections to this work.

.4 Submit product data for all finishes.

.5 Submit samples of materials, construction method and finishes for Consultant's approval. The colour of stain shall be selected by the Consultant; submit prepared 300mm x 300mm finished samples for approval.

.6 Submit samples of all hardware.

.7 Submit one full size sample of proposed units of Type selected by Consultant prior to proceeding with the remainder of cabinet work.

1.6 CO-OPERATION

.1 Co-operate with other Sections and do all cutting, fitting and making good of own work for all Sections as may be necessary to carry out the true intent of the Drawings and Specifications. Examine the work and materials installed by others insofar as it affects this Work, and report to Consultant any such work not done properly.

1.7 OWNER'S EQUIPMENT

.1 Confirm the standard equipment dimensions with the OWNER prior to fabrication for all printer/copiers.

1.8 MEASUREMENTS

.1 Take necessary measurements at the Building of spaces and conditions to which work must conform or through which access is required. Take such measurements prior to fabrication of the Work of this Section and in ample time to avoid delays in the Work.

1.9 DELIVERY AND STORAGE

.1 Do not deliver finished material during rain or damp weather or until "Wet Trades" have completed their work and windows are glazed or covered. Carefully protect from damage of any kind.

1.10 WARRANTY

.1 Provide an extended Warranty to the General Conditions of the Contract to two (2) years from date of Substantial Performance of the Contract.

.2 The warranty shall cover replacing, reworking and/or refinishing to make good defects in architectural woodwork due to faulty workmanship or defective materials, which appear during this two (2) year period. Work showing defects during this period shall be replaced or made good without delay and at no cost to Owner.

PART 2 – MATERIALS

2.1 MATERIALS

1. All wood must be straight and true, dressed 4 sides and conform to details. It must conform to official grading rules of Canadian Lumberman's Association for quality and moisture content. It must conform to NBC Structural requirements and be grade stamped according to CSA Standards 0140 or 0151. Stained woods and plywoods must be selected for colour and grain uniformity.
2. All materials shall be low VOC products.
3. Softwood Lumber: Conform to CAN/CSA 0141 and National Lumber Grades Authority requirements.
4. Hardwood Lumber: Conform to National Hardwood Lumber Association (NHLA) requirements. Provide stain finish to AWMAC Premium Grade. Select white hard maple moisture content 7% or less in accordance with:
   .1 National Hardwood Lumber Association (NHLA)
   .2 AWI/AWMAC premium grade, moisture content as specified.
5. Hardwood Plywood: Conform to CSA 0115 and AWMAC. Select white hard maple, plain sliced and bookmathed face veneer core as specified. Exposed faces to be natural grade per AWMAC. Interior of cupboard and closet doors to be classified as exposed faces.
6. Canadian Softwood Plywood: Veneer plywood conforming to CSA 0151.
7. Douglas Fir Plywood: Veneer plywood conforming to CSA 0121.
8. Poplar Plywood: Veneer plywood conforming to CSA 0153.
9. Wood Particleboard:

   Conform to CAN3-0188.1. fabricated from 100% recycled or recovered wood fibre, containing no added urea formaldehyde, and certified by the Forest Stewardship Council (FSC). Conform to ANSI A208.1/Grade M-2, with formaldehyde emissions of 0.09 ppm or less.

   .1 Nu Green 2 Particleboard as manufactured by Uniboard, or equal by Panolam Industries or Flakeboard.
10. Hardboard: Conform to CGSB 11-GP-3M.
11. Nails and Staples: Conform to CSA B111.
12. Glue: Waterproof synthetic resinous glue, of approved type for general carpentry work and thermo-setting type for plastic laminate work, low VOC emitting. Adhesives shall be free of urea formaldehyde. All adhesives to conform to CSA 0112 Series.
13. Melamine Faced Particleboard: Melamine Faced Particleboard: to CAN3-0.188.1-M78, grade "H" particleboard sanded faces, 13 mm, 16 mm, 19 mm, 28.6 mm and 32 mm thickness, faced with laminated plastic. Melamine resin impregnated cover sheet with coloured and/or patterned paper inner layer. Melamine shall be thermally fused to rigid particle board substrate. Melamine faces shall be 120 Gram Weight Paper. Colour to be Hardrock Maple.
14. Melamine Faced Particle Board Edge Banding: Solid polyvinylchloride (PVC), 3 mm thickness x full width of board, wood core, wood grain type to match melamine face by Canada Wood tape or approved

colour equal. Edging rigid PVC with a measured degree of hardness of " 95 shore D" and thickness of "3mm (+0.15mm, -0.2mm)" with the primer side having a concave measuring 0.10 to 0.25mm.

14. Finish at Base Framing: Rubber base. Refer to Section 09 65 00.

2.2 CABINET HARDWARE

.1 The hardware specified herein is to be provided as listed. Any proposed substitutions must be submitted to the Consultant for approval prior to shop drawing submission. Proposed substitutions must be equal or better quality than the specified items and will be considered at the Consultant's discretion. Hinges must be as specified.

.2 Furnish and install all hardware to custom millwork as follows:

Hardware for 19mm thick closet doors			Finish
Hinges at closet doors	Hettich	Continuous Piano Hinge To suit height of doors	Steel Nickel Plated
Roller Catches	Richelieu	Selekta Pro 2000	603
Pulls, D Pull Type	Richeleu	Functional Steel Pull-332 104mm in length 8mm thick	Brushed Nickel
Closet Door Deadbolt	Hafele	235.08.358	Polished Nickel
Lock	complete with lock cores 210.04.606 and cylinder rosettes 210.04.062		
Strike Plates	Hafele	239.61.319 gable catch 239.08.705 bottom slot	Black
Elbow Latch & Strike	Richelieu		

Hardware for Adjustable Shelves			Finish
Pin Supports	Richelieu	Metal 7mm round	Nickel

Provide associated matching shelf support accessories.

3. Keying:
   - .1 All locks in a room to be keyed alike.
   - .2 Provide 6 extractor keys.

2.3 FABRICATION – GENERAL

.1 Check job dimensions and conditions and notify the Consultant in writing of unacceptable conditions. Do not proceed until remedial instructions are received.

.2 As far as practical, assemble work at the shop and deliver to the job ready for installation. Leave ample allowance for fitting and scribing on the job.

.3 Fabricate work square and to the required lines. Recess and conceal fasteners and anchor heads. Fill with matching wood plugs. All fixed elements must be glued and screwed or dowelled to ensure rigid construction.

.4 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.

.5 Provide exposed end grain of solid members and edges of exposed plywood and particleboard with matching solid hardwood edging at least 6.4mm thick.

.6 Make all necessary cut-outs in the millwork for mechanical duct work, electrical switch and outlet boxes and pre-drill all mounting holes for equipment, fittings and outlet boxes. Refer to electrical and mechanical Drawings and specifications.

.7 Provide and install pipe covers, scribing pieces, top, bottom and/or and closures and filler panels where necessary, including wherever units require furring out or blocking to existing conduits, pipes, etc.

.8 Provide trim around mechanical and electrical equipment and other equipment and after installation of equipment.

.9 Provide removable panels to be provided at all pipe chases. End closing panels to be provided at all exposed ends of millwork units and assemblies. Front filler panels to be provided where called for on Drawings and as required by field conditions.

.10 Resilient base around all toe spaces where indicated on the drawings is specified in Section 09 65 00.

2.4 CASEWORK COUNTERS, STORAGE CLOSETS

.1 Casework shall be melamine finish.

.2 All door fronts, front panels, exposed gables and all shelving in open shelving units, shall be thermofused melamine finish. Interiors and concealed gables cabinetry shall be thermofused melamine panels. Melamine to be hardrock maple in colour. Panels to be installed with vertical grain pattern.

.3 All exposed edges of melamine panels to have 3mm PVC edging, in colour to match laminate. All other edges to be sealed and moisture proofed before assembly.

.4 Unless noted otherwise on drawings, provide all floor cabinets with 115mm high base of 19 mm water resistant plywood; melamine panels are not to come into contact with the floor. Provide 115mm high toe space set back from front face of cabinets 115 mm minimum. Provide one coat of sealer to cabinet base; ensure compatibility with base adhesive. Plywood base must be concealed by base.

.5 All cabinet work shall be factory assembled in modular, unitized construction. Carefully machine with dovetailed mortised and tenoned or blind dado joints. Each unit shall be self-supporting and designed to be bolted together with fasteners inside units with plastic plugs over fasteners. All joints to be securely glued. Fabricate units as per Drawings and as specified.

.6 Gables to be 19mm thick panels, with PVC edging on all exposed edges.

.7 Provide top front, top back rails and posts of solid maple hardwood 19mm x 50mm framing members, tongue and grooved together and dadoed to gables.

.8 Bottoms to be 19mm melamine panels, with PVC edging.

.9 Panel doors generally to be flush overlay 19mm melamine faced panels with matching pvc edges all four sides.

.10 Back panels shall be minimum 13mm thick melamine panels, removable within unit where access is required behind. Removable panels to have PVC edge trim, four sides. Where back panels are exposed to view, they shall be 19mm melamine faced panels.

.11 Shelves to be 19mm melamine panels, finished all 4 sides edges, with pvc edging on all four edges.

.12 Sit all adjustable shelves on pilaster clips. Pilasters to be recessed into gables and fastened with screws.

.13 Depth of shelving in cabinets and closets are to be as noted on the drawings; full depth of cabinets and shelving except provide a 10mm gap minimum between shelf edge and interior face of doors. Provide centre pilaster to all shelves 1200mm long or over.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Set and place all materials and components in place, rigid, plumb and secure.

.2 Provide heavy duty fixture attachments for wall mounted cabinets.

.3 Install all shelving and doors.

.4 Apply water resistant building paper over wood framing members in contact with masonry or cementitious construction.

.5 After installation, fit and adjust operating hardware for wood cabinet access door panels.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

.1 Provide all countertops as indicated on drawings, except where counters are part of equipment specified elsewhere. Countertops shall be plastic laminate finish.

1.2 RELATED WORK

.1	Finish Carpentry	Section 06 20 00
.2	Architectural Wood Casework	Section 06 41 13
.3	Door Hardware	Section 08 71 00
.4	Electrical	Divisions 26, 27, 28

1.3 SUBMITTALS

.1 Refer to Section 01 33 23.

.2 Submit two 300 x 300mm samples of all materials to the Consultant for approval. The samples shall be identified by the project number, date and the name of the contractor the samples shall show colours and details of edging, forming and construction. The materials used in the building shall correspond to the approved samples.

.3 Shop Drawings:

- .1 Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
- .2 Show full-size details, edge details, attachments, etc.
- .3 Show locations and sizes of furring, blocking, including concealed blocking and reinforcement required.
- .4 Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers and other items installed in countertops.

.4 Submit data sheets for particle board, plywood, adhesives, joint sealants, and sealers.

.5 Maintenance Data and Materials:

- .1 Submit manufacturer’s care and maintenance data, including repair and cleaning instructions. Include in project closeout documents.
- .2 Provide maintenance kit for finishes.

1.4 PROTECTION

.1 Refer to General Instructions Section 01 10 00.

.2 Handle and store countertops in accordance with manufacturers recommendations. Countertop surfaces shall be covered with heavy kraft paper, or tops shall be put in cartons for protection during shipment.

.3 If protective film is provided, do not remove until counters have been installed.

.4 Remove any stickers immediately after installation

.5 Protect installed countertop surfaces with heavy kraft paper secured in position with masking tape. Do not remove until final inspection.

.6 Comply with the printed directions, issued by the material manufacturers.

1.5 **WARRANTY**

.1 Plastic laminate work shall be warranted against warping or delamination for a period of two (2) years from the date of Substantial Performance of the Contract.

.2 Work showing defects during the warranty periods shall be replaced or made good without delay and at no expense to the Owner.

PART 2 – MATERIALS

2.1 MATERIALS - PLASTIC LAMINATE COUNTERTOPS

.1 Plastic laminate:

.1 Conforming to CAN3-A172; by Formica and Nevamar as indicated below.
.2 1.6mm (.062") thick, general purpose grade for flatwork and 1.25mm (.050") thick standard postforming grade for shaped profiles and bends; finishes to be sued, solid and wood grain colours as later selected by the Consultant from the manufacturers standard range of colours. Balancing sheet shall be the same thickness as surface sheet and shall be supplied by the same manufacturer.
.3 Plastic Laminate selections are as follows:
Nevamar, Silver Alu Metalx, MXT003T or
Formica, Stainless Brush Finish, 9319-BH or
Wilsonart, Satin Stainless, 4830K-18, Linearity Finish

.2 Cores

.1 Wood products shall be FSC certified, manufactured with no added urea formaldehyde.
.2 Particle board shall be NuGreen 2 NAUF particle board, as manufactured by Uniboard, meeting the requirements of ANSI A208.1 Grade M-2. Surface shall be smooth, dense, and free from loose particles, or defects which will telegraph through the laminate.
.3 Plywood core - fir core, poplar faced, 3, 5, or 7 ply, exterior grade veneer plywood, urea-formaldehyde free. Faces and second ply shall be without voids, or fir plywood conforming to CSA 0121, graded solid faces, 3, 5, or 7 ply.

.4 Provide waterproof cores in countertops with sinks and in all other areas where moisture is possible.

.3 Adhesives:

.1 Formulated for use in decorative laminate fabrication and to suit the conditions of application without failure.
.2 Adhesive conforming to CSA 0112 Series, no added urea formaldehyde; Greenguard Children & Schools certified low emitting products.
.3 Adhesive for countertops where sinks will be installed is to be water resistant.
.4 Adhesive shall be acceptable to the laminate manufacturer.
.5 Plastic Laminate adhesives applied onsite and used within the weatherproofing system must have a VOC content equal to or less than 20 g/L as per section 01 67 00.

.4 Sealant - approved water-resistant sealer or glue, low VOC.

.5 Draw bolts - mechanical devices of approved manufacture which can be recessed into the core of decorative laminated panels and used to draw two parts together for permanently tight joints. Fixing clips - 1.6mm. (16 ga.) steel, galvanized (or prime painted), as detailed.

2.2 FINISH SCHEDULES

.1 Refer to room finish schedule and drawings for details of countertop work.

2.3 PLASTIC LAMINATE COUNTERTOPS

.1 All units shall be shop fabricated. Plastic laminate shall be applied to an approved underlayment with a thermosetting adhesive.

.2 Build work plumb, true and square. Arrange adjacent parts of continuous laminate work to match in colour and pattern.

.3 Obtain the governing dimensions before fabricating items which are to accommodate or abut appliances or equipment.

.4 Veneering of plastic laminate to core material shall be done according to the laminate manufacturer's directions. All veneered work shall be backed with a balancing sheet except where exposed in the finished work, then face veneer to be applied to all exposed surfaces.

.5 Where fabrication is done at the site, laminate and core materials shall be stored in the work area for not less than 48 hours for preconditioning before bonding together.

.6 Form shaped profiles and bends as detailed, using postforming or bending grade according to manufacturer's recommendations. Core and laminate profiles shall coincide to provide continuous support and bond over the entire surface.

.7 Self Edging.

.1 Straight self edging shall be decorative laminate 1.6mm thick.
.2 Curved self edging shall be postformed material or bending grade.
.3 Chamfer exposed edges of laminate uniformly, at approximately 15mm.
.4 Do not mitre the decorative laminate sheet at edges.

.8 Joints:

.1 Locate joints where indicated, where not indicated at approximately 2440 or 3660mm centres also include joints at corners, and changes in superficial area.

.2 Accurately fit decorative laminate together to provide tight, flush, butt joints. Joints in cored. panels shall be made with 6mm blind splines and draw bolts, one draw bolt for widths up to 150mm, two or more draw bolts at maximum 450mm o.c. for widths exceeding 150mm.

.3 Seal the core at joints with sealer.

2.4 CUTOUTS

.1 Provide cutouts as required for inserts, grilles, appliances, outlet boxes, and other fixtures. Radius the internal corners, chamfer the edges, and seal the core.

.2 Provide face finish, to match countertop material, at cutouts for under counter sinks.

2.5 EXAMINATION OF SURFACES AND CONDITIONS

.1 Refer to General Instructions 01 10 00.

.2 Surface and ambient temperatures shall be minimum of 20oC at a relative humidity between 20 to 80%.

PART 3 - EXECUTION

3.1 INSTALLATION – GENERAL

.1 Install all work plumb, true and square, neatly scribed to adjoining surfaces.

.2 Make allowances around periphery and where fixed objects pass through or project into countertops, to permit normal movement without restriction.

.3 Secure work by concealed means in an approved manner (or as detailed). Fasteners shall not be more than 600mm o.c. and 150mm from edges and ends. Where concealed fastening is not possible use stainless steel trim threaded screws with matching cup washers or other approved means.

.4 Sand or chamfer site cut edges of the laminate free from chips. Radius any internal angle cuts. Seal core edges.

.5 Isolate decorative laminate panels from direct contact with exterior metal frames.

.6 Upon completion of installation remove identification marks and clean surfaces. Protect as specified in 1.4 above.

.7 At junction of counter back splash and adjacent wall finishes, apply small bead of sealant.

3.2 TRIM

.1 Decorative laminate trim shall be as detailed. Joints shall be kept to the minimum, with none occurring in lengths under 3000mm. Slightly bevel the laminate edges of joints. Secure trim with adhesive.

END OF SECTION

PART 1 – GENERAL

1.1 SECTIONS INCLUDES

.1 Rigid Insulation at Interior of Exterior Walls in Rooms
.2 Rigid Insulation at Concrete Pavers at Roof Level

1.2 RELATED SECTIONS

.1	General Requirements	Division 01
.2	Masonry Procedures	Section 04 05 00
.3	Rough Carpentry	Section 06 10 00
.4	Sheet Vapour Retarders	Section 07 26 00
.5	Mechanical	Division 22 and 23

1.3 REFERENCES

.1 ASTM-E96-95, Standard Test Methods for Water Vapour Transmission of Materials.
.2 CGSB 71-GP-24M-77, Adhesive, Flexible, for Bonding Cellular Polystyrene Insulation.
.3 CAN/ULC-S701-1997, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
.4 CAN/ULC-S702-1997, Thermal Insulation, Mineral Fibre, for Buildings.

1.4 SUBMITTALS

.1 Submit 200mm by 300mm samples under provisions of Section 01 33 00 – Submittal Procedures.

.2 If requested by Consultant, submit under provisions of Section 01 78 10 - Closeout Submittals, manufacturer's certificate stating that products meet or exceed specified requirements.

1.5 MOCKUP

.1 Mockup is specified in Section 04 05 00 - Masonry Procedures.

.2 Coordinate with all trades involved in exterior wall work to incorporate specified insulation and insulation accessories in the mockup panel.

1.6 PRE-INSTALLATION MEETING

.1 Convene a pre-installation meeting one week prior to commencing work of this section.

.2 Request attendance of parties directly affecting work of this section.

.3 Review conditions of installation, installation procedures, procedure for inspection and coordination of work with related sections.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Store, handle and protect products under provisions of Division 01 – General Requirements.

.2 Minimize the time polystyrene insulation products are stored or exposed to sunlight at project site.

.3 Store products away from construction activity and sources of ignition.

.4 Protect products from damage during handling, installation and at point of installation.

1.8 WARRANTY

.1 Submit a warranty for insulation work in accordance with the Contract Requirements, but for a period of two (2) years.

.2 The warranty shall cover defects in materials, installation, and workmanship.

.3 Warranties shall be issued to the Owner within two (2) Working Days following the date of Substantial Performance of the Work.

PART 2 - PRODUCTS

2.1 INSULATION

.1 Concrete Pavers and Rigid Insulation at Roof Level:
- .1 Light-weight concrete 450mm by 450mm or 600mm by 600mm nominal concrete pavers with 50mm high-density rigid Styrofoam SM insulation pad below concrete pavers, for loose installation with 25 mm gap between pavers.
- .2 Extruded polystyrene to CAN/ULC-S701, Type 4, thickness as indicated on mechanical drawings.
- .3 Thermal Resistance: RSI Value of 0.87 per 25mm thickness.
- .4 Dow Chemical Canada Inc.: Styrofoam SM.
- .5 Owens Corning Canada Inc.: Celfort 300.

.2 Rigid Insulation for Interior Applications at exterior walls and at mechanical dog house:
- .1 Extruded polystyrene to CAN/ULC-S701, Type 3, thickness as indicated on architectural drawings.
- .2 Thermal Resistance: RSI value of 0.87 per 25mm thickness.
- .3 Dow Chemical Canada Inc.: Styrofoam Styrospan.
- .4 Owens Corning Canada Inc.: Celfort 200.

2.2 ADHESIVES

.1 Adhesive (for polystyrene): to CGSB 71-GP-24. Bakor Inc.: Air-Bloc 21.
.2 Adhesive (for insulation clips): Rubber resin, solvent type. Bakor Inc.: 230-35 Insulation Clip Adhesive.

2.3 ACCESSORIES

.1 Air Seal: As specified in Section 07 26 00 – Sheet Vapour Retarders.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Verify that building substrate surfaces, adjacent materials and installation conditions are ready to accept the work of this section. Ensure insulation materials and surfaces are dry.

.2 Verify that substrate is flat, sound, clean and free of objectionable air surface voids, fins, irregularities, and materials or substances that may impede adhesive bond.

.3 Notify Consultant upon completion of installation of vapour retarder and air seal to allow inspection before insulating material is installed or work is obscured.

.4 Beginning of installation shall mean acceptance of substrate.

3.2 PREPARATION

.1 Clean substrates of substances harmful to insulation.

3.3 INSTALLATION – GENERAL

.1 Keep insulation a minimum of 75mm from light fixtures and heat emitting devices.

.2 Use boards of largest possible dimensions to reduce the number of joints. Boards with chipped and broken edges are unacceptable.

.3 Offset both vertical and horizontal joints in multiple layer applications

.4 Apply adhesives in accordance with manufacturer’s instructions. Attach boards prior to skinning of adhesive.

3.4 INTERIOR APPLICATIONS

.1 Apply adhesive in three continuous beads each board length. Apply adhesive fully around protrusions.

.2 Install boards on wall surface, vertically between steel “Z” - stud furring.

.3 Stagger end joints. Butt edges and ends tight to adjacent boards and to protrusions.

.4 Extend boards across control and expansion joints, unbonded to substrate for 75mm on one side of joint.

3.5 PROTECTION

.1 Protect insulation and vapour retarders under provisions of Section 01 51 00 - Temporary Barriers and Controls.

.2 Do not permit work to be damaged prior to covering insulation. Protect from harmful weather exposures and physical abuse.

.3 Provide temporary coverings or enclosures when insulation will be subject to damage and cannot be protected by permanent construction immediately after installation.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDED

.1 Batt Insulation.

1.2 RELATED SECTIONS

.1	Division 1 - General Requirements.	
.2	Rough Carpentry	Section 06 10 10
.3	Sheet Vapour Retarders	Section 07 26 00
.4	Fire Stopping and Smoke Seals	Section 07 84 00
.5	Non – Structural Metal Framing	Section 09 22 00
.6	Mechanical	Division 23

1.3 REFERENCES

.1 CAN/ULC-S702-1997, Thermal Insulation, Mineral Fibre, for Buildings.

PART 2 – PRODUCTS

2.1 INSULATION

.1 Batt Insulation:
- .1 Mineral fibre to CAN/ULC-S702, Type 1-unfaced, thickness as indicated.
- .2 Thermal Resistance: RSI value of 2.1 per 89mm thickness.
- .3 Acceptable Products:
  - .1 CertainTeed Insulation Canada Inc.: Sustainable Insulation Fibre Glass Building Insulation.
  - .2 Owens Corning Canada Inc.: EcoTouch Pink Fiberglas Insulation.

2.2 ACCESSORIES

.1 Insulation Clips: Impale type, perforated 50mm by 50mm cold rolled galvanized carbon steel 0.8mm thick, spindle of 2.5mm diameter annealed steel, length to suit insulation, 25mm diameter washers of self-locking type.

.2 Retaining Mesh: Galvanized steel, hexagonal wire mesh.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Verify that substrate surfaces, adjacent materials and installation conditions are rec1dy to accept the work of this section. Ensure insulation materials and surfaces are dry.

.2 Beginning of installation means acceptance of substrate and conditions.

3.2 INSULATION INSTALLATION

.1 Supply insulation to Section 06 10 10 - Rough Carpentry as required for building-in to work of that section.

.2 Install insulation to maintain continuity of thermal protection and acoustical separation of building elements and spaces.

.3 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation. Trim insulation neatly to fit spaces.

.4 Do not compress insulation to fit into spaces. Install in spaces without gaps or voids.

.5 Install friction fit insulation tight to framing members.

.6 On sloping surfaces or in ceiling applications retain insulation in place with impale type fastener spaced at 600mm on centre. Adhere fastener to substrate with adhesive compatible with fastener and substrate.

.7 In unfinished unexposed applications retain insulation in place with wire mesh secured to framing members with fasteners appropriate for framing material.

.8 Keep insulation minimum 75mm from heat emitting devices such as recessed light fixtures.

.9 Notify the Consultant upon completion of insulation installation to allow for inspection before work is enclosed and obscured.

3.3 PROTECTION

.1 Protect insulation under provisions of Section 01 56 00 -Temporary Controls.

.2 Protect insulation from harmful weather exposures and physical abuse.

.3 Provide temporary coverings or enclosures when insulation will be subject to damage and cannot be protected by permanent construction immediately after installation.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDED

.1 Sheet vapour retarders.
.2 Vapour retarder accessories.

1.2 RELATED SECTIONS

.1	General Requirements	Division 01
.2	Board Insulation	Section 07 21 13

1.3 REFERENCES

.1 CAN/CGSB-19.21-M87, Sealing and Bedding Compound, Acoustical.
.2 ASTM E96/E96M-16: Standard Test Methods for Water Vapor Transmission of Materials.
.3 CAN/CGSB-51.34-M86: Vapour Barrier, Polyethylene Sheet for Use In Building Construction.
.4 SWI Sealant and Caulking Guide Specification.

1.4 SEQUENCING

.1 Sequence installation of Products in conjunction with other air and vapour barrier materials and seals.

1.5 PRODUCT DATA

1.6

.1 Submit Product data as specified in Section 01 33 00.
.2 Product Data: Manufacturer's standard data sheets, indicating material characteristics, performance criteria, and limitations.

1.7 MANUFACTURER'S INSTRUCTIONS

.1 Submit manufacturer's instructions as specified in Section 01 33 00.
.2 Manufacturer's Instructions: Manufacturer's standard installation guidelines, indicating preparation and installation requirements and techniques.

PART 2 – PRODUCTS

2.1 SHEET VAPOUR RETARDER

.1 Polyethylene Film: to CAN/CGSB-51.34, 0.15mm thick.

2.2 ACCESSORIES

.1 Joint Sealing Tape: air resistant pressure sensitive adhesive tape, type recommended by vapour retarder manufacturer, 50mm wide for lap joints and perimeter seals, 25mm wide elsewhere.

.2 Sealants: Non-drying, non-hardening synthetic rubber to CAN/CGSB-19.21. Acceptable Product: Tremo Ltd., Tremco Acoustical Sealant.

.3 Staples: minimum 6mm leg.

2.3 PERFORMANCE CRITERIA

.1 Ensure continuity of building enclosure vapour retarder in conjunction with materials specified in other Sections.

.2 Seal gaps between building enclosure components and opening frames.

2.4 MATERIALS

.1 Plastic Sheet Vapour Retarder: To CAN/CGSB-51.34-M; polyethylene sheet, as follows:
- .1 Thickness: 0.15 mm.
- .2 Water Vapour Permeance (ASTM E96/E96M): < 2.2 ng/Pa•s•m2.
- .3 Manufacturer and Product Name: eg. Super Six by Polytarp Products.

.2 Bituminous Membrane Vapour Retarder: Self-adhering bituminous membrane with laminated top surface; as follows:
- .1 Thickness: 0.76 mm.
- .2 Core: SBS modified asphalt.
- .3 Top Surface: Tri-laminate woven high density polyethylene.
- .4 Water Vapour Permeance (ASTM E96/E96M): < 1.5 Ng/Pa•s•m2.
- .5 Manufacturer and Product Name: eg. V-Force Vapour Barrier Membrane by Firestone Building Products.

.3 Primer for Bituminous Membrane Vapour Retarder: Single-component, water-based primer; eg. V-Force WB Primer by Firestone Building Products.

.4 Adhesive: Compatible with sheet membranes and substrate, permanently non-curing.

.5 Joint Sealant: As specified in Section 07 92 00, types as follows:
- .1 Plastic Sheets: Interior general purpose sealant, Type SEAL-INT-GP.
- .2 Bituminous Membranes: Exterior flashing sealant, Type SEAL-EXT-FL.

PART 3 – EXECUTION

3.1 PREPARATION

.1 Ensure surfaces are clean, dry and free of oil, grease, dirt, excess mortar and other contaminants.

.2 Cure new concrete for minimum two weeks.

.3 Prime substrate prior to applying self-adhering bituminous membranes.

3.2 INSTALLATION

.1 Ensure services are installed and inspected prior to installation of retarder.

.2 Install sheet vapour retarder where indicated on warm side of exterior wall, ceiling and floor assemblies prior to installation of wall finish to form a continuous vapour retarder.

.3 Use sheets of largest practical size to minimize joints.

.4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

.5 Install Products to SWI Sealant and Caulking Guide Specification.

.6 Plastic Sheet Vapour Retarders

.1 Position joints or laps of sheets over firm bearing to achieve an effective and permanent seal.

.2 Seal laps, joints, and terminations with an approved sealant to ensure complete, continuous seal of building envelope.

.7 Bituminous Membrane Vapour Retarders

.1 Apply self-adhered bituminous membranes over primed surface, from low points to high points, overlapping edges by 65 mm.

.2 Stagger end laps.

.3 Install membrane to avoid fishmouths and wrinkles.

.4 Roll membrane with a weighted roller wrapped in resilient material.

3.3 FIELD QUALITY CONTROL

.1 Inspect vapour retarders prior to concealment and identify gaps, holes, and punctures.

.2 Seal gaps, holes and punctures in vapour retarder membranes with joint sealant, as specified in Section 07 92 00.

.3 Request Consultant inspection of vapour retarders prior to concealment. Work that has been concealed prior to Consultant inspection will be exposed while Consultant remains at Place of the Work, inspected, and then only concealed upon Consultant acceptance.

3.4 EXTERIOR SURFACE OPENINGS

.1 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

3.5 PERIMETER SEALS

.1 Seal perimeter of sheet vapour retarder as follows:
- .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
- .2 At metal stud substrate apply bead of sealant at each stud. Lap sheet over sealant and press into sealant bead. Affix sheet temporarily with joint sealing tape.
- .3 At wood substrate install staples through lapped sheets at sealant bead into substrate.
- .4 Use only enough fasteners to ensure sheet remains in place until wall finish is installed.
- .5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.6 LAP JOINT SEALS

.1 Seal lap joints of sheet vapour barrier as follows:
- .1 Attach first sheet to substrate.
- .2 Apply continuous bead of sealant over solid backing at joint.
- .3 Lap adjoining sheet minimum 150mm and press into sealant bead.
- .4 At metal stud substrate install joint sealing tape to cover joint completely.
- .5 At wood substrate install staples through lapped sheets at sealant bead into substrate.
- .6 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.7 CLEANING

.1 Refer to Section 01 74 00.

.2 Clean extra materials from adjacent surfaces.

.3 Leave a suitable substrate for subsequent installations.

END OF SECTION

PART 1 - GENERAL

3.1 SECTION INCLUDED

.1 Membrane air seal materials and installation methods.
.2 Air seal materials to bridge and seal openings and penetrations at roofing penetrations.

3.2 RELATED SECTIONS

.1	General Requirements	Division 01
.2	Masonry Procedures: Masonry wall construction	Section 04 05 00
.3	Masonry Accessories	Section 04 05 23
.4	Board Insulation	Section 07 21 13
.5	Sealants: Sealant materials and installation techniques	Section 07 92 00
.6	Fire Stopping and Smoke Seals: Fire stopping materials	Section 07 84 00
.7	Cold-Applied Built-up Asphalt Roofing	Section 07 51 13.13

3.3 REFERENCES

.1 CAN/CGSB-19.13M-M87, Sealing Compound, One Component, Elastomeric Chemical Curing.
.2 CGSB-19-GP-14M-84, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.
.3 CAN/CGSB-19.18M-M87, Sealing Compound, One Component, Silicone Base, Solvent Curing.
.4 CAN/CGSB-19.24-M90, Multi-Component, Chemical Curing Sealing Compound.
.5 Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification.
.6 ASTM D412-16: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
.7 ASTM E96/E96M-16: Standard Test Methods for Water Vapor Transmission of Materials.
.8 ASTM E154/E154M-08a(2019): Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.ASTM E2178-21: Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials.
.9 SWI Sealant and Caulking Guide Specification.
.10 CAN/ULC-S741-2008 (R2016): Standard for Air Barrier Materials - Specification.CAN/ULC-S742-2011 (R2016): Standard for Air Barrier Assemblies - Specification.

3.4 SUBMITTALS

.1 Submit samples of air barrier material in accordance with Section 01 33 00 - Submittals.

.2 Manufacturer's Installation Instructions: Submit indicating preparation, installation requirements and techniques, product storage and handling criteria.

.3 Inspection Company Reports: Submit reports on air barrier membrane installation as it progresses.

3.5 SEQUENCING

.1 Sequence installation in conjunction with other air and vapour barrier materials and seals.

3.6 PRODUCT DATA

.1 Submit Product data as specified in Section 01 33 00.

.2 Product Data: Manufacturer's standard data sheets, indicating material characteristics, performance criteria, and Product limitations.

3.7 MANUFACTURER'S INSTRUCTIONS

.1 Submit manufacturer's instructions as specified in Section 01 33 00.

.2 Manufacturer's Instructions: Manufacturer's standard installation instructions, indicating substrate preparation, and Product installation requirements and techniques.

3.8 QUALIFICATIONS

.1 Applicators: A firm recognized by manufacturer as suitable for applying specified air barrier Products.

3.9 DELIVERY STORAGE AND HANDLING

.1 Deliver Products in undamaged containers and original packaging indicating name of manufacturer and product.

.2 Store roll materials on end in original packaging.

.3 Store adhesives and primers at 5 degrees C to facilitate handling.

.4 Keep solvent away from open flame or excessive heat.

.5 Protect rolls from direct sunlight until ready for use.

3.10 AMBIENT CONDITIONS

.1 Apply sheet membranes when ambient air temperature is above 5 degrees C.
.2 Apply membranes only during dry conditions, and to dry substrates that are free of snow, ice and water.

.3 Apply only dry materials, during weather that will not introduce moisture into assembly.

3.11 QUALITY ASSURANCE

.1 Perform Work in accordance with Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification.

.2 Air barrier applicators shall be licensed or approved by the membrane material manufacturer.

.3 Air barrier materials and accessory materials shall be from the Product line of one manufacturer.

3.12 QUALIFICATIONS

.1 Applicator: Company specializing in performing work of this section approved and trained by materials' manufacturers.

.2 The applicator shall have proven experience in the work of this section for jobs of similar size.

3.13 MOCKUP

.1 Co-ordinate with Section 04 05 00 - Masonry Procedures to provide mockup of air barrier materials under provisions of Section 01 45 00 - Quality Control.

.2 Allow 48 hours for inspection of mockup by Consultant before proceeding with air barrier work.

3.14 PRE-INSTALLATION CONFERENCE

.1 Convene one week prior to commencing work of this section.

.2 The meeting shall cover the work of other sections directly affecting this section, substrate preparation and acceptance, material storage and handling, air barrier installation and interfaces with other wall components, criteria for air barrier system acceptance, and any special conditions that may affect this work.

3.15 ENVIRONMENTAL REQUIREMENTS

.1 Do not install solvent curing sealants or vapour release adhesive materials in enclosed spaces without ventilation.

.2 Maintain temperature and humidity recommended by materials manufacturers before, during and after installation. Ensure materials are stored at a minimum temperature of 5C.

3.16 SEQUENCING AND COORDINATION

.1 Sequence work to permit installation of materials in conjunction with related materials and seals.

.2 Coordinate work of this section with all sections referencing this section.

3.17 WARRANTY

.1 Provide a warranty in accordance with the Contract Requirements, but for a period of two (2) years.

.2 The warranty shall cover defects in material, installation, and workmanship.

.3 Warranties shall be issued to the Owner within two (2) Working Days following the date of Substantial Performance of the Work.

PART 2 – PRODUCTS

3.18 MANUFACTURERS

.1 Manufacturers having Product considered acceptable for use:
- .1 Carlisle Coatings and Waterproofing, Inc.
- .2 Henry Company Canada.
- .3 IKO Industries Ltd.
- .4 Soprema Inc.
- .5 W. R. Meadows of Canada Limited.

3.19 PERFORMANCE CRITERIA

.1 Ensure continuity of building enclosure air barrier in conjunction with adjacent Products.
.2 Seal gaps between building enclosure components and opening frames.

3.20 MATERIALS

.1 Air/Vapour Barrier Sheet Membrane: To CAN/ULC-S741 and CAN/ULC-S742, Class A1; SBS rubberized asphalt sheet membrane, self-adhering grade; and as follows:
- .1 Thickness: > 1.0 mm.
- .2 Air Leakage (ASTM E2178): < 0.02 L/s•m2 @ 75 Pa.
- .3 Water Vapour Permeance (ASTM E96/E96M, Method A): < 1.71 ng/Pa•s•m2.
- .4 Elongation (ASTM D412 - Modified): 200 percent.
- .5 Tensile Strength (ASTM D412 - Modified): 3.45 MPa.
- .6 Puncture Resistance (ASTM E154/E154M): 178 N.
- .7 Product and Manufacturer Name: eg. Bakor Blueskin SA by Henry Company Canada.

.2 Air/Vapour Barrier Sealant: To CAN/ULC-S741 and CAN/ULC-S742, Class A1; single-component, trowel- or brush-applied solvent type synthetic rubber; and as follows:

.1 Air Leakage (ASTM E2178): < 0.02 L/s•m2 @ 75 Pa.

.2 Water Vapour Permeance (ASTM E96/E96M, Method A): < 1.7 ng/Pa•m2•s.

.3 Solids Content by Weight: 72 percent.

.4 Product and Manufacturer Name: eg. Bakor Air-Bloc 21 by Henry Company Canada.

.3 Attachments: Galvanized steel bars and anchors.

.4 Tape: 66 mm wide, self-adhesive polypropylene tape; eg. Contractor Tape by Dupont.

.5 Primer: As recommended by self-adhering membrane manufacturer.

.6 Joint Sealant: Exterior flashing sealant, Type SEAL-EXT-FL as specified in Section 07 92 00.

3.21 AIR BARRIER MATERIALS

.1 Membrane Air Barrier - Typical: Self-adhesive, rubberized asphalt bonded to sheet polyethylene, nominal total thickness of 1mm to 1.5mm.

.1 Henry Company Canada: Blueskin SA.
.2 Soprema Inc.: Sopraseal Stick 1100T.
.3 W.R. Grace & Co. of Canada Ltd.: Perm-A-Barrier.
.4 W.R. Meadows of Canada Ltd.: Sealtight Air-Shield.

.2 Vapour Permeable Air Barrier: Fluid-applied vapour permeable air barrier membrane.

.1 BASF Corporation: Enershield-1.
.2 Henry Company Canada: Air-Bloc 31.
.3 Tremco Incorporated: ExoAir 220.
.4 W.R. Grace & Co. of Canada Ltd.: Perm-A-Barrier VP.
.5 W.R. Meadows of Canada Ltd.: Air-Shield LMP.

.3 Sheet Steel Air Barrier: Galvanized steel, 2275 zinc coating, 1.5mm core steel thickness.

3.22 SEALANTS

.1 Sealants: Refer to Section 07 92 00 - Sealants.

.2 Sealant Primer: Recommended by sealant manufacturers.

.3 Substrate Cleaner: Non-corrosive, type recommended by sealant manufacturer, compatible with adjacent materials.

3.23 MASTIC AND PRIMER

.1 Mastic: Compatible with membrane air barrier and substrate, thick mastic of uniform consistency.

.1 Henry Company Canada: Blueskin Sealant.
.2 Soprema Inc.: Sopramastic 200.

.3 W.R. Grace & Co. of Canada Ltd.: Bituthene Mastic.
.4 W.R. Meadows of Canada Ltd.: Sealtight Pointing Mastic.

.2 Primer: Compatible with membrane air barrier and substrate.
.1 Henry Company Canada: Bakor Blueskin Primer.
.2 Soprema Inc.: Elastocol 700 Primer.
.3 W.R. Grace & Co. of Canada Ltd.: Perm-A-Barrier Primer.
.4 W.R. Meadows of Canada Ltd.: Sealtight Mel-Prime.

PART 3 – EXECUTION

3.24 EXAMINATION

.1 Verify that substrate surfaces are dry and clean and conditions are ready to accept the work of this section.

.2 Commencement of work implies the acceptance of substrate surfaces.

3.25 PREPARATION

.1 Remove loose or foreign matter which might impair adhesion of materials.

.2 Clean and prime substrate surfaces to receive air barrier membrane in accordance with manufacturer's instructions.

.3 Prime only substrate surface that can be covered with membrane the same day.

.4 Ensure surfaces to receive air barrier are clean, dry and free of oil, grease, dirt, excess mortar and other contaminants.

.5 Cure new concrete for minimum two weeks.

.6 Fill spalled concrete or open mortar joints to provide an even plane.

.7 Apply primer to porous surfaces designated to receive self-adhered sheet membranes.

.8 Tape joints in sheathing boards.

3.26 INSTALLATION

.1 Install Products to SWI Sealant and Caulking Guide Specification.

.2 Provide airtight joints.

.3 Seal Products completely around projections and penetrations.

.4 Fully adhere sheet membranes to primed substrate, using consecutive weatherboard method.

.5 Eliminate wrinkles, gaps, bubbles, air pockets, and fishmouths.

.6 Apply transition sheet membranes at openings and transitional connections.

.7 Leave a sufficient amount of excess membrane over top of parapet walls and around wall openings for tie-in by others.

.8 Cut membrane neatly around penetrations. Use a heated trowel to soften and form membrane. Seal with air/vapour barrier sealant.

.9 Do not leave installed membranes exposed to UV or weather for more than 42 days.

3.27 FIELD QUALITY CONTROL

.1 Inspect air barriers prior to concealment and identify gaps, holes and punctures.

.2 Seal gaps, holes and punctures in sheet membranes with air/vapour barrier sealant.

.3 Request Consultant inspection of air barriers prior to concealment. Work that has been concealed prior to Consultant inspection will be exposed while Consultant remains at Place of the Work, inspected, and then only concealed upon Consultant acceptance.

.4 Inspection: An inspection and testing company selected by the Owner will inspect and report on the installation of the air barrier system.

.5 The cost of inspection services will be paid from the cash allowance specified in Section 01 21 00 – Allowances.

3.28 INSTALLATION OF MEMBRANE AIR BARRIER

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

.2 Seal joints and perimeter edges of sheet steel air barrier.

.3 Co-operate with other trades to ensure continuity of air barrier membrane at junctions of different components and constructions.

.4 Stagger end laps to avoid four-way joints in air barrier membrane.

.5 Apply a bead of mastic to end laps, application terminations, and around all penetrations of the membrane.

.6 Ensure air barrier membrane js lapped and sealed onto window, curtain wall, and door frames.

.7 At the end of each day ensure that the work of this section is protected from adverse weather and other mechanical damage.

3.29 APPLICATION OF VAPOUR PERMEABLE AIR BARRIER

.1 Mix air barrier material until thoroughly blended in conformance with the manufacturer's printed instructions.

.2 Spot all fasteners and sheathing joints, terminations, inside and outside corners with mixed air barrier material.

.3 Place and centre the manufacturer's recommended sheathing fabric at all sheathing joints, terminations, inside and outside corners. Ensure sheathing fabric extends evenly on both sides of sheathing joint.

.4 Lap sheathing fabric 65mm minimum at intersections.

.5 Allow to dry to the touch before applying the air barrier membrane to the entire wall surface.

.6 Apply air barrier membrane to wall surface with. roller, brush, or spray gun to a consistent even coating that is free of voids and pin holes. Follow the manufacturer's printed application recommendations.

.7 Thickness of membrane shall be sufficient to achieve the required air barrier performance requirements.

3.30 PROTECTION OF FINISHED WORK

.1 Protect finished work under provisions of Section 01 61 00 - Product Requirements.

.2 Do not permit adjacent work to damage work of this section.

3.31 CLEANING

.1 Refer to Section 01 74 00.

.2 Clean extra material from adjacent surfaces.

.3 Leave a suitable substrate for subsequent construction.

3.32 SCHEDULE

.1 Wall Air Seal Over Outer Surface of Inner Wythe of Masonry or Concrete: Membrane air barrier over masonry unit or concrete surface, seal masonry anchor and other penetrations air tight.

.2 Window Perimeter: Lap and seal air barrier membrane onto window frames and fill space between frames and wall with air barrier foam sealant and elastomeric sealant as specified in Section 07 92 00 - Sealants.

.3 Wall and Roof Junction: Lap wall membrane air barrier onto roof deck with 150mm of contact over firm bearing. Lap roof air seal membrane over wall membrane air barrier with 100mm of full contact.

.4 Junctions between dissimilar materials: Where shown on Drawings install sheet steel air barriers to configuration shown. Lap and seal air barrier membranes over sheet steel air barrier providing a minimum of 100mm contact.

END OF SECTION

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.

1.0 GENERAL

1.1. RELATED SECTIONS

.1 Section 05 31 00 – Steel Decking
.2 Section 06 10 00 – Rough Carpentry
.3 Section 07 21 00 – Thermal Insulation
.4 Section 07 26 00 – Vapour Retarders

.5 Section 07 27 00 – Air Barriers
.6 Section 07 62 00 – Sheet Metal Flashing and Trim
.7 Section 07 72 33 – Roof Hatches
.8 Section 07 92 00 – Joint Sealants

1.2. REFERENCES

.1 ASTM D4601-98: Standard Specification for Asphalt-Coated Glass Fibre Base Sheet Used In Roofing.
.2 CSA A123.4-M1979: Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems.
.3 CGSB 37-GP-9Ma: Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.
.4 CGSB 37-GP-52M: Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric.
.5 CAN/CGSB-51.33-M89: Vapour Barrier Sheet, Excluding Polyethylene, for Use In Building Construction.
.6 CAN/ULC-S704-2001: Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
.7 CAN/ULC-S706-02: Standard for Wood Fibre Thermal Insulation for Buildings.
.8 ASTM A446/A446M, Specification for sheet steel, zinc coated: Steel Roof Deck.
.9 CAN/CSA 0141-91: Dimension Lumber
.10 CSA 0151-M1978: Canadian Softwood Plywood

1.3. PERFORMANCE REQUIREMENTS

.1 Roofing System: three ply cold-applied built-up roofing system with thermal barrier underlay board, vapour retarder, rigid board insulation, tapered insulation, overlay board, tapered drain sump insulation, composite ply roofing membranes and aggregate surfacing.
.2 Provide Products that are compatible with one another under field conditions, as demonstrated by roofing manufacturer.
.3 Provide watertight roofing system capable of resisting specified uplift pressures, thermally induced movement and exposure to weather without failing during the specified warranty period.
.4 Roofing Membrane System Load-Strain Properties: Provide a roofing membrane identical to component systems that have been successfully tested by a qualified independent testing and inspecting agency to meet the following minimum load-strain properties at membrane failure when tested according to ASTM D 2523:
Tensile strain at failure, at -18 deg C (0 deg F): 2,015N machine direction, minimum;
Tensile strain at failure, at -18 deg C (0 deg F): 1820 N cross-machine direction minimum.

1.4. SUBMITTALS

.1 Make Submittals in accordance with Section 01 33 00.
.2 Product Data
  .1 Submit Product data for each major component, including membrane, vapour retarder, rigid board insulation, adhesives and pavers. Highlight critical criteria for proper installation.

.3 Shop Drawings
  .1 Submit Shop Drawings for prefabricated work and details.
  .2 Include plans, sections, details in accordance with performance requirements, and for attachment to other portions of the Work.
  .3 Sloped Insulation: Indicate degree of slope and layout of sloping insulation on roof surfaces. Ensure positive drainage to roof drains.

1.5. CERTIFICATES

.1 Manufacturer Certificates: Signed by roofing manufacturer verifying that installer is approved, authorized or licensed by manufacturer to install specified Products.
.2 Installer Certificates: Signed by installer verifying that they have the specified qualifications described below.
.3 Copy of Manufacturer’s 20 Year Warranty.

1.6. TEST REPORTS

.1 Submit test reports as specified in Section 01 33 00.
.2 Product Test Reports: based on the evaluation of comprehensive tests conducted by an independent testing agency of the specified roofing Products.
.3 Manufacturer Field Inspection Reports: manufacturer's written acceptance of roofing installation based on daily inspections.

1.7. QUALITY ASSURANCE

.1 Manufacturer: qualified manufacturer having roofing systems listed by UL and approved for use by Factory Mutual.
.2 Installer: a company and persons specializing in the application of protected elastomeric roofing, with minimum 5 years documented experience and approved to apply roofing system by manufacturer.
.3 Conform to CRCA Roofing Specifications and roofing membrane manufacturer's instructions.

1.8. PREQUALIFIED ROOFING CONTRACTORS

.1 Through the OECM agreement, only the prequalified roofing contractors listed below may participate in this solicitation:
  .1 Atlas-Apex Roofing Inc.
  .2 Eileen Roofing Inc.
  .3 Flynn Canada Inc.
  .4 Lafleche Roofing (1992) Ltd.
  .5 Nedlaw Roofing Ltd.
  .6 Nortex Roofing Ltd.
  .7 Provincial Industrial Roofing & Sheet Metal Co. Ltd.
  .8 Semple Gooder Roofing Corp.
  .9 Trio Roofing Systems Inc.

1.9. PRE-INSTALLATION MEETINGS

The manufacturer is to review the specification with the architect prior to tender.

.1 Conduct pre-installation meeting.

.2 Meeting: prior to commencement of deck installation, review and document methods and procedures related to roof deck and roofing system construction, including the following:

.1 Participants: authorized representatives of the Contractor, Construction Manager, Owner, roofing Subcontractor, roofing manufacturer, and installers of roof accessories and roof-mounted equipment.

.2 Review methods and procedures related to roofing installation, including manufacturer's written installation instructions.

.3 Review construction schedule and confirm availability of Products, Subcontractor personnel, equipment and facilities.

.4 Review deck installation criteria and finishes for conformance with roofing system criteria, including issues of flatness and fastening.

.5 Review structural loading conditions and limitations of roof deck both during and after roofing application.

.6 Review flashing details, special roofing details, roof drainage, roof penetrations, equipment curbs, and other conditions affecting roofing installation.

.7 Review governing regulatory requirements, and requirements for insurance and certificates as applicable.

.8 Review safety requirements, including temporary fall-arrest measures.

.9 Review field quality control procedures.

1.10. DELIVERY, STORAGE AND HANDLING

.1 Participants: authorized representatives of the Contractor, Construction Manager/Owner, Architect, roofing Subcontractor, roofing manufacturer, and installers of roof accessories and roof-mounted equipment.

.2 Review methods and procedures related to roofing installation, including manufacturer's written installation instructions.

.3 Review construction schedule and confirm availability of Products, Subcontractor personnel, equipment and facilities.

.4 Review deck installation criteria and finishes for conformance with roofing system criteria, including issues of flatness and fastening.

.5 Review structural loading conditions and limitations of roof deck both during and after roofing application.

.6 Review flashing details, special roofing details, roof drainage, roof penetrations, equipment curbs, and other conditions affecting roofing installation.

.7 Review governing regulatory requirements, and requirements for insurance and certificates as applicable.

.8 Review safety requirements, including temporary fall-arrest measures.

.9 Review field quality control procedures.

1.11. ENVIRONMENTAL REQUIREMENTS

.1 Deliver and store Products undamaged in original containers with manufactur¬er's labels and seals intact.

.2 Store Products in designated areas elevated off the ground and protected from ultra-violet radiation, inclement weather and construction activities.
.3 Store solvent-based liquids away from excessive heat and open flame.
.4 Store adhesives and sealants at temperature above -5 degrees Celsius.
.5 Store membrane rolls on end, dry, and protected from moisture and damage. Cover rolls, insulation and other moisture-sensitive Products with tarpaulins.
.6 Store products on roof deck in a manner to prevent overloading the structure and properly secured to prevent movement due to wind or other forces.

1.12. WARRANTY

.1 Submit extended warranties in accordance with the General Conditions of the Contract.
.2 Installer's Extended Warranty: standard 2-year warranty, commencing from the date of Substantial Performance of the Work.
.3 Manufacturer's Extended Warranty: The Manufacturer shall issue a non-prorated warranty for a period of Twenty (20) Years. All components including the vapor retarder, insulation, cover board, membrane, flood coat, perimeter flashings including metal shall be covered under this warranty. Wind uplift warranty shall cover wind velocity up to a maximum wind speed of not greater than 117km/h (73 mph).
.4 Warranty shall include inspections in years 2, 5 ,10 & 15 of the warranty. The following duties shall be carried out at no extra cost to the Owner as required, by the Manufacturer.
    .1 Sealing of flashing seam
    .2 Filling of pitch pockets
    .3 Repairs to blisters and ridges
    .4 Caulking at metal details as required
    .5 Written inspection report
    .6 Removal of light debris from roof
    .7 Cleaning of drain screens

1.13. MAINTENANCE

.1 The Manufacturer shall issue a non-prorated warranty for a period of Twenty (20) Years. All components from the vapour retarder up shall be covered under this warranty.
.2 Warranty shall include inspections in years 2 and 5, 10 & 15 of the warranty. The following duties shall be carried out at no extra cost to the Owner as required, by the Manufacturer.
    .1 sealing of flashing seams
    .2 filling of pitch pockets
    .3 repairs to blisters and ridges
    .4 caulking at metal details as required
    .5 written inspection report
    .6 removal of light debris from the roof and premises
    .7 cleaning of drain screens

.3 Documentation shall be provided that the manufacturer has personnel to carry out above noted warranty requirements and has a history of providing these for a minimum of 5 years.
.4 Upon satisfactory completion, the warranty and all construction information regarding the roof installation shall be placed on an Online Roof Management Program at no additional cost to the Owner.

.5 Prior to the 2-year expiration of the contractor's warranty, the manufacturer shall carry out an Infra-Red Scan of the roof areas completed under this contract.

1.14. ADDITIONAL WARRANTY SERVICES

.1 All pertinent details regarding this project shall be provided for the owner's database such as:
- .1 Roof assembly types, roof inspection reports, roof specs
- .2 Construction of the roof system including all components
- .3 Inspection schedule (warranty requirements)
- .4 Substantial completion date
- .5 Progress photos on a per roof basis
- .6 Warranty information
- .7 Leak history/sensitivity
- .8 Emergency Leak call service
- .9 Handheld Infra-red analysis reports

2.0 PRODUCTS

2.1. MANUFACTURERS

.1 Manufacturers of cold-applied built-up asphalt roofing systems having products considered acceptable for use. All products supplied for the Multi Ply built-up asphalt roofing systems shall be from a single (one) manufacturer.

2.2. MATERIALS

.1 Primer: non-fibrated, asbestos free, water-based, low-VOC formulation; to CGSB 37-GP-9Ma; Meets the following requirements:
- .1 Asbestos Content, EPA 600/R13/116: None.
- .2 Non-Volatile Content, minimum, ASTM D 2823: 45 percent.
- .3 Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 3 g/L.

.2 Roof Vapour Retarder: Self-Adhering Sheet Vapour Retarder: 1.0 mm- (40 mil-) thick, self-adhered air and vapour control membrane consisting of a self-adhering SBS rubberized asphalt laminated to a tough, slip resistant, cross laminated polyethylene surface film, maximum permeance rating of 0.05 perms when tested to ASTM E96/E96M; cold-applied, with slip-resisting surface and release-paper backing. Provide primer as recommended by vapour-retarder manufacturer.

.3 Thermal Barrier Underlay Board: 15.9 mm thick Type X fiber reinforced gypsum board, to ASTM C1278/C1278M; Securock Gypsum Fiber Roof Board By CGC. Inc.

.4 Roof Insulation: Polyisocyanurate rigid board insulation; Type INS-RB-3 as specified in Section 07 21 00.

.5 Overlay Board: 12 mm thick asphalt-coated six sides, fibreboard, to CAN/ULC-S706, Type II, Grade 1.

.6 Tapered Insulation: Polyisocyanurate rigid board; to CAN/ULC-S704, Type 2, Class 1, closed cell type: As indicated on Drawings.

.7 Roofing Membrane Ply Sheets: 1.5 mm thick polyester-glass-polyester tri-laminate reinforced asphalt-coated sheet; Meeting the following requirements:
  .1 Breaking Strength, minimum, ASTM D 146: machine direction, 28.5 kN/m (164 lbf/in); cross machine direction, 26.0 kN/m (145 lbf/in).
  .2 Tear Strength, minimum, ASTM D 4073: machine direction, 1150 N (260 lbf); cross machine direction,1000 N (230 lbf).
  .3 Pliability, 12.7 mm (1/2 inch) radius bend, ASTM D 146: No failures.
  .4 Thickness, minimum, ASTM D 146: 1.5 mm (0.060 inch).
  .5 Weight, minimum, ASTM D 228: 1.85 kg/sq. m. (38 lb/100 sq. ft.).
  .6 Mass of desaturated polyester/glass/polyester mat, ASTM D 228: 0.95 g/sq. m. 3.0 lb/100 sq. ft.).
  .7 Asphalt, minimum, ASTM D 228: 488 g/sq. m. (10 lb/100 sq. ft.).
.8 Aggregate Ballast: Washed, commercial grade white Calcite or Dolomite, free of dust or foreign matter, 6-12mm OD, graded to ASTM D 1863.

2.3. ACCESSORIES

.1 Adhesive for Top Layer of Primary Insulation, Tapered Insulation and Overlay Boards: Single-component, solvent free, moisture curing, low VOC, asphaltic urethane adhesive; meeting ULC and tested by Factory Mutual; Meeting the following requirements:
  .1 Asbestos Content, EPA 600/R13/116: None.
  .2 Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 20 g/L.
  .3 Non-Volatile Content, minimum, ASTM D 1644: 98 percent.
  .4 Density at 25 deg. C (77 deg. F), minimum: ASTM D 1875: 1.01 kg/L
  .5 (8.5 lb/gal).
  .6 Elongation at 25 deg. C (77 deg. F), minimum, ASTM D 412: 1200 percent.
  .7 T-Peel Strength at 25 deg. C (77 deg. F), minimum: ASTM D 1876: 66 N(15 lbf).
  .8 .7 Adhesion Strength in Shear at 25 deg. C (77 deg. F), minimum, ASTM D 816: 552 kPa (80 psi).
  .9 .8 Low-Temperature Flexibility, maximum, ASTM D 816: -51 deg. C (-60 deg. F).
.2 Adhesive for Base Layer of Primary Insulation to Vapour Barrier: Two component, solvent free elastomeric urethane adhesive; Low Rise Foam Insulation Adhesive."
.3 Adhesive for Aggregate Ballast and Roofing Membrane Felts: Asbestos-free, cold- process asphalt adhesive; Meeting the following requirements:
  .1 Asbestos Content, EPA 600 R-93/116: None.
  .2 Volatile Organic Compounds (VOC), maximum, ASTM D 6511: 255 g/L.
  .3 Nonvolatile Content, minimum, ASTM D 6511: 70 percent.
  .4 Flash Point, minimum, ASTM D 93: 38 deg. C (100 deg. F).
  .5 Density at 25 deg. C (77 deg. F), minimum, ASTM D 6511: 1.0 kg/L (7.5 lb/gal).
  .6 Uniformity and Consistency, ASTM D 6511: Pass.
  .7 Asphalt Content, minimum, ASTM D 6511: 50 percent.

.4 Adhesive for Flashing Membranes and Stripping Ply Adhesive : One-part, solvent- free, asbestos-free, low-odor elastomeric roof mastic specially formulated for compatibility and use with specified roofing membranes and flashings, with the following properties:
  .1 Asbestos Content, EPA 600/R13/116: None
  .2 Volatile Organic Compounds (VOC), maximum, ASTM D 3960: Less than 20 g/L
  .3 Elongation at 25 deg. C (77 deg. F), minimum, ASTM D 412: 300 percent.

.5 Mechanical Fasteners: Flat-head, countersunk, self-tapping screws; size, type and length in accordance with FMG; corrosion resistant coating in accordance with FM 4470, with locking plastic or metal plates.

.6 Flexible Flashing Membrane: 1.14 mm thick, reinforced EPDM/SBR elastomeric sheeting; Meeting the following requirements:.

.1 Breaking Strength, minimum, ASTM D 751: machine direction 1.55 kN (350 lbf); cross machine direction 1.33 kN (300 lbf).

.2 Tear Strength, minimum, ASTM D 751: machine direction 340 N (75 lbf); cross machine direction 340 N (75lbf).

.3 Elongation at Failure: ASTM D 751: 25 percent minimum.

.4 Low Temperature Flexibility, minimum, ASTM D 2136: -40 deg. C (-40 deg. F).

.5 Thickness, minimum, ASTM D 751: 1.1mm (0.040 inch).

.6 Weight: ASTM D228: 1.4 kg/sq. m. (4.5 oz/sq. ft.).

.7 Stack Flashings: As specified in Section 07 62 00.

.8 Roof Drains: Drains: Prefabricated drains as manufactured by Altra Metal Specialties – Model ABD-CR-X-SS: Aluminum Body Roof Drain complete with clamping ring or as specified

.9 Metal Flashing: As specified in Section 07 62 00.

.10 Starter Strips: Starter strips to be manufactured from the same type of material used for cap and counter flashings and shall be 24 gauge galvanized steel. Starter strips are to be continuous. Exposed starter strips to match prefinished sheet metal in colour.

.11 Cant Strips: purpose made asphalt impregnated wood fibreboard, 75 x 75 mm size. Stripping Membrane: Vinyl-coated fibreglass mesh.

.12 Stripping Ply Adhesive: One-part rubberized elastomer.

.13 Stripping Ply Mastic: Asphalt based, fibrated roof mastic.

.14 Pitch Pan: premanufactured type; 0.61 mm thick galvanized steel sheet, minimum 100 mm high.

.15 Sealant: One part elastomeric urethane based caulking compound to CAN/CGSB 19.13-M87: Silicone based caulking compound to CAN/CGSB 19.13-M87.

.16 Termination Bar: 3 mm thick aluminum bar, 25 mm wide profile, pre-drilled for mechanical attachment.

.17 Copper: 0.8 mm cold rolled copper to ASTM B370-81.

.18 Wood: “Construction” grade light framing and blocking in accordance with the National Lumber Grades Authority Standard Grading Rules 1987. Grade #2 or better. Wood to be pressure treated in accordance with CSA 080.1 – M89.

.19 Wood Preservative: Copper napthenante or pentachlorophenol base. Water repellent wood preservative to CSA 080 – M89

.20 Nails, spikes, staples: to CSA B111. Hot dipped galvanized.

.21 Gas Pipe Supports: Concrete paver placed on extruded polystyrene insulation complete with pressure treated wood blocking. Provide one-piece galvanized pipe clamp, one pipe size larger than gas pipe fastened to wood blocking. Can be used for all pipes up to six-inch nominal pipe size.

.22 Fasteners:

.1 Wood to wood: Minimum #12 corrosion resistant screw of sufficient length to penetrate lower piece 33 mm.

.2 Wood to steel deck: Minimum #12 corrosion resistant screw of sufficient length to penetrate deck 19 mm.

.3 Wood to masonry or concrete: Screws, expansion shields or wall anchors, corrosion resistant of sufficient length to penetrate substrate to a depth recommended by the manufacturer.

3.0 EXECUTION

3.1. EXAMINATION

.1 Inspect existing conditions to ensure they are suitable for roofing work to begin. Do not proceed until unacceptable conditions are corrected.
.2 Ensure substrate is solid, clean, dry and free of any contaminants prior to commencing any roofing work.
.3 Ensure Products are dry prior to installation. Replace damaged Products.

3.2. PREPARATION

.1 Protect existing roofing from damage with minimum 12.5 mm thick plywood runways.
.2 Remove all existing roof membrane components down to the deck and remove from the roof surface.
.3 Prime metal and concrete surfaces designated to be covered with asphaltic Products.
.4 Apply primer at an average rate of 4.3 m2/litre. Allow to cure.
.5 Ensure primer does not enter building through cracks and other openings.

3.3. CARPENTRY

.1 Replace areas of obviously rotted and otherwise deteriorated wooden nailers and cant strips.
.2 Augment securement of existing base nailers to underlying structural members to ensure positive attachment prior to roof system installation.
.3 Install plywood sheeting, wood blocking, shims and nailers as required and /or as detailed on drawings.
.4 Fasten wood nailers, blocking, cants and shims with appropriate fasteners at 300 mm on centre in a staggered pattern.
.5 Within 6100 mm of outside corners, install twice as many fasteners per linear foot as installed along remaining roof edges.
.6 Curbs shall be a minimum of 300 mm above the roof membrane.

3.4. THERMAL BARRIER UNDERLAY BOARD

.1 Adhere thermal barrier underlay board to metal deck with approved adhesive at a rate of .4 L/m2. Stagger boards 150 mm.
.2 Install thermal barrier underlay boards with long axis perpendicular to ribs, with end joints fully supported.
.3 Firmly butt each board to surrounding boards. Do not jam or deform boards.
.4 Cut and fit boards where roof deck intersects vertical surfaces.
.5 Provide filler boards every 450 mm in both directions [and secure with minimum two fasteners per board].
.6 Tape joints of thermal barrier underlay board with 50 mm wide tape.

3.5. VAPOUR RETARDER

.1 Prime all areas to receive self-adhered vapour barrier.
.2 Adhere vapour retarder to thermal barrier overlay board.
.3 Overlap vapour retarder minimum 100 mm for side laps and 150 mm for end laps. Seal all laps with adhesive.
.4 Extend vapour retarder under cant strips and blocking. Extend to perimeter and deck protrusions.
.5 Seal roof vapour retarder to wall air/vapour barrier system with flexible flashing membranes to ensure continuity of building air/vapour barrier envelope.

3.6. INSULATION AND OVERLAY BOARD

.1 Install insulation boards to maintain continuity of thermal envelope.
.2 Adhere base layer of roof insulation to vapour retarder with approved adhesive at at a rate of 0.4 -0.6 L/m2.
.3 Adhere subsequent layers of roof insulation to base layers os insulation with approved adhesive at at a rate of 0.4 -0.6 L/m2.
.4 Adhere single layer of overlay board over roof insulation with approved adhesive at manufacturer’s recommended rate of 0.4 -0.6 L/m2.
.5 Stagger boards 300 mm.
.6 Adhere overlay board to base insulation and tapered insulation sumps with approved adhesive at manufacturer’s recommended rate of 0.4 -0.6 L/m2.
.7 Fit insulation tight to roof penetrations.
.8 Firmly butt insulation boards. Do not jam or deform boards.
.9 Stagger joints minimum 300 mm.
.10 Stagger overlay board seams with insulation board seams.

3.7. CANT STRIPS

.1 Install cant strips at intersections of roofing and vertical surfaces.
.2 Embed in a continuous bed of approved adhesive applied to overlay boards.
.3 Lay true to line, level and with flush butt joints and accurately mitred corners.

3.8. ROOF MEMBRANE

.1 Install three plies of roof membrane in shingle fashion, starting at roof low point. Apply membrane perpendicular to overlay board joints. Conform to manufacturer's recommended method.
.2 Overlap starter strips 660 mm with first ply, then overlap each succeeding ply 625 mm.
.3 Place ply sheets to ensure water will flow over or parallel to, but not against, exposed edges.
.4 Shingle in direction to shed water. Extend ply membranes over and terminate beyond cants and cut evenly.
.5 Embed plies in approved adhesive, at a minimum rate of 1.2 L/m2, and solidly coating each ply for full width.
.6 Ensure complete and continuous seal and contact between adhesive and ply membranes, including ends, edges and laps without wrinkles, fish mouths or blisters.

.7 Do not step or walk on felts during or immediately after application until adhesive has set.
.8 Install each ply so that it shall be firmly and uniformly set, without voids, into adhesive. Thoroughly and effectively broom or roll each membrane application to ensure full adhesion.
.9 Lap ply membrane ends 150 mm. Stagger end laps 1.0 metres minimum.
.10 Overlap previous day's work 600 mm, as required.
.11 Terminate all ply layers to outer edge of roof perimeter.

3.9. ELASTOMERIC FLASHINGS

.1 Install flashings to ensure the roof is watertight at the end of each Working Day.
.2 Extend flashing membrane minimum 150 mm over roof membrane.
.3 Extend flashing membranes minimum 200 mm up vertical surfaces.
.4 Secure flashings at 200 mm OC. Secure vertical flashings through termination bar.
.5 Overcoat lap edges with end lap stripping adhesive and membrane.
.6 Tie-in leading edge of elastomeric sheet flashing with stripping ply membrane embedded between alternate courses of stripping ply mastic.
.7 Canted Eave
  .1 Extend reinforced elastomeric sheeting over outside face of cant and extend minimum 25 mm below blocking. Mechanically fasten with 38 mm common roofing nails, 200 mm OC.
  .2 Extend reinforced elastomeric sheeting down over cant strip and embed in flashing adhesive from top of cant to at least 150 mm beyond toe of cant onto roof.
  .3 Ensure complete bond and continuity without wrinkles or voids. Lap sheeting ends 100 mm and adhere with flashing adhesive.

.8 Canted Eave With Fascia
  .1 Extend reinforced elastomeric sheeting over outside face of cant and fascia and secure to underside of fascia. Mechanically fasten with 38 mm common roofing nails, 200 mm OC.
  .2 Extend reinforced elastomeric sheeting down over cant strip and embed in flashing adhesive onto roof surface a minimum of 150 mm.
  .3 Ensure complete bond and continuity without wrinkles or voids. Lap sheeting ends 100 mm and adhere with flashing adhesive.

.9 Low Parapet Wall Flashing
  .1 Seal exposed joint between the wall and roof deck for airtight seal.
  .2 Adhere elastomeric sheeting completely to flashing surface, cant, and roofing with flashing adhesive.
  .3 Ensure complete bond and continuity without wrinkles or voids. Lap sheeting ends 100 mm and adhere with flashing adhesive.
  .4 Extend elastomeric sheeting up and over parapet at least 38 mm and face nail with 38 mm common roofing nails, 200 mm OC.

.10 Flashing At Scuppers
  .1 Fabricate and install new one-piece scupper with downspouts.
  .2 Prior to setting and nailing horizontal flanges of gutter, uniformly trowel a 1.5 mm thick layer of cold flashing adhesive to roofing surface designated to receive metal flange.
  .3 Nail flange to wood blocking 75 mm OC, staggered.

.4 Prime metal flange with asphaltic primer.
.5 Adhere sufficiently wide strip of elastomeric sheeting completely to flashing surface with flashing adhesive. Ensure complete bond and continuity without wrinkles or voids lap sheeting ends 100 mm and adhere with flashing adhesive. Elastomeric sheeting to cover gravel stop completely and overlap onto adjacent roof a minimum of 150 mm.

.11 Wall Flashing
.1 Seal exposed joint between the wall and roof deck for airtight seal.
.2 Adhere elastomeric sheeting completely to flashing surface, cant and roofing with flashing adhesive.
.3 Ensure complete bond and continuity without wrinkles or voids. Lap sheeting ends 100 mm and adhere with flashing adhesive.
.4 Elastomeric sheeting width: sufficient to extend at least 150 mm beyond toe of cant onto roof surface and 200 mm above the roof surface.
.5 Secure top of elastomeric sheeting to vertical plane with termination bar.
.6 Mechanically fasten 300 mm OC. Overcoat bar with end lap stripping adhesive and membrane.

.12 Building Expansion Joints
.1 Fill joint with loose insulation.
.2 Provide 19 mm thick plywood to top of wood blocking, secured one side only.
.3 Apply foam rubber or 25 mm thick mineral fibre insulation to top of plywood.
.4 Install elastomeric sheeting centred over expansion joint.
.5 Fully adhere sheeting to horizontal and vertical blocking surfaces with flashing adhesive. Press sheeting into adhesive. Ensure complete bond and continuity without wrinkles or voids.
.6 Elastomeric Sheeting Width: Sufficient to extend onto adjacent roofing minimum 150 mm.
.7 Lap sheeting ends 100 mm and adhere with flashing adhesive.

.13 Expansion Joint at Wall
.1 Extend vapour retarder from deck level up wall sufficiently and secure to wall.
.2 Fill joint with loose insulation.
.3 Install blocking, sheathing and compressible insulation.
.4 Adhere elastomeric sheeting completely to flashing surface, cant and roofing with flashing adhesive.
.5 Ensure complete bond and continuity without wrinkles or voids. Lap sheeting ends 100 mm and adhere with flashing adhesive.
.6 Elastomeric Sheeting Width: sufficient to extend at least 150 mm beyond toe of cant onto roof surface and 200 mm above the roof surface.
.7 Secure top of elastomeric sheeting to vertical plane with a termination bar.
.8 Mechanically fasten 300 mm OC. Overcoat bar with end lap stripping adhesive and membrane.

.14 Area Divider
.1 Install elastomeric sheeting centered over area divider extending onto roof membrane a minimum of 150 mm beyond toe of cant on either side.

.2 Fully adhere sheeting with flashing adhesive. Press sheeting into adhesive.
.3 Ensure complete bond and continuity without wrinkles or voids.
.4 Lap sheeting ends 100 mm and adhere with flashing adhesive.

.15 Control Joint
.1 Install elastomeric sheeting centered over joint.
.2 Fully adhere sheeting to horizontal and vertical blocking surfaces with flashing adhesive. Press sheeting into adhesive. Ensure complete bond and continuity without wrinkles or voids.
.3 Flashing Width: Sufficient to extend onto adjacent roofing minimum 150 mm.
.4 Lap sheeting ends 100 mm and adhere with flashing adhesive.

.16 Curb Flashing
.1 Fully adhere sheeting to horizontal and vertical blocking surfaces with flashing adhesive. Press sheeting into adhesive. Ensure complete bond and continuity without wrinkles or voids.
.2 Elastomeric Sheeting Width: Sufficient to extend from top of curb down onto adjacent roofing minimum 150 mm. Mechanically fasten sheeting on top face of curb.
.3 Lap sheeting ends 100 mm and adhere with flashing adhesive.
.4 If membrane does not completely cover sleeper, secure top edge with a termination bar. Mechanically fasten 300 mm OC. Overcoat bar with end lap stripping adhesive and membrane.

.17 Projection Flashing
.1 Apply flashing adhesive to prepared area and Provide aluminum base over pipe and set into the flashing adhesive.
.2 Select proper step of rubber cap and cut off above index ring.
.3 Install cap onto base collar and press edge to ensure proper seal.
.4 Provide clamp around pipe and rubber cap. Prime flange.
.5 Install elastomeric sheeting with stripping ply adhesive and membrane.
.6 Cover flange completely. Extend flashing minimum 100 mm onto adjacent roofing. Remove wrinkles and voids. Lap flashing ply ends 100 mm.

.18 Pitch Pans
.1 Uniformly apply a 3 mm thick layer of flashing adhesive to surfaces designated to receive metal flange.
.2 Install pre-manufactured pitch pan into adhesive. Prime flange prior to installation.
.3 Ensure minimum 50 mm clearance between projection and side wall.
.4 Fully adhere elastomeric sheeting to flashing surface with flashing adhesive. Cover flange completely. Extend flashing at least 100 mm onto adjacent roofing. Ensure complete bond and continuity without wrinkles and voids. Lap sheeting ends minimum 100 mm.
.5 Fill pitch pan 25 mm from top with pitch pan base filler.
.6 Fill remainder with rubberized elastomer mastic. Crown top of mastic to ensure water run-off.

.19 Roof Drain
.1 Install drain assembly in accordance with manufacturer's written installation guidelines.

.2 Plug and seal drain to prevent water entry until service connection is completed.
.3 Provide 600 x 600 mm size elastomeric sheeting reinforcement, centered over drain; and fully adhered with flashing adhesive. Remove wrinkles and entrapped air.
.4 Apply mastic to exposed edge of membrane inside the drain opening.
.5 Reclamp flashing collar to drain in bed of flashing adhesive.
.6 Trim excess sheeting within drain.

.20 Roof Drain Insert
.1 Cut 225 mm OD opening through membrane and insulation; coinciding with existing drain opening.
.2 Install roof drain insert into existing drain pipe in accordance with drain insert manufacturer's written installation guidelines.
.3 Adhere drain flange to membrane with flashing adhesive.
.4 Provide 900 x 900 mm size elastomeric sheeting reinforcement, centered over drain; and fully adhere sheeting with flashing adhesive. Remove wrinkles and entrapped air.
.5 Trim excess sheeting within drain.
.6 Seal leading edge of sheet with reinforcing membrane embedded between alternate continuous courses of flashing adhesive.

3.10. SHEET METAL FLASHINGS

.1 Install all sheet metal caps, counter flashings, metal siding and all other roof related metal flashings as required to complete roof installation.
.2 Form profiles as required to suit site conditions.
.3 Sheet metal flashing work shall be carried out in accordance with the best standard practices; with joints locked, cleated, caulked as required and exposed edges hemmed.
.4 Mitered corners shall be straight and true with flat surfaces free of distortion and free of face nailing.
.5 Install sheet metal work per CRCA standards and as specified on detail drawings.
.6 Provide underlay beneath all sheet metal flashings except where membrane flashings have been installed.
.7 Provide continuous starter strips where indicated or required. Fasten starter strips a minimum of 300 mm on center to substrate.
.8 Secure sections of metal in "S- lock" joints, and allow for sufficient expansion and contraction between each piece.
.9 Provide continuous termination bar along top of membrane flashing where such flashings terminate at the base of a wall. Fasten termination bar 300 mm on center to substrate.
.10 Secure metal counter flashing a minimum of 300 mm above roof membrane. Use fasteners of sufficient length to penetrate at least 25 mm into substrate.
.11 Reglets that are not of sufficient height are not to be reused. New reglets are to be cut at a suitable height and are to be a minimum of 13 mm wide and 19 mm deep.
.12 Fabricate scuppers from copper in accordance with CRCA standard flashing detail.

3.11. SEALANTS

.1 Install caulking in accordance with manufacturers latest recommendations.
.2 Provide polyethylene backer rod for reglets greater than 13 mm wide and 19 mm deep, prior to installing caulking compound.
.3 Tool finish to the satisfaction of the Owners.

3.12. SURFACING

.1 Flood coat roof surface with cold-process asphalt adhesive, applied at a rate of 2.4 L/m2.
.2 Immediately broadcast aggregate ballast into cold-adhesive at a rate of 20 kg/m2, covering flood coat completely.
.3 Do not use power buggies or heavy equipment to distribute ballast.
.4 Rake out aggregate to a neat, even surface.

3.13. FIELD QUALITY CONTROL

.1 Contractor Inspection: Prior to application of aggregate surfacing, inspect completed membrane and flashing for punctures, tears, and discontinuously sealed seams.
.2 Apply additional layer of membrane over punctures and tears, extending minimum 50 mm beyond damaged area in all directions, and seal seams.
.3 Manufacturer's Field Service: Arrange for manufacturer's technical representative to regularly inspect the roofing application and confirm that the roofing system installation is in strict accordance with manufacturer's recommendations.

3.14. CLEANING

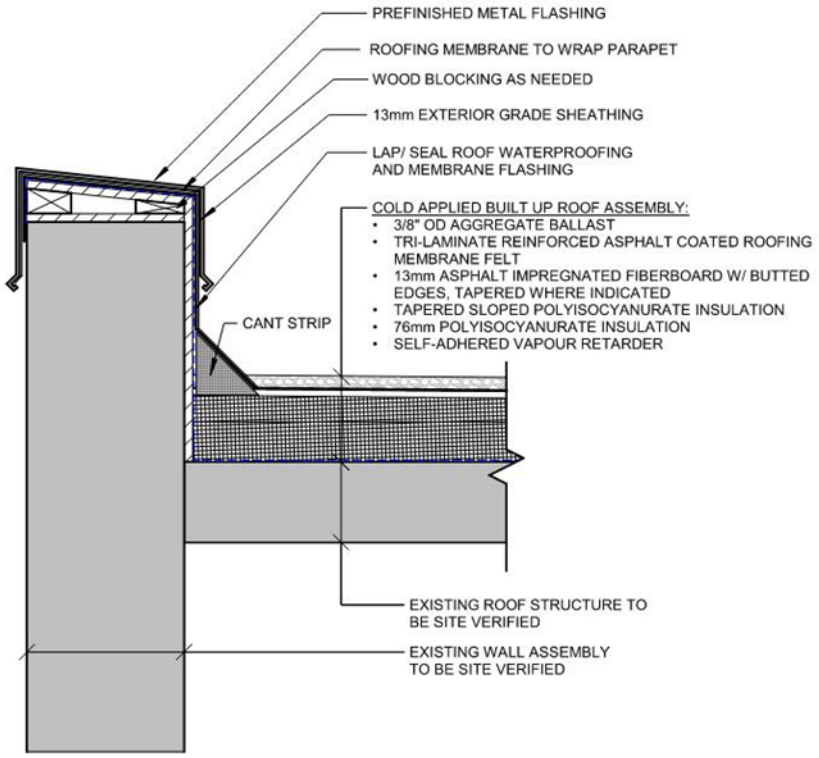
.1 Clean drains, gutters and downspouts of debris, ensuring free drainage.
.2 Clean adjacent roof surfaces, levels and ground level areas of debris and excess Products.

3.15. PROTECTION

.1 Adequately protect products and work from damage by weather, traffic and other causes.
.2 At the end of each Working Day, seal exposed edges of roofing membrane to be watertight.
.3 Protect adjacent Work from damage. Repair damage.

END OF SECTION

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1 SECTION DETAIL - COLD APPLIED PARAPET DETAIL
1 : 10

NOTE: DETAILS MAY VARY BASED ON EXISTING CONDITIONS

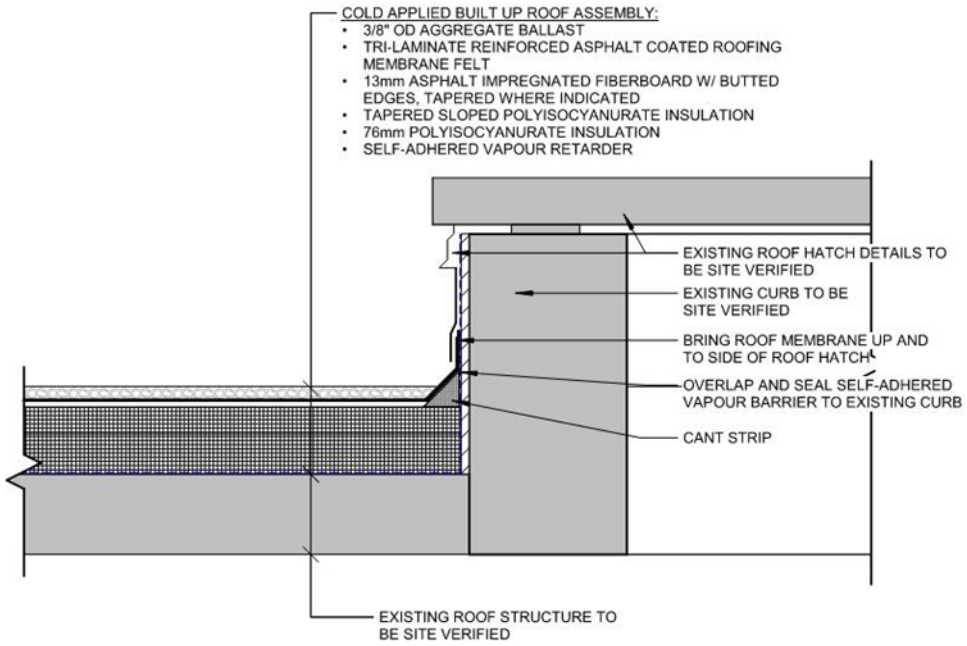
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WRDSB ROOF REPLACEMENT

COLD APPLIED BUILT UP ROOF SYSTEM - PARAPET DETAIL

Project No:	26017
Date:	12/05/25
Drawn By:	AMJ
Plot Date / Time:	2025-12-11 3:56:52 PM
Drawing Scale:	1 : 10
Status:	
Revision No.:	
Drawing No.:	SKA-03a

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1 SECTION DETAIL - COLD APPLIED CURB DETAIL
1 : 10

NOTE: DETAILS MAY VARY BASED ON EXISTING CONDITIONS

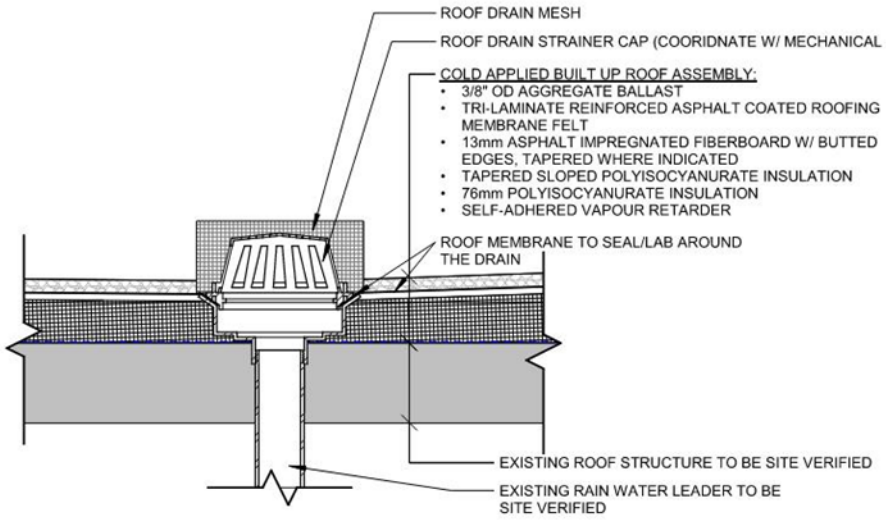
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WRDSB ROOF REPLACEMENT

COLD APPLIED BUILT UP ROOF SYSTEM - CURB DETAIL

Project No: 26017	Drawing Scale: 1 : 10
Date: 12/05/25	Status:
Drawn By: AMJ	Revision No.:
Plot Date / Time: 2025-12-11 3:56:52 PM	Drawing No.: SKA-03b

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1 SECTION DETAIL - COLD APPLIED ROOF DRAIN DETAIL
1 : 10

NOTE: DETAILS MAY VARY BASED ON EXISTING CONDITIONS

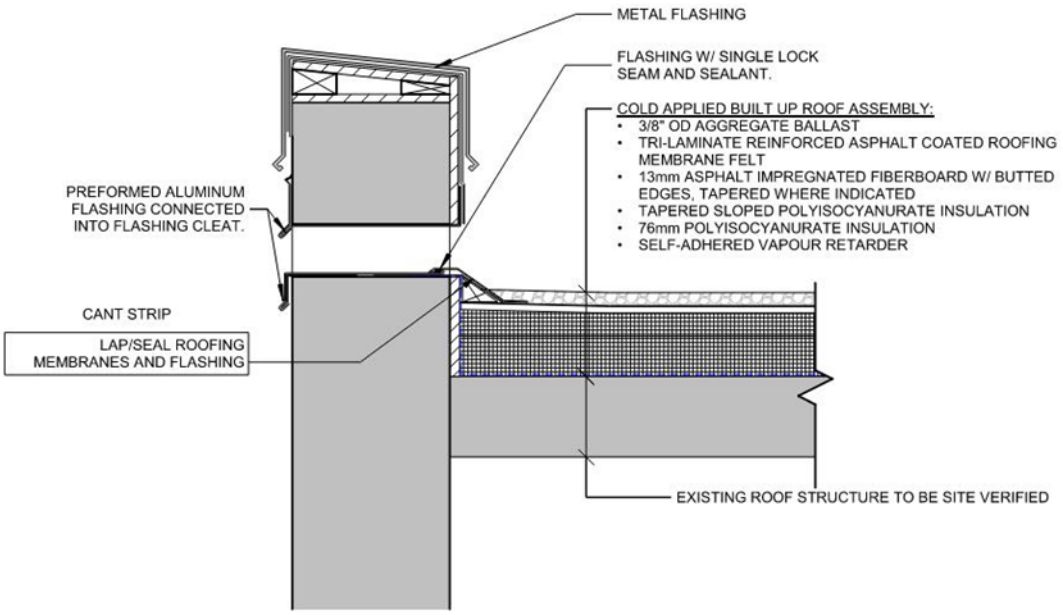
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WRDSB ROOF REPLACEMENT

COLD APPLIED BUILT UP ROOF SYSTEM - ROOF DRAIN DETAIL

Project No: 26017	Drawing Scale: 1 : 10
Date: 12/05/25	Status:
Drawn By: AMJ	Revision No.:
Plot Date / Time: 2025-12-11 3:56:52 PM	Drawing No.: SKA-03c

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1 SECTION DETAIL - COLD APPLIED SCUPPER DETAIL
1 : 10

NOTE: DETAILS MAY VARY BASED ON EXISTING CONDITIONS

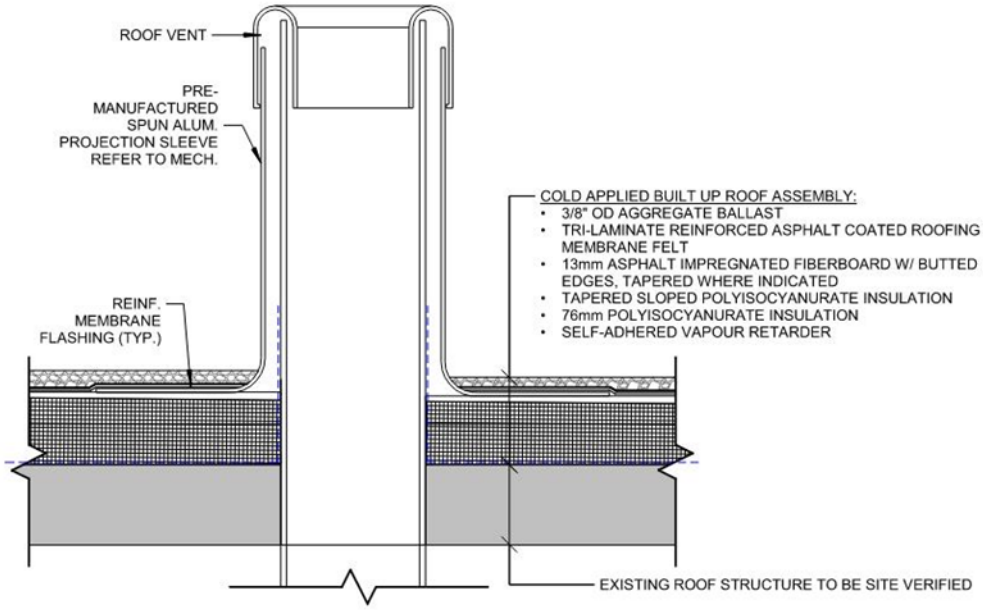
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WRDSB ROOF REPLACEMENT

COLD APPLIED BUILT UP ROOF SYSTEM - SCUPPER DETAIL

Project No: 26017	Drawing Scale: 1 : 10
Date: 12/05/25	Status:
Drawn By: AMJ	Revision No.:
Plot Date / Time: 2025-12-11 3:56:52 PM	Drawing No.: SKA-03d

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1 SECTION DETAIL - COLD APPLIED ROOF VENT DETAIL
1 : 10

NOTE: DETAILS MAY VARY BASED ON EXISTING CONDITIONS

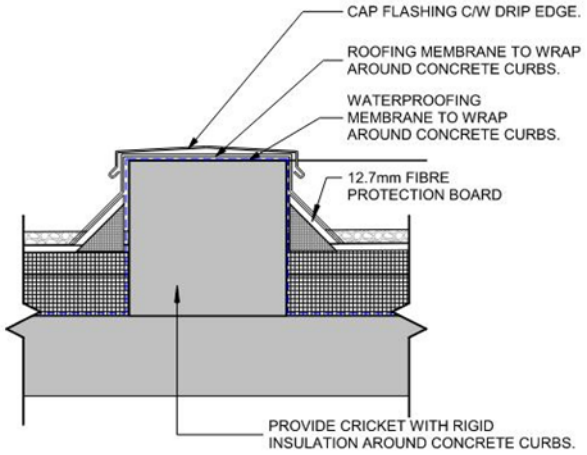
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WRDSB ROOF REPLACEMENT

COLD APPLIED BUILT UP ROOF SYSTEM - ROOF VENT DETAIL

Project No:	26017
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1 SECTION DETAIL - EQUIPMENT CURB DETAIL
1 : 10

NOTE: DETAILS MAY VARY BASED ON EXISTING CONDITIONS

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COLD APPLIED BUILT UP ROOF SYSTEM - EQUIPMENT CURB DETAIL

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PART 1 - GENERAL

1.1 SECTION INCLUDED

.1 Metal flashings, reglets and flashing receivers.
.2 Metal copings.
.3 Metal coverings and associated flashing at mechanical dog houses and exhaust penthouse roof penetrations.

1.2 RELATED SECTIONS

1.	General Requirements.	Division 01
2.	Masonry Procedures	Section 04 05 00
3.	Rough Carpentry	Section 06 10 00
4.	Cold Applied Built-up Roofing	Section 07 51 13.13

1.3 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

.1 Metal flashing receivers and recessed reglets supplied to Section 04 05 00 – Masonry Procedures.

1.4 REFERENCES

1.	AAMA-611-98	Voluntary Specification for Anodized Architectural Aluminum.
2.	ASTM-A653/A653M-11	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3.	ASTM-A924/A924M-10a	Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
4.	ASTM-B32-96	Standard Specification for Solder Metal.
5.	ASTM-D523-89 (1994)e1	Standard Test Method for Specular Gloss.
6.	ASTM-D822-96	Standard Practice for Conducting Tests on Paint and Related Coatings and Materials Using Filtered Open-Flame Carbon-arc Exposure Apparatus.
7.	CAN/CGSB-37.5-M89	Cutback Asphalt Plastic Cement.
8.	CAN/CGSB-51.32-M77	Sheathing, Membrane, Breather Type.
9.	Canadian Roofing Contractors Association (CRCA), Roofing Specifications Manual, 2011.	
10.	CSA-A123.3-M1979	Asphalt or Tar Saturated Roofing Felt.
11.	CSA-Blll-1974	Wire Nails, Spikes and Staples.
12.	SMACNA Architectural Sheet Metal Manual, Fifth Edition, 1993	

1.5 SUBMITTALS AND SHOP DRAWINGS

.1 Submit Shop Drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit 100mm by 100mm samples of each type of sheet metal material, colour and finish. Verification Samples: 300 mm long sample, indicating design method of locking and method of anchoring and corner section fabricated from materials specified.

.3 Shop Drawings: Project-specific drawings, illustrating:
- .1 Fascia, trim and closure pieces;
- .2 Anchorage devices;
- .3 Connection and jointing details;
- .4 Dimensions and thicknesses;
- .5 Finishes, and
- .6 Other pertinent data.

.4 Submit Product data as specified in Section 01 33 00.

.5 Product Data: Manufacturer's standard data sheets for manufactured items, indicating catalogue numbers, Products' names and manufacturers' names; and including finish specifications and other pertinent data.

1.6 MOCK-UPS

.1 Mock-Ups: Full-width, 1 220 mm long, mock-up panels for each type of sheet metal flashing, demonstrating interfaces with adjacent construction; profiles, textures, and colours; edge seaming and sealing techniques; and methods of attachment.

.2 Accepted mock-ups will be used as the standard for acceptance of the Work.

.3 Remove and replace installed Product that does not conform to accepted mock-up.

.4 Remove mock-ups from Place of the Work upon Substantial Performance of the Work.

1.7 QUALIFICATIONS

.1 Installer: A firm specializing in fabricating and installing sheet metal flashing and trim in accordance with SMACNA standard practices and details.

1.8 WARRANTY

.1 Provide a warranty for metal flashing work in accordance with the Contract Requirements, but for a period of five (5) years.

.2 Extended Warranty: For a period of 5 years, protecting against leakage, joint spalling and similar defects.

.4 The warranty shall cover materials, installation and workmanship.

.5 Warranties shall be issued to the Owner within two (2) Working Days following the date of Substantial Performance of the Work.

PART 2 – PRODUCTS

2.1 MEMBRANE UNDERLAYMENT

.1 Manufacturers of membrane underlayment having Product considered acceptable for use:
- .1 Grace.
- .2 Henry Company Canada.
- .3 Soprema Inc.

2.2 PREFINISHED SHEET METAL MATERIAL

.1 Prefinished steel sheet with factory applied 2-coat silicon modified polyester finish system, Perspectra Series on exposed surfaces.
- .1 Zinc coated steel sheet: commercial quality to ASTM-A653/A653M, with 2275 designation zinc coating to ASTM-A924/A924M.
- .2 Class: F2S.
- .3 Specular gloss: 30 units+/- 5 degrees in accordance with ASTM-D523.
- .4 Coating thickness: not less than 25 micrometers.
- .5 Resistance to accelerated weathering for chalk rating of 8, colour fade 7 units or less and erosion rate less than 20% to ASTM-D822 as follows:
  - .1 Outdoor exposure period 1000 hours.
  - .2 Humidity resistance exposure period 1000 hours.
- .6 Unexposed or reverse side shall have a clear wash coat finish.
- .7 Manufacturers:
  - .1 Stelco Steel.
  - .2 Dofasco Inc.

.2 Prefinished aluminum, supplied by Section 07 42 10 - Composite Aluminum Panels for forming and installation by this section.

2.3 PREFABRICATED FLASHING

.1 Stack Jack Flashing: pre-insulated aluminum flashing sleeve with integral flange coated with bituminous paint, aluminum hood and perforated collar, and EPDM base seal. Thaler Metal Industries: Model SJ-31 Vandal Proof Stack Jack Flashing.

.2 Flexible Conduit Flashing: liquid-tight, gooseneck shaped aluminum flashing pipe sleeve with integral flange coated with bituminous paint, and EPDM end cap and base seals. Thaler Metal Industries: Model MEF-2A liquid Tight Flexible Conduit Flashing.

.3 Rigid Conduit Flashing: aluminum flashing sleeve with integral flange coated with bituminous paint, EPDM base seal, removable cap, and EPDM grommet seal. Thaler Metal Industries: Model MEF-1 Rigid Conduit Flashing.

.4 Square Post Flashing: split stainless steel flashing sleeve with integral flange coated with bituminous paint, contoured vented cap filled with EPDM pressure grommet seal, and continuous EPDM seals at split junctures of sleeve and flange. Thaler Metal Industries: Model SP J-4 Square Split Flashing (Vented Cap).

.5 Mechanical Doghouse and Exhaust Gooseneck Roof Penetrations of Aluminum Sheet Panels and Flashing: pre-insulated aluminum sheet and associated flashing.

.6 Pre-Insulated Stack Jack Flashings: 1.6 mm thick seamless, spun aluminum; 457 mm overall height with 356 mm high insulated sleeve; diameters to suit applications; complete with premoulded urethane insulation on inner side of sleeve and 102 mm widebituminous painted deck flange; with removable 1.29 mm thick aluminum hood and perforated collar; eg. Model SJ-31 Vandal Proof Stack Jack Flashing by Thaler Roofing Specialties Products Inc.

.7 Flashing for Flexible Conduit: Goose neck shaped aluminum flashing pipe sleeve; 305 mm high, diameters to suit application; complete with 102 mm wide bituminous painted deck flange; Model MEF-2A/2A1/2A2 Liquid Tight Flexible Conduit Flashing by Thaler Roofing Specialties Products Inc.

.8 Flashing for "B" Vent Pipes with Split Collars: 1.6 mm thick seamless spun aluminum sleeve flashing with sloping sides to allow for air movement, 305 mm high, diameters to suit; complete with 50 mm wide perforated aluminum vent holes at top of sleeve for air circulation, 102 mm wide bituminous painted deck flange, and a 1.6 mm thick split aluminum collar, eg. Model MEF-4A "B" Vent Flashings by Thaler Roofing Specialties Products Inc.

.9 Mastic Pans: 1.29 mm thick, prefabricated, spun aluminum mastic pans having seamless construction, minimum 200 mm high with 100 mm wide bituminous paint primed flange.

.10 Through Wall Scuppers: 1.6 mm thick prefinished aluminum sheet, factory welded construction; prefabricated to custom sizes as indicated on Drawings; eg. Through Wall Scupper by W. P. Hickman Company.

2.4 ACCESSORIES

.1 Isolation Coating: alkali resistant bituminous paint.

.2 Plastic Cement: to CAN/CGSB-37.5.

.3 Underlay for Metal Flashing: dry sheathing to CAN/CGSB-51.32 or No. 15 perforated asphalt felt to CSA-A123.3.

.4 Sealants: Refer to Section 07 92 00 – Sealants.

.5 Cleats and Starter Strips: of same material, and temper as sheet metal, minimum 50mm wide. Thickness 1.0mm.

.6 Fasteners: of same material as sheet metal, to CSA-8111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.

.7 Washers: of same material as sheet metal, 1mm thick with rubber packings.

.8 Touch-up Paint: as recommended by prefinished material manufacturer.

2.5 FABRICATION

.1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details and as indicated.

.2 Form pieces in 2400mm maximum lengths. Use lock type joints between sections. Make allowance for expansion at joints.

.3 Hem exposed edges on underside 12mm. Miter and seal corners with sealant.

.4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

.6 Shop fabricate flashing components as much as possible to minimize site operations.

.7 Fabricate Products to SMACNA Architectural Sheet Metal Manual.

.8 Form sheet metal on bending brake.

.9 Perform shaping, trimming and hand seaming on bench, where practicable, using proper sheet metal working tools.

.10 Fabricate material in clean shops, located away from areas where carbon steel is torch cut, ground, or cut with abrasive wheels to ensure carbon steel dust will not be embedded in prefinished surfaces.

.11 Clean tools and dies which have been used on carbon steel prior to fabrication to prevent contamination of surface with carbon steel dust.

.12 Form sections square, true and accurate to size. Flashings shall be free from distortion, waves, twists, buckles or other defects detrimental to appearance and performance.

.13 Allow for thermal movement when forming, installing, interlocking and soldering sheet metal components to avoid buckling, fullness of metal straining of joints or seams.

.14 Limit maximum length of flashing pieces to 2 400 mm.

.15 Double back exposed edges at least 12 mm for appearance and stiffness.

.16 Fabricate flashings, copings, closures, plastic boxes, pipe sleeves and flashings for roof mounted equipment to details shown, unless otherwise indicated.

.17 Wipe and wash clean soldered joints immediately after joint is soldered to remove acid.

.18 Where soldered joints are absolutely necessary and where approved for use in prefinished metal, clean paint off both surfaces before soldering for minimum area necessary.

2.6 FINISHES

.1 Shop Priming:
- .1 Clean surfaces of rust, scale, grease, and foreign matter prior to shop priming.
- .2 Do not prime surfaces designated to come into direct contact with concrete, or where field welding is required.
- .3 Prime components with a minimum of two coats.

.2 Galvanized Coating on Sheet Steel: To ASTM A653/A653M, Z275 hot dipped zinc alloy coating.

.3 Monochromatic Paint Coating on Sheet Steel: To ASTM A755/A755M; two-coat silicone modified polyester coil coating, factory-applied to 0.028 mm dry film thickness; eg. WeatherXL by Valspar, colour as selected by Consultant.

.4 Faux-Woodgrain Paint Coating on Sheet Steel: To ASTM A755/A755M; thermoplastic fluoropolymer PVDF coil coating, factory-applied to 0.028 mm dry film thickness; complete with a simulated wood grain texture; eg. Expressence by Vicwest Steel Inc., , colour as selected by Consultant.

2.7 METAL FLASHINGS

.1 Form flashings, and flashing receivers to profiles indicated of 0.5mm thick prefinished galvanized steel sheet. Colour: to be selected by the Consultant.

.2 Form copings and fascias to profiles indicated of 0.7mm thick prefinished galvanized steel sheet and 1.0mm thick prefinished aluminum.
- .1 Prefinished Metal Flashing Colour: to be confirmed by Consultant.

2.8 REGLETS AND CAP FLASHINGS

.1 Form recessed and surface mounted reglets and metal cap flashing of 0.5mm thick galvanized steel sheet metal to be built-into masonry work for base flashings as detailed.

.2 Provide slotted fixing holes and steel/plastic washer fasteners.

.3 Colour: To be selected by the Consultant.

PART 3 – EXECUTION

3.1 PREPARATION

.1 Prime substrates designated to receive self-adhered membrane underlayment.

.2 Secure membrane underlayment in place and lap joints 100 mm.

3.2 INSTALLATION

.1 Install sheet metal work in accordance with CRCA FL series details, SMACNA Architectural Sheet Metal Manual, and as detailed.

.2 Use concealed fastenings except where approved before installation.

.3 Provide underlay under sheet metal. Secure in place and lap joints 100mm.

.4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock seams forming tight fit over hook strips.

.5 Lock end joints and caulk with sealant.

.6 Install surface mounted reglets true and level, and caulk top of reglet with sealant.

.7 Insert metal flashing under cap flashing to form weathertight junction.

.8 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25mm. Lead wedge flashing securely into joint.

.9 Caulk flashing at reglet with sealant.

.10 Supply metal flashing receivers and recessed reglets to Section 04 05 00 – Masonry Procedures for building into masonry walls.

.11 Provide flashings required for proper execution and completion of the Work in an acceptable manner, including metal flashing around mechanical and other equipment occurring on roof.

.12 Install sheet metal flashings with joints lapped, locked, cleated with S-cleats and sealed, or soldered, as required.

.13 Hem exposed edges 12 mm.

.14 Type of joints used shall be adequate for various conditions, subject to approval.

.15 Fabricate exposed fastening in such a manner to prevent water penetration at point of fastening.

.16 Provide starter strips where indicated or required to present true, non-waving, leading edge. Anchor to back-up to provide rigid, secure installation.

.17 Make end joints where adjacent lengths of metal flashing meet using 300 mm long back-up flashing secured in place before installing flashing.

.18 Apply beads of sealant on face of back-up plate to seal ends of metal flashing.

.19 Leave 12 mm wide space between end of adjacent lengths of metal flashings.

.20 Fabricate back-up of same material and finish as metal flashing with which it is being used. Make back-up plate exact profile of flashing allowing for thickness of flashing joints.

.21 Form metal fascia with inner edge extended over fascia top and down cant to meet roofing aggregate. Nail with roofing nails and neoprene washers at 300 mm OC. Avoid placing nails in face of fascia, through membrane or flashing.

.22 Interlock counter flashing pieces with prefinished metal base flashing and fold locking seam into position ensuring complete sealing. Continue counter flashing down to hemmed and sprung position at base of cant and junction of aggregate.

3.3 ADJUSTING

.1 Imperfections in sheet metal work (such as holes, dents, creases or oil-canning) will be rejected.

.2 Make Good damaged sheet metal work.

.3 Wash entire installation down and leave in neat condition.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDED

.1 Firestopping of Penetrations in Rated Assemblies.

.2 Fire Resistive Joint Systems.

.3 Perimeter Fire Containment Systems.

.4 Firestopping of Penetrations in Fire Blocking Compartments.

.5 Smoke Seals

.6 It is the intent of this section of the specifications to establish a single, competent source to be responsible for providing all labour, materials, products, equipment and services, to supply and install firestopping and smoke seals for the area of work, including at the following locations:

- .1 Openings in fire rated walls, floors and roofs both empty and those containing penetrations.
- .2 Gaps between fire rated floor slabs and exterior curtain walls.
- .3 Gaps between fire rated walls and exterior curtain walls.
- .4 Gaps located within expansion joints.
- .5 Openings at each floor level in fire rated shafts or stairwells.
- .6 Gaps between the tops of fire rated walls and underside of fire rated floor or roof assemblies.
- .7 Penetrations through construction enclosing compartmentalized concealed areas (fire blocks), involving both empty openings and openings containing penetrating items.
- .8 Penetrations through smoke barriers.

.7 Note: It is not the intention of this section to delete firestopping work fully specified in the mechanical and electrical specifications. Coordinate with all mechanical and electrical sections to ensure the complete firestopping of the area of work. All firestopping not specifically called for in the mechanical and electrical specifications is to be included under this section.

1.2 RELATED WORK

.1 Fire blocking of concealed spaces:

- .1 Fire separation of concealed spaces shall be provided under applicable specification sections, and as indicated on drawings.

.2 Non-Rated Openings through Floors and Walls:

- .1 Non-rated openings through floors and walls shall be sealed under applicable architectural, mechanical, and electrical specification sections.

.3 Metal sleeves for fire rated openings through floors and walls shall be provided under applicable mechanical and electrical specification sections.

.4 Firestopping and smoke seals within mechanical (i.e. inside ducts, dampers) and electrical assemblies shall be sealed under applicable mechanical and electrical specifications sections and only in accordance with the equipment or device manufacturers' installation instructions.

1.3 RELATED SECTIONS

.1	Concrete Unit Masonry	Section 04 22 00
.2	Sealants	Section 07 92 00
.3	Gypsum Board	Section 09 29 00
.4	Mechanical work requiring firestopping	Division 20, 22
.5	Electrical work requiring firestopping	Division 26, 27, 28

1.4 REFERENCE STANDARDS/DOCUMENTS

.1	ASTM E814	Test Method of Fire tests of Through Penetration Firestops
.2	ASTM E 2174	Standard Practice for On-Site Inspection of Installed Fire Stops
.3	ASTM E 2393	Standard Practice for On-Site Inspection of Installed Fire Stop Joint System.
.4	ASTM E 2307	Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus (ISMA)
.5	ASTM C 920	Standard Specification for Elastomeric Joint Sealants systems

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

.1	UL	Fire Resistance Directory
.2	UL 263	Fire Tests of Building Construction and Materials
.3	ANSI/UL 1479	Fire Tests Of Through-Penetration Firestops
.4	ANSI/UL 2079:	Standard for Tests for Fire Resistance of Building Joint Systems

.2 Underwriters Laboratories, Inc. (UL):

.1	ULC	List of Equipment and Materials, Firestop Systems and Components
.2	CAN/ULC-S101	Standard Methods of Fire Endurance Tests of Building Construction and Materials
.3	CAN/ULC-S115	Standard Method of Fire Tests of Firestop Systems

.3 Underwriters Laboratories of Canada (ULC):

.4 Intertek: WH Mark Product Directory

.5 Factory Mutual Approval Guide

1.5 PERFORMANCE REQUIREMENTS

.1 Provide firestopping systems of sufficient thickness, width and density to provide and maintain a fire resistance rating, as indicated on drawings and in accordance with ULC, cUL or WH design numbers.

.2 Provide a seal completely filling all annular spaces to prevent the passage of flame, smoke and gases through the opening in the fire separation in which it is installed.

.3 Provide materials which are compatible with all materials used in the system including materials used in or on penetrating items as well as all construction materials used in conjunction or contiguous with the system.

.4 Accessories:

.1 Provide components for each firestopping system that are needed to install fill materials.
.2 Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire resistance rated systems.
.3 Accessories include but are not limited to the following items:

.1 Permanent forming/damming/backing materials temporary forming materials
.2 substrate primers
.3 collars
.4 steel sleeves

.5 Provide products that upon curing, do not re-emulsify, dissolve, leach, and breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.

.6 Provide firestop sealants sufficiently flexible to accommodate motion such as pipe vibration, water hammer, thermal expansion and other normal building movement without damage to the seal.

.7 Pipe insulation shall not be removed, cut away or otherwise interrupted through wall or floor openings. Provide products appropriately tested for the thickness and type of insulation utilized.

.8 Openings within walls and floors designed to accommodate voice, data and video cabling shall be provided with re-enterable products specifically designed for retrofit.

.9 Penetrations through fire-resistance rated floor-ceiling assemblies contained within chase wall assemblies shall be protected with products tested by being fully exposed to the fire outside of the chase wall.

.10 Provide fire-resistive joint sealants sufficiently flexible to accommodate movement such as thermal expansion and other normal building movement without damage to the seal.

.11 Provide fire-resistive joint sealants designed to accommodate a specific range of movement and tested for this purpose in accordance with a cyclic movement test criteria as outlined in Standard ANSI/ UL 2079.

.12 Provide through penetration firestop systems and fire-resistive joint systems subjected to an air leakage test conducted in accordance with Standards, ANSI/UL1479 and ANSI/ UL2079, respectively, with published L-Ratings for ambient and elevated temperatures as evidence of the ability of the through penetration firestop system or fire-resistive joint system to restrict the movement of smoke. Provide fire-resistive joint systems subjected to an air leakage test conducted in accordance with Standard, ANSI/ UL2079 with published L-Ratings for ambient and elevated temperatures as evidence of the ability of the fire-resistive joint system to restrict the movement of smoke.

1.6 SUBMITTALS

.1 Manufacturer's Data:

.1 Submit manufacturer's specifications, installation instructions and product data for each material required, in accordance with Section 01 33 23.
.2 Include ULC, cUL, or WH tested systems or designs, to show compliance with the Contract Documents.

.2 Shop Drawings: Submit shop drawings showing typical installation details, including reinforcement, anchorage, fastenings and method of installation for each type of firestopping condition.

.3 Samples: If requested, submit samples of each type of firestopping systems, smoke seals and accessories. Indicate location where material/system shall be utilized.

.4 Qualifications: Submit certificate indicating qualifications of installer.

1.7 QUALITY ASSURANCE

.1 Manufacturer: Manufacturer shall be one of the approved manufacturers listed below.

.2 Applicator: Company having a minimum of three (3) years' experience in the installation of materials specified herein, on projects comparable to this project, who is certified, licensed or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products in accordance with the specified requirements. Installer shall be certified by ULC, or other approved agency.

1.8 REGULATORY REQUIREMENTS

.1 Conform to the Ontario Building Code for fire resistance ratings.

.2 Provide materials, accessories and application procedures which have been listed by ULC, cUL, or tested by a nationally recognized independent testing agency in accordance with ASTM E814, ANSI/UL 1479, CAN4-S115 or ANSI/UL 2079 to achieve the required fire protection rating(s).

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Do not proceed with the installation of firestopping materials when temperatures or weather conditions exceed the manufacturer's recommended limitations for installation.

.2 Ventilate solvent based and moisture-cure firestopping per firestopping manufacturer's instructions by natural means or, where this is inadequate, by forced air circulation.

1.10 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to Site in manufacturer's sealed, undamaged containers, with labels intact. Labels shall identify product and manufacturer, date of manufacture; lot number; shelf life, qualified testing and inspection agency's classification marking, and mixing instructions for multi-component materials.

.2 Handle and store materials in accordance with manufacturer's instructions.

1.11 PROJECT/SITE CONDITIONS

.1 Comply with manufacturer's recommended requirements for temperature, relative humidity and substrate moisture content during application and curing of materials.
.2 Maintain minimum temperature before, during, and for minimum 3 days after installation of materials.
.3 Do not install firestopping products when substrates are wet due to rain, frost, condensation, or other causes.

1.12 SEQUENCING AND SCHEDULING

.1 Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

.2 Coordinate sizing of sleeves, openings, core-drilled holes or cut openings to accommodate through-penetration firestop systems.

.3 Do not install firestopping system until Work within opening has been completed. Coordinate with other applicable Sections.

.4 Schedule installation of safing materials in linear opening at curtain wall prior to construction that limits access to safing slot.

.5 Schedule work of other trades so that firestopping applications can be inspected prior to being covered by subsequent construction.

PART 2 – PRODUCTS

2.1 APPROVED MANUFACTURERS

.1 Provide firestopping silicone sealants, water-based sealants, intumescent sealant, mortars, or firestop devices from one of the following manufacturers:

.1 A/D Fire Protection Systems Inc.
.2 Tremco Fire Protection Systems Group
.3 Hilti (Canada) Corporation
.4 Nuco Inc., Self-Seal Firestops

2.2 MATERIALS

.1 Firestop systems:
- .1 Provide a complete system of asbestos-free firestop systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of CAN4-S115, ASTM E814, ANSI/UL 1479, or ANSI/UL 2079, and listed by ULC, cUL, or Warnock Hersey, and approved by jurisdictional authorities and the Consultant.
- .2 Comply with applicable Building Code requirements for locations and ratings.

.2 Materials specified below are as manufactured by A/D Fire Protection Systems Inc. Equivalent products manufactured by one of the approved manufacturers listed above are acceptable.

.3 Silicone Sealants:
- .1 Primerless, single component silicone sealant, curing to durable, flexible, silicone rubber; to ASTM C 920, Type S, Grade NS, class 25; A/D Fire barrier Silicone Sealant or equivalent.
- .2 For use in: openings with penetrating items subject to high movement; multiple penetration systems; for combustible pipes up to 2-in. diameter; in control joints; in curtain wall joints; expansion joints; floor/wall joints; wall/wall joints; head of wall joints; and as a sealant for smoke barrier construction.

.4 Pourable Sealant:
- .1 Single component, water based, elastomeric sealants, forming durable, flexible, watertight bonds; A/D Firebarrier Seal (pourable) and Seal NS (non-slumping) or equivalent.
- .2 Use non-slumping type for vertical applications.
- .3 Water based firestop sealants for use with: control joints; head of wall joints; floor/wall joints; wall/wall joints; multiple penetration systems; plumbing; mechanical; electrical; and where sprayed sealant application is required or desired.

.5 Intumescent Caulk:
- .1 Single component, water based, elastomeric sealant for use in interior building locations; A/D Firebarrier Intumescent Caulk or equivalent.
- .2 For general use as a firestop sealant with: insulated pipes; pipes; electrical cables and conduit; ducts.

.6 Mortar:
- .1 Non-combustible, fibre reinforced, foamed cement mortar; A/D Fire barrier Mortar or equivalent.
- .2 For use in: large openings; static non-moving penetrations such as cable trays; for multiple penetration systems; electrical and communication bundles; conduits; non-combustible sleeves; and insulated pipes.

.7 Collars:

.1 Steel collars with intumescent silicone strip, in diameters to suit pipe sizes; A/D Firebarrier Collar or equivalent.
.2 For use in openings with single combustible pipe penetrations greater than 50mm diameter; confirm maximum pipe diameter (for applicable tested assemblies) with manufacturer.

.8 Pillows:
.1 Self-supporting, sealed polyethylene bags containing intumescent materials and non-combustible insulation; A/D Firebarrier Pillows or equivalent.
.2 For use in openings with: cable tray; multiple cable penetrations; where retrofitting of penetrating items is anticipated; and as a temporary firestop system.

.9 Mineral Wool:
.1 Non-combustible, semi-rigid, preformed mineral wool strips and sheets; A/D Firebarrier Mineral Wool or equivalent.
.2 For use in tested firestop systems, as fire barrier and forming material.

.10 Additional Materials:
.1 All materials shall be by the manufacturer's listed above and shall be components of tested assemblies, acceptable to local authorities having jurisdiction, for the fire rating required.

.11 Fire Stopping:
.1 Asbestos-free materials and systems capable of maintaining an effective barrier against flame and heat in compliance with requirements of CAN4-S115 and not to exceed opening sizes for which they are intended.
.2 Acceptable Products:
.1 A/D Fire Protection Systems Inc.: A/D Firebarrier Mineral Wool Fire Stopping Insulation.
.2 Roxul Inc.: RXL Safe Fire Stop Batt.

.12 Smoke Seals: fire resistant material capable of maintaining an effective barrier against smoke and gases.
.1 Fire Rated Sealant - Type 1 (for joints in vertical surfaces): non-sagging, fire rated silicone listed for use in fire separations:
.3 Hilti (Canada) Corporation: CP 601S Elastomeric Firestop Sealant.
.4 3M Canada Inc.: Firebarrier 2000.
.5 Tremco Construction Products: TREMstop Fyre-Sil.
.2 Fire Rated Sealant - Type 2 (for head of wall applications): sprayable single component, water-based, acrylic fire stop sealant.
.6 Hilti (Canada) Corporation: CP672 Firestop Joint Spray.
.7 3M Canada Inc.: 3M FireDam Spray.
.8 Tremco Construction Products: TREMstop Acrylic SP.
.3 Fire Rated Sealant - Type 3 (for joints in horizontal surfaces): self-leveling, fire rated silicone, listed for use in fire separations.
.1 Hilti (Canada) Corporation: CP604 Self-leveling Firestop Sealant.
.2 3M Canada Inc.: Firebarrier 2003.
.3 Tremco Construction Products: TREMstop Fyre-Sil Self Leveling

2.3 ACCESSORIES

.1 Damming and backup materials, supports and anchoring devices: Non-combustible, to manufacturer's recommendations and in accordance with the tested system being installed, and as acceptable to local authorities having jurisdiction.

.2 Primers: As required by firestopping manufacturer and compatible with selected system and contiguous materials.

.3 Water: Potable.

.4 Tape: Pressure sensitive masking tape as recommended by the firestopping manufacturer.

.5 Fasteners: Provide suitable fasteners, for applicable substrates, for all collars and other field fastened firestopping components.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Examine substrates, openings, voids, adjoining construction and conditions under which the Work is to be installed. Confirm compatibility of surfaces scheduled to receive firestopping.

.2 Verify that penetrating elements are securely fixed and properly located with the proper space allowance between penetrations and surfaces of openings.

.3 Do not proceed with Work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Surfaces to receive firestopping shall be free of dirt, dust, grease, oil, rust, loose materials, form release agents, frost, moisture or any other matter which would impair the bond of firestopping material to the substrate of penetrating item(s).

.2 Prime substrates in accordance with manufacturer's written instructions or recommendations. Confine primers to areas of bond; do not allow spillage or migration onto exposed surfaces.

.3 Do not apply firestopping and smoke seals to surfaces previously painted or treated with sealers, curing compounds, water repellent or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure that anchoring devices, back-up materials, clips, sleeves, supports and other related materials used in the actual fire tests are provided.

.5 Mask where necessary to prevent firestopping materials from contacting adjoining surfaces that will remain exposed upon completion of Work. Remove tape as soon as it is possible to do so without disturbing firestopping seal with substrates.

.6 Installation is not to proceed until submittals have been reviewed and returned by the Consultant.

3.3 INSTALLATION

.1 Manufacturer's Instruction:

.1 Comply with ULC, cUL, or Warnock Hersey listings and manufacturer's instructions for the type of material and condition of opening in each case.
.2 Consult with the manufacturer's technical representative to determine proper procedure for conditions not fully covered by printed instructions.
.3 Record in writing any oral instructions received, with copy to manufacturer.

.2 Firestopping for vertical applications: Non-sag caulk or spray grade sealants, Mortar, Collars or Pillows.

.3 Firestopping for horizontal applications: Non-sag caulk or self-levelling or spray grade sealants, Mortar, Collars or Pillows.

.4 Firestopping for overhead applications: Non-sag caulk or spray grade sealants or Mortar.

.5 Install firestopping with sufficient pressure to properly fill and seal openings to ensure an effective smoke seal. Tool or trowel exposed surfaces. Remove excess firestopping material promptly as the Work progresses and upon completion.

.6 Damming: Provide leak-proof dams as required to seal openings and contain liquid sealants, putty or mortar until cured. Install damming in accordance with manufacturer's instructions.

.7 Damming Boards: Install forming/damming materials and other accessories of type required to support fill materials during their application and in the position needed to produce the shapes and depths required to achieve fire ratings of through-penetration firestop systems.

.1 Combustible Type: For temporary dams only. Remove after firestopping material has cured.
.2 Non-Combustible Type: For temporary or permanent dams. Provide non-combustible type wherever damming material cannot be removed after applying firestopping materials.

.8 Void Filler: Use materials recommended by the firestopping manufacturer to seal gaps created by non-combustible type damming boards and to seal around cables, conduits, pipes and where void filler material becomes part of the fire rated assembly.

.9 Sealant:

.1 Install damming material or mineral wool as required.
.2 Apply sealant so air voids are not present and sealant is in full contact with penetrating items. Tool sealant to ensure substrate contact.

.3 Remove excess sealant in accordance with manufacturer's recommendations.

.10 Mortar:

.1 Install damming material as required.
.2 Mix mortar in strict accordance with manufacturer's instructions.
.3 Pump, trowel or hand pack mortar through openings to minimum thickness as recommended by manufacturer and as listed by ULC, or cUL, to achieve required fire rating.

.11 Firestopping Mineral Wool:

.1 Install firestopping by compressing material to the minimum required by ULC, cUL, or WH listing.
.2 Apply firestopping in sufficient thickness, depth and density so as to achieve the required fire resistance rating.
.3 Use impaling clips to support and secure firestopping where required by tested system.

.12 Where joint application is exposed to the elements, fire-resistive joint sealant must be approved by manufacturer for use in exterior applications.

3.4 FIELD QUALITY CONTROL

.1 Notify Consultant when completed installations are ready for inspection prior to concealing or enclosing an area containing firestopping materials.

.2 Arrange for inspections by the Owners independent inspection and testing company, appointed and paid for by Owner.

.3 Following field inspections, provide all repair as required to ensure compliance with the Contract Documents.

.4 Keep areas of work accessible until inspection by authorities having jurisdiction

3.5 SCHEDULE

.1 Fire stop for full depth or thickness of the assembly or component being fire stopped.
.2 Apply smoke seal material to both sides of vertical assemblies required to have smoke seals. This applies to all fire separations, whether rated or unrated.
.3 Fire Stop and Smoke Seal At:
  .1 Penetrations through vertical fire separations of masonry, concrete, or gypsum board construction.
  .2 Edge of floor slabs at curtain wall and precast concrete panels.
  .3 Top of fire separations of masonry construction at underside of fluted steel deck assemblies:
    .1 Option No. 1: cUL Design No. HW-D-0098.
      .1 Fire stopping: all specified fire stopping Products.
      .2 Smoke seal: Hilti Type 2 fire rated sealant.
    .2 Option No. 2: ULC Design No. HW23.

.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: 3M Type 2 fire rated sealant.
.3 Option No. 3: cUL Design No. HW-D-0092.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: Tremco Type 2 fire rated sealant.

.4 Top of fire separations of gypsum board construction at underside of fluted steel deck assemblies:
.1 Option No. 1: cUL Design No. HW-D-0042.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: Hilti Type 2 fire rated sealant.
.2 Option No. 2: ULC Design No. HW21.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: 3M Type 2 fire rated sealant.
.3 Option No. 3: ULC Design No. HW71.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: Tremco Type 2 fire rated sealant.

.5 Intersection of fire separations of masonry or gypsum board construction.

.6 Control joints in fire separations of masonry construction.
.1 Option No. 1: ULC Design No. JF83.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: Hilti Type 1 fire rated sealant.
.2 Option No. 2: ULC Design No. JF 13
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: 3M Type 1 fire rated sealant.
.3 Option No. 3: ULC Design No. JF 18
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: Tremco Type 1 fire rated sealant.

.7 Control joints in fire separations of gypsum board construction: ULC Design No. JF 70.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: 3M Type 1 fire rated sealant.

.8 Joints in horizontal fire separation assemblies - concrete floor slabs:
.1 Option No. 1: ULC Design No. JF82.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: Hilti Type 3 fire rated sealant.
.2 Option No. 2: ULC Design No. JF13.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: 3M Type 3 fire rated sealant.
.3 Option No. 3: ULC Design No. JF18.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: Tremco Type 3 fire rated sealant.

.9 Penetrations through fire-resistance rated floor slabs, ceilings and roofs, and horizontal fire separations.

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

.11 Mechanical assemblies penetrating fire separations: Refer to Division 23 - Heating, Ventilating, and Air Conditioning (HVAC).

.12 Electrical assemblies penetrating fire separations: Refer to Division 26 - Electrical.

3.6 CLEANING AND PROTECTION

.1 Clean all surfaces adjacent to sealed openings to be free of excess firestopping materials and soiling as work progresses.

.2 Upon completion of this work, remove all materials, equipment and debris from the site. Leave work area and adjacent surfaces in a condition acceptable to the Consultant.

.3 Leave installed work with sufficient protection to enable it to remain untouched until project turnover.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Sealants and caulking for exterior wall openings and joints.
.2 Sealants and caulking for interior wall openings and joints.
.3 Sealants and caulking for floor joints and roof joints.

1.2 RELATED WORK

.1	General Requirements	Division 01
.2	Masonry Procedures	Section 04 05 00
.3	Firestopping and Smoke Seal	Section 07 84 00
.4	Non-Structural Metal Framing	Section 09 22 00

1.3 REFERENCES

.1	CGSB-19-GP-5M-84	Sealing Compound, One Component, Acrylic Base, Solvent Curing.
.2	CAN/CGSB-19.13-M87	Sealing Compound, One-Component, Elastomeric, Chemical Curing.
.3	CAN/CGSB-19.17-M90	One-Component Acrylic Emulsion Base Sealing Compound.
.4	CAN/CGSB-19.21-M87	Sealing and Bedding Compound, Acoustical.
.5	CAN/CGSB-19.22-M89	Mildew Resistant Sealing Compound for Tubs and Tiles.
.6	CAN/CGSB-19.24-M90	Multi-Component, Chemical Curing Sealing Compound.
.7	CAN/ULC-S711.1-05	Standard for Thermal Insulation – Bead-Applied One Component polyurethane Air Sealant Foam, Part 1.
.8	CAN/ULC-S711.1-05	Standard for Thermal Insulation – Bead-Applied Two Component Polyurethane Air Sealant Foam, Part 1 : M.

1.4 APPROVED MANUFACTURERS

.1 The products of the following manufacturers are approved for use subject to meeting the specifications for the particular type of sealants listed below. However, this is not an approval to substitute another type of sealant for those specified unless the material manufacturer requests change in his product in writing to the Consultant.

.1 Canadian General Electric Company Ltd.
.2 Dow Corning Canada Inc.
.3 Tremco

.2 Material manufacturers must be willing to review Shop Drawings and drawing details, visit the site to review sealant installation and provide written reports to the Consultant.

1.5 INSTALLER QUALIFICATIONS

.1 Sealants and caulking shall be installed by a specialized Subcontractor, having skilled mechanics thoroughly trained and competent in all aspects of caulking work, with minimum 5 years experience.

.2 Sealants shall be appropriate for the application and materials to be caulked.

1.6 SUBMITTALS

.1 Submit samples of each sealant, in conformance with Section 01 33 00 – Shop Drawings, Product Data and Samples.

.2 Provide colour cards for Consultants selection.

.3 Submit written adhesion and compatibility approval from the sealant manufacturer for all materials to be sealed.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels intact. Protect from freezing, moisture, water and contact with ground or floor.

1.8 ENVIRONMENTAL AND SAFETY REQUIREMENTS

.1 Comply with requirements of Workplace Hazard Materials Information System (WHIMIS) regarding use, handling, storage, and disposal of hazardous materials, and regarding labelling and provision of material safety data sheets acceptable to the authority having jurisdiction.

.2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.3 Ventilate area of work as required and as may be directed by the Consultant by use of approved portable supply and exhaust fans.

1.9 WARRANTY

.1 Extend Contractor's warranty to five (5) years, in writing. Warranty shall commence on the date of Substantial Performance.

.2 Defective work shall include, but not be restricted to, joint leakage, cracking, crumbling, melting, running, loss of adhesion, loss of cohesion, or staining of adjacent surfaces.

.3 Provide manufacturer's project-specific twenty (20) year non-staining warranty and ten (10) year weather seal warranty for "Type A" sealant listed below.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Sealant Type A: For exterior locations. Non-Staining, primer less, silicone weather-proofing sealant:
- .1 SilPruf SCS9000 NB, manufactured by Canadian General Electric Company Limited, Dow Corning 756 SMS, manufactured by Dow Corning Canada Inc., or
- .2 Spectrem 3, manufactured by Tremco Ltd., and
- .3 conforming to the product properties published.

.2 Sealant Type B: For interior locations. Non-staining, primer less, silicone hybrid sealant:
- .1 SCS7000, manufactured by Canadian General Electric Company Limited.
- .2 Dow Corning 756 SMS, manufactured by Dow Corning Canada Inc., or
- .3 Spectrem 3, manufactured by Tremco Ltd., and

.3 Sealant Type C: For interior locations where conditions of high humidity exist such as washrooms, showers, Mildew resistant, one component silicone conforming to CGSB 19-GP.22M and ASTM C920:
- .1 CGE SCS1700 Sanitary Sealant,
- .2 Dow Corning 786, or
- .3 Tremco Tremsil 200 White

.4 Sealant Type D: For interior locations. Paintable, non-staining, primer less, silicone hybrid sealant:
- .1 SCS7000, manufactured by Canadian General Electric Company Limited.

.5 Sealant Type E:
- .1 Multi-component, epoxidized polyurethane sealant conforming to CAN/CGSB-19.24, Type 2, Class B, SWRI Certified.
- .2 Dymeric 240, manufactured by Tremco Ltd.
- .3 Contractors Weatherproofing Sealant (CWS) Contractors Concrete Sealant by Dow Corning.

.6 Colours of sealants and caulking when exposed in the finished work to later selection by the Consultant. Allow different colours for different situations and materials. Allow for custom colours for exterior sealants.

.7 Primers for sealing: As manufactured or recommended by the manufacturer of the sealing materials for the specific applications.

.8 Joint backing material:

.1 circular foam strips, of approved manufacture, compatible with sealant and 50% greater width than joint width;
.2 Vertical Surfaces: extruded polyolefin foam, Sof Rod by Tremco Ltd.
.3 Horizontal Surfaces: closed cell polyethylene foam, Standard Backer Rod by Tremco.

.9 Bond Breaker: pressure sensitive plastic tape backing material, which will not bond to sealant; 3M #226 or #481, or Valley Industries #40.

.10 Acoustical Sealant.
.1 To CAN/CGSB-19.21.
.2 Acceptable Product: Tremco Commercial Sealants & Waterproofing, Tremco Acoustical Sealant.

.11 Air Barrier Foam Sealant - One Part.
.1 One part polyurethane insulating foam sealant, to CAN/ULC-S710.1.
.2 Acceptable Products:
.1 Adfast Inc.: ADFOAM 1885-2
.2 Dow Chemical Canada ULC: GREAT STUFF PRO Gaps & Cracks Insulating Foam Sealant.
.3 Zerodraft Products Inc.: Zerodraft Foam Sealant.

.12 Air Barrier Foam Sealant - Two Part.
.1 Two part polyurethane insulating foam sealant, to CAN/ULC-S711.1.
.2 Acceptable Products:
.1 Dow Chemical Canada ULC: FROTH-PAK Foam Sealant.
.2 Zerodraft Products Inc.: Zerodraft Insulating Air Sealant.

.13 Preformed Compressible and Non-Compressible Back-up Materials.
.1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
.1 Extruded closed cell foam backer rod.
.2 Size: oversize 30 to 50%.
.2 Neoprene or Butyl Rubber: Round solid rod, Shore A hardness 70.
.3 High Density Foam: Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200kPa, extruded polyolefin foam, 32kg/m; density, or neoprene foam backer, size as recommended by manufacturer.
.4 Bond Breaker Tape: Polyethylene bond breaker tape which will not bond to sealant.

.14 Cleaning material for surfaces to receive sealant to be as recommended by the manufacturer of the sealant.

2.2 EXTERIOR SEALANTS

.1 Weatherseal Sealant (SEAL-EXT): To ASTM C920, Type S, Grade NS, Class 35, Use NT, M, A and O; one-part, moisture curing, low modulus polyurethane sealant; accommodating joint movement of plus or minus 35 percent, with a 30- to 90-minute skin time; colours as selected by Consultant.
.2 Weatherseal Sealant - High Movement (SEAL-EXT-HM): To ASTM C920, Type S, Grade NS, Class 50, Use NT, T, M, A, O, and I; one-part medium modulus, low VOC, UV stable, non-sag polyurethane sealant; accommodating joint movement of plus 100 percent and minus 50 percent, with a 120-minute skin time; colours as selected by Consultant.

.3 Weatherseal Sealant - Flashing (SEAL-EXT-FL): To ASTM C920, Type S, Grade NS, Class 25, Use NT, M, A and O; one-part, moisture curing, low modulus polyurethane sealant; accommodating joint movement of plus or minus 25 percent; colours as selected by Consultant.

2.3 GLAZING SEALANTS

.1 Glazing Sealant (SEAL-GLZ): To CAN/CGSB-19.13-M, Type MG-2-25-A-L; one-part, moisture curing, acetoxy silicone sealant; colours as selected by Consultant.

PART 3 – EXECUTION

3.1 LOCATIONS

.1 Seal all exterior junctions and joints wherever required to close gap and wherever sealant is essential to maintain the continuity of air barrier, water barrier, or non-rated smoke separation of wall with Sealant Type A. Areas to be caulked include:

- .1 Concrete to metal, masonry, concrete and precast concrete.
- .2 Masonry to metal, concrete, precast concrete, and masonry.
- .3 Metal to metal, masonry, concrete, and precast concrete.
- .4 Around pipes and conduit through foundation walls.
- .5 Between hollow metal frames and screens and adjacent materials.
- .6 Between metal panels and adjacent materials.
- .7 Between window and louvre frames and sills and adjacent materials.
- .8 At all control and expansion joints.

.2 Seal all interior junctions and joints wherever required to close gap and wherever sealant is essential to maintain the continuity of air barrier, water barrier, or non-rated smoke separation of wall with Sealant Type B. Areas to be caulked include:

- .1 Concrete to metal, masonry, concrete and precast concrete.
- .2 Masonry to metal, concrete, precast concrete, and masonry.
- .3 Metal to metal, masonry, concrete, and precast concrete.
- .4 Around pipes and conduit through walls.
- .5 Between hollow metal frames and screens and adjacent materials.
- .6 Between window and louvre frames and sills and adjacent materials.
- .7 At all joints between millwork and masonry, to provide neat junction.
- .8 At junction between all counters and/or splashbacks and adjacent substrate with neat 3mm bead.
- .9 At all control and expansion joints.

.3 Seal with Sealant Type C at the following locations:

- .1 Around access panels in ceramic tile faced walls with a neat 3mm bead.
- .2 Around perimeter of piping penetration at tile work.
- .3 At junctions between all counter tops and/or splashbacks and adjacent substrate in washrooms, with neat 3mm bead.
- .4 At junctions of lavatories, toilets, and other plumbing fixtures and adjacent substrate.

.4 Seal with Sealant Type D at all interior non-moving joints to be painted.

.5 Seal at all other vertical and horizontal joint locations with Sealant Type E.

.6 Refer to Section 07 84 00, Firestopping and Smoke Seal, for location of fire stopping and fire-resistant caulking.

.7 Refer to Section 09 29 00, Gypsum Board, for acoustic sealant work.

3.2 SUPERVISION

.1 Unless specified otherwise herein comply with the recommendations and directions of the manufacturer whose materials are being used on the work.

.2 Arrange for the sealant manufacturer's technical representatives to visit the site prior to the commencement of the sealing to meet with the Contractor and the Consultant.

.3 Sealant manufacturer to visit site periodically and to provide written reports to Consultant ensuring sealant is in accordance with good trade practice, the manufacturer's recommendations and the intent of this Specification.

3.3 PROTECTION

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

3.4 PREPARATION

.1 Install sealants only when surfaces and ambient temperatures are suitable for the material used, as per manufacturer’s recommendations.

.2 Clean all joints and spaces to be sealed.

.3 Ensure that surfaces are structurally sound, free from grease, chalk or other contaminants which may adversely affect the adhesion of the sealing materials. Use dry oil free clean compressed air stream if necessary to clean out the joint.

.4 Clean surfaces with a solvent or cleaner recommended by the manufacturer of the sealant materials.

.5 Remove chalk lines completely. Do not place clear sealant over coloured chalk lines.

.6 Test materials for indications of staining or poor adhesion before any sealing is commenced.

.7 Submit colour chart to Consultant and obtain his written instructions for colours and locations of colours.

3.5 PRIMING

.1 If recommended by the manufacturer of the sealing materials, prime joints to prevent staining, or to assist the bond, or to stabilize porous surfaces.

.2 Apply primer with a brush which will permit the priming of all joint surfaces.

3.6 BACKUP MATERIAL

.1 Apply bond breaker tape where required to manufacturer’s instructions.

.2 Install joint back-up to achieve correct joint depth and shape, with approximately 30% compression.

3.7 MIXING

.1 Mix materials in strict accordance with sealant manufacturer’s instructions.

3.8 MASKING

.1 Where necessary to prevent contamination of adjacent surfaces, mask the areas adjacent to the joints with masking tape.

3.9 INSTALLATION

.1 Install joint backing materials at all locations as detailed or where required by sealant manufacturer's printed directions.

.2 Install a bond breaker tape or packing over asphalt impregnated fibre board as recommended by sealant manufacturer.

.3 Ensure that the correct sealant depth is maintained.

.4 Finished joints shall be free of wrinkles, sags, air pockets, ridges and embedded impurities.

.5 Tool all sealant surfaces to produce a smooth surface.

.6 Remove droppings and excess sealant as work progresses and before material sets.

.7 Sealing materials shall be gun grade or tool grade consistency to suit the joint conditions.

.8 Commence sealing only after all adjacent surfaces have been painted under Painting Section.

3.10 CLEANING

.1 Clean adjacent surfaces immediately and leave work neat and clean. Remove excess sealant and droppings using recommended cleaners as work progresses. Remove masking after joint tooling.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

1.	Rough Carpentry	Section 06 10 00
2.	Gypsum Board	Section 09 29 00
3.	Acoustic Ceilings	Section 09 51 00

1.2 REFERENCES

1.	CSA S136	North American Specification for the Design of Cold-Formed Steel Structural Members
2.	CAN/ULC-S101	Standard Methods of Fire Endurance Tests of Building Construction and Materials
3.	AISI	North American Standard for Cold-Formed Steel Framing – Product Data
4.	ASTM International	
.1	A653/A653M	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
.2	A641/A641M	Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
.3	A792/A792M	Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
.4	A1003	Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic coated for Cold-Formed Framing Members
.5	C645	Standard Specification for Nonstructural Steel Framing Members
.6	C754	Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
.7	C840	Standard Specification for Application and Finishing of Gypsum Board
.8	C841	Standard Specification for Installation of Interior Lathing and Furring
.9	C844	Standard Specification for Application of Gypsum Base to Receive Gypsum Veneer Plaster
.10	C1002	Standard Specification for Steel-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster bases to Wood Studs or Steel Studs
.11	ASTM E90	Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
.12	ASTM E413	Classification for Rating Sound Insulation
.13	E488	Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
.14	E1190	Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members

.5 Canadian Sheet Steel Building Institute (CSSBI:

.1 Lightweight Steel Framing Technical Bulletin Volume 7, Number 1, Maximum Height Tables for Interior Non-Loadbearing Partitions.

1.3 QUALITY ASSURANCE

.1 Fire-Test-Response Characteristics:

.1 For fire-resistance-rated assemblies that incorporate non-loadbearing interior steel framing, provide materials and construction identical to those tested in assembly indicated according to CAN/ULS-S101.

.2 STC-Rated Assemblies:

.1 For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413.

1.4 DELIVERY AND STORAGE

.1 Handle and store materials carefully to prevent damage.

.2 Obtain approval of proposed locations for stockpiling material. Provide any necessary temporary covers, skids and the like.

.3 Do not install damaged or deteriorated material but remove from Site.

1.5 RELATIONS WITH OTHER TRADES

.1 Coordinate with other trades for the locations of items to be framed in and framed around.

.2 Co-ordinate with mechanical and electrical Trades to ensure that all services are installed prior to application of wall board.

.3 Coordinate with mechanical and electrical trades for locations of access panels. Install access doors and panels supplied by those trades.

.4 Co-ordinate with forces installing insulation and vapour barrier in exterior soffits.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Metal framing shall be as manufactured by Bailey Metal Products or approved alternate; to ASTM C645.

.2 Metal Studs and Track: minimum 0.455mm (18 mils) galvanized steel; depths as indicated on drawings, [41mm] [64mm] [92mm] [152mm].

.3 Metal Furring Channels: minimum 0.455 (18 mils) sheet galvanized steel channel and accessories as manufactured by Bailey Metal Products, or approved alternate; to ASTM C645.

.4 Cold Rolled Furring Channel: 20mm, x 12.7mm zinc coated channel weighing minimum 0.446 kg per m.

.5 Cold Rolled Carrying Channel: 38mm x 15mm zinc coated channel weighing min 0.707 kg per m.

.6 Hanger wire: minimum 3.77mm (9ga) galvanized steel wire.

.7 Tie Wire: minimum 1.5mm (16 ga) galvanized soft annealed steel.

.8 CGC Brand Screws (or approved equal) of type recommended by the board manufacturer.

.9 Thermal Break: Permanent adhesive faced rubberized cork, 3 mm thick by width of stud on channel to be used between masonry in exterior wall and metal furring channels.

.10 Ceiling Anchors: Self drilling tie wire anchors, Phillips "Red Head" T-32 or approved equal.

PART 3 - EXECUTION

3.1 GENERALS

.1 Provide plumb, straight, level, rigid, and secure installation. Failing to achieve this result shall be cause for rejection and reinstallation of this work.

.2 Where walls run parallel and under steel joists, the joists shall be framed both sides and enclosed with gypsum board to provide sound barrier between rooms.

3.2 CEILING SUSPENSION

.1 Do not regard grillage system indicated on drawings as exact or complete. The Specification for metal framing contained in CGC Gypsum Construction Handbook and ASTM C840 shall govern installation conditions not covered by this Specification. The more stringent specifications shall apply.

.2 Hangers:

.1 Install hangers for suspended wallboard ceilings to support the grillage independent of walls, columns, pipes, ducts and the like. Erect plumb and securely anchor to the structure. Submit details of proposed method to the Consultant for approval. If so requested, test hangers to prove that anchorage is adequate to support the proposed loading. Erect hangers plumb and securely anchor to structural steel or support channels fastened to structural steel (DO NOT FASTEN TO STEEL DECK).

.2 Space hangers at 1200mm maximum o.c. along the carrying channels and not more than 150mm from ends (or as required to conform with fire tested assemblies where applicable).

.3 Carrying Channels:

.1 Space channels at 1200mm maximum o.c. (or as required to conform with fire tested assemblies where applicable).
.2 Run channels transversely to structural framing members.
.3 Where splices are necessary, lap members at least 200mm and wire each end with two laps; avoid clustering or lining up splices.
.4 Attach to hangers by bending hanger under runner and securely wire in place with a saddle tie.
.5 Provide 25mm clearance between channels and abutting walls and partitions.

.4 Cross Furring
.1 Install drywall screw channels transversely across runner channels, joists or other supports.
.2 Space drywall screw channels at 600mm o.c. and not more than 150mm from perimeter walls. Provide 25mm clearance between channels and abutting walls and partitions. Use closer spacing if so noted on drawings.
.3 Secure drywall screw channels to each support with approved clip or attachment; splice joints by messing minimum 200mm and tying channels together with double strand 16 gauge tie wire.
.4 Level drywall screw channels to a maximum tolerance of 4mm over 3600mm.
.5 Drywall shall not be fixed directly to open web steel joists and the like. Provide cross furring as specified.

.5 Openings
.1 Frame openings with suitable channels; check clearances with respective Trades. Provide support for edges of boards at all cut-outs and openings in ceilings.
.2 Provide all additional hangers and supports for fixtures as required.
.3 Provide additional hangers and framing for enclosure of radiant heating panels.

.6 Bulkheads
.1 Fur out bulkheads in areas indicated and as required to conceal mechanical, electrical or other services in rooms where drywall finishes are scheduled, and elsewhere if called for on drawings.
.2 Use methods and materials as previously specified in this section.

3.3 STEEL STUD SYSTEM (PARTITION) INSTALLATION

.1 Conform to the guidelines for metal framing contained in The Gypsum Construction Handbook, CSA A.82.31, and these specifications. The most stringent requirements shall apply.

.2 Attach metal runners at floor and ceiling to structural elements with suitable fasteners located 50mm from each end and spaced 600 mm. o.c. with toggle or molly bolts spaced 400mm o.c.

.3 Position studs vertically, engaging floor and ceiling runners, and spaced 400mm o.c., unless otherwise noted on drawings. When necessary, splice studs with 200mm nested lap and one positive attachment per stud flange. Place studs in direct contact with door frame jambs, abutting partitions, partition corners and existing construction elements.

.4 Where studs are installed directly against exterior walls install rubberized cork stip between studs and wall surfaces to provide thermal break.

.5 Anchor studs for shelf-walls and those adjacent to door and window frames, partition intersections and corners to ceiling and floor runner flanges with an approved crimping tool. Securely anchor studs to jamb and head anchor clips of door or borrowed-light frames by bolt or screw attachment. Over metal door and borrowed-light frames, place horizontally a cut-to-length section of runner, with a web-flange bent at each end, and secure with one positive attachment per flange. Position a cut-to-length stud (extending to ceiling runner) at vertical panel joints over door frame header.

.6 Stiffen partitions exceeding 3m long or 2.7m high with 19mm. cold rolled channels. Fix horizontally and provide the number of rows necessary to ensure a rigid installation. Provide other partition reinforcing necessary to support wall hung components, cupboards, closets and the like. Use 2 studs at jambs of openings and corners.

.7 Where horizontal runs of service lines are to be installed within the partition, erect studs with web openings aligned.

.8 Provide reinforcing and necessary stiffeners to support hollow metal frames and screens. Reinforcing to be capable of supporting screens rigidly and solid without deflection.

3.4 CHASE WALL INSTALLATION

.1 Align two parallel rows of floor and ceiling runners spaced apart as indicated. Attach to concrete slabs with concrete stub nails or power driven anchors 600 mm o.c. Attach to suspended ceilings with toggle or molly bolts 400mm o.c. Attach to wood framing with suitable fasteners 600mm o.c.

.2 Align metal studs vertically in runners, 200mm o.c. with flanges in the same direction and with studs on opposite sides of chase directly across from each other. Anchor studs to floor and ceiling runner flanges with an approved metal crimping tool.

.3 Cut cross bracing to be placed between rows of studs from gypsum panels, 400mm high by chase wall width. Space braces at quarter points not to exceed 600mm o.c. vertically and attach to stud webs with six 25mm screws 200mm o.c. maximum on each side.

.4 Bracing with 64mm metal studs may be used in place of gypsum panels. Anchor web at each end of metal brace to stud web with two 10mm pan head screws. When chase wall studs are not opposite, install metal stud cross braces 400mm o.c. horizontally and securely anchor each end to a continuous horizontal 64mm runner screw-attached to chase wall studs with the cavity.

.5 Adapt cross bracing as necessary to avoid interference with service.

3.5 WALL FURRING INSTALLATION

.1 Direct Furring Channel Attachment - Attach metal furring channels, vertically or horizontally spaced 400mm o.c. to masonry or concrete surfaces with hammer-set ro power-driven fasteners or concrete stub nails staggered 600mm o.c. on opposite flanges. Nest channels 200mm at splices and anchor with two fasteners in each wing. Where furring channel is installed directly to exterior wall, install thermal break strip between

furring channel and wall. For horizontally placed channels attach maximum 100mm from floor and ceiling.

.2 Bracketed Furring Channel Attachment:

.1 Attach adjustable wall furring brackets with serrated edges up, 900mm o.c. horizontally, 1200mm o.c. vertically, within 100mm of columns or other abutting construction, within 150mm of floor and ceiling, and as required above and below openings. Use 50mm cut nails in mortar joints of brick or clay tile or concrete block, or in field of lightweight aggregate blocks; use 16mm concrete stub nails or power driven nails or other suitable fasteners in monolithic concrete. Place fastener in top hole of bracket.

.2 Lay cold-rolled channels horizontally with flanges down, on furring brackets, plumb with other channels, and tie with double strand 16 ga. or triple strand 18 ga. wire at each junction with cold rolled channel.

.3 Free Standing Furring - In locations where wall furring is indicated as self-supporting, use steel studs and furring channels installed to provide a rigid frame to receive wall board.

3.6 CONSTRUCTION OF SOUND ATTENUATED PARTITIONS

.1 Where sound insulated drywall partitions are indicated on the drawings, provide double stud wall, offsetting studs and wrapping acoustic insulation between studs.

3.7 CONSTRUCTION OF FIRE RATED PARTITIONS

.1 Where fire rated construction is required, the framing shall be governed by rating required and material used in approved assemblies.

.2 Provide 1 hour rated beam enclosures, where required, to ULC design.

3.8 CONSTRUCTION OF SUSPENDED AND FURRED CEILINGS

.1 Apply gypsum panels of maximum practical length with long dimension at right angles to drywall furring channels. Position end joints over furring channel web and staggered in adjacent rows.

.2 Fasten panels to drywall furring channels with screws spaced a maximum of 300mm o.c. in field of panels and along abutting ends and edges.

.3 Provide framing and drywall finish in stairwells, where required to enclose underside of stairs and landings.

.4 Where noted on plans, provide bulkheads with steel framing and drywall finish.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

1.	Rough Carpentry	Section 06 10 00
2.	Acoustic Ceilings	Section 09 51 00
3.	Painting and Coating	Section 09 90 00

1.2 REFERENCES

.1 ASTM International:

1.	ASTM C1396	Standard Specification for Gypsum Board
2.	ASTM C840	Standard Specification for Application and Finishing of Gypsum board
3.	ASTM C1629	Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fibre-Reinforced Cement Panels.

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

.3 Gypsum Association:

.1	GA-214	Recommended Levels of Gypsum Board Finish
.2	GA-216	Application and Finishing of Gypsum Panel Products

.4 The Gypsum Construction Handbook - CGC Inc.

1.3 DELIVERY AND STORAGE

.1 Handle and store materials carefully to prevent damage. Materials must be delivered to site in their original, unopened packages.

.2 Obtain approval of proposed locations for stockpiling material. Materials must be stored in an enclosed shelter providing protection from exposure to the elements. Provide any necessary temporary covers, skids and the like.

.3 Store all panels flat.

.4 Do not install damaged or deteriorated material but remove from Site.

.5 Materials as delivered shall bear manufacturer's name, brand name of material and where applicable, ULC designation.

1.4 ENVIRONMENTAL CONDITIONS

.1 Do not apply gypsum board or joint filler to surfaces that are damp or contain frost.

.2 During gypsum panel application and joint finishing, temperatures within work areas shall be within the range 12 degrees C. to 25 degrees C.

.3 Provide adequate ventilation to carry off excess moisture

1.5 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 Coordinate with mechanical and electrical trades for locations of access panels. Install access doors and panels supplied by those trades.

.3 Co-ordinate with forces installing insulation and vapour barrier in exterior soffits.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 All materials to conform to ASTM C1396 unless specified otherwise. Except where noted otherwise, products listed herein are produced by Canadian Gypsum Company (CGC). Equivalent products from Georgia Pacific (GP) and Certainteed will be accepted, subject to acceptance of equivalency by the Consultant.

.2 Gypsum panels:

.1 Typical panels to be 16mm thick abuse resistant and mould resistant, to ASTM C1629. Sheetrock Mold Tough Abuse Resistant Firecode Core gypsum panels or GP ToughRock Fireguard X Mold-Guard Abuse Resistant gypsum board.

.2 Panels in gypsum board ceilings at high ceilings may be 13mm thick mould resistant panels; CGC Sheetrock Mold Tough or GP ToughRock Mold-Guard.

.3 Refer to notes below regarding gypsum panels in washrooms.

.3 Rated Gypsum panels:

.1 To ASTM C1629. Abuse resistant, mould resistant, Type X-Fire Rated
.2 CGC Sheetrock Mold Tough Abuse Resistant Firecode Core gypsum panels or GP ToughRock Fireguard X Mold-Guard Abuse-Resistant gypsum board.
.3 Minimum thickness to be 16mm.

.4 Fibreglass Mat panels:

.1 Where interior panels are to be installed before the building is fully enclosed, all rated and non-rated panels shall be fibreglass mat faced panels. Panels must be warranted by the manufacturer for extended exposure to the elements.
.2 GP DensArmor Plus Abuse Resistant panel.

.5 High Impact Panels:
- .1 To ASTM C1629. Impact resistant, mould resistant wallboard
- .2 CGC “Sheetrock Mold Tough VHI Firecode Core” gypsum board, or GP DensArmor Plus Impact-Resistant interior panels.
- .3 Minimum thickness to be 16mm.
- .4 All framed partition walls within 3m of a floor area shall be constructed using high impact wallboard.

.6 Shaft Liner Panels:
- .1 To ASTM-C442, fire resistant gypsum panel, square cut ends and edges, 600mm wide by practical length.
- .2 to ULC tested assembly
- .3 CGC shaftwall Liner Panels; 25mm
- .4 CertainTeed Gypsum Canada Inc.: Pro ROC shaftliner 25mm thick.
- .5 G-P Gypsum Corporation: GyProc Fireguard Shaft Liner Panels, 25mm thick.

.7 Sheathing at base of gypsum board stud partitions in Washrooms: Georgia Pacific, DensGlass Gold Fibreglass Fireguard Sheathing in 16mm thickness.

.8 Metal Studs and Channels: minimum 0.455mm (26 ga) galvanized steel as manufactured by Bailey Metal Products or approved alternate; to ASTM C645.

.9 Metal Furring Channels: minimum 0.455 (26ga) sheet galvanized steel channel and accessories as manufactured by Bailey Metal Products, or approved alternate; to ASTM C645.

.10 Cold Rolled Furring Channel: 20mm, x 12.7mm zinc coated channel weighing minimum 0.446 kg per m.

.11 Cold Rolled Carrying Channel: 38mm x 15mm zinc coated channel weighing min 0.707 kg per m.

.12 Cold Rolled Carrying Channel: 28 ga. galvanized steel with perforated flanges; one piece per location.

.13 Control Joint: CGC No. 093.

.14 Hanger wire: minimum 3.77mm (9ga) galvanized steel wire.

.15 Tie Wire: minimum 1.5mm (16 ga) galvanized soft annealed steel.

.16 Screws: CGC Brand Screws (or approved equal) of type recommended by the board manufacturer.

.17 Thermal Break: Permanent adhesive faced rubberized cork, 3 mm thick by width of stud on channel to be used between masonry in exterior wall and metal furring channels.

.18 Joint Treatment Material:

.1 Joint compound, topping compound, laminating compound; to ASTM C474 and C475.
.2 Use material recommended by board and tape manufacturer for the proposed use.
.3 CGC Sheetrock or Durabond Setting-Type, for use with CGC fibreglass drywall tape.

.19 Reinforcing Tape:
.1 Paper or fibreglass mesh tape, as recommended by the panel manufacturer for the panel type.

.20 Finish materials
.1 Over surface of glass mat faced boards, use level 5 finisher such as CGC Tuff Hide.

.21 Acoustic sealant: Quietseal Pro as manufactured by Quietrock, or equivaltent as manufactured by CGC, Tremco or Presstite Division of Interchemical Corporation for acoustic partitions.

.22 Acoustic Insulation: AFB acoustic fire batt by Roxul or Thermafiber SAFB Sound Attenuation Fire Blankets (unfaced) from Owens Corning, to thickness shown on drawings, and as required to obtain required S.T.C. rating.

.23 Ceiling Anchors: Self drilling tie wire anchors, Phillips "Red Head" T-32 or approved equal.

.24 Drywall Reveals: Fry Reglet, reveal mouldings and “F” reveal mouldings, 13mm wide, with baked on finish, as follows:
.1 DRM-625-50 and DRM-50-50
.2 DRMF-625-50 and DRMF-50-50
.3 Aluminum alloy 6063 T5 with chemical conversion coating.
.4 Colour to be selected by the Consultant.

.25 Access Panels: Refer to mechanical and electrical.

PART 3 - EXECUTION

3.1 GENERAL

.1 Provide plumb, straight, level, rigid, and secure installation. Failing to achieve this result shall be cause for rejection and reinstallation of this work.

.2 Conform to The Gypsum Construction Handbook, ASTM C840, and these specifications. The most stringent requirements shall apply.

.3 Where walls run parallel and under steel joists, the joists shall be enclosed both sides with gypsum board to provide sound barrier between rooms. Fill with minimum 100 mm acoustic batt insulation.

.4 Install access panels supplied by mechanical and electrical contractors. Rigidly secure panel frames to furring or framing systems.

3.2 CEILING SUSPENSION

.1 Do not regard grillage system indicated on drawings as exact or complete. The Specification for metal framing contained in CGC Gypsum Construction Handbook and ASTM C840 shall govern installation conditions not covered by this Specification. The more stringent specifications shall apply.

.2 Hangers

.1 Install hangers for suspended wallboard ceilings to support the grillage independent of walls, columns, pipes, ducts and the like. Erect plumb and securely anchor to the structure. Submit details of proposed method to the Consultant for approval. If so requested, test hangers to prove that anchorage is adequate to support the proposed loading. Erect hangers plumb and securely anchor to structural steel or support channels fastened to structural steel (DO NOT FASTEN TO STEEL DECK).

.2 Space hangers at 1200mm maximum o.c. along the carrying channels and not more than 150mm from ends (or as required to conform with fire tested assemblies where applicable.

.3 Carrying Channels

.1 Space channels at 1200mm maximum o.c. (or as required to conform with fire tested assemblies where applicable).

.2 Run channels transversely to structural framing members.

.3 Where splices are necessary, lap members at least 200mm and wire each end with two laps; avoid clustering or lining up splices.

.4 Attach to hangers by bending hanger under runner and securely wire in place with a saddle tie.

.5 Provide 25mm clearance between channels and abutting walls and partitions.

.4 Cross Furring

.1 Install drywall screw channels transversely across runner channels, joists or other supports.

.2 Space drywall screw channels at 600mm o.c. and not more than 150mm from perimeter walls. Provide 25mm clearance between channels and abutting walls and partitions. Use closer spacing if so noted on drawings.

.3 Secure drywall screw channels to each support with approved clip or attachment; splice joints by messing minimum 200mm and tying channels together with double strand 16 gauge tie wire.

.4 Level drywall screw channels to a maximum tolerance of 4mm over 3600mm.

.5 Drywall shall not be fixed directly to open web steel joists and the like. Provide cross furring as specified.

.5 Opening

.1 Frame openings with suitable channels; check clearances with respective Trades. Provide support for edges of boards at all cut-outs and openings in ceilings.

.2 Provide all additional hangers and supports for fixtures as required.

.3 Provide additional hangers and framing for enclosure of radiant heating panels.

.6 Bulkheads

.1 Furr out bulkheads in areas indicated and as required to conceal mechanical, electrical or other services in rooms where drywall finishes are scheduled, and elsewhere if called for on drawings.

.2 Use methods and materials as previously specified in this section. Drywall panels at bulkheads shall be as specified for walls.

3.3 STEEL STUD SYSTEM (PARTITION) INSTALLATION

.1 Conform to the guidelines for metal framing contained in The Gypsum Construction Handbook, CSA A.82.31, and these specifications. The most stringent requirements shall apply.

.2 Attach metal runners at floor and ceiling to structural elements with suitable fasteners located 50mm from each end and spaced 600 mm. o.c. with toggle or molly bolts spaced 400mm o.c.

.3 Position studs vertically, engaging floor and ceiling runners, and spaced 400mm o.c., unless otherwise noted on drawings. When necessary, splice studs with 200mm nested lap and one positive attachment per stud flange. Place studs in direct contact with door frame jambs, abutting partitions, partition corners and existing construction elements. Where studs are installed directly against exterior walls install rubberized cork stip between studs and wall surfaces to provide thermal break.

.4 Anchor studs for shelf-walls and those adjacent to door and window frames, partition intersections and corners to ceiling and floor runner flanges with an approved crimping tool. Securely anchor studs to jamb and head anchor clips of door or borrowed-light frames by bolt or screw attachment. Over metal door and borrowed-light frames, place horizontally a cut-to-length section of runner, with a web-flange bent at each end, and secure with one positive attachment per flange. Position a cut-to-length stud (extending to ceiling runner) at vertical panel joints over door frame header.

.5 Stiffen partitions exceeding 3m long or 2.7m high with 19mm. cold rolled channels. Fix horizontally and provide the number of rows necessary to ensure a rigid installation.

Provide other partition reinforcing necessary to support wall hung components, cupboards, closets and the like. Use 2 studs at jambs of openings and corners.

.6 Where horizontal runs of service lines are to be installed within the partition, erect studs with web openings aligned.

.7 Provide reinforcing and necessary stiffeners to support hollow metal frames and screens. Reinforcing to be capable of supporting screens rigidly and solid without deflection.

3.4 CHASE WALL INSTALLATION

.1 Align two parallel rows of floor and ceiling runners spaced apart as indicated. Attach to concrete slabs with concrete stub nails or power driven anchors 600 mm o.c. Attach to suspended ceilings with toggle or molly bolts 400mm o.c. Attach to wood framing with suitable fasteners 600mm o.c.

.2 Align metal studs vertically in runners, 200mm o.c. with flanges in the same direction and with studs on opposite sides of chase directly across from each other. Anchor studs to floor and ceiling runner flanges with an approved metal crimping tool.

.3 Cut cross bracing to be placed between rows of studs from gypsum panels, 400mm high by chase wall width. Space braces at quarter points not to exceed 600mm o.c. vertically and attach to stud webs with six 25mm screws 200mm o.c. maximum on each side.

.4 Bracing with 64mm metal studs may be used in place of gypsum panels. Anchor web at each end of metal brace to stud web with two 10mm pan head screws. When chase wall studs are not opposite, install metal stud cross braces 400mm o.c. horizontally and securely anchor each end to a continuous horizontal 64mm runner screw-attached to chase wall studs with the cavity.

.5 Adapt cross bracing as necessary to avoid interference with service.

3.5 WALL FURRING INSTALLATION

.1 Direct Furring Channel Attachment - Attach metal furring channels, vertically or horizontally spaced 400mm o.c. to masonry or concrete surfaces with hammer-set ro power-driven fasteners or concrete stub nails staggered 600mm o.c. on opposite flanges. Nest channels 200mm at splices and anchor with two fasteners in each wing. Where furring channel is installed directly to exterior wall, install thermal break strip between furring channel and wall. For horizontally placed channels attach maximum 100mm from floor and ceiling.

.2 Bracketed Furring Channel Attachment

.1 Attach adjustable wall furring brackets with serrated edges up, 900mm o.c. horizontally, 1200mm o.c. vertically, within 100mm of columns or other abutting construction, within 150mm of floor and ceiling, and as required above and below openings. Use 50mm cut nails in mortar joints of brick or clay tile or concrete block, or in field of lightweight aggregate blocks; use 16mm concrete stub nails or

power driven nails or other suitable fasteners in monolithic concrete. Place fastener in top hole of bracket.

.2 Lay cold-rolled channels horizontally with flanges down, on furring brackets, plumb with other channels, and tie with double strand 16 ga. or triple strand 18 ga. wire at each junction with cold rolled channel.

.3 Free Standing Furring - In locations where wall furring is indicated as self-supporting, use steel studs and furring channels installed to provide a rigid frame to receive wall board.

3.6 APPLICATION OF GYPSUM BOARD

.1 Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are approved.

.2 Apply all gypsum board parallel to framing. Position all ends over studs. Use maximum practical lengths to minimize end joints. Fit ends and edges closely, but not forced together.

.3 Stagger joints on opposite sides of partition.

.4 Apply single, double or triple layers of gypsum board to metal furring as indicated using screw fasteners.

.5 Maximum screw spacing for single-ply gypsum board and face ply of 2-ply gypsum board to be 300mm o.c.

.6 Maximum spacing of screws for base-ply of 2-ply gypsum board over steel framing to be 300mm o.c. along edges of the gypsum board and 600mm o.c. into stud or furring channel in the field of the gypsum board.

.7 Use cement board as backer board wherever tile is to be installed to walls of shower partitions.

3.7 ADHESIVE APPLICATION

.1 Where gypsum board is called to be laminated to masonry walls, application shall conform to Gypsum Association Publication GA-216-2013, Section 11, “Adhesive Application of Gypsum Panel Products to Interior Masonry, Concrete, or Brick Walls”.

.2 Do taping and filling, as specified below, for paint finish.

3.8 CONSTRUCTION OF SOUND ATTENUATED PARTITIONS

.1 Where sound insulated drywall partitions are indicated on the drawings, provide double stud wall, offsetting studs and wrapping acoustic insulation between studs. Apply one layer of specified soundproof wallboard, on both faces of wall.

.2 Install sound attenuation batts to completely fill void between studs.

.3 A 6mm continuous bead of acoustical sealant around perimeter of wall at web of top and bottom tracks and end studs. Lay gypsum board into position forcing caulking bead to fill space between gypsum board and structure.

.4 Seal full perimeter for cut-outs around electrical boxes and ducts with acoustical sealant.

3.9 CONSTRUCTION OF FIRE RATED PARTITIONS

.1 Where fire rated construction is required, the thickness and number of layers of board shall be governed by rating required and material used in approved assemblies.

.2 Provide 1 hour rated beam enclosures, where required, to ULC design.

3.10 CONSTRUCTION OF SUSPENDED AND FURRED CEILINGS

.1 Apply gypsum panels of maximum practical length with long dimension at right angles to drywall furring channels. Position end joints over furring channel web and staggered in adjacent rows.

.2 Closely fit together, ends and edges but not forced together.

.3 Fasten panels to drywall furring channels with screws spaced a maximum of 300mm o.c. in field of panels and along abutting ends and edges.

.4 Provide control joints in ceilings as noted but maximum 7500 mm o.c. each way or at change in direction.

.5 Provide framing and drywall finish in stairwells, where required to enclose underside of stairs and landings.

.6 Where noted on plans, provide bulkheads with steel framing and drywall finish.

3.11 WALL FURRING

.1 Apply gypsum panels parallel to framing. Position all edges over drywall furring channels with joints staggered in successive courses.

.2 Use maximum practical lengths to minimize end joints. Fit ends and edges closely, but not forced together.

.3 Fasten panels to channels with screws spaced a maximum 300mm oc.

3.12 APPLICATION OF ACCESSORIES

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Joints shall be made tight, accurately aligned and rigidly secured.

.2 Reinforce all vertical and horizontal exterior corners with cornerbead fastened with screws 200mm oc on both flanges along entire length of bead.

.3 Where assembly terminates against masonry or other dissimilar material, apply ledge trim over panel edge and fasten with screws or staples spaced 300 mm. oc.

.4 Power drive screws at least 9mm. from edges or ends of panel to provide uniform dimple 0.8mm deep.

.5 Where recessed reglets are noted on drawings, built into drywall assembly to provide edges flush with drywall.

3.13 TAPING AND FILLING

.1 Finish in accordance with GA-214, as follows:

.1 Exposed gypsum board to Level 5 finish, suitable for finish painting with semi-glass and gloss coatings. Use full skim coat of joint compound over entire surface to achieve smooth and uniform appearance.
.2 Concealed gypsum board to minimum Level 1 finish. Where a fire-resistance rating is required, finishing level must conform to ULC rated assembly design.

.2 Finish face panel joints and internal angles with joint system consisting of self-adhering cross-fibre fibreglass joint tape and joint compound installed according to manufacturer's directions and feathered out into panel faces. Note: If self-adhering joint tape is not used, taping compound will be required.

.3 Be sure drywall surface is dry and clean.

.4 Center and apply CGC Fiberglass Drywall Tape directly over joint, pressing firmly to ensure even adherence to surface. Eliminate wrinkles by pressing entire length of tape with drywall knife. Avoid overlapping tape at intersections. Cut tape with drywall knife.

.5 Cover taped joint with a layer of setting-type joint compound, forcing compound through the tape with a drywall knife or trowel to completely fill and level the joint. Allow joint to dry, and sand lightly. Apply second coat of setting-type or drying-type joint compound, feathering approximately 50mm beyond first coat. Let dry and sand lightly as required.

.6 To finish inside corners, bend tape with to form a “U” shape. Apply tape along one side only. Press tape into corner for approximately 30mm, then apply the other side. Work downward, alternating sides in this manner until tape is pressed firmly in place. Apply setting-type joint compound as specified above, first on one side for the length of the corner and then repeating the process on the second side.

.7 Finish fastener heads, corner bead and trim as required with two to three coats of joint compound, feathered out onto panel faces and sanded to a smooth surface.

.8 Provide skim coat over entire face of boards to ensure smooth surface for painting.

.9 Fill screw head depressions to bring flush with adjacent surface of gypsum board so as to be invisible after painting is completed.

.10 Sand dried taping compound lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.11 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for painting.

.12 Painting shall be done in accordance with Section 09 90 00

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1	Gypsum Board	Section 09 29 00
.2	Mechanical Equipment	Division 20, 22
.3	Electrical Equipment	Division 26, 27, 28

1.2 CEILING SYSTEMS

.1 This Specification includes the ceiling assembly systems listed below, noted in schedules and shown on reflected ceiling plans, including ceiling panels, suspension system and trim.

.2 Ceiling systems shall be lay in exposed Tee system, non- rated.

1.3 REFERENCE STANDARDS

.1	ASTM C635	Specifications for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
.2	ASTM C636	Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
.3	CAN/CGSB 92.1	Sound Absorptive Prefabricated Acoustical Units

1.4 DESIGN

.1	N.R.C. Range:	Unless otherwise noted under description of ceiling system the N.R.C. Range shall be 60-65 (Table 1 of CAN/CGSB 92.1).
.2	Ceiling S.T.C.:	Unless otherwise noted under description of ceiling system the S.T.C. rating shall be 35 or better.
.3	Light Reflectance:	Unless otherwise noted under description of ceiling system, panels shall have a light reflectance co-efficient designation of L.R.1 (0.75 minimum). Table 3 of CAN/CGSB 92.1 refers.

1.5 SHOP DRAWINGS

.1 Reflected ceiling plans indicate proposed layout but this shall not relieve Contractor of responsibility for co-ordination of the work and provision of Shop Drawings where field conditions call for variation from proposed layout.

.2 Submit shop drawings accurately locate lighting fixtures, ventilating grilles, sprinkler heads, exit lights and other ceiling fittings.

.3 Conform to Section 01 33 23 – Shop Drawings, Product Data and Samples.

3.6 SAMPLES

.1 Upon award of the Contract submit duplicate 300mm by 300mm sample panels of each acoustical unit proposed for installation in the project. All panels subsequently used on the job shall match the approved sample.

.2 Submit one representative model sample of each suspension system members for approval prior to commencement of installation.

.3 Ceiling system sample shall show basic construction and assembly, treatment at walls, recessed fixtures, splicing, interlocking, finishes and acoustical unit installation.

3.7 DELIVERY AND STORAGE

.1 Transport, handle and store material in manner to prevent warp, twist and damage to tile and board edges and surfaces in accordance with the manufacturer's recommendations.

.2 Any warped and/or damaged boards, tile and trim shall be rejected and be replaced by new, straight, undamaged and acceptable materials at no cost to the Owner.

.3 Store material in warm, dry place away from water and the elements. Protect against undue loading stresses and shock.

.4 All packaged material shall be delivered in original manufacturers' wrappers and containers with labels and seals intact.

3.8 PROTECTION

.1 Exercise care in the execution of work under this Section to prevent damage to finished surfaces and adjacent work, and mechanical and electrical installations.

3.9 EXTRA PANELS

.1 Provide 2 full boxes of acoustic panels of each type specified for use in maintenance work. Obtain receipt from the Consultant or Owner’s representative on site.

.2 Do not use panels supplied to Owner for maintenance work to make good any damaged or removed tile required by Contract.

.3 Clearly label all boxes and delivery and store the boxes as directed by the Owner.

3.10 SPECIAL CLEANING

.1 Clean, repair or replace dirty, discoloured or defective units or exposed suspension members to Consultant's satisfaction.

3.11 ENVIRONMENT AND REGULATORY REQUIREMENTS

.1 Commence installation after building enclosed and dust- generating activities completed.

.2 Permit wet work to dry prior to commencement of installation.

.3 Maintain uniform minimum temperature of 15 deg. C. and humidity of 20% to 40% prior to, during and after installation.

.4 Comply with Ontario Hydro Electrical Inspection Bulletin No. 30-4-3 regarding support of luminaires in suspended ceilings. Submit to the Consultant a certificate confirming that the ceiling support grid provides support for lighting fixtures in accordance with Ontario Hydro requirements.

.5 Deliver finish materials in unopened packaging provided by manufacturer.

.6 Store materials in work area 48 hours prior to installation, in protected dry areas.

6.1 QUALITY ASSURANCE

.1 Installer is to be experienced in performing work of this section and who has specialized in installation of work similar to that required for this project.

.2 Installer is to have a minimum of five (5) years of experience in performing the work described.

6.2 WARRANTY

.1 The Warranty stipulated in the General Conditions of the Contract shall be deemed to include the following definition in reference to Work specified in this Section. The following will be considered defects without being limited thereto:

- .1 Failure of the suspended ceiling to remain water level.
- .2 Lifting or sagging of tile and board between supports.
- .3 Staining and discolouration of factory finishes.
- .4 Development of corrosion of galvanized ferrous metal.
- .5 Development of cracks, splits and other surface deterioration in acoustic panels.
- .6 Failure of hanging wire anchorage.

.2 The warranty period shall be two (2) years, commencing on the date of Substantial Performance of the Work.

.3 Warranties shall be issued to the Owner within two (2) Working Days following the date of Substantial Performance of the Work.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Acoustic Ceiling Panels (ACT and ACT-N):

- .1 Typical non-fire rated ceilings, to CAN/CGSB-92.1
- .2 Type: Mineral composition acoustical units, sag resistant.
- .3 Pattern: Non-directional fissured.
- .4 Edge type: Square Lay-in.
- .5 Colour: White.
- .6 Thickness: 16mm minimum.
- .7 Size: 610mm x 1220mm and 610mm x 610mm. Refer to architectural reflected ceiling plans for location and layout.
- .8 Shape: Flat
- .9 Flame spread rating of 25 or less.
- .10 Smoke developed class of 50 of less.
- .11 Acceptable Products:
  - .1 Armstrong World Industries Canada Ltd., Cortega No.823.
  - .2 Equivalents by CGC Interiors and CertainTeed Ceilings may be submitted for review but may not be considered or accepted.

.2 Suspension:

- .1 Acceptable Products, contingent on compatibility with specified ceiling tiles:
  - .1 Armstrong World Industries Canada Ltd.: Prelude ML Exposed Tee System. The Prelude XL suspension system can be supplied and installed in lieu of the Prelude ML suspension system, as long as the Prelude XL system is compatible with the Armstrong Cortega 823 acoustic ceiling panels.
  - .2 Equivalents as noted above under paragraph 1.11 by:
    - .1 CGC, Suspension system Donn “DX” 24mm wide faced T-bar.
    - .2 CertainTeed Ceilings: Classic Aluminum Capped Hook System.
    - .3 Chicago Metallic Corporation: Series 1200 Suspension System.
- .2 Exposed interlocking tee grid system, formed out of cold rolled zinc-bond steel 0.54mm thick. Provide fire rated grid where fire ratings noted.
- .3 Main Tees: 38mm x 25.4mm double web rectangular bulb top with capping plate in precoat baked-on white paint finish and incorporating holes for hangers and slots for connecting pieces, and capable of supporting 12.5 kg per 1200mm. for continuous spans and 6.5 kg per 1200mm span for single span without exceeding a deflection of 1/360 of the span.
- .4 Standard Cross-Tees: 25.4 x 25.4mm double web, bulb top, capping plate in precoated white baked-on finish, capable of supporting 11.3 kg per 600mm span without exceeding a deflection of 1/360 of span, and with positive interlock with main tees.
- .5 Structural Cross-Tees as main tees, but with crimped ends for lapping bottom flange of main tees and interlocking tack ends to engage slots in main tees.
- .6 Accessories:
  - .1 Splice plate, clips, screws, etc. as required to complete the installation. All galvanized finish.
- .7 Concealed flat spline: 0.71mm flat steel spline.

.8 Edge Trim:
- .1 0.635mm zinc bonded, cold rolled steel mould.
- .2 Trim shall be minimum 22mm x 22mm angles.
- .3 Provide 50mm wide shadowline trim at perimeter of corridor ceilings.

.9 Finish to tees and edge trim: flame resistant white baked enamel satin finish to match panel finish, 2 coats on exposed surfaces, 1 coat elsewhere.

.10 Carrying Channels: 38mm x 19mm cold rolled galv. weighing 1.042 kg per metre.

.11 Tie Wire: 1.6mm galvanized soft annealed steel

.12 Hangers: 2.6mm galvanized steel wire.

.13 Screws: Corrosion resistant, self-tapping Philips truss head, of length and gauge to suit installation.

.14 Ceiling Hanger Pins (for fixing to metal): capacitor discharge ceiling hanger pins, by Continental Studwelding Ltd., or approved equivalent, of type approved by Consultant.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

.1 Employ mechanics skilled in this Trade and install work in strict accordance with the system manufacturer's printed directions to produce a first class, true finish, free from dropping, warpage, soiled or damaged tile.

.2 Make provisions for thermal movement.

.3 Install hanger inserts in a manner approved by Consultant.

.4 Locate hangers directly over Main Tees and as close to intersections as possible. Secure hangers firmly to concrete inserts, steel joists and beams, bracing, etc. Do not install hangers to metal deck, provide separate grid off joists if required.

.5 Erect ceiling grid plumb and square with accurately fitted locked-in joints in true alignment, secure and rigid and with provision for thermal movement. Water level ceiling to tolerance of 1mm in 1m and maximum deviation of 4mm. from mean level.

.6 Frame around recesses fixtures, diffusers, grilles, and the like and provide heavier section hangers and supports as necessary to support same. Provide hanger within 150mm. of each fixture corner.

.7 Consult with Electrical and Mechanical Trades for requirements and provide access to valves and switches.

.8 Ensure that all hangers and carrying members are designed and spaced to support entire ceiling system including recessed lighting fixtures. Note, weight of fixtures is approximately 9-13.5 kg.

.9 Install panels only after all mechanical and electrical equipment, conduits, piping, telephone distribution, etc. are in place.

.10 Co-ordinate ceiling work to accommodate components of other sections, to be built into acoustical ceiling components, such as light fixtures, diffusers, speakers and sprinkler heads.

.11 Neatly cut acoustical units to fit tightly around all building elements that penetrate ceiling.

3.2 INSTALLATION OF LAY-IN SUSPENSION SYSTEM

.1 Install suspension system in accordance with ASTM-C636 except where specified otherwise. Install suspension system to manufacturer's instructions and certification organization's tested design requirements where referenced.

.2 Generally hangers shall be spaced at not more than 1200mm o.c. directly above main runner tees, except at fixtures, where they shall be 600mm o.c. or closer as required to adequately support fixtures. Locate hangers as close as possible to tee junctions. Locate first hanger within 300mm of perimeter wall.

.3 Install main tee runners continuous at 1200mm o.c. with interlocking structural cross-tees each side of fixtures at right angles to main tees. Install standard cross-tees generally at 90 degrees to main tees and as required to achieve pattern shown on reflected ceiling plans. Secure joints by web of tees; snaplock into place forming rigid connections. Main tees shall be as long as possible with butt ends joined by means of splice plates locked into webs.

.4 Frame up around light fixtures, grilles, diffusers, speakers, openings, etc. as required.

.5 Secure edge moldings to walls, bulkheads and other vertical surfaces at perimeter edges of acoustic ceilings. Note special moldings required.

.6 Securely fix hangers to tees by bending ends 90 degrees at the correct height and inserting through holes in top of main tees, then wiring around open side at least 3 turns twisting ends together. Flats shall be bolted to tees. Secure to concrete inserts in similar manner.

.7 Do not erect ceiling suspension system until work above ceiling has been inspected by the Building Inspector.

.8 Do not secure hangers to fluted steel floor or roof deck. Secure hangers to overhead structure using attachment methods as required for particular structure and acceptable to the Consultant. Where structural spacing exceeds ceiling hanger spacing, provide double carrying channels nested and placed perpendicular to and on top of bottom flange of steel beams or on top of the lower chords of the open web steel joists, and secured to each joist with three loops of 1.2mm galvanized soft steel wire.

.9 Where obstructions interfere with the placement of ceiling hangers, provide double carrying channels nested and hung from the structure above on both sides of the obstruction.

.10 Provide isolation hangers at all hangers where indicated as required for specific ceiling assemblies.

.11 Install hangers on main tees spaced at maximum 1200mm centres and within 150mm from ends of main tees and tee splices.

.12 Lay out with border units not less than 50% of standard unit width and according to reflected ceiling plans.

.13 Ensure suspension system is coordinated with location of related components.

.14 Install typical wall moulding to provide correct ceiling height.

.15 Completed suspension system shall support super-imposed loads, such as lighting fixtures, diffusers, grilles, speakers and other ceiling mounted fixtures.

.16 Support at light fixtures and diffusers with additional ceiling suspension hangers within 150mm of each corner and at maximum 600mm around perimeter of fixture. Install an additional hanger immediately above each fastener for ceiling mounted curtain tracks.

.17 Interlock cross member to main runner to provide rigid assembly. Ensure all main tee splices and cross tee end clips are fully engaged.

.18 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.

.19 Finished ceiling system shall be square with adjoining walls and level within 6mm in 3000mm.

3.3 LAY-IN PANEL INSTALLATION

.1 End panels shall not be less than half full size and installation in each area shall be symmetrical, with end tiles and abutting opposite vertical wall surface to be of the same width. Do all necessary cutting and fitting neatly and accurately to suit grid openings and accommodate fixtures, grilles, detectors, speakers and the like located on the ceiling panels.

.2 Lay directionally patterned acoustic panels in one direction, parallel to the longest direction of the grid concerned.

.3 Place panels between tees so that edges bear evenly on flanges.

.4 Confirm with reflected ceiling plans.

.5 Provide fire rated enclosures as required around light fixtures and mechanical equipment in fire rated ceilings, according to applicable ULC Design Criteria.

.6 Where mechanical equipment is located above the ceiling, panels shall be suitably and inconspicuously marked by the use of small colour-coded stickers. Mechanical equipment to be located shall include valves, dampers, heat exchangers, heat pumps, VAV boxes, electrical disconnects, as applicable, and other such equipment not visible from below.

3.4 CLEANING

.1 Upon completion, clean acoustic tile of all finger marks and other defacements.

.2 Remove all accumulated rubbish and excess materials from the site.

.3 Clean acoustic tile and replace any damaged tiles immediately before occupation of building by Owner.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1 General Requirements — Division 01

1.2 SCOPE OF WORK

.1 Resilient Sheet and Tile Flooring and Rubber Base.
.2 Flooring Preparation and Flooring Accessories.

1.3 REFERENCE STANDARDS

.1 ASTM Standards:

.1	F 141	Resilient Floor Coverings
.2	F 386	Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces
.3	F 511	Quality of Cut (Joint Tightness) of Resilient Floor Tile
.4	F 710	Standard Practice for Preparing Concrete Floors to Receive Resilient
.5	F 1344	Flooring Specification for Rubber Floor Tile
.6	F 1861	Specification for Resilient Wall Base
.7	F 2055	Size and Squareness of Resilient Floor Tile by Dial Gage Method
.8	E 662	Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
.9	E 1907	Methods of Evaluating Moisture Conditions of Concrete Floors to Receive Resilient Floor Coverings
.10	F 970	Standard Test Method for Static Load Limit
.11	F2034	Standard Specification for Linoleum Sheet Floor Covering

.12 CAN/ULC-S102.2 Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies

.13 RFCI:
- .1 IP #1 Recommended Installation Practice for Homogeneous Sheet Flooring.
- .2 Recommended Work Practices for Removal of Resilient Floor Coverings

1.4 SUBMITTALS AND SAMPLES

.1 Submit samples as per Section 01 33 23 – Shop Drawings, Product Data and Samples.

.2 Submit duplicate full-size tiles, 300mm long base, nosing, and treads as specified.

.3 Submit colour samples of flooring accessories for selection by the Consultant.

.4 Submit 300mm x 300mm samples of resilient sheet flooring.

.5 Submit samples of rubber floor base.

.6 Submit product technical data sheets indicating material performance criteria, physical characteristics and requirements.

.7 Submit manufacturer's written installation recommendations and requirements.

.8 Provide maintenance data for resilient flooring for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 EXTRA MATERIALS

.1 Provide extra materials of resilient tile flooring and base.

.2 Provide one unopened box of flooring installed of each colour, pattern and type of flooring material required for this Project for maintenance use.

.3 Provide one 3600mm length of each type and colour of resilient base required for this Project for maintenance use.

.4 Extra materials shall be from same production run as installed materials.

.5 Store where directed by the Owner.

.6 Material to be in wrapped packages or fully labelled as to product and colour.

1.6 WARRANTY

.1 Submit manufacturer's warranty warranting material and performance for a minimum period of five (5) years for all resilient products, following the date of Substantial Performance of the Work.

.2 Installation Warranty: Submit the flooring contractor's installation warranty agreeing to repair or replace work which has failed a as result of defects in workmanship. Failure shall include, but not limited to, tearing, cracking, separation, deterioration or loosening from substrate, seam failure, ripples, bubbling or puckering.

.3 Installation Warranty Period: Two (2) year limited warranty commencing on Date of Substantial Completion from flooring contractor.

.4 Warranties shall be issued to the Owner within two (2) Working Days following the date of Substantial Performance of the Work.

4.7 QUALITY ASSURANCE

.1 Installer is to be experienced in performing work of this section and who has specialized in installation of work similar to that required for this project.

.2 Installer is to have a minimum of five (5) years of experience in performing the work described.

PART 2 – PRODUCTS

4.1 MATERIALS

.1 Primers and Adhesives:
- .1 Solvent-free white acrylic.
- .2 Supply and install as recommended by manufacturers of resilient sheet flooring, vinyl composite flooring, and base.
- .3 Rubber base adhesive: Mapei Ultrabond ECO 575 or equivalent.
- .4 Adhesive must produce good and permanent waterproof bond between wall surfaces and cove base.

.2 Transition strips at dissimilar materials:
- .1 At transition between resilient flooring: Tarkett, Johnsonite Rubber Reducer Transition Strip to floor type SSR-B. Colour to be confirmed at a later date by the Consultant.

.3 Resilient Sheet Flooring (RFL):
- .1 Sheet Linoleum Flooring to ASTM F2034.
- .2 Slip Resistance: Tested in accordance with ASTM D2047; meeting or exceeding A.D.A recommendations of 0.6.
- .3 Construction: Homogeneous sheet floor covering.
- .4 Minimum Thickness and Wear Layer: 2.0mm.
- .5 Net Fit Seams and Welding Rods: Provide for net fit seams and welding rods to match in colour to linoleum sheeting flooring.
- .6 Consultant to pick any standard or premium colours from any of the acceptable products described above. A minimum of two (2) colours may be selected.
- .7 Acceptable Manufacturers and Products:
  - .1 Forbo, Sphera Element.
  - .2 Tarkett, iQ Optima Homogeneous Sheet Flooring.
  - .3 Gerflor, Accord.
  - .4 Polyflor, 2000PUR

.4 Resilient Base (RB or RB100): to CAN/CSA-A126.5, Type 1, rubber.
- .1 Manufacturer: Tarkett, Rubber Baseworks with toe/cove base.
- .2 Minimum 1200mm length and 100mm high by 3mm thick, with grooved back.
- .3 Colour: To be confirmed by the Consultant from the standard range.

.5 Sub-floor Filler and Leveler: as recommended by flooring manufacturer for use with their Product.

.6 Sealer: type recommended by flooring manufacturer, meeting the requirements of CAN/CGSB-25.20.

.7 Floor Protection: heavy kraft paper laminated with non-staining adhesive to both sides of glass fibre reinforcing ply.

PART 3 - EXECUTION

3.1 INSPECTION AND TESTING

.1 Check floor surfaces for evidence of carbonation, dusting, excessive moisture or other defects affecting bond of adhesive. Ascertain nature of curing and/or sealing compound used on concrete and its compatibility with flooring adhesive. Take all required remedial measures. Remove compounds if necessary to ensure that adhesive bonds to concrete.

.2 Test concrete slab, using anhydrous calcium chloride test, in conformance with ASTM F1869. Do not proceed until moisture vapour emission rate is equal or less than 2.44kg/100m2/24hours (3lbs/1000sq.ft./24hours).

.3 Confirm ph level of concrete is acceptable to manufacturers of adhesive and tile. Generally, ph level is to be 9 or less.

.4 Perform bond testing to confirm compatibility between concrete slab and adhesives.

.5 Provide test results to manufacturers of products proposed for use and obtain approval of conditions before commencing installation. If the test results exceed the limitations specified to not proceed until the problem is corrected and satisfactory test results are obtained.

3.2 INSTALLATION – GENERAL

.1 Do not start installation of resilient flooring until all other trades have completed their work and just prior to completion of building.

.2 Obtain approval from manufacturers for all adhesives, caulking, patching and levelling agents, and installation methods, before proceeding with the work of this section.

.3 Ensure flooring materials are clean of any contaminants which would interfere with proper bonding.

3.3 PREPARATION

.1 On concrete floors, level depressions and cracks with non-shrinking latex joint filler. Patching and levelling products must be compatible with adhesives; obtain approval from manufacturer of adhesive. Do not use products containing gypsum.

.2 Report large cracks to Consultant. Do not proceed until remedied. Prime surface with approved primer.

.3 Thoroughly clean concrete floors of any substances deleterious to bond of adhesive.

.4 Close off areas where work is in progress to prevent deposit of dust or grit on slabs where flooring is being laid.

.5 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

.6 Clean floor thoroughly of any dirt, oil, grease and other material which may affect adhesive bonding and cause telegraphing. Apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler has cured and is dry.

.7 Prime concrete to flooring manufacturer's printed instructions.

3.4 INSTALLATION - RESILIENT FLOORING

.1 Material Installation:

- .1 Measure the area to be installed and determine the direction in which the material will be installed and seam placement.
- .2 Seams should be a minimum of 6” away from underlayment and concrete joints, saw cuts, etc. Cut the required length for the first sheet off of the roll, adding approximately 3” - 6” for extra trimming. Fit the first sheet along the main (long) wall and at the ends using standard fitting methods. Position the fitted sheet in place against the main wall. The factory edge must be trimmed in order to produce a clean edge suitable for seaming. Utilize a straight edge, utility knife and hooked blade knife may also be used. Position the straight edge approximately 1/2” - 3/4” from the factory edge and score the material using the utility knife along the straight edge.
- .3 After scoring, complete the cut using a hooked blade knife following the score line. Hold the blade at a slight angle to the surface of the material so the seam edge will have a slight undercut. After trimming the seam edge, draw a pencil line on the substrate lengthwise along the trimmed edge. This line will serve as a spread line when applying the adhesive.
- .4 Do not reverse the sheets. Install all sheets in the same direction.
- .5 Immediately roll the flooring in all directions using a 100 lb. roller to ensure proper adhesive transfer. Additional rolling is required during adhesive setup to ensure that the material is flat and fully adhered. The use of a three-section wall roller or steel seam roller is required at walls, under toe kicks or anywhere the full weight of a 100 lb. roller cannot access or be applied.
- .6 Adhesive Application: Follow manufacturer’s instructions, using the manufacturer’s recommended products.
- .7 Seaming: Allsheet products shall be installed utilizing net fit seams. A properly executed net fit seam will have no gaps or fullness. If the material is cut too full, it will result in bubbled or peaked seams. Gaps will allow dirt or contaminants to accumulate. Cut the material at an angle so as to slightly undercut the material. This will compensate for any slight expansion that may occur. Roll the seam with a steel seam roller, making sure that the flooring material is placed into wet adhesive.

.2 Installation Techniques:

.1 Where millwork and partitions and other items are indicated for installation on top of finished flooring, install flooring before these items are installed.

.2 Scribe, cut, fit flooring to butt tightly to vertical surfaces, permanent fixtures, including pipes, outlets, edgings, thresholds and nosings.

.3 Extend flooring into toe spaces, door reveals, closets, and similar openings.

.4 Install flooring on covers for telephone and electrical ducts, and similar items occurring within finish floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers.

.5 Do not install resilient flooring over expansion joints. Use expansion joint covers manufactured for use with resilient flooring. Refer to other specification sections for expansion joint covers.

.6 Adhere resilient flooring to substrate without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed installation.

.7 Use adhesive applied to the substrate in compliance with the flooring manufacturer's recommendations, including those for proper spreading of the adhesive, adhesive missing and adhesive open and working times.

.8 Immediately roll the flooring in all directions using a 100 lb. roller to ensure proper adhesive transfer. Additional rolling is required during adhesive setup to ensure that the material is flat and fully adhered. The use of a three-section wall roller or steel seam roller is required at walls, under toe kicks or anywhere the full weight of a 100 lb. roller cannot access or be applied.

.3 Avoid all traffic for at least 12 hours and limit to light traffic for a period of 72 hours after the installation. Avoid cold or excessive heat, including direct sunlight during this 72 hour period.

.4 Protection: Protect installed product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of Substantial Completion.

.5 72 hours after installation is completed, implement initial maintenance procedures, as per manufacturer's printed maintenance instructions.

3.5 APPLICATION - RUBBER BASE AND TRANSITION STRIPS

.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.

.2 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.

.3 For right angled external corners use preformed matching cove corner units. Make end joints flush with gap.

.4 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 or so that filled gap, if gap is necessary, is not less than 38mm wide and located in middle of wall or end of opening.

.5 Resilient Transition Strips:

.1 Install specified resilient transition strips at junction with dissimilar floor materials and coordinate installation with trades installing these materials.

.2 Install resilient transition strips fully bonded to floors using manufacturer recommended adhesive.

.3 Where resilient flooring meets carpet flooring coordinate installation of transition strips with carpet installation.

.4 Install strips under doors at openings.

3.6 CLEANING AND PROTECTION

.1 Remove surplus adhesive from face of material as work progresses.

.2 Upon completion of work remove all markings and heel scuffs. Broom clean.

.3 Prior to occupation by Owner, broom clean all resilient floors and remove all noticeable stains and marks. Remove all surface soil, debris, sand and grit by dust mopping, sweeping or vacuuming the floor.

.4 All wet mopping will be done by the custodian staff.

.5 Protect new floors from time of final set of adhesive until Project completion.

.6 Prohibit traffic on floor for 72 hours after installation.

.7 Protect floors by lapping joints of protection material a minimum of 150mm, sealing with non-asphaltic tape.

.8 Remove excess adhesive from floor, base and wall surfaces without damage, as work progresses.

.9 Clean and seal resilient base surface to flooring manufacturer's instructions immediately after installation.

.10 Apply sealers and waxing as directed by the manufacturer.

.11 Final cleaning is specified in Section 01 74 00 – Cleaning and Waste Management.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1	Concrete Unit Masonry	Section 04 22 00
.2	Structural Steel	Section 05 12 00
.3	Rough Carpentry	Section 06 10 00
.4	Gypsum Board System	Section 09 29 00
.5	Shop Priming Specified in various Sections of the Specification.	
.6	Factory applied paint coatings unless otherwise specified.	
.7	Mechanical	Division 20, 22
.8	Electrical	Division 26, 27, 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 Consultant.

.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 items, new work and existing surfaces in areas affected by the Work of this project, including miscellaneous metal work, shall be painted.

.3 Work includes moisture testing and surface preparation of substrates as required for acceptance of paint, including cleaning, small crack repair, patching, caulking, and making good surfaces, and specific pre-treatments, sealing, and priming of surfaces.

.4 Check conditions of all existing surfaces to be repainted before commencing new work, including assessing the level of degradation of the surface, the type of coating existing, and the thickness of the existing coating. Perform adhesion tests on all existing coatings to be repainted to ensure that surfaces are sound and well adhered before applying new coatings. It is expected that the Contractor will have visually assessed the existing conditions during the pre-tender site visit, and no contract extras will be considered for addressing conditions which were readily apparent at that time.

.5 Paint all new exterior surfaces which normally require painting, including hollow metal doors, screens, galvanized steel lintels, ladders and hardware and gas lines.

.6 Perform interior painting called for in Room Schedule and Door Schedule and noted on drawings. Paint all new walls, ceilings, bulkheads, and all surfaces which normally receive a paint finish, whether noted on schedules, or not noted. Walls shall be completely painted before installation of tackboards, whiteboards/markerboards and millwork, etc.

.7 All heating units, recessed convectors, grilles, pipes, access panels, hangers and miscellaneous exposed metal work (other than stainless steel, anodized aluminum and

baked enamel) to be painted to match the surfaces on which they occur, unless otherwise directed by Consultant.

.8 For special painted graphics, colour changes, accent stripes, etc. see drawings.

.9 In all renovated areas, paint affected walls as specified for new construction. All other walls in the room are to be cleaned and painted with one coat. If more than one colour is used in the room, confirm colours with Consultant.

.10 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.

.11 Paint all exposed structural steel and steel roof deck and mechanical ducts in finished areas.

.12 Paint exposed structure and metal deck in all mechanical and storage rooms, except Water Meter and Electrical Rooms.

.13 Paint pipes, conduit, ducts and related thermal insulation and all prime painted mechanical and electrical equipment and supports located in mechanical and electrical rooms and in all locations where Drawings call for paint or similar finish on walls and/or ceilings. Paint all mechanical equipment exposed on the roof. Exposed pipes shall be painted to Owner's Colour Coding/Piping schedule to suit use (i.e. hot water, etc.), included below.

.14 Paint all gas piping, inside and out, whether exposed or concealed. Do not paint other pipe, conduit, ducts, insulation and the like where concealed above ceilings or in service shafts.

.15 Make good paint finish on shop coated work where damaged.

.16 Paint visible portions of steel shelf angles, lintels and structural steel.

.17 Paint edges and all faces of metal doors.

.18 Paint interior of ducts and diffusers visible from exterior on room side.

.19 Painting, as referred to herein shall include paint, enamel, stain, varnish and other finishes herein specified and normally applied to the various materials by the painting Subcontractor.

1.3 GENERAL REQUIREMENTS

.1 The Contractor shall furnish all labour, materials, equipment, tools, and services to complete the specified painting work indicated in the specifications, drawings and schedules within the bid document.

.2 Prior to work commencing a meeting shall be scheduled and forms completed to review the project with the Contract Supervisor.

.3 The Contractor must provide signage at each door where work is taking place and a Health and Safety Board to include Safety Data Sheets, at the main entrance of the school.
.4 All persons visiting the site shall report to the School Office immediately upon arrival.
.5 Employees working on Board property must “sign in” and “sign out” in the log kept by the Main Office.
.6 The Contractor must sign for all keys required to work on the premises.
.7 The Contractor must keep the project lead informed about any problems related to security, fire alarms, safety problems, parking, or any other Board related problems.
.8 The Contractor will not be allowed to work on Board property unless all appropriate documents have been provided.
.9 The Contractor shall confine necessary apparatus, the storage of materials, and the operations of workers limits indicated by laws, ordinances, permits or directions of the board, and shall not unreasonably encumber the job site materials. “No Smoking” to be observed in Board buildings and on school property. No person who is impaired by alcohol or drugs shall enter and/or remain on the grounds.
.10 The Contractor must only park in the spaces designated by the Board.

10.4 REFERENCE STANDARDS

.1 Do painting and finishing to CAN/CGSB-85-GP series standards including Appendix A and to material manufacturer's instructions and to The Master Painters Institute (MPI) Architectural Painting Specification Manual and Maintenance Repainting Manual, except where specifically specified otherwise. The most stringent standards shall apply.

.2 All coatings must conform to Regulation SOR/2009-264, Volatile Organic Compound (VOC) Concentration Limits for Architectural Coatings Regulations, and the VOC limits set therein.

.3 All paints and coatings used must conform to Green Seal Standard GS-11 for paints and coatings based on performance requirements and reduced use of hazardous substances and reduced volatile organic compounds.

10.5 QUALIFICATIONS

.1 The Painting Subcontractor must be a member in good standing of the Ontario Painting Contractors’ Association and have a minimum of ten (10) years proven satisfactory experience.

.2 Manufacturer’s Qualifications: The paint Products of the Paint Manufacturer shall be as listed in Chapter 5 - Approved Products List of the MPI Manual.

10.6 INSPECTION

.1 A cash allowance has been included for independent painting inspections. The cost of the painting inspection is to be paid from the Cash Allowance included in the Contract. Refer to Section 01 10 10 – Project Instructions.

.2 Prior to commencing the work of this section the painting Subcontractor shall arrange for OPCA inspection in accordance with the requirements of the OPCA Quality Assurance Program.

.3 Painting shall not commence until the inspection company has been notified and the Inspector makes the initial site visit.

.4 Supply the Inspector with a schedule of materials intended for use on the job at the commencement of the painting.

.5 The Inspector will issue Inspection Reports during the Project. On completion of the job, the final Inspection Report will be issued.

10.7 WORK ENVIRONMENT

.1 Do not apply paint finish in areas where dust is being generated.

.2 Maintain environmental conditions within limits recommended by manufacturer, for optimum results. Do not apply coatings under environmental conditions outside manufacturer's absolute limits.

.3 Conform to requirements of MPI Architectural Specification Manual including recommendations for surface preparation.

.4 Temperature: No painting shall be performed when surface and ambient temperatures are below 5^0C. The minimum temperature for Latex paints shall be 10^0C for both interior work and exterior work.

.5 Relative humidity shall not be higher than 85%.

.1 Moisture Content of Surfaces:

.2 Tests shall be by electronic moisture meter.

1. Plaster and Gypsum Board and Cement Board: Maximum moisture content of 12%.
2. Concrete and Concrete Masonry Units: Maximum moisture content of 12% for solvent type paint. Concrete and masonry walls must be installed at least 28 days and must be visually dry on both sides before painting commences.
3. Wood: Maximum moisture content of 15%.
4. Concrete Floors: Shall be tested for moisture by Acover patch test@.

.6 Lighting: Painting shall not proceed unless the permanent lighting is in place and operational or a minimum of 161 lm/m5 lighting is provided on the surfaces to be painted.

.7 Ventilation: In areas where painting is proceeding provide adequate continuous ventilation and heating to maintain temperatures above 7^0C for 24 hours before, during and 24 hours after paint application.

.8 Do not paint exterior work immediately following rain, frost or dew. Do not paint interior work where condensation has formed or is likely to form. Proceed only when proper environmental conditions are achieved.

.9 Avoid applying paint to surfaces when exposed to direct sunlight.

10.8 ACCEPTANCE OF WORK IN PLACE

.1 Submit written confirmation of acceptance of existing conditions, to the Consultant, prior to commencing painting work. Painting may not commence without submission of this confirmation.

.2 Receipt of this confirmation will be considered a prerequisite for certification of payment for this work.

.3 Notify the Consultant, in writing, immediately if any existing condition is encountered that will prevent the attainment of satisfactory results in this work

10.9 REGULATORY REQUIREMENTS

.1 Conform to requirements of applicable Volatile Organic Compound (VOC) concentration limits for Architectural Coatings Regulations.

.2 Conform to the latest edition of Industrial Health and Safety Regulations issued by authorities having jurisdiction regarding site safety, including, but not limited to, ladders, scaffolding, and ventilation.

.3 Conform to requirements of local authorities having jurisdiction regarding the storage, mixing, application, and disposal of all paint and related waste materials.

.4 Notify the OPCA on award of contract and make application for assignment of an inspector using the appropriate forms.

.5 Fully cooperate at all times with the requirements of the OPCA in the performance of their duties, including providing access and assistance as required to complete inspection work.

10.10 SUBMITTALS

.1 Samples:

- .1 Submit triplicate samples consisting of 300mm x 200mm panels of each type of paint finish specified.
- .2 Panels shall be of same material as that on which sample coatings are to be applied in the field where possible.
- .3 Identify each sample as to job, name of paint manufacturer, finish, colour, name and number, sheen and gloss units and name of Contractor.
- .4 Retain one set of approved samples on site until completion of the Work.

.2 Submit manufacturer's data sheets for each paint product, including:
- .1 Product characteristics.
- .2 Surface preparation instructions and recommendations Primer requirements and finish specifications.
- .3 Storage and handling recommendations.
- .4 Application methods.
- .5 Cautions.
- .6 VOC data.
- .7 Complete Material Safety and Data Sheets (MSDS) for each product.

.3 Submit written confirmation of acceptance of existing conditions, as specified above.

10.11 STORAGE AND HANDLING

.1 Store paint and painter's materials in clean, dry locations approved by the Consultant. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

.2 All paint shall be in unopened containers, labelled with:

- .1 manufacturer's name,
- .2 product name, product type,
- .3 instructions for surface preparation and product application,
- .4 VOC content,
- .5 environmental issues,
- .6 batch date, and
- .7 colour name and number.

.3 Provide C02 fire extinguisher minimum 9 kg capacity in paint storage area.

.4 Dispose of materials in accordance with the requirements of authorities having jurisdiction.

.5 Paint materials shall be delivered to the job site in original sealed and labeled containers bearing the manufacturer's name, type of paint, brand name, colour designation, and instructions for mixing and reducing, and application requirements.

.6 Take all necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion. Take appropriate precautions, including no smoking restrictions, where toxic and explosive solvents are used.

10.12 SIGNS

.1 Provide legible signs throughout the Work reading "WET PAINT" in prominent positions during painting and while paint is drying.

.2 Use 75mm high letters on white card or board.

10.13 TEMPORARY COVERS AND PROTECTION

.1 Protect floors and other surfaces with temporary covers such as dust sheets, polyethelene film or tarpaulins. All to Consultant'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 closers which shall be painted. Light switches and electrical communication outlet plates to be removed and reinstalled on completion of painting.

.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.

10.14 RETOUCHING

.1 Do all retouching, etc. to ensure that the building may be handed over to the Owner in perfect condition, free of spatter, finger prints, rust, watermarks, scratches, blemishes of other disfiguration.

.2 After fully decorating and retouching a room or other area, notify Consultant. After inspection and final approval by Consultant post sign 'DECORATING COMPLETE - NO ADMITTANCE WITHOUT PERMISSION'.

10.15 TEST AREAS

.1 In areas to be repainted, test existing coatings for adhesion before applying new coatings, in accordance with the recommended practices in the MPI Repainting Specification Manual. Check for loose paint using a scraper and check for adhesion by cutting through the coatings and performing duct tape tests, or other acceptable means of testing adhesion. Once adequate adhesion is confirmed, apply a test section of the proposed new coating, allow to dry, and perform adhesion tests in area of new coating to confirm compatibility with existing coatings before proceeding with repainting work. Perform tests in all areas and on all surface types to ensure positive repainting results. Advise Consultant of any areas in which existing or new coatings fail adhesion tests. Do not proceed with the work until a recommended course of action is agreed upon by all parties. Commencement of work will signify acceptance of existing conditions.

.2 In areas of new construction, A room or area in the building will be designated by the Consultant as a test area to establish standard of workmanship, texture, gloss and coverage.

.3 Prior to any painting being started, request a meeting on Site between Consultant, Contractor, and Subcontractor and Inspector to review conditions, surfaces, anticipated problems and to clarify quality of workmanship acceptable to Consultant.

.4 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.

.5 Retain test area until after completion of Work. Test area to be minimum standard for the Work.

.6 Failure to comply with the above will be cause for Consultant to request all Work previously painted to be repainted.

10.16 WASTE MANAGEMENT AND DISPOSAL

.1 Remove and dispose of excess material and waste resulting from the work of this Section.

.2 All excess materials and empty containers shall be removed from the site and disposed of or recycled in accordance with local regulations.

.3 Obtain information regarding applicable Provincial and local government regulations for disposal of paint, stain, wood preservative finishes, and related thinners and solvents.

.4 All waste materials shall be separated and recycled. Collect waste paint by type and provide for delivery to recycling or collection facility. Materials that cannot be reused shall be treated as hazardous waste and disposed of in an appropriate manner.

.5 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.6 Cleaning and Disposal Procedures:

- .1 Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
- .2 Retain cleaners, thinners, solvents, and excess paint and place in designated containers and ensure proper disposal.
- .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
- .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
- .5 Ensure empty paint cans are dry prior to disposal or recycling.
- .6 Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

.7 Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.

10.17 MAINTENANCE MATERIALS

.1 Provide one sealed can, one 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 Maintenance material shall be of the same run as the installed material.

10.18 WARRANTY/GUARANTEE

.1 Provide a warranty, valid for three (3) years from date of Substantial Performance, or from date of completion of Work if work is not complete at date of Substantial Performance, will be required.

.2 Subcontractor’s shall warrant that the work has been performed in accordance with the standards and requirements of the MPI Architectural Painting Specification Manual, most recent edition.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Paint and finishing materials - highest grade, first line quality, low VOC products provided by any of the following manufacturers:

.1 Glidden
.2 The Sherwin-Williams Company
.3 Dulux Paints/PPG Canada

.2 Paints, enamels, fillers, primers, varnishes and stains - ready mixed products of one of the manufacturers listed. Substitutes will not be allowed.

.3 Thinners, cleaners - type and brand recommended by the paint manufacturer, or Inspector.

.4 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 Consultant and Inspector.

.5 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, and all previous painted work repainted with proper material.

2.2 COLOUR SCHEDULE

.1 Consultant will provide detailed colour schedule at a later date. Conform to schedule including patterns, colours, and locations for all finishes.

.2 A minimum of ten (10) paint colours may be selected by the Consultant.

.3 In each room, the Consultant may select one wall where an accent colour may be applied.

.4 Refer to room finishing notes for detailed application instructions.

2.3 MATERIALS

.1 All materials shall be delivered to the building in the original containers, labels intact and seals unbroken and stored in a single clean locked space. Waste shall not be stored in the building at any time and every precaution shall be taken to avoid and control fire danger and to prevent damage to floors.

.2 All priming, sealing and painting materials shall be manufactured by Dulux, Glidden or Sherwin Williams.

.3 All materials shall be pure and of the manufacturer's highest quality for work specified and shall bear an identifying label on the containers.

.4 Application shall be carried out by applicators, approved by the manufacturer, and shall be applied in accordance with the manufacturer's current printed instructions.

.5 **Note: the contractor shall in all cases leave on site in a properly sealed can, all remaining paint of each color and/or type of paint used.**

.6 **Metal, Glazed and any area identified as oil Surfaces Primed** with: Dulux, Glidden, or Sherwin Williams Oil Primer.

.7 **Classrooms & all other areas not specified herein**: Dulux, Glidden or Sherwin Williams Semi-Gloss finish water-based epoxy paint.

.8 **Interior doors and trim:** Dulux, Glidden or Sherwin Williams Semi-Gloss finish water-based epoxy paint.

.9 **Exterior Doors and trim**: Dulux, Glidden or Sherwin Williams Gloss Finish Polyurethane Enamel paint.

.10 **Ceilings:** Dulux, Glidden or Sherwin Williams Ceiling Paint.

.11 **Natural Wood (shelving):** Dulux, Glidden or Sherwin Williams Clear Acrylic Urethane Satin Finish.

.12 **Natural Wood (doors and Trim):** Dulux, Glidden or Sherwin Williams Clear Acrylic Urethane Satin Finish.

.13 **Hallways:** Dulux, Glidden or Sherwin Williams Semi-Gloss finish water-based epoxy paint.

.14 **Lockers:** Dulux, Glidden or Sherwin Williams Acrylic Semi-Gloss finish.

.15 **Washrooms:** Dulux, Glidden or Sherwin Williams Semi-Gloss finish water-based epoxy paint.

.16 **Washroom & Metal toilet Partitions:** Dulux, Glidden or Sherwin Williams Acrylic Semi-Gloss finish.

.17 **Gymnasiums and Change Rooms:** Dulux, Glidden or Sherwin Williams Semi-Gloss finish water-based epoxy paint.

.18 **Cafeterias:** Dulux, Glidden or Sherwin Williams Semi-Gloss finish water-based epoxy paint.

2.4 FINISHING SYSTEMS

.1 Interior Work: Refer to the description below, except where noted otherwise under 2.3 Materials which provides specific requirements according to room and material type that supersedes the description below.

.1 Gypsum Board:

.1 Walls (typical): INT 9.2M Institutional Low Odour/ Low VOC, semi-gloss finish, 1 coat Primer; MPI #149, Finish: 2 coats MPI #147.

.2 Walls (corridors, service rooms): INT 9.2F Epoxy-Modified Latex (over latex primer sealer), Semi-Gloss finish. Acceptable paint: Sherwin-Williams, Pro Industrial Zero VOC Waterborne Catalyzed Epoxy or Equivalent.

.3 Ceilings (typical): 2 coats of one of the following:
2 coat Dulux Lifemaster Interior Acrylic Ceiling Flat # 59170 Zero VOC or equal by one of the approved manufacturers.

.4 Ceiling (corridors, mechanical, electrical, custodian and washrooms): INT 9.2F Epoxy-Modified Latex (over latex primer sealer), Flat Finish. Acceptable paint: Sherwin-Williams, Pro Industrial Zero VOC Waterborne Catalyzed Epoxy or Equivalent.

.5 All drywall, whether requiring finish painting or not, must receive prime coat.

.2 Concrete Block, paint (typical):

.1 INT 4.2E (modified), Institutional Low Odour/ Low VOC, semi-gloss finish, 4 coat system.

.2 2 coats latex blockfiller; MPI #4.

.3 2 coats finish; MPI #147.

.4 Provide gloss finish, MPI #148, where noted as “gloss” in Room Finish Schedule.

.3 Concrete Block, glaze and wet areas:
- .1 INT 4.2J (modified), Epoxy-modified Latex Finish, 4 coat system
- .2 2 coats latex blockfiller; MPI #4
- .3 2 Coats epoxy-modified latex finish; MPI #115
- .4 Provide in all corridors, custodian room, mechanical room and washrooms, and where noted as “glazed” in Room Finish Schedule.
- .5 Acceptable Paint: Sherwin-Williams, Pro Industrial Zero VOC Waterborne Catalyzed Epoxy or Equivalent.

.4 Cast in Place Concrete walls, ceilings:
- .1 INT 3.1M Institutional Low Odour/ Low VOC, semi-gloss finish.
- .2 1 coat MPI #149.
- .3 2 coats MPI #147.

.5 Woodwork (Opaque Finish):
- .1 INT 6.4T Institutional Low Odour/ Low VOC, semi-gloss finish.
- .2 1 coat latex primer MPI #39.
- .3 2 coats institutional low VOC latex finish; MPI #147.

.6 Stain Finish:
- .1 LEED Complaint Stain.
- .2 Coats Varnish, Water Based, clear gloss; MPI #130.

.7 Ferrous Metal:
- .1 INT 5.1S Institutional Low Odour/ Low VOC, semi-gloss finish.
- .2 1 coat MPI #107.
- .3 2 coats MPI #147.

.8 Shop Primed Ferrous Metal:
- .1 INT 5.1S Institutional Low Odour/ Low VOC, semi-gloss finish.
- .2 Confirm type of shop primer used with structural steel supplier.
- .3 Confirm compatibility of all coatings with manufacturers.
- .4 Touch up prime coat where damaged, with compatible primer, type MPI#107.
- .5 2 coats interior latex, MPI #147

.9 Galvanized Metal:
- .1 Includes all hollow metal doors, frames and screens and pipe rails.
- .2 INT 5.3N Institutional Low Odour/ Low VOC, semi-gloss finish
- .3 1 coat galvanized Primer MPI #134
- .4 2 coats Acrylic Semi-Gloss MPI #147

.10 Insulation on Pipes & Ducts:
- .1 INT 6.8F Institutional Low Odour/ Low VOC, semi-gloss finish
- .2 1 coat Primer MPI #17

.3 2 coats Acrylic Semi-Gloss MPI #147

.11 Mechanical Equipment:

.1 Institutional Low Odour/ Low VOC, semi-gloss finish
.2 As specified for metal types.

.12 Piping, Conduit & Ductwork (uncoated):

.1 INT 5.3N Institutional Low Odour/ Low VOC, semi-gloss finish
.2 1 coat galvanized Primer MPI #134
.3 2 coats Acrylic Semi-Gloss MPI #147

.13 Surfaces behind grilles, within 30mm of grille:

.1 INT 5.3N Institutional Low Odour/ Low VOC, flat finish
.2 1 coat galvanized Primer MPI #134
.3 2 Coats Acrylic Flat, Black; MPI #143

.14 Concrete Floors:

.1 1 Coat Water-Borne Epoxy (diluted 10-20% with water) MPI #115
.2 2 Coats Water-Borne Epoxy MPI #115
.3 VOC emissions of coating not to exceed 200 g/l.

.15 Zinc-Coated Metal:

.1 INT 5.3M with Epoxy-Modified Latex (over water based galvanized primer), Semi-gloss Finish.
.2 Acceptable Paint: Sherwin-Williams, Pro Industrial Zero VOC Waterborne Catalyzed Epoxy, or Equivalent.

.16 Exposed Steel Floor and Roof Deck and Steel Floor and Roof Structure:

.1 INT 5.1CC, Waterborne Dry Fall (over galvanized steel or quick dry shop primer, Flat Finish.

.17 High Temperature Pipe and Fittings: INT 5.2A Heat Resistant Enamel, Semi-gloss Finish.

.18 NOTE: Use heat resistant paint where required.

.19 ".19 Gymmasium Game Lines:

.1 Supply and install painted games lines on new resilient sheet sports flooring in Gymnasium 135.

.2 Acceptable Manufacturer and Product: Advantage Sport, Gymline Paint, Type 100 Game Line Paint, Parts A and B as required to suit flooring surface.

.3 Refer to architectural drawing A5.2 for layout of game lines."

.2 Exterior Work:

.1 To MPI Manual Chapter 2.
.2 Painted Wood: EXT 6.3L Latex (over latex primer), Semi-Gloss Finish.
.3 Stained Wood: EXT 6.3N Satin, Semi-transparent, Water Based.
.4 Soffit Sheathing: EXT 9.1A Latex, Flat Finish.
.5 Ferrous Metal: EXT 5.1F Epoxy (over epoxy primer and high build epoxy) Finish.
.6 Zinc-Coated Metal: EXT 5.3C Epoxy (over epoxy primer) Finish.

.3 Paint systems are to be of premium grade.

.4 Use low odour, zero VOC products.

PART 3 - EXECUTION

3.1 PREPARATION OF SURFACES

.1 Prepare surfaces in accordance with the following standards and to MPI Architectural Specification Manual Chapters 2 and 3; the most stringent requirements shall apply. Preparation of surfaces must be reviewed with painting inspector. Prepared surfaces must be inspected before application of prime coat.

.1 Prepare wood surfaces to CGSB 85-GP-lM. Use CAN/CGSB 1.126 vinyl sealer over knots and resinous areas. Use CGSB 1-GP -103M wood paste filler for nail holes. Tint filler to match.

.2 Touch up damaged spots of shop paint primer on steel with CAN/CGSB 1.40M to CGSB 85-GP-14M.

.3 Prepare galvanized steel and zinc coated surfaces to CGSB 85-GP-16M. This includes wiped coated steel surfaces.

.4 Prepare masonry and concrete surfaces to CGSB 85-GP-31M.

.5 Prepare wallboard surfaces to CGSB 85-GP-33M. Fill minor cracks with plaster patching compound for stained woodwork.

.6 Prepare concrete floors to CGSB 85-GP-32M.

.7 Prepare copper piping and accessories to CGSB 85-GP-20M.

.8 Apply prime coat on wood scheduled for paint finish before installation.

.9 Back prime wood scheduled for transparent finish. Do not prime surfaces scheduled for transparent finish.

.10 Remove all surface contamination such as oil, wax, grease, loose paint, mill scale, dirt, foreign matter, rust, mould, mildew, mortar, efflorescence, and sealers from existing surfaces to assure sound bonding to tightly adhering old paint.

.11 Scape peeling paint off existing masonry surfaces and apply a compatible masonry sealer, approved for use by the paint manufacturer, before applying new coatings.

.12 Glossy surfaces must be clean and dull before repainting. Wash with abrasive cleanser, or, wash thoroughly and dull by sanding.

.13 Spot prime any existing bare areas with an appropriate primer.

.14 Check for compatibility between existing and new coatings by applying a test patch of the recommended coating system, covering at least 2 to 3 square feet. Allow surface to dry one week before testing adhesion per ASTM D3359. If the coating system is incompatible, complete removal is required.

.15 Where existing paint is flaking or peeling, remove using the following procedure: Spray area with water. Remove loose, scaling, paint by scraping and sanding while continually spraying.

.16 Dull glossy surfaces by wet sanding.

.17 When using wet sanding the surface and paper shall be always kept wet. Dust shall kept to a minimum to avoid excessive post project cleaning. The floor and surroundings areas shall be always protected by means of either a disposable drop sheet or plastic. The worker shall wear rubber gloves during surface preparation.

.18 Remove mildew with an anti-microbial: ensure surface is dry prior to painting.

.19 Fill cracks and large voids in block work by caulking, repointing or other approved methods; spot prime these areas before applying overall coat of paint.

.20 Repair damaged or dented surfaces in drywall and plaster with spackling compound or other appropriate measures; wet sand these areas flush with adjacent surface; for best results.

.21 Contractors shall adhere to the proposed regulation respecting lead in paint on construction projects.

.22 Contractors shall adhere to the regulation respecting lead under the Occupational Health and safety Act, revised Statues of Ontario 1980 Chapter 321, Ontario Regulation 843. As amended by Ontario Regulation 519/92.

.23 All drop sheets, sanding material and gloves shall be laced in a sealed garbage bag and disposed of daily off site and not in the Boards garbage bin on site.

.24 Areas identified as being non-latex shall be prepped with oil primer. Test patches shall be done throughout the school to identify areas.

.25 NOTE: ABOVE NOTED SURFACES MAY NOT ALL BE APPLICABLE TO THIS PROJECT.

3.2 PREPARATION AND RESTORATION OF ROOMS PRIOR TO AND AFTER PAINTING

.1 Contractor shall advise Owner 24 hours prior to painting each room.

.2 Contractor shall be responsible for removal and rehanging drapery.

.3 Contractor shall be responsible for removal and rehanging of wall mounted, corkboards, whiteboards, plaques, banners that might be necessary.

.4 Board to remove furniture out of rooms.

.5 Contractor to protect all building contents and components during painting operations.

.6 Shut down all air handling units and cover all grills with plastic carefully taped in place.

.7 Air monitoring may be conducted by the owner’s consultant.

3.3 APPLICATION

.1 Apply coatings in accordance with manufacturer's printed instructions.

.2 Use suitable, clean equipment in good condition.

.3 Maintain 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.

.4 At all hollow metal doors and frames, prime coat must be inspected and signed off by painting inspector before painting work may proceed.

.5 Apply evenly, 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 Permit paint to dry between coats. Touch up uneven spots after applying first coat. Tint various coats of multiple coat work in light shades of the final colour selected, to distinguish between coats.

.7 Give Consultant and Inspector due notice and sufficient opportunity (minimum 48 hours) to inspect each coat. Do not proceed with subsequent coat until preceding coat approved. Consultant reserves the right to order complete retreatment if this condition is not observed.

.8 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 Consultant and have formulas rectified before commencing work. Surfaces imperfectly covered shall

receive additional coats at no additional cost. Provide additional coat where ever dark colours are used.

.9 Use paint unadulterated. Use same brand of paint for primer, intermediate and finish coats. Factory mix all paints.

.10 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.

.11 Spray painting will not be permitted unless specifically approved in writing by the Consultant in each instance. Consultant 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 Consultant.

.12 Paint entire surfaces, including areas where millwork or other items are to be installed.

.13 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.

.14 Even up stained woodwork in colour as required by nature of wood and as directed by Consultant. Apply same finish on trim, fitments cupboards and other protecting ledges as on surrounding work, disregard sight lines.

.15 Carefully hand smooth and sandpaper wood between coats (including priming). Apply one coat sealer before applying first coat paint filler to knots or sap blemishes on wood surfaces to receive paint or stain finish.

.16 After first coat, fill nail holes, splits and scratches, using putty coloured to match finish.

.17 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.

.18 Clean castings with wire brush before application of first paint coat.

.19 Do not etch galvanized metal. Use zinc rich primer. This includes metal door frames and the like with wiped zinc coating.

.20 Note that primer is required on all hollow metal doors, frames and screens. Three coat system is required. Sand between all coats.

.21 Remove form oil or parting compounds from concrete surfaces. Use Xylol or approved compound.

.22 Paint interior of pipe spaces, ducts, etc. visible through grilles or through linear metal ceilings in black matt finish.

.23 Conform with Consultant's colour schedule and exactly match approved samples.

.24 All coats shall be of the proper consistency and well applied to show minimum of brush or roller marks. Varnish and enamel finish coat shall be uniformly flowed on with brush. All brushes or other equipment shall be clean and in good condition. Remove all electrical outlet plates and hardware, escutcheons or plates before painting and replace properly.

.25 All woodwork to be refinished with enamel or varnish and shall be smooth and the surface cleaned proceeding with the application of the first coat. Enamel or varnish finish applied to wood or metal shall produce an even smooth finish. **ALL SURFACES RECEIVE A MINIMUM OF TWO COATS UNLESS OTHERWISE SPECIFIED. PRIME COATS NOT INCLUDED.**

.26 All metal partitions, locker doors, locker face frames shall be coated with an oil primer. Glazed wall surfaces shall be primed. All coats shall be thoroughly dry before the succeeding coat is applied.

.27 All work where a coat of material including primer has been applied must be inspected and approved by the Boards representative before the application of succeeding specified coat, otherwise no credit for the coat applied will be given, and the Contractor automatically assumes the responsibility to recoat the work in question. The painting Contractor will notify the applicable Board’s Representative when a particular coat is completed for inspection.

.28 Both sides, tops, bottoms, and edges of interior and exterior doors shall be painted or varnished to match face of doors.

.29 Exterior painting shall not be done while surface is damp, or during rainy or frost weather (below 10 degrees C).

.30 Painting coats as specified are intended to cover surfaces perfectly: if the surfaces are not covered further coats shall be applied, at no addition to the contract sum.

.31 All surfaces in the designated areas, previously painted or urethaned are to be repainted or re-urethaned. Coating procedures remain as noted in the main specifications.

.32 All knots, pitch streaks and sappy spots shall be first touched up with white shellac before paint or enamel. All necessary puttying of nail holes, cracks, joints, etc., shall be done after the first coat, with putty of a color to match the finish. Putty shall be brought flush with the adjoining surface in a neat and work like manner. Interior block joints shall be full and smooth before priming. Concrete block surface and edge irregularities shall be repaired before filler. Concrete blocks shall be filled with masonry latex block filler except where thermoplastic coating is used, and specifications require a different base.

.33 Temperature of space in building where painting is being done or where it is drying shall be maintained above 10 degrees C.

.34 All work shall be done by skilled trades people in a quality work like manner. All materials shall be applied under adequate illumination, including filler on concrete block. Wood and

steel surfaces may be brushed, masonry surfaces shall be rolled. All materials shall be evenly brushed or rolled and free of sags, runs, crawls, or other defects. Note: spraying is not permitted.

.35 Upon completion of the work, all paint and varnish spots shall be removed from the floors, sash, fixtures, hardware, glass, and other surfaces. All empty paint cans, brushes, rollers, rags and accumulated materials shall be removed from the school site daily and shall not be disposed of in the garbage receptacles at the school. Work areas are to be left clean and in an orderly condition, that is acceptable to the Board's representative.

.36 Paint colors to match paint schedules provided in the bid document.

.37 Mechanical and Electrical Pipes, Ducts and Conduits:

.1 Commence Work when piping installation is complete in the area concerned.
.2 Do not paint plated or other prefinished surfaces, unless otherwise noted.
.3 Paint conduit in same colour as background paint.
.4 Apply formulae specified even though surface prime painted at shop prior to delivery. Touch up shop priming where damaged.
.5 Use heat resistant epoxy paint on pipes and surfaces where operating surface temperature exceeds 65 degrees C.
.6 Paint exposed pipes and ducts and their supports and related items in colours to suit colour coding included below; confirm with Consultant. Refer to Mechanical Division 20 for further instructions.

3.4 COLOUR CODING OF PIPING

.1 The following is a preliminary list of painting requirements for piping. All colours are to be confirmed by the Owner prior to commencing this work.

FUNCTION	COLOUR	WHERE EXPOSED	WHERE CONCEALED	DIRECTION INDICATION
Natural Gas	Yellow	Solid	Solid	-
Stand Pipe System	Red	Solid	Solid	-
Heating Water Supply	Dark Green	Solid	12" Band Every 20'	At minimum of every 20', Direction Arrow 9" Long, 1" wide
Heating Water Return	Pale Green	Solid	12" Band Every 20'	
Chilled Water Supply	Orange	Solid	Solid	
Chilled Water Return	Orange	Solid	Solid	
Cooling Water To Tower	Buff	Solid	Solid	

Cooling Water From Tower	Buff	Solid	Solid	
Domestic Hot Water	Dark Blue	Solid	Band Every 20'	At minimum of every 20', Direction Arrow 9" Long, 1" wide
Domestic Cold Water	Pale Blue	Solid	Band Every 20'	

3.5 CLEANING

.1 Remove paint where spilled, splashed, or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.

.2 Keep work area free from unnecessary accumulation of tools, equipment, surplus materials and debris.

.3 Dispose of general construction debris and materials.

.4 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.

.5 Recycle paint and coatings in excess of repainting as specified.

3.6 ASBESTOS

.1 The successful respondent shall ensure that employees who may come into contact with asbestos due to the nature of the work that they perform, have received training that enables them to recognize asbestos and that enable them to react in accordance with the Occupational Health and Safety Act (Ontario) and regulations thereto should contact asbestos occur during the course of their work.

.2 The building occupied by the Board are known to contain asbestos in thermal insulating materials and some manufactured products such as vinyl asbestos floor tile. A survey of each building documenting the location and condition of asbestos-containing materials is available for your mandatory review prior to commencing any work on Board premises.

.3 Any insulating materials, on pipes, fittings, boilers, tanks, ductwork, etc. may contain asbestos and is under no circumstances to be disturbed.

.4 The work being performed does not involve these materials: however, should it become necessary to penetrate, remove or in any way interact with any building or insulating materials, a request must be made to the Contract Supervisor, who will arrange for a qualified asbestos abatement contractor to preform this portion of the work.

3.7 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 1m.

.2 If patch painting is not acceptable, repaint entire wall, or ceiling.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Division 01 General Requirements

1.2 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-44.40 for Steel Clothing Locker.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit submittals in accordance with Section 01 33 00- Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's printed product literature and data sheets for metal lockers and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.

.2 Indicate on drawings: type and class of locker, thicknesses of metal, fabricating and assembly methods, assembled banks of lockers, end/back panels, trim, doors, filler panels, slanted tops, finishes, bases, hooks, locking method, shelves, rods, handle, ventilation method .

.4 Samples:

.1 Submit duplicate 50 x 50 mm samples of colour and finish on actual base metal.

.2 Samples will be returned for inclusion into work.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect metal lockers from nicks, scratches, and blemishes .

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and retur [by manufacturer, of pallets, padding, packaging materials, crates, in accordance with Section 01 74 19- Waste Management and Disposal.

1.5 WARRANTY

.1 Provide guarantee for one (1) year period from date of completion. Warranty to cover both labour and materials. Warranty shall start from completion.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

.1 Door material – Outer panel 16ga. cold rolled steel. Inner panel 20ga. cold rolled Steel. Sandwich panel fully welded and complete with honeycomb core for Strength and sound proofing. Door complete with recessed handle box to accept padlock locking device and complete with a metal pull and number plate. The door shall close on two (2) rubber bumpers on a 16ga. frame member with a closer strike the fill height of the door and shall fit flush with the outside of the frame. Doors shall be hung on heavy duty full length piano hinge welded to the frame.

.2 Ventilation – Ventilation shall be by louvers in the top and bottom frame members and cross bars, along with slots in the top, bottom and back of door.

.3 Locker Body – Locker sides, back and tops shall be constructed of 20ga. and shall all be formed from pre-painted cold rolled steel in light reflecting grey. Locker shelves & bottoms shall be constructed of 16ga. steel to the same specification. The edges shall be suitably formed to provide a rigid assembly when bolted or pop riveted together. Tops, bottom & shelves shall be flanged on all four sides with a channel formation at the front of the shelves.
The sides shall be double ribbed their entire length to ensure a stiff rigid installation.

.4 Colour – Paint shall have a 60 – 65 percent minimum gloss & be selected from the Manufacturer's standard colour chart.

.5 Interior Equipment – Supply one (1) 16ga. interior shelves, three (3) zinc plated round tipped metal coat hooks attached with two (2) bolts or pop rivets per hook to walls & one (1) double hook mounted on the bottom center of the lower double shelf.

.6 Exposed Trims – All required trims to close off head, jambs & foot lockers shall be supplied in 16ga. colour matched bent steel fastened securely with rivets or bolts.

2.2 ACCEPTABLE MANUFACTURER

.1 Acceptable Manufacturer: Shanahans SML Deluxe Lockers.

.2 Equal Products are acceptable by:
- .1 G.S.S.
- .2 Cambrian.
- .3 Hadrian
- .4 Mitchell Division 10 Ltd.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates and surfaces to receive metal lockers previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's instructions prior to metal locker installation.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval from Consultant.

3.2 FABRICATION

.1 Locker units – 305 mm wide X 380 mm deep, 1968+/- mm high overall size; single tier.

.2 Bodies – Formed & flanged with stiffener ribs; electrically spot welded.

.3 Door Frames – Formed channel shape, welded & ground flush, welded to body.

.4 Doors – Fully welded. Finish edges smooth.

.5 Provide recessed locking handle for padlock.

.6 Provide 89 mm high steel base.

.7 Provide 16ga. adjustable end panels, filler panels at head, and trim to close of all openings.

.8 Provide 16ga. sloped filler panels from front face of locker to wall complete with gusset supports and finishing trims.

.9 Finish edges smooth without burrs.

.10 Provide number plates. Verify numbering sequence with owner.

3.3 FINISHES

.1 Clean degrease, & neutralize metal; prime & finish with two (2) coats of baked enamel.

.2 Paint locker door frames black & the remainder of the locker a light grey.

.3 Door Colour – Door colour shall be selected from standard manufactures colours.

3.4 INSTALLATION

.1 Assemble and install lockers in accordance with manufacturer's written instructions.

.2 Securely fasten lockers to grounds and nailing strips.

.3 Install filler panels (false fronts) where indicated and where obstructions occur.

.4 Install finished back and end panels to exposed ends and backs of locker banks.

.5 Install locker numbers and locks.

.6 Install lockers secure, plumb, square & in line.

.7 Anchor lockers with appropriate anchor devices to suit materials encountered.

.8 Bolt adjoining locker units together & fastened to base to provide rigid installation.

.9 Install end panels, filler panels, & bases to completely close of openings.

3.5 ADJUSTING AND INSPECTION

.1 Adjust metal lockers for correct function and operation in accordance with manufacturer's written instructions.

.2 Lubricate moving parts to operate smoothly and fit accurately.

.3 Verify that surfaces are ready to receive work & opening dimensions are as indicated on shop Drawings instructed by the manufacture.

.4 Beginning of installation means acceptance of existing surfaces, sub-trade, & site conditions

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section - 01 74 00 - Cleaning.

3.7 PROTECTION

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

.2 Repair damage to adjacent materials caused by metal locker installation.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Coat Rack Shelf and Mounting Brackets and associated Hooks.

1.2 RELATED SECTIONS

.1 Division 01 - General Requirements.

1.3 SUBMITTALS AND SHOP DRAWINGS

.1 Submit in accordance with Section 01 33 00 - Submittals.
.2 Shop Drawings:
  .1 Submit Shop Drawings or Product data sheets.
  .2 Indicate materials, thicknesses, sizes and dimensions, finishes, colours, construction details, and mounting methods.
.3 Samples:
  .1 Submit colour samples for selection by the Consultant.

PART 2 - PRODUCTS

2.1 MATERIALS AND ACCEPTABLE MANUFACTURERS/SUPPLIERS

.1 Coat Rack Shelf and Mounting Brackets and associated Hooks:
  .1 Acceptable Manufacturer: ASI or equivalent manufacturers.
  .2 Model No: STL 1001.
  .3 SHELF: to consist of four 3/4" (19mm) OD square 18 gauge steel tubes closed and protected with form fitting black plastic end caps.
  .4 BRACKETS: two-piece heavy duty die cast designed with an integral backplate that provides a positive grip fastening. All screw fastenings shall color match bracket finish.
  .5 DOVETAIL: mounting shall be heavy duty extruded aluminum engineered for a slide fitting vertical adjustment of one full shelf and a length of 13" (330mm). Spacing as per manufacturer's standard but not to exceed 40" (1016mm).
  .6 FINISH: for shelf tubes, brackets, and dovetails is a high performance electrostatically applied powder coating, baked on to provide a uniform, smooth protective finish. Color as selected by architect from manufacturer's standard color range (STL-Black or STL-Gray).
  .7 COAT HOOKS: manufacturer's standard double prong molded ABS high-impact plastic formed to be non-turning, positive gripping and laterally adjustable. Architect to select from manufacturer's standard color range - Black, Red, and Yellow. Hooks to be arranged on 2nd and 4th tubes with spacing to be 6" (152mm) on center.
  .8 Equivalent products may be reviewed during the bidding period for compliance and acceptance.
  .9 Refer to proposed floor plans for quantity of racks and hooks and length of racks to infill all corridor wall openings.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Provide manufacturer's installation procedures and coordinate with the Contractor the placement of blocking and anchorage devices as may be required, concealed within all partitions.
.2 Install components of this section to meet manufacturer's recommendations.
.3 Locations and mounting heights, and arrangement and spacing shall be as indicated on the drawings. Where not indicated on the drawings, confirm location and height with the Consultant and Owner prior to installation.
.4 Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
.1 Verify blocking has been installed properly.
.2 Verify location does not interfere with door swings or use of fixtures.
.3 Comply with manufacturer's recommendations for backing and proper support.
.4 Use fasteners and anchors suitable for substrate and project conditions.
.5 Install units rigid, straight, plumb, and level, in accordance with manufacturer's installation instructions and approved shop drawings.
.6 Conceal evidence of drilling, cutting, and fitting to room finish.
.7 Test for proper operation.

3.2 ADJUSTING AND CLEANING

.1 Refinish damaged surfaces so that completed installation presents a consistent appearance with no visible defects.
.2 Clean and polish all exposed surfaces. Exercise care to avoid damage to coatings.
.3 Remove debris and packaging materials.

END OF SECTION

Division 21 Fire Suppression

Common Contract Requirements for Fire Suppression

21 02 51 Fire Protection General Requirements
21 02 61 Fire Protection Occupancy Requirements

Fire Suppression Sprinkler Systems

21 13 13 Wet Pipe Fire Suppression

Division 22 Plumbing

Contract Requirements for Plumbing

22 02 51 Plumbing General Requirements

Common Work Results for Plumbing

22 05 11 Plumbing Work Requirements
22 05 21 Plumbing Demolition and Renovation
22 05 34 Plumbing Bases, Hangers, and Supports (Indoor)

Commissioning for Plumbing

22 05 65 Plumbing Contractor Commissioning Requirements

Plumbing Insulation

22 07 19 Plumbing Piping Insulation

Facility Sanitary Sewerage

22 13 16 Sanitary Waste and Vent Piping – Cast Iron and Copper
22 13 17 Sanitary Waste and Vent Piping – Plastic

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

Common Contract Requirements for HVAC

23 02 51 HVAC General Requirements

Common Work for HVAC

23 05 21 HVAC Demolition and Renovation
23 05 34 Bases, Hangers and Supports (Indoor)
23 05 35 Bases, Hangers, and Supports (Outdoor)
23 05 49 HVAC Vibration and Noise Control Measures
23 05 53 Identification of HVAC Services

Testing, Adjusting, and Balancing

23 07 11 Testing, Adjusting, and Balancing (TAB) of HVAC Systems

Commissioning for HVAC

23 08 11 HVAC Contractor Commissioning Requirements

HVAC Insulation

23 10 19 HVAC Piping Insulation

Hydronic Piping and Pumps
23 21 11 Hydronic Accessories
23 21 13 Hydronic Piping - Screwed/Welded
Refrigerant Piping
23 23 13 Refrigerant Piping and Specialties
HVAC Water Treatment
23 25 13 Water Treatment for Closed-Loop Hydronic Systems
HVAC Ducts and Casings
23 31 13 Metal Ducts
Air Duct Accessories
23 33 13 Duct Accessories
23 33 18 Operating Dampers
23 33 53 Duct Liners
HVAC Fans
23 34 23 Packaged Exhausters
Air Outlets and Inlets
23 37 13 Diffusers, Registers, and Grilles
23 37 23 Louvres, Intakes, and Exhaust
Decentralized Unitary HVAC Equipment
23 81 26 Split System Air Conditioning
Convection Heating and Cooling Units
23 82 23 Hydronic Unit Ventilators

Division 25 Integrated Automation
Control Systems
25 40 11 Building Control System

END OF SECTION

Part 1 General

1.1 GENERAL PROVISIONS

.1 Conform to Division 1 General Conditions and to all sections of Mechanical Division.

.2 Furnish labour, materials, and equipment necessary for completion of work as described in contract documents.

.3 Unless specifically indicated, all materials and equipment provided under this contract shall be new and shall be manufactured in the project year.

.4 The term “Mechanical Contractor” shall remain active and shall mean a “single contractor” performing plumbing, drainage, heating, cooling, ventilation, and control services.

.5 When quoting as a subcontractor this contractor shall explicitly state the services, they are providing i.e. Mechanical (all services), Plumbing (water and drainage systems) or HVAC (including hydronic and air systems).

.6 Contractors shall be explicit to identify whether Fire Protection is included or omitted from the mechanical scope.

1.2 INTENT

.1 Mention herein or indication on Drawings of articles, materials, operations or methods requires: supply of each item mentioned or indicated, of quality, or subject to qualifications noted; installation according to conditions stated: and, performance of each operation prescribed with furnishing of necessary labour, equipment, and incidentals for fire protection work.

.2 Where used, words “Section” and “Division” shall also include other Subcontractors engaged on site to perform work to make building and site complete in all respects.

.3 Where used, word “supply” shall mean furnishing to site in location required or directed complete with accessory parts.

.4 Where used, word “install” shall mean secured in place and connected up for operation as noted or directed.

.5 Where used, word “provide” shall mean supply and install as each is described above.

1.3 REGULATIONS, PERMITS, AND FEES

.1 All materials and quality of work shall meet all current and latest Provincial, Municipal and Fire Marshall requirements, regulations, codes, and by-laws in force in the area of the project.

.2 Each contractor shall give all necessary notices, obtain all necessary permits, and pay all fees in order that the work shown or specified may be carried out. Each contractor shall furnish any certificates necessary as evidence that the work installed conforms with the laws and regulations of all authorities having jurisdiction.

.3 In the event that changes, or alterations are required on completed work by authorized inspectors, these changes shall be made at the contractor’s expense.

.4 Special equipment which does not have a standard CSA label shall be inspected by the local electrical authority having jurisdiction and the Approval Certificate shall be submitted to the Consultant as soon as possible. All costs and fees for inspections shall be borne by this contractor.

1.4 DRAWINGS

.1 The drawings and this specification have been assembled together as a responsibility of the consultant. The same is true for the other consultants, i.e. architect, structural engineer, civil engineer, fire protection engineer, electrical engineer, etc.

.2 The drawings and specifications are not assembled together for responsibility/division between subcontractors. The division of work between subcontractors remains the responsibility of the buildings' contractor (also known as the prime contractor or general contractor).

.3 All subcontractors are encouraged to perform work amicably utilizing all of the drawings and specifications published by all of the consultants.

.4 Fire protection drawings do not show architectural, structural, plumbing, mechanical and related details. Take information involving accurate measurement of building from building drawings, or at building. Make, without additional charge, any necessary changes, or additions to runs of piping, conduits, and ducts to accommodate structural conditions. Location of pipes and other equipment may be altered by Consultant without extra charge provided change is made before installation and does not necessitate major additional material.

.5 As work progresses and before installing piping and any other fittings and equipment which may interfere with interior treatment and use of building, provide detail drawings, or obtain directions for exact location of such equipment and fitment's.

.6 Install piping clear structural members and any fireproofing. Locate work to permit installation of specified insulation. Do not remove or damage structural fireproofing. Leave space to permit fireproofing and insulation to be inspected and repaired.

.7 Before commencing work, check and verify all sizes, locations, grade and invert elevations, levels, and dimensions to ensure proper and correct installation.

.8 Locate all fire protection piping and equipment in such a manner as to facilitate easy and safe access to and maintenance and replacement of any part.

.9 In every place where there is indicated space reserved for future or other equipment, leave such space clear, and install piping and other work so that necessary installation and connections can be made for any such apparatus. Obtain instructions whenever necessary for this purpose.

.10 Relocate equipment and/or material installed but not coordinated with work of other Sections and/or installed incorrectly as directed, without extra charge.

.11 Where drawings are done in metric and product not available in metric, the corresponding imperial trade size shall be utilized.

1.5 INTERFERENCE AND COORDINATION DRAWINGS

.1 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the constructed spaces provided.

.2 Prepare drawings to indicate co-ordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus, and connections are coordinated.

.3 Ensure that clearances required by jurisdictional authorities and clearances for proper maintenance are indicated on drawings.

.4 Upon consultant's request submit copies of interference drawings to consultant.

.5 Due to the nature of the building and the complexity of the building systems provide the following:

.1 Interference drawings, showing coordination of architectural, structural, plumbing, mechanical, and electrical systems for the consultant's review prior to fabrication.

.2 Detailed layout drawings, clearly showing fasteners and hangers.

.6 Provide CAD drawings (minimum file version AutoCAD 2013) in addition to hard copies.

1.6 QUALITY ASSURANCE

.1 Perform work in accordance with applicable provisions of local Code and NFPA requirements. Ordinances, and adoptions thereof for all fire protection systems. Provide materials and labor necessary to comply with rules, regulations, and ordinances.

.2 In case of differences between building codes, provincial laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Consultant in writing of such differences.

1.7 EXAMINATION

.1 Site Reviews

.1 Examine premises to understand conditions which may affect performance of work of this Division before submitting proposals for this work.

.2 No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

.2 Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.

1.8 SEQUENCING, SCHEDULING, AND COORDINATION

.1 It is understood that while Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for installation of systems according to the true intent and meaning of Contract Documents. Anything not clear or in conflict will be explained by making application to Consultant. Should conditions arise where certain changes would be advisable, secure Consultant's approval of these changes before proceeding with work.

.2 Coordinate work of various trades in installing interrelated work. Before installation of fire protection items, make proper provision to avoid interferences in a manner approved by Consultant. Each Contractor shall refer to all sections of the specification for their responsibilities with other trades. Changes required in work specified in Fire Protection Division caused by neglect to do so shall be made at no cost to Owner.

.3 Arrange pipes, ducts, and equipment to permit ready access to valves, unions, traps, starters, motors, control components, and to clear openings of doors and access panels.

.4 Furnish sleeves, inserts, supports, and equipment that are an integral part of other Divisions of the Work to Sections involved in sufficient time to be built into construction as the Work proceeds. Locate these items and see that they are properly installed. Expense resulting from improper location or installation of items above shall be borne by Fire Protection Division.

.5 Be responsible for required cutting, and patching incident to work of this Division and make required repairs afterwards to satisfaction of Consultant. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.

.1 Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.

.2 Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.

.6 Adjust locations of pipes, equipment, fixtures, etc., to accommodate work from interferences anticipated and encountered. Determine exact route and location of each pipe prior to fabrication.

.1 Make offsets, transitions, and changes in direction of pipes as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.

.7 Slots and openings through floors, walls, and ceilings shall be provided by this contractor but performed by a trade specializing in this type of work. This Division shall see that they are properly located and do any cutting and patching caused by its neglect to do so.

1.9 REQUEST FOR INFORMATION (RFI) PROCEDURES

.1 RFIs shall be submitted to the consultant a minimum of two (2) weeks prior to answer being required. Failure to submit an RFI in a timely manner will forfeit delay claims and schedule extension requests by the contractor.

.2 All RFIs will be submitted with the following information:

.1 RFI number
.2 Name of project
.3 Date of initiation
.4 Date response required by (minimum two (2) weeks)
.5 Subject
.6 Submitter's name
.7 Drawing/specification reference
.8 Photograph of the issue (if applicable)
.9 Description of the issue
.10 Contractor's proposed resolution

1.10 SHOP DRAWINGS AND PRODUCT DATA

.1 Furnish complete catalog data for manufactured items of equipment to be used in the Work to Consultant for review within 14 days after award of Contract.

.2 Upon receipt of reviewed shop drawing, product is to be ordered immediately.

.3 Provide a complete list of shop drawings to be submitted prior to first submission.

.4 Before submitting to the Consultant, review all shop drawings to verify that the products illustrated therein conform to the Contract Documents. By this review, the Contractor agrees that it has determined and verified all field dimensions, field construction criteria, materials, catalogue numbers, and similar data and that it has checked and coordinated each shop drawing with the requirements of the work and of the Contract Documents. The Contractor's review of each shop drawings shall be indicated by stamp, date and signature of a qualified and responsible person possessing by the appropriate authorization.

.5 If material or equipment is not as specified or submittal is not complete, it will be rejected by Consultant.

.6 Additional shop drawings required by the contractor for maintenance manuals, site copies etc., shall be photocopies of the "reviewed" shop drawings. All costs to provide additional copies of shop drawings shall be borne by the contractor.

.7 Submit all shop drawings for the project as a package. Partial submittals will not be accepted.

.8 Catalog data or shop drawings for equipment, which are noted as being reviewed by Consultant or their Engineer shall not supersede Contract Documents.

.9 Review comments of Consultant shall not relieve this Division from responsibility for deviations from Contract Documents unless Consultant's attention has been called to such deviations in writing at time of submission, nor shall they relieve this Division from responsibility for errors in items submitted.

.10 Check work described by catalog data with Contract Documents for deviations and errors.

.11 Shop drawings and product data shall show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances. e.g., access door swing spaces.

.12 Shop drawings and product data shall be accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify as to current model production.

.5 Certification of compliance to applicable codes.

.13 State sizes, capacities, brand names, motor HP, accessories, materials, gauges, dimensions, and other pertinent information. List on catalog covers page numbers of submitted items. Underline applicable data.

.14 Shop drawings shall be submitted electronically as per the following directions:

.1 Electronic Submissions:

.1 Electronically submitted shop drawings shall be prepared as follows:

.1 Use latest software to generate PDF files of submission sheets.

.2 Scanned legible PDF sheets are acceptable. Image files are not acceptable.

.3 PDF format shall be of sufficient resolution to clearly show the finest detail.

.4 PDF page size shall be standardized for printing to letter size (8.5"x11"), portrait with no additional formatting required by the consultant. Submissions requiring larger detail sheets shall not exceed 11"x17".

.5 Submissions shall contain multiple files according to section names as they appear in Specification.

.6 File names shall include consultant project number and description of shop drawing section submitted.

.7 Each submission shall contain an index sheet listing the products submitted, indexed in the same order as they appear in the Specification. Include associated PDF file name for each section.

.8 On the shop drawing use an “electronic mark” to indicate what is being provided.

.9 **Each file shall bear an electronic representation of the “company stamp” of the contractor. If not stamped the file submission will not be reviewed.**

.2 Email submissions shall include subject line to clearly identify the consultants project number and the description of the shop drawings submitted.

.3 Electronic attachments via email shall not exceed 10MB. For submissions larger than 10MB, multiple email messages shall be used. Denote related email messages by indicating “1 of 2” and “2 of 2” in email subject line for the case of two messages.

.4 Electronic attachments via web links (URL) shall directly reference PDF files. Provide necessary access credentials within link or as username/password clearly identified within body of email message.

.5 On site, provide one (1) copy of the “reviewed” shop drawings in a binder as noted above.

.6 Contractor to print copies of “reviewed” shop drawings and compile into maintenance manuals in accordance with requirements detailed in this section.

1.11 EQUIPMENT NAMEPLATE DATA

.1 Between the manufactures design published literature, the shop drawing submission literature, and the nameplate data on the equipment, they can all read differently.

.2 Most of the confusion and differences are coming out of the electrical power installation.

.3 The contractors installing and connecting the equipment are responsible for the coordination of this data through the construction period.

.4 The contractors shall share and/or request this information through out the project and monitor/make adjustments, provide recommendations accordingly based on any discrepancies.

.5 The contractors are responsible for any cost associated with the changing data.

.6 The final installation must meet the “Nameplate Data” on the equipment on site.

1.12 OPERATION AND MAINTENANCE MANUAL

.1 Provide operation and maintenance data for incorporation into manual as in submittals’ requirements.

.2 Operation and maintenance manual to be approved by, and final copies deposited with, Consultant before final inspection.

.3 Submit one (1) copy of Operation and Maintenance Manual to Consultant for review and approval. Submission of individual data will not be accepted unless directed by Consultant. Submission can be done electronically in PDF format or as a hard copy.

.1 Electronic submission/pdf file is required to be bookmarked. Any submission received without bookmarking will be immediately returned as unacceptable.

.2 Hard copy submission shall be in a three-ring binder (minimum 50 mm (2") ring) and labelled as ‘Operation and Maintenance Manual’ with project name and location. Dividers are to be used for binder organization.

.4 Make changes as required and re-submit as directed by Consultant.

1.13 AS-BUILT DRAWINGS

.1 Site records:

.1 Contractor shall provide two (2) sets of reproducible fire protection drawings. Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include changes to existing fire protection systems, control systems, and low voltage control wiring.

.2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection at all times.

1.14 WARRANTIES

.1 In addition to guarantee specified in General Conditions, guarantee fire protection systems to be free from defects that may develop from failure to construct system in accordance with Contract Documents.

.2 Provide certificates of warranty for each piece of equipment made out in favor of Owner. Clearly record "start-up" date of each piece of equipment on certificate. Include certificates as part of Operation and Maintenance Manual.

.3 Warranty period shall start from date of ready for takeover. Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.

.3 Warranty Duration:

.1 Two (2) year warranty period applies unless otherwise noted.

.4 Warranty Coverage:

.1 Applies to parts and labour.

1.15 READY FOR TAKEOVER

.1 Complete the following to the satisfaction of the consultant prior to request for ready for takeover:

.1 As-built Drawings

.2 Maintenance Manuals

.3 System Start up

.4 Instructions to Owners.

1.16 REVISION TO CONTRACT

.1 Provide the following:

.1 Itemized list of material with associated costs.

.2 Labour rate and itemized list of labour for each item.

.3 Copy of manufacturers/supplier’s invoice if requested.

1.17 DELIVERY, STORAGE, AND HANDLING

.1 Follow Manufacturer's directions in delivery, storage, and protection, of equipment and materials. Contractor to include all costs associated with delivery storage and handling in tender price.

.2 Deliver equipment and material to site and tightly cover and protect against dirt, water, chemical, and other environment damaging conditions but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in dry, heated space.

.3 Remove any damaged materials from site.

1.18 DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS

.1 If designated substances and/or hazardous materials are suspected or identified cease all work in the immediate area in accordance with OHSA and notify Consultant.

.2 Each Contractor and on site employee of the Contractor shall have "asbestos awareness training".

.3 The Contractor shall ensure that employees who may come into contact with designated substances and/or hazardous materials due to the nature of the work that they perform, have received training that enables them to recognize designated substances and/or hazardous materials and that enables them to react in accordance with the Occupational Health and Safety Act and regulations thereto should contact with designated substances and/or hazardous materials occur during the course of their work.

.4 It is the responsibility of the Contractor to review the designated substances and/or hazardous materials book in the building prior to starting any work.

.5 Existing occupied buildings (depending upon their age) may contain designated substances and/or hazardous materials in thermal insulating materials and some manufactured products, such as vinyl asbestos floor tile. Any insulating materials on pipes, fittings, boilers, tanks, ductwork, etc. may contain designated substances and/or hazardous materials and shall not be disturbed.

.6 A survey of each building documenting the location and condition of designated substances and/or hazardous containing materials is available for your mandatory review prior to commencing any work on premises.

1.19 CONFINED SPACES

.1 Certain areas of the building may be defined as a "Confined Space". Any personnel working in these areas must have confined space training, appropriate equipment and undertake all work in conformance with appropriate codes and standards.

.2 Refer to building documentation for any spaces deemed "Confined Space".

1.20 TESTS

.1 Give 48 hours written notice of date for tests.

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

.3 Conduct tests in presence of Consultant.

.4 Bear costs including retesting and making good.

.1 Test fire systems in accordance with authorities having jurisdiction and as specified elsewhere.

.5 Test fire systems in accordance with authorities having jurisdiction (AHJ) NFPA requirements and as specified elsewhere.

.6 Equipment: test as specified in relevant sections.

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

1.21 TRIAL USAGE

.1 Consultant or owner may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to all fire protection.

1.22 ELECTRICAL

.1 Electrical work to conform to Electrical Division including the following:

.1 Power wiring and conduit is specified in Electrical Division except for conduit, wiring and connections below 50 V which are related to control systems. Follow Electrical Division for installation methods, quality of materials, and workmanship.

.2 Electrically operated equipment shall be C.S.A. approved label. Special Inspection Label of Provincial Authority having jurisdiction will be accepted in lieu of C.S.A. approval. Each motor shall have an approved starter. Starter will be supplied and installed by Electrical Division unless otherwise indicated.

1.23 PIPING AND EQUIPMENT SUPPORTS

.1 Equipment supports supplied by equipment manufacturer shall follow the manufacturer's recommendation.

.2 Piping and equipment supports not supplied by equipment manufacturer: fabricate from structural grade steel meeting requirements of - Structural Steel Section. Submit structural calculations with shop drawings.

1.24 SLEEVES

.1 Pipe sleeves: at points where pipes pass through masonry, concrete or fire rated assemblies and as indicated. Grout sleeves in place.

.2 Schedule 40 steel pipe.

.3 Sleeves with annular fin continuously welded at midpoint:

.1 Through foundation walls.

.2 Where sleeve extends above finished floor.

.3 Through fire rated walls and floors.

.4 Sizes: minimum 6 mm (1/4") clearance all around, between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25 mm (1") above other floors.

.6 Fill voids around pipes:

.1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof fire retardant non-hardening mastic.

.2 Where sleeves pass through walls or floors, provide space for firestopping. Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.

.3 Ensure no contact between copper tube or pipe and ferrous sleeve.

.4 Fill future-use sleeves with lime plaster or other easily removable filler.

.5 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CGSB 1-GP-181M+Amdt-Mar-78.

.7 Provide minimum 20 gauge duct sleeves where ducts pass through masonry concrete or fire rated assemblies. Maintain minimum 25 mm clearance all around or to the requirements of the authority having jurisdiction. Seal at wall as indicated.

1.25 FIRE STOPPING

.1 This contractor shall work with all other contractors on the project in providing one common method of fire stopping all penetrations made in fire rated assemblies.

.2 Approved fire stopping and smoke seal material in all fire separations and fire ratings within annular space between pipes, ducts, insulation and adjacent fire separation and/or fire rating.

.3 Do not use cementitious or rigid seals around penetrations for pipe or other fire protection items piercing walls, floors, etc.

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

.5 Provide materials and systems capable of maintaining effective barrier against flame, smoke and gases. Ensure continuity and integrity of fire separation.

.6 Comply with the requirements of CAN4-S115-M35, and do not exceed opening sized for which they have been tested.

.7 Systems to have an F or FT rating (as applicable) not less than the fire protection rating required for closures in a fire separation. Provide “fire wrap” blanket around services penetrating fire walls. Extent of blanket must correspond to ULC recommendations.

.8 The fire stopping materials are not to shrink, slump or sag and to be free of asbestos, halogens and volatile solvents.

.9 Firestopping materials are to consist of a component sealant applied with a conventional caulking gun and trowel.

.10 Fire stop materials are to be capable of receiving finish materials in those areas which are exposed and scheduled to receive finishes. Exposed surfaces are to be acceptable to consultant prior to application of finish.

.11 Firestopping shall be inspected and approved by local authority prior to concealment or enclosure.

.12 Install material and components in accordance with ULC certification, manufacturers instructions and local authority.

.13 Submit product literature and installation material on fire stopping in shop drawing and product data manual. Maintain copies of these on site for viewing by installers and consultant.

.14 Manufacturer of product shall provide certification of installation. Submit letter to the consultant.

.15 Acceptable alternate manufacturers to approval of local authority:

.1 Minnesota Mining and Manufacturing
.2 Fryesleeve Industries Inc.
.3 General Electric Pensil Firestop Systems
.4 International Protective Coatings Corp.
.5 Rectorseal Corporation (Metacaulk)
.6 Proset Systems
.7 3M
.8 AD Systems
.9 Hilti

.16 Ensure firestop manufacturer representative performs onsite inspections and certifies installation. Submit inspection reports/certification at time of substantial completion.

1.26 ESCUTCHEONS

.1 On pipes and ductwork passing through walls, partitions, floors and ceilings in exposed finished areas and on water and drain pipes inside millwork and cabinets.

.2 Chrome or nickel plated brass or Type 302 stainless steel, one piece type with set screws.

.3 Outside diameter to cover opening or sleeve.

.4 Inside diameter to fit around finished pipe.

1.27 PAINTING

.1 Refer to Section Interior Painting and specified elsewhere.

.2 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.

.3 Apply two coats of paint to exposed piping service in mechanical room, electrical, and service rooms. Base colour shall be red.

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

.5 Restore to new condition, or replace equipment at discretion of consultant, finishes which have been damaged too extensively to be merely primed and touched up.

1.28 ACCESS DOORS

.1 Provide access doors to concealed fire protection equipment for operating, inspecting, adjusting and servicing.

.2 Flush mounted 600 x 600 mm (24" x 24") for body entry and 300 x 300 mm (12" x 12") for hand entry unless otherwise noted. Doors to open 180°, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.

.3 Material:

.1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Consultant.

.2 Remaining areas: use prime coated steel.

.3 Fire rated areas: provide ULC listed access doors.

.4 Washrooms or high moisture area ceilings: Aluminum with mill finish suitable for painting.

.4 Installation:

.1 Locate so that concealed items are accessible.

.2 Locate so that hand or body entry (as applicable) is achieved.

.5 Acceptable Manufacturers:

.1 Le Hage

.2 Zurn

.3 Acudor

.4 Nailor Industries Inc.

1.29 REPAIRS, CUTTING, AND RESTORATION

.1 Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.

.2 Each Section of this Division shall bear expense of cutting, patching, and repairing to install their work and/or replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.

.3 Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.

.4 All patching, painting and making good of the existing walls, floors, ceilings, partitions and roof will be at the expense of this Contractor, but performed by the Contractor specializing in the type of work involved unless otherwise noted.

1.30 EXISTING SYSTEMS

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

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

1.31 CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units prior to turn over to owner.

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

1.32 DISCONNECTION AND REMOVAL

.1 Disconnect and/or remove equipment, piping, etc. as indicated.

.2 Cap and conceal all redundant and obsolete connections.

1.33 INTEGRATED LIFE SAFETY SYSTEMS TESTING

.1 Fire protection systems in this building, including but not limited to flow switches, valves, fire pumps, etc. will be subject to Integrated Life Safety Systems testing.

.2 The Fire Protection Contractor shall co-ordinate with the Integrated Life Safety Systems Testing Agent as follows:

.1 Confirm which fire protection systems are to be included as part of the testing process.

.2 Verify in writing to the Integrated Life Safety Systems Testing Agent that fire protection commissioning of the affected systems/devices is complete prior to the scheduled testing date(s).

.3 Participate in the Integrated Life Safety Systems Testing to confirm proper operation of all associated systems.

.4 This Contractor shall work with the Integrated Life Safety Systems Testing Agent to reset all systems back to normal operating mode after the testing is complete.

.3 Include all costs associated with Integrated Life Safety System Testing in the tender value.

.4 Refer to Division 1/Division 26 Integrated Life Safety Systems Testing specifications for additional information/requirements.

1.34 IDENTIFICATION OF SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend, direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Background colour marking and legends for piping systems:

CONTENTS	BACKGROUND COLOUR MARKING	LEGEND
Fire protection water	Red	FIRE PROT. WTR
Sprinklers	Red	SPRINKLERS

1.35 FUNCTIONAL PERFORMANCE TESTS

.1 This Contractor shall be responsible for the Functional Performance Tests. These tests ensure that all equipment and systems operate in accordance with design intent. Test the systems through all possible modes of operation.

.2 The function performance test shall be:

.1 Test piping systems.

.2 Test all valves and flow switches.

.3 Test flow and record flow from end of inspector's test port.

.4 Test flow from all standpipe systems at the most remote and highest hose connection.

.5 Test flow thru all backflow preventors.

.6 Test flow thru all fire pumps.

.7 Other test that maybe a requirement of NFPA.

.3 All test shall be recorded and presented to the Consultant and Owner.

.4 Include all test results in the Operation and Maintenance Manuals.

Part 2 Product

2.1 Not Used.

Part 3 Execution

3.1 Not Used.

END OF SECTION

Part 1 General

1.1 OCCUPANCY REQUIREMENTS

.1 The contractor shall provide the following documentation to the consultant's satisfaction prior to receiving occupancy. Failure to provide the proper documentation will result in the occupancy not being granted. List of required documentation:

.1 Final Certificates (required prior to consultant's release of conformance letter):

.1 NFPA-13 Contractors Material and Test Certificate (sprinkler)

.2 Sprinkler Design Engineers' Letter

Part 2 Not Used

Part 3 Not Used

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 NFPA 13 latest edition, Installation of Sprinkler Systems.

.3 Ontario Fire Code.

.4 Ontario Building Code.

.5 Factory Mutual guidelines.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with general requirements in accordance with NFPA 13, working plans and design requirements.

.2 Shop drawings shall be approved by authority having jurisdiction prior to submission.

.3 Submit to Consultant for general review and information only.

.4 Submitted drawings shall be reproducible. Do not submit marked up prints.

.5 Drawings shall be in AutoCad format.

1.3 SAMPLES

.1 Submit samples in accordance with general requirements.

.2 Submit samples of following:

.1 Each type of sprinkler head.

.2 Signs.

1.4 ENGINEERING DESIGN CRITERIA

.1 Design system in accordance with Ontario Fire Marshall, local authority having jurisdiction, Owner's underwriters as required, and NFPA 13, NFPA 20, and NFPA 45 using following parameters:

.1 To suit occupancy as indicated.

.2 Pipe size and layout: Hydraulic design.

.3 Conduct flow and pressure test of water supply in vicinity of project to obtain criteria for bases of design in accordance with NFPA 13. Indicate location and flow on shop drawings.

.4 System zoning as indicated in accordance with NFPA 13.

.5 Provide complete drawings and calculations stamped by a qualified professional engineer registered in the Province of Ontario.

.6 Professional Engineer shall provide on site review and certification for local building code review.

.2 System shall be approved by Ontario Fire Marshall, local authority, and Owner's underwriter prior to shop drawing submission.

1.5 COMMISSIONING & INTEGRATED TESTING OF FIRE PROTECTION & LIFE SAFETY SYSTEMS

.1 Sprinkler Contractor to perform services with the Fire Commissioning Agent (FCA) to meet their requirements for administration, verification, and final sign-off.

.2 The Fire Commissioning Agent (FCA) is being retained by the Electrical Contractor, however; this Contractor's work to satisfy the FCA requirements shall be included in the tender price.

.3 The Sprinkler Contractor at a minimum must include for:

.1 Providing FCA with all documentation of design and shop drawings.

.2 Provide documents for sequence of operation and maintenance of system.

.3 Movement of all valves and accessories to confirm Alarm/Supervisory/Trouble at the fire panel.

.4 Create flow at all initiating devices to verify detection at the fire panel.

.5 Testing and operation of any fire pumps.

.6 Other items that may be requested by the FCA.

.7 Re-commissioning of any items that may have failed.

.8 Putting the system back into proper operation after tests are completed.

.4 All work is to be performed in accordance with NFPA 3 2010 Edition. Special consideration to be given to Figure A3.3.16 (b) for Sequence of Operation Form required to be completed in conjunction with the FCA and submitted to the Consultant's prior to occupancy.

.5 The work to be performed by this Contractor is also described in NFPA 3 table A.5.1.1 as labelled "Construction Stage" and "Occupancy Stage".

1.6 MAINTENANCE DATA

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

1.7 MAINTENANCE MATERIALS

.1 Provide maintenance materials in accordance with general requirements.

.2 Provide spare sprinklers and tools as required by NFPA 13.

1.8 PERMITS AND FEES

.1 Obtain and pay for all permits, fees, and inspections as required by authority having jurisdiction.

1.9 EQUIPMENT

.1 ULC listed and labeled.

1.10 STORAGE

.1 Store in original packaging with manufacturers' labels and seals intact.

.2 Store in dry secure location.

.3 Damaged material and/or equipment shall be replaced.

1.11 UNDERWRITERS REQUIREMENTS

.1 Confirm with owner insurance underwriters prior to submitting quote.

Part 2 Products

2.1 PIPE, FITTINGS, AND VALVES

.1 Pipe and Fittings:

.1 25 mm (1"): Schedule 40 steel pipe with screwed fittings.

.2 32 mm (1¼") to 50 mm (2"):

.1 Schedule 40 steel pipe with screwed fittings or,

.2 Schedule 10 steel pipe with roll grooved fittings.

.3 65 mm (2½") and larger: Schedule 10 steel pipe with roll grooved fittings.

.2 Pipe hangers:

.1 ULC listed for fire protection services.

2.2 SPRINKLER HEADS

.1 General: to NFPA 13 and ULC listed for fire services.

.2 Indicate type and location of sprinkler heads on drawings. Co-ordinate sprinkler heads location with other trades.

.3 Locate sprinkler heads in acoustic tile ceiling in centre of tile.

.4 Provide sprinkler heads as follows:

.1 Upright bronze: Exposed with no ceilings.

.2 Concealed fusible link type brass pendent with ring and cup in ceiling and brass coverplate. Coverplate finish selected by Consultant. Concealed heads installed in unsupervised areas (corridors, washrooms).

.3 White semi-recessed fusible link type brass pendent with adjustable, recessed escutcheon ring and cup. Sprinkler and escutcheon cup. Finish selected by Consultant. Semi-recessed heads installed in supervised areas (classrooms, offices, seminar rooms, etc.).

.4 Sprinkler heads with O-ring design shall not be used.

.5 Provide guards on upright sprinkler heads in all storage rooms, in the gymnasium and on heads below 1800 mm AFF.

.5 Provide sprinkler heads under all equipment/ductwork over 1200 mm wide.

2.3 DOCUMENTATION

.1 Prepare documentation as indicated.

.2 Provide documentation based on tender documents. Coordinate sprinkler drawings with all trades.

.3 Provide one hard copy and one electronic copy of As Built drawings acceptable to Consultant prior to final payment.

Part 3 Execution

3.1 INSTALLATION

.1 Install, inspect and test to acceptance in accordance with NFPA 13 and FC 403.

.2 Testing to be witnessed by authority having jurisdiction.

.3 Space hangers and support of sprinkler piping in accordance with N.F.P.A. regulations.

.4 Hydrostatically test systems at 350kPa in excess of normal working pressure, but not less than 1.4 MPA for two hours without loss under supervision of authority having jurisdiction and NFPA requirements.

.5 Provide hydraulic pump, temporary connections and labour required for tests.

.6 Protect exposed work, in accordance with 'Painting' section.

.7 Do not cover or conceal piping accessories or work prior to inspection and approval by authorities having jurisdiction.

.8 Adjust equipment to satisfaction of authority having jurisdiction and Consultant.

.9 Protect equipment during painting. Replace damaged and painted components.

.10 Co-ordinate the sprinkler piping and equipment with that of other trades on the job. Mains and branches shall be run so as not to interfere with building's structure, mechanical, or electrical installations. Branch piping above ceilings is to run in joist space or minimum 300 mm above ceiling. Provide drops at head locations only. All exposed piping to run in joist space.

.11 Guarantee that the systems and equipment be installed in accordance with all Local and Provincial by-laws and the rules and regulations of the Insurance Underwriters and the Building Code of Ontario.

.12 Provide a flow test for each system on the remote inspectors test connection using methods approved by the local fire department and local water commission. Report the test results in writing to the Consultant.

END OF SECTION

Part 1 General

1.1 GENERAL PROVISIONS

.1 This section covers items common to all sections of Plumbing Division.

.2 Conform to Division 1 General Conditions.

.3 Furnish labour, materials, and equipment necessary for completion of work as described in contract documents.

.4 Unless specifically indicated, all materials and equipment provided under this contract shall be new and shall be manufactured in the project year.

.5 The term “Mechanical Contractor” shall remain active and shall mean a “single contractor” performing plumbing, drainage, heating, cooling, ventilation, and control services.

.6 When quoting as a subcontractor this contractor shall explicitly state the services they are providing i.e. Mechanical (all services), Plumbing (water and drainage systems) or HVAC (including hydronic and air systems).

.7 Contractors shall be explicit to identify whether Fire Protection is included or omitted from the mechanical scope.

1.2 INTENT

.1 Mention herein or indication on Drawings of articles, materials, operations or methods requires: supply of each item mentioned or indicated, of quality, or subject to qualifications noted; installation according to conditions stated: and, performance of each operation prescribed with furnishing of necessary labour, equipment, and incidentals for plumbing work.

.2 Where used, words “Section” and “Division” shall also include other Subcontractors engaged on site to perform work to make building and site complete in all respects.

.3 Where used, word “supply” shall mean furnishing to site in location required or directed complete with accessory parts.

.4 Where used, word “install” shall mean secured in place and connected up for operation as noted or directed.

.5 Where used, word “provide” shall mean supply and install as each is described above.

1.3 REGULATIONS, PERMITS, AND FEES

.1 All materials and quality of work shall meet all current and latest Provincial, Municipal and Fire Marshall requirements, regulations, codes, and by-laws in force in the area of the project.

.2 Each contractor shall give all necessary notices, obtain all necessary permits, and pay all fees in order that the work shown or specified may be carried out. Each contractor shall furnish any certificates necessary as evidence that the work installed conforms with the laws and regulations of all authorities having jurisdiction.

.3 In the event that changes, or alterations are required on completed work by authorized inspectors, these changes shall be made at the contractor's expense.

.4 Special equipment which does not have a standard CSA label shall be inspected by the local electrical authority having jurisdiction and the Approval Certificate shall be submitted to the Consultant as soon as possible. All costs and fees for inspections shall be borne by this contractor.

1.4 DRAWINGS

.1 The drawings and this specification have been assembled together as a responsibility of the consultant. The same is true for the other consultants, i.e. architect, structural engineer, civil engineer, fire protection engineer, electrical engineer, etc.

.2 The drawings and specifications are not assembled together for responsibility/division between subcontractors. The division of work between subcontractors remains the responsibility of the buildings' contractor (also known as the prime contractor or general contractor).

.3 All subcontractors are encouraged to perform work amicably utilizing all of the drawings and specifications published by all of the consultants.

.4 Plumbing and Mechanical Drawings do not show structural and related details. Take information involving accurate measurement of building from building drawings, or at building. Make, without additional charge, any necessary changes, or additions to runs of piping, conduits, and ducts to accommodate structural conditions. Location of pipes, ducts, conduits and other equipment may be altered by Consultant without extra charge provided change is made before installation and does not necessitate major additional material.

.5 As work progresses and before installing piping, ductwork, heating units, registers, diffusers, fixtures and any other fittings and equipment which may interfere with interior treatment and use of building, provide detail drawings, or obtain directions for exact location of such equipment and fittments.

.6 Plumbing and Mechanical Drawings indicate general location and route of pipes, ducts and conduits which are to be installed. Where required work is not shown or only shown diagrammatically, install same at maximum height in space to conserve head room (minimum 2200 mm (88") clear) and interfere as little as possible with free use of space through which they can pass. Follow building lines, conceal piping, conduits and ducts in furred spaces, ceilings and walls unless specifically shown otherwise. Install work close to structure so furring will be small as practical.

.7 Install piping and ductwork to clear structural members and any fireproofing. Locate plumbing work to permit installation of specified insulation. Do not remove or damage structural fireproofing. Leave space to permit fireproofing and insulation to be inspected and repaired.

.8 Before commencing work, check and verify all sizes, locations, grade and invert elevations, levels, and dimensions to ensure proper and correct installation. Verify existing/municipal services.

.9 Locate all plumbing, mechanical, and electrical equipment in such a manner as to facilitate easy and safe access to and maintenance and replacement of any part.

.10 In every place where there is indicated space reserved for future or other equipment, leave such space clear, and install piping and other work so that necessary installation and connections can be made for any such apparatus. Obtain instructions whenever necessary for this purpose.

.11 Relocate equipment and/or material installed but not co-ordinated with work of other Sections and/or installed incorrectly as directed, without extra charge.

.12 Where drawings are done in metric and product not available in metric, the corresponding imperial trade size shall be utilized.

1.5 INTERFERENCE AND COORDINATION DRAWINGS

.1 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the constructed spaces provided.

.2 Prepare drawings to indicate co-ordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus, and connections are coordinated.

.3 Ensure that clearances required by jurisdictional authorities and clearances for proper maintenance are indicated on drawings.

.4 Upon consultant's request submit copies of interference drawings to consultant.

.5 Due to the nature of the building and the complexity of the building systems provide the following:

.1 Interference drawings, showing coordination of architectural, structural, plumbing, mechanical, and electrical systems for the consultant's review prior to fabrication.

.2 Detailed layout drawings, clearly showing fasteners and hangers.

.6 Provide CAD drawings (minimum file version AutoCAD 2013) in addition to hard copies.

1.6 QUALITY ASSURANCE

.1 Perform work in accordance with applicable provisions of local Plumbing Code, Gas Ordinances, and adoptions thereof for all plumbing systems. Provide materials and labor necessary to comply with rules, regulations, and ordinances.

.2 In case of differences between building codes, provincial laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Consultant in writing of such differences.

1.7 ALTERNATES AND SUBSTITUTIONS

.1 Each bidder may elect to use "Alternate or equal Equipment" manufacturers from lists of Alternates where listed. Include for any additional costs including all costs for revisions to electrical contract to suit Alternate used. Prices are not required in Tender for Alternates listed except where specifically noted as "Separate Price" in which case contractor will complete the Supplementary Tender Form.

.2 It is responsibility of this Division to ensure “Alternate Equipment” fits space allocated and gives performance specified. If an “Alternate Equipment” nor “equal” specified product unit is proposed and does not fit space allotted in Consultant’s opinion, supply of specified described equipment will be required without change in Contract amount. Should electrical characteristics for “alternate” or “equal” equipment differ from equipment specified it shall be the responsibility of the equipment manufacturer to pay all costs associated with the revisions to the electrical contract. Only manufacturers listed will be accepted for their product listing. All other manufacturers shall be quoted as substitution stating conditions and credit amount.

.3 If pipe or item, of size or weight indicated, is unobtainable, supply next larger size or heavier weight without additional charge.

1.8 EXAMINATION

.1 Site Reviews

.1 Examine premises to understand conditions which may affect performance of work of this Division before submitting proposals for this work.

.2 No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

.2 Drawings:

.1 Plumbing and Mechanical Drawings show general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.

.2 Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Plumbing, Mechanical, and Fire Protection Drawings.

.3 Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories, which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.

.3 Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.

1.9 SEQUENCING SCHEDULING AND COORDINATION

.1 It is understood that while Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for installation of systems according to the true intent and meaning of Contract Documents. Anything not clear or in conflict will be explained by making application to Consultant. Should conditions arise where certain changes would be advisable, secure Consultant's approval of these changes before proceeding with work.

.2 Coordinate work of various trades in installing interrelated work. Before installation of plumbing items, make proper provision to avoid interferences in a manner approved by Consultant. Each Contractor shall refer to all sections of the specification for their responsibilities with other trades. Changes required in work specified in Plumbing Division caused by neglect to do so shall be made at no cost to Owner.

.3 Arrange pipes, ducts, and equipment to permit ready access to valves, unions, traps, starters, motors, control components, and to clear openings of doors and access panels.

.4 Furnish and install inserts and supports required by Plumbing Division unless otherwise noted. Furnish sleeves, inserts, supports, and equipment that are an integral part of other Divisions of the Work to Sections involved in sufficient time to be built into construction as the Work proceeds. Locate these items and see that they are properly installed. Expense resulting from improper location or installation of items above shall be borne by Plumbing Division.

.5 Be responsible for required excavation, backfilling, cutting, and patching incident to work of this Division and make required repairs afterwards to satisfaction of Consultant. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.

.1 Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.

.2 Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.

.3 Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.

.6 Adjust locations of pipes, ducts, equipment, fixtures, etc., to accommodate work from interferences anticipated and encountered. Determine exact route and location of each pipe and duct prior to fabrication.

.1 Make offsets, transitions, and changes in direction of pipes, ducts, and electrical raceways as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.

.2 Furnish and install traps, air vents, sanitary vents, pull boxes, etc., as required to affect these offsets, transitions, and changes in direction.

.7 Slots and openings through floors, walls, ceilings, and roofs shall be provided by this contractor but performed by a trade specializing in this type of work. This Division shall see that they are properly located and do any cutting and patching caused by its neglect to do so.

1.10 REQUEST FOR INFORMATION (RFI) PROCEDURES

.1 RFIs shall be submitted to the consultant minimum two (2) weeks prior to answer being required. Failure to submit an RFI in a timely manner will forfeit delay claims and schedule extension requests by the contractor.

.2 All RFIs will be submitted with the following information:

.1 RFI number
.2 Name of project
.3 Date of initiation
.4 Date response required by (minimum two (2) weeks)
.5 Subject
.6 Submitter's name
.7 Drawing/specification reference
.8 Photograph of the issue (if applicable)
.9 Description of the issue
.10 Contractor's proposed resolution

1.11 CONTRACT BREAKDOWN

.1 Provide breakdown of contract exclusive of HST to acceptance of consultants prior to first draw submission.

.2 Provide labour and material cost for each item.

.3 Breakdown shall indicate total contract amount.

.4 Contract breakdown shall be as follows as a minimum.

.1 Mobilization and shop drawings (max. $2,000.00)
.2 Demolition
.3 Above grade rough-in plumbing and drainage/condensate piping
.4 Piping insulation
.5 Firestopping
.6 Plumbing contractor closeout requirements (min. of 3% for the first $500,000.00, 1% from $500,000.00 to $5,000.000.00, and 0.5% beyond. Shall not be less than $5,000.00).

.5 Progress claims, when submitted are to be itemized against each item of the contract breakdown, this shall be done in table form showing contract amount, work complete to date, previous draw, amount this draw and balance.

.6 Mobilization amount may only be drawn when all required shop drawings have been reviewed by the consultant.

1.12 SHOP DRAWINGS AND PRODUCT DATA

.1 Furnish complete catalog data for manufactured items of equipment to be used in the Work to Consultant for review within 14 days after award of Contract.

.2 Upon receipt of reviewed shop drawing, product is to be ordered immediately.

.3 Provide a complete list of shop drawings to be submitted prior to first submission.

.4 Before submitting to the Consultant, review all shop drawings to verify that the products illustrated therein conform to the Contract Documents. By this review, the Contractor agrees that it has determined and verified all field dimensions, field construction criteria, materials, catalogue numbers, and similar data and that it has checked and coordinated each shop drawing with the requirements of the work and of the Contract Documents. The Contractor's review of each shop drawings shall be indicated by stamp, date and signature of a qualified and responsible person possessing by the appropriate authorization.

.5 If material or equipment is not as specified or submittal is not complete, it will be rejected by Consultant.

.6 Additional shop drawings required by the contractor for maintenance manuals, site copies etc., shall be photocopies of the "reviewed" shop drawings. All costs to provide additional copies of shop drawings shall be borne by the contractor.

.7 Submit all shop drawings for the project as a package. Partial submittals will not be accepted.

.8 Catalog data or shop drawings for equipment, which are noted as being reviewed by Consultant or their Engineer shall not supersede Contract Documents.

.9 Review comments of Consultant shall not relieve this Division from responsibility for deviations from Contract Documents unless Consultant's attention has been called to such deviations in writing at time of submission, nor shall they relieve this Division from responsibility for errors in items submitted.

.10 Check work described by catalog data with Contract Documents for deviations and errors.

.11 Shop drawings and product data shall show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances. e.g., access door swing spaces.

.12 Shop drawings and product data shall be accompanied by:

- .1 Detailed drawings of bases, supports, and anchor bolts.
- .2 Acoustical sound power data, where applicable.
- .3 Points of operation on performance curves.
- .4 Manufacturer to certify as to current model production.
- .5 Certification of compliance to applicable codes.

.13 State sizes, capacities, brand names, motor HP, accessories, materials, gauges, dimensions, and other pertinent information. List on catalog covers page numbers of submitted items. Underline applicable data.

.14 Shop drawings shall be submitted electronically as per the following directions:

.1 Electronic Submissions:

.1 Electronically submitted shop drawings shall be prepared as follows:

.1 Use latest software to generate PDF files of submission sheets.

.2 Scanned legible PDF sheets are acceptable. Image files are not acceptable.

.3 PDF format shall be of sufficient resolution to clearly show the finest detail.

.4 PDF page size shall be standardized for printing to letter size (8.5"x11"), portrait with no additional formatting required by the consultant. Submissions requiring larger detail sheets shall not exceed 11"x17".

.5 Submissions shall contain multiple files according to section names as they appear in Specification.

.6 File names shall include consultant project number and description of shop drawing section submitted.

.7 Each submission shall contain an index sheet listing the products submitted, indexed in the same order as they appear in the Specification. Include associated PDF file name for each section.

.8 On the shop drawing use an “electronic mark” to indicate what is being provided.

.9 **Each file shall bear an electronic representation of the “company stamp” of the contractor. If not stamped the file submission will not be reviewed.**

.2 Email submissions shall include subject line to clearly identify the consultants project number and the description of the shop drawings submitted.

.3 Electronic attachments via email shall not exceed 10MB. For submissions larger than 10MB, multiple email messages shall be used. Denote related email messages by indicating “1 of 2” and “2 of 2” in email subject line for the case of two messages.

.4 Electronic attachments via web links (URL) shall directly reference PDF files. Provide necessary access credentials within link or as username/password clearly identified within body of email message.

.5 On site, provide one (1) copy of the “reviewed” shop drawings in a binder as noted above.

.6 Contractor to print copies of “reviewed” shop drawings and compile into maintenance manuals in accordance with requirements detailed in this section.

1.13 EQUIPMENT NAMEPLATE DATA

.1 Between the manufactures design published literature, the shop drawing submission literature, and the nameplate data on the equipment, they can all read differently.

.2 Most of the confusion and differences are coming out of the electrical power installation.

.3 The contractors installing and connecting the equipment are responsible for the coordination of this data through the construction period.

.4 The contractors shall share and/or request this information through out the project and monitor/make adjustments, provide recommendations accordingly based on any discrepancies.

.5 The contractors are responsible for any cost associated with the changing data.

.6 The final installation must meet the “Nameplate Data” on the equipment on site.

1.14 OPERATION AND MAINTENANCE MANUAL

.1 Provide operation and maintenance data for incorporation into manual as in submittals’ requirements.

.2 Operation and maintenance manual to be approved by, and final copies deposited with, Consultant before final inspection.

.3 Submit one (1) copy of Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant. Submission can be done electronically in PDF format or as a hard copy.

.1 Electronic submission/PDF file is required to be bookmarked. Any submission received without bookmarking will be immediately returned as unacceptable.

.2 Hard copy submission shall be in a three-ring binder (minimum 50 mm (2") ring) and labelled as ‘Operation and Maintenance Manual’ with project name and location. Dividers are to be used for binder organization.

.4 Make changes as required and re-submit as directed by Consultant.

.5 Operation data to include:

.1 Control schematics for each system including environmental controls.

.2 Description of each system and its controls.

.3 Operation instruction for each system and each component.

.4 Description of actions to be taken in event of equipment failure.

.5 Valves schedule and flow diagram.

.6 Colour coding chart.

.7 Spare parts equipment list.

.8 Manufacturers standard or extended warranty information.

.6 Maintenance data shall include:

.1 Servicing, maintenance, operation, and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.7 Performance data to include:

.1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified elsewhere.

.4 Testing, adjusting and balancing reports as specified in Testing, Adjusting and Balancing Section.

.5 Copy of all substantial performance final certificates.

.8 Miscellaneous data to include:

.1 Letter of contractor’s warranty and guarantee.

.2 WRDSB Project Asset and Warranty Card for all assets replaced, newly installed, and removed.

.3 Index sheet.

.4 Tabbed format for each section.

.5 Manufacturers approved shop drawings.

.6 Spare parts list and source.

.7 List of Manufacturers and suppliers address for each piece of equipment.

.9 Final Submittals:

.1 Upon acceptance of Operation and Maintenance Manual by the Consultant, provide the following:

.1 Provide**,** two (2) copies of final Operation and Maintenance Manuals, as well as a PDF file of the entire approved manual on a USB stick. Only one (1) USB stick is to be provided containing both the approved manual and as-built drawings.

1.15 AS-BUILT DRAWINGS

.1 Site records:

.1 Contractor shall provide two (2) sets of reproducible plumbing drawings. Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include changes to existing plumbing systems, control systems, and low voltage control wiring.

.2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection at all times.

.2 As-built drawings submittal for TAB and review:

.1 Prior to start of Testing, Adjusting, and Balancing (TAB), finalize production of as-built drawings.

.2 Identify **each drawing** in lower right-hand corner in letters at least 3 mm (1/8") high as follows: - "AS-BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW PLUMBING SYSTEMS AS INSTALLED" (Company Name) (Signature of Contractor) (date).

.3 TAB to be performed using as-built drawings.

.4 Submit copy to Consultant for review and approval. When returned, make corrections as directed.

.3 As-built drawings final submittal:

.1 Once approved, submit completed, reproducible paper as-built drawings as well as a scanned PDF file copy on USB stick with Operation and Maintenance Manuals.

1.16 WARRANTIES

.1 In addition to guarantee specified in General Conditions, guarantee plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.

.2 Provide certificates of warranty for each piece of equipment made out in favor of Owner. Clearly record "start-up" date of each piece of equipment on certificate. Include certificates as part of Operation & Maintenance Manual.

Warranty period shall start from date of ready for takeover. Warranty start date based on shipment date, start up date, substantial completion date, etc. are not applicable.

.4 Warranty Duration:

.1 Two (2) year warranty period applies unless otherwise noted.

.5 Warranty Coverage:

.1 Applies to parts and labour.

1.17 READY FOR TAKEOVER

.1 Complete the following to the satisfaction of the consultant prior to request for ready for takeover.

.1 As-built Drawings

.2 Maintenance Manuals

.3 System Start up

.4 TAB Reports

.5 Plumbing Systems Commissioning

.6 Instructions to Owners

1.18 REVISION TO CONTRACT

.1 Provide the following:

.1 Itemized list of material with associated costs.

.2 Labour rate and itemized list of labour for each item.

.3 Copy of manufacturers/supplier's invoice if requested.

1.19 DELIVERY, STORAGE, AND HANDLING

.1 Follow Manufacturer's directions in delivery, storage, and protection, of equipment and materials. Contractor to include all costs associated with delivery storage and handling in tender price.

.2 Deliver equipment and material to site and tightly cover and protect against dirt, water, and chemical or environmental damages but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in dry, heated space.

.3 Remove all damaged materials from site.

1.20 DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS

.1 If designated substances and/or hazardous materials are suspected or identified cease all work in the immediate area in accordance with OHSA and notify consultant.

.2 Each contractor and on site employee of the contractor shall have "asbestos awareness training".

.3 The Contractor shall ensure that employees who may come into contact with designated substances and/or hazardous materials due to the nature of the work that they perform, have received training that enables them to recognize designated substances and/or hazardous materials and that enables them to react in accordance with the Occupational Health and Safety Act and regulations thereto should contact with designated substances and/or hazardous materials occur during the course of their work.

.4 It is the responsibility of the contractor to review the designated substances and/or hazardous materials book in the building prior to starting any work.

.5 Existing occupied buildings (depending upon their age) may contain designated substances and/or hazardous materials in thermal insulating materials and some manufactured products, such as vinyl asbestos floor tile. Any insulating materials, on pipes, fittings, boilers, tanks, ductwork, etc. may contain designated substances and/or hazardous materials and shall not be disturbed.

.6 A survey of each building documenting the location and condition of designated substances and/or hazardous materials -containing materials is available for your mandatory review prior to commencing any work on premises.

1.21 CONFINED SPACES

.1 Certain areas of the building may be defined as a "Confined Space". Any personnel working in these areas must have confined space training, appropriate equipment and undertake all work in conformance with appropriate codes and standards.

.2 Refer to building documentation for any spaces deemed "Confined Space".

1.22 ENERGY EFFICIENCY

.1 The systems of this building must achieve the energy efficiency levels by conforming to ANSI/ASHRAE/IESNA 90.1 “Energy Standard for Buildings Except Low-Rise Residential Buildings” and Chapter 2 of Division 3 of SB-10 prescriptive method from the Ontario Building Code.

.2 All equipment, products, and installations must conform to the Codes and Standards.

END OF SECTION

Part 1 General

1.1 TESTS

.1 Give 48 hours written notice of date for tests.

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

.3 Conduct tests in presence of Consultant.

.4 Bear costs including retesting and making good.

.5 Piping:

.1 General: maintain test pressure without loss for 4 h unless otherwise specified.

.2 Test drainage, waste and vent piping to Ontario Building Code and authorities having jurisdiction.

.3 Test domestic hot, cold and recirculation water piping at 1-1/2 times system operating pressure or minimum 860 kPa (124.8 psi), whichever is greater.

.6 Equipment: test as specified in relevant sections.

1.2 SYSTEM START UP

.1 Provide adjusting testing and start up of all equipment prior to testing and balancing (TAB) specified elsewhere.

.2 Provide consultant with written notice verifying all equipment operation and installation is complete.

.3 Start up shall be in presence of the following: owner or representative, contractor, building automation systems (BAS) contractor, and manufacturer's representative. Each person shall witness and sign off each piece of equipment. Consultant's attendance will be determined by consultant.

.4 Simulate system start up and shut down and verify operation of each piece of equipment.

.5 Arrange with all parties and provide 72 hours notice for start up procedure.

.6 Arrange with building automation systems contractor to sequence all components and ensure system operation.

1.3 COMMISSIONING

.1 Co-ordinate and direct each step of the commissioning process and recommend acceptance or non-acceptance to the Owner/Owner's Representative.

.2 Prepare, in writing, documentation of any deficiencies discovered during the commissioning process. Submit to consultant and Owner/Owner's Representative.

.3 The Commissioning Process is detailed in ASHRAE Guideline 1-1996 HVAC Commissioning Process. The commissioning plan may be modified to reflect the actual construction schedule and design.

.4 Provide a pre-functional test of all plumbing system and sub-system elements, including control devices, shall be checked for the following:

.1 Verify that each element has been properly installed, properly identified, and that all connections (including electrical) have been made correctly.

.2 Verify that each element has been checked for proper lubrication, drive rotation, belt tension, control sequence, flow direction, or other conditions which may cause damage or reduce system performance.

.3 Verify that tests, meter readings, and specific plumbing/mechanical/electrical performance characteristics agree with those required by equipment or system manufacturer.

.4 Controls calibration to be completed in accordance with the specification.

.5 The TAB shall be done in accordance with the specifications.

.5 Reports:

.1 The contractor shall be responsible for recording, documenting, and maintaining detailed inspection and testing data on the test documentation reports. The data record shall be comprehensive and concise.

.2 All data must be recorded as soon as possible during the course of the inspection and testing.

.3 All documentation shall have the date, time, and names of persons participating in the inspection and testing.

.6 Plumbing System Execution:

.1 Operate equipment and systems shall be tested in the presence of the owner's representative and the consultant to demonstrate compliance with specified requirements. To minimize the time of Commissioning Team members, testing shall be done in four seasonal single blocks of time insofar as possible.

.2 Notify the consultant, in writing, fourteen (14) days prior to tests scheduled under requirements of this Section.

.3 Testing shall be conducted under specified design operating conditions as recommended or approved by the consultant.

.4 All elements of systems shall be tested to demonstrate that total systems satisfy all requirements of these Specifications. Testing shall be accomplished on hierarchical basis. Test each piece of equipment for proper operation, followed by each sub-system, followed by entire system, followed by any inter-ties of other major systems.

.5 All special testing materials and equipment shall be provided by the appropriate contractor.

.6 Provide three copies of all test reports and records to the consultant.

.7 The verification testing procedures shall address all operating characteristics of all plumbing equipment and systems.

1.4 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTION

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Plumbing contractor to schedule and coordinate the demonstration all on the same day, starting at a pre-approved time and continuing consequently until complete.

.3 Where specified elsewhere in this Division, qualified manufacturers' representatives who are knowledgeable about the project to provide demonstrations and instructions.

.4 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.

.5 Instruction duration time requirements as specified in appropriate sections.

.6 Where deemed necessary, Consultants may record these demonstrations on video tape for future reference.

1.5 TRIAL USAGE

.1 Consultant or owner may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to following equipment and systems:

.1 Domestic water

.2 Plumbing and drainage.

1.6 DEFICIENCIES

.1 During the course of construction, the consultants will monitor construction and provide written reports of work progress, discussions, and instruction to correct work.

.2 Instruction to correct work shall be done within the work period before the next review.

.3 The contractor shall not conceal any work until inspected.

.4 The contractor shall expedite 100% complete rough-in work and have inspected prior to concealing services and equipment especially above ceiling.

.5 Upon completion of the project the consultant will do a final review. Upon receiving the final inspection report, the contractor must correct and sign back the inspection report indicating the deficiencies are completed. A re-inspection will only be done once consultant receives this in writing.

1.7 EQUIPMENT INSTALLATIONS

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

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

.3 Equipment drains: pipe to floor drains.

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

1.8 PROTECTION OF OPENINGS

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

1.9 ELECTRICAL

.1 Electrical work to conform to Electrical Division including the following:

.1 Supplier and installer responsibility and related plumbing responsibility is indicated in Equipment Schedule on plumbing/mechanical and/or electrical drawings.

.2 Power wiring and conduit is specified in Electrical Division except for conduit, wiring and connections below 50 V which are related to control systems. Follow Electrical Division for quality of materials and workmanship.

.3 Electrically operated equipment shall be C.S.A. approved label. Special Inspection Label of Provincial Authority having jurisdiction will be accepted in lieu of C.S.A. approval. Each motor shall have an approved starter. Starter will be supplied and installed by Electrical Division unless otherwise indicated.

1.10 CONTROL WIRING

.1 Furnish and install all components, devices, and control wiring for all plumbing, fire protection, HVAC equipment, HVAC systems, lighting, and other electrical loads to make all equipment operable to satisfaction of owner and consultant and to manufacturer's requirements and recommendations.

.2 All electrical wiring and installations shall comply with local and national electrical codes.

.3 Supply and install wiring as required for all devices and systems. Install wiring in EMT conduit and otherwise comply with all requirements of the Electrical Division. Approved plenum wire may be used for sensor and network communication wiring where it complies with appropriate building codes and regulatory authorities.

.4 All wiring concealed in walls and chases, and all exposed wiring shall be run in conduit.

.5 Provide recessed conduit and backer boxes where controls are wall mounted. Surface mounted boxes and conduit are acceptable in service rooms.

.6 Free-run plenum rated cable shall be run in cable hangers where provided by Electrical Division or tied neatly to pipe and duct hangers in the ceiling. Avoid wiring that droops. Follow building lines and do not run wiring "as the crow flies".

1.11 MOTORS

.1 Provide high efficiency motors for plumbing equipment.

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

.3 Motors under 373 W, (1/2 hp): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, voltage as indicated.

.4 Motors 373 W, (1/2 hp) and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40°C (72°F), 3 phase, voltage as indicated.

1.12 SLEEVES

.1 Pipe sleeves: at points where pipes pass through masonry, concrete or fire rated assemblies and as indicated. Grout sleeves in place.

.2 Schedule 40 steel pipe.

.3 Sleeves with annular fin continuously welded at midpoint:

.1 Through foundation walls.

.2 Where sleeve extends above finished floor.

.3 Through fire rated walls and floors.

.4 Sizes: minimum 6 mm (1/4") clearance all around, between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25 mm (1") above other floors.

.6 Fill voids around pipes:

.1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof fire retardant non-hardening mastic.

.2 Where sleeves pass through walls or floors, provide space for firestopping. Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.

.3 Ensure no contact between copper tube or pipe and ferrous sleeve.

.4 Fill future-use sleeves with lime plaster or other easily removable filler.

.5 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CGSB 1-GP-181M+Amdt-Mar-78.

.7 Provide minimum 20 gauge duct sleeves where ducts pass through masonry concrete or fire rated assemblies. Maintain minimum 25 mm clearance all around or to the requirements of the authority having jurisdiction. Seal at wall as indicated.

1.13 FIRE STOPPING

.1 This contractor shall work with all other contractors on the project in providing one common method of fire stopping all penetrations made in fire rated assemblies.

.2 Approved fire stopping and smoke seal material in all fire separations and fire ratings within annular space between pipes, ducts, insulation and adjacent fire separation and/or fire rating.

.3 Do not use cementitious or rigid seals around penetrations for pipe(s) or other equipment at all wall, floor, or ceiling penetrations.

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

.5 Provide materials and systems capable of maintaining effective barrier against flame, smoke and gases. Ensure continuity and integrity of fire separation.

.6 Comply with the requirements of CAN4-S115-M35, and do not exceed opening sized for which they have been tested.

.7 Systems to have an F or FT rating (as applicable) not less than the fire protection rating required for closures in a fire separation. Provide “fire wrap” blanket around services penetrating fire walls. Extent of blanket must correspond to ULC recommendations.

.8 The fire stopping materials are not to shrink, slump or sag and to be free of asbestos, halogens and volatile solvents.

.9 Firestopping materials are to consist of a component sealant applied with a conventional caulking gun and trowel.

.10 Fire stop materials are to be capable of receiving finish materials in those areas which are exposed and scheduled to receive finishes. Exposed surfaces are to be acceptable to consultant prior to application of finish.

.11 Firestopping shall be inspected and approved by local authority prior to concealment or enclosure.

.12 Install material and components in accordance with ULC certification, manufacturers instructions and local authority.

.13 Submit product literature and installation material on fire stopping in shop drawing and product data manual. Maintain copies of these on site for viewing by installers and consultant.

.14 Manufacturer of product shall provide certification of installation. Submit letter to the consultant.

.15 Acceptable Alternate Manufacturers to approval of local authority:

.1 Minnesota Mining and Manufacturing

.2 Fryesleeve Industries Inc.

.3 General Electric Pensil Firestop Systems

.4 International Protective Coatings Corp.

.5 Rectorseal Corporation (Metacaulk)

.6 Proset Systems

.7 3M

.8 AD Systems

.9 Hilti

.16 Ensure firestop manufacturer representative performs onsite inspections and certifies installation. Submit inspection reports/certification at time of substantial completion.

1.14 ESCUTCHEONS

.1 On pipes and ductwork passing through walls, partitions, floors and ceilings in exposed finished areas and on water and drain pipes inside millwork and cabinets.

.2 Chrome or nickel plated brass or Type 302 stainless steel, one piece type with set screws.

.3 Outside diameter to cover opening or sleeve.

.4 Inside diameter to fit around finished pipe.

1.15 PAINTING

.1 Refer to Section Interior Painting and specified elsewhere.

.2 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.

.3 Apply two coats of paint to exposed piping service in service room(s). Base colour as specified in Pipe Identification Section.

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

.5 Restore to new condition, or replace equipment at discretion of consultant, finishes which have been damaged too extensively to be merely primed and touched up.

1.16 ACCESS DOORS

.1 Provide access doors to concealed plumbing equipment for operating, inspecting, adjusting and servicing.

.2 Flush mounted 600 x 600 mm (24" x 24") for body entry and 300 x 300 mm (12" x 12") for hand entry unless otherwise noted. Doors to open 180°, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.

.3 Material:

.1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Consultant.

.2 Remaining areas: use prime coated steel.

.3 Fire rated areas: provide ULC listed access doors.

.4 Washrooms or high moisture area ceilings: Aluminum with mill finish suitable for painting.

.4 Installation:

.1 Locate so that concealed items are accessible.

.2 Locate so that hand or body entry (as applicable) is achieved.

.5 Acceptable Manufacturers:

.1 Le Hage

.2 Zurn

.3 Acudor

.4 Nailor Industries Inc.

1.17 DIELECTRIC COUPLINGS

.1 General:

.1 To be compatible with and to suit pressure rating of piping system.

.2 Where pipes of dissimilar metals are joined.

.2 Pipes NPS 50 mm (2") and under: isolating unions.

.3 Pipes NPS 65 mm (2 1/2") and over: isolating flanges.

1.18 DRAIN VALVES

.1 Locate at low points and at section isolating valves unless otherwise specified.

.2 Minimum NPS 20 mm (3/4") unless otherwise specified: bronze, with hose end male thread and complete with vacuum air breaker and chain with cap.

.3 Drain valves on potable water systems shall be complete with vacuum breaker.

1.19 REPAIRS, CUTTING, AND RESTORATION

.1 Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.

.2 Each Section of this Division shall bear expense of cutting, patching, and repairing to install their work and/or replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.

.3 Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.

.4 All patching, painting and making good of the existing walls, floors, ceilings, partitions and roof will be at the expense of this Contractor, but performed by the Contractor specializing in the type of work involved unless otherwise noted.

1.20 EXISTING SYSTEMS

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

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

1.21 CLEANING

.1 Clean interior and exterior of all systems including strainers.

.2 In preparation for final acceptance, clean and refurbish all equipment and leave in operating condition.

1.22 DISCONNECTION AND REMOVAL

.1 Disconnect and/or remove equipment, piping, etc. as indicated.

.2 Cap and conceal all redundant and obsolete connections.

.3 Provide a list of equipment to be removed to the owner, for his acceptance of same. Remove all equipment from site, which the owner does not retain.

.4 Store equipment to be retained by owner on site where directed by consultant.

1.23 OWNER SUPPLIED EQUIPMENT

.1 Connect to equipment supplied by the owner and make operable.

1.24 DEMOLITION

.1 The general requirements are indicated on the drawings and on the outline specification in Division 1.

.2 The general execution of the demolition is to be carried out in a clean and efficient manner.

.3 Demolition of existing ceiling, walls etc., to facilitate removal of existing services or equipment or installation of new to be kept to a minimum and then restored to match existing.

.4 All openings or holes created by removal of existing plumbing systems which are not being reused are to be patched with the same material surrounding surfaces.

.5 All new holes and openings to facilitate plumbing systems are to be patched to match surrounding surfaces.

.6 Protect all existing furnishings materials and equipment. Any damage occurring as a result of the work of this Division shall be repaired or replaced at the expense of this Division.

.7 Where work involves breaking into or connecting to existing services, carry out work at times directed by the Owners in an expedient manner with minimum disruption to the facility and systems downtime.

.8 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.

.9 Where the location of any services has been shown on the plans, such information is not guaranteed. It is this Division's responsibility to verify locations, invert elevations, etc., immediately after moving on site. Should for any reason the information obtained necessitates changes in procedure or design, advise the Consultant at once. If verification of existing conditions is not done at the outset and any problems arise, the responsibility for same is entirely this Divisions.

1.25 CONFINED SPACES

.1 Certain areas of the building may be defined as a "Confined Space". Any personnel working in these areas must have confined space training, appropriate equipment and undertake all work in conformance with appropriate codes and standards.

.2 Refer to building documentation for any spaces deemed "Confined Space".

1.26 EXISTING SYSTEM DRAINAGE

.1 Drain all existing piping and drainage systems including all related equipment as required to facilitate system renovations.

.2 Disposal of existing system shall be to the requirements of the local and/or provincial regulations.

1.27 BALANCING OTHER PLUMBING SYSTEM

.1 Plumbing systems:

.1 Pressure booster systems: test for capacity and pressures under all conditions and at all times.

.2 Recirculating Systems pump flows, pressures

.3 Pumped sanitary and storm water systems: test for proper operation at all possible flow rates.

1.28 COOPERATION WITH OTHER TRADES

.1 Give full cooperation to other trades and furnish in writing to other trades, with copies to the engineer, any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

.2 Where plumbing work will be installed in close proximity to, or will interfere with work of other trades, assist in working out space conditions to make a satisfactory adjustment. Prepare composite working drawings and sections at a suitable scale, not less than ¼ inches = 1-foot – 0-inches, clearly showing how the plumbing work is to be installed in relation to the work of other trades. If work is installed before coordinating with other trades, or if it causes any interference with work of other trades, make the necessary changes in the work to correct the conditions and bear all costs.

.3 Furnish to other trades necessary templates, patterns, setting drawings, and shop details for the proper installation of work and for coordinating adjacent work.

1.29 SLEEVE, CUT, AND FORMED OPENING LOCATION DRAWINGS

.1 Prepare and submit for review, drawings indicating size and location of required sleeves, recesses, and formed openings in poured or precast concrete work.

.2 Such drawings are to be completely and accurately dimensioned and relate sleeve, recesses, and formed openings to suitable grid lines and elevation datum, and are to take into account structural items such as grade beams, column caps, and column drop slabs.

.3 Begin to prepare such drawings immediately upon notification of acceptance of bid and award of Contract.

1.30 SUSTAINABLE CONSTRUCTION

.1 Construction Waste Management:

.1 Recycle all waste materials to avoid land fill sites where possible.

.2 All metal contents shall be recycled.

.3 All cardboard and paper shall be recycled.

.4 All plastic packaging shall be recycled.

.5 All wood shall be directed to the appropriate recycled wood section at the landfill site.

.2 This contractor is responsible for their own waste management system and cost associated with the disposal. This can be their own on site system, daily removal, back to shop, or a communal system shared with other contractors on site.

.3 In all cases the cost to remove materials on site are the cost of this contractor.

1.31 FREEZE PROTECTION

.1 Do not run lines in outside walls, or locations where freezing may occur. Piping next to outside walls shall be in furred spaces with insulation between the piping and the outside wall. Insulation of piping shall not be considered freeze protection.

1.32 SCAFFOLDING, RIGGING, AND HOISTING

.1 Provide all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished; remove same from premises when no longer required. Conform to OSHA requirements and standards.

END OF SECTION

Part 1 General

1.1 GENERAL PROVISIONS

.1 Conform to the General Provisions of General Requirements Section.

.2 This project is one of a retrofit nature in part, and which will require some demolition.

.3 Allow for all remedial work in areas indicated on the drawings and as generally defined in the relevant sections of the specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

.1 Electrical Division.

1.3 SCOPE OF WORK

.1 The scope of work is essentially the selected disconnection and/or removal of services and/or equipment, piping, ductwork, etc. as indicated or required to complete the work.

Part 2 Products

2.1 GENERAL

.1 This Division is to liaise with the Owners or Consultant for equipment being removed that may be suitable for reuse to that specified or handed over to the Owner.

.2 This Division is to take full responsibility for any special tools or equipment required to disassemble or remove material from building.

Part 3 Execution

3.1 GENERAL

.1 The general requirements are indicated on the drawings and on the outline specification in Division 1.

.2 The general execution of the demolition is to be carried out in a clean and efficient manner.

.3 Demolition of existing ceilings, walls, etc., to facilitate removal of existing services or equipment or installation of new to be kept to a minimum and then restored to match existing.

.4 All openings or holes created by removal of existing plumbing systems which are not being reused are to be patched with the same material surrounding surfaces.

.5 All new holes and openings to facilitate plumbing systems are to be patched to match surrounding surfaces.

.6 Protect all existing furnishings, materials, and equipment. Any damage occurring as a result of the work of this Division shall be repaired or replaced at the expense of this Division.

.7 Where work involves breaking into or connecting to existing services, carry out work at times directed by the Owners in an expedient manner with minimum disruption to the facility and systems downtime.

.8 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.

.9 Where the location of any services has been shown on the plans, such information is not guaranteed. It is this Division's responsibility to verify locations, invert elevations, etc., immediately after moving on site. Should for any reason the information obtained necessitate changes in procedure or design, advise the Consultant at once. If verification of existing conditions is not done at the outset and any problems arise, the responsibility for same is entirely this Division's.

.10 Disconnect and/or remove equipment, piping, ductwork, etc. as indicated.

.11 Cap and conceal all redundant and obsolete connections.

.12 Provide a list of equipment to be removed to the Owner, for their acceptance of same. Remove all equipment from site which the Owner does not retain.

.13 Maintain equipment to be retained by Owner on site where directed by Consultant.

.14 Demolition of all parts of the work must be completed within the confines of the work area and in such a way as the dust produced and risk to injury of will not adversely affect the building users.

.15 Demolished areas of the existing building will remain in their current use in some cases. Demolition in these areas must be kept to the minimum required to complete the work.

.16 Demolition shall take place within areas isolated from all other areas with appropriate hoarding, scaffolding, netting, fencing or other means of security between building users and the work.

.17 Co-ordinate making safe electrical devices, capping plumbing and removal of fixtures prior to commencement of demolition.

.18 All piping and equipment to be removed and/or abandoned shall be drained prior to capping and/or abandoning. Disposal of all liquids shall be to the approval of authority of having jurisdiction and/or provincial regulations.

3.2 EXISTING SYSTEM DRAINAGE

.1 Drain all existing piping systems including all related equipment as required to facilitate system renovations.

.2 Disposal of existing system shall be to the requirements of the local and/or provincial regulations.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME)

.1 ANSI/ASME B31.1, Power Piping, (SI Edition).

.3 American Society for Testing and Materials (ASTM)

.1 ASTM A 125, Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A 563, Specification for Carbon and Alloy Steel Nuts.

.4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.1 MSS SP-58, Pipe Hangers and Supports - Materials, Design, Manufacture Selection, Application, and Installation.

1.2 DESIGN REQUIREMENTS

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP-58.

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP-58.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with general requirements.

.2 Submit shop drawings and product data for following items:

.1 All bases, hangers and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

1.4 MAINTENANCE DATA

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

Part 2 Products

2.1 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS-SP-58.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports: to ANSI & ULC requirements

.2 Ensure steel hangers in contact with copper piping are copper plated.

.2 Upper attachment structural: Suspension from upper flange of I-Beam or joist.

.1 Cold piping NPS 50 mm (2") maximum: Ductile iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.

.1 Rod: 10 mm (3/8") UL listed

.2 Cold piping NPS 65 mm (2 1/2") or greater, all hot piping: Malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed & FM approved.

.3 Upper attachment structural: Suspension from upper flange of I-Beam.

.1 Cold piping NPS 50 mm (2") maximum: Ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed.

.2 Cold piping NPS 65 mm (2 1/2") or greater, all hot piping: Malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nuts.

.4 Upper attachment to concrete.

.1 Ceiling: Carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm (1/4") minimum greater than rod diameter.

.2 Concrete inserts: wedge shaped body with knockout protector plate ULC listed. Note: Rapidex and Siporex are <u>not</u> considered concrete. Should one of these systems be encountered, piping/ductwork and/or equipment shall be supported from adjacent walls or from supplemental steel provided by this contractor attached to the adjacent walls/structure.

.5 Shop and field-fabricated assemblies.

.1 Trapeze hanger assemblies: ASME B31.1.

.2 Steel brackets: ASME B31.1.

.6 Hanger rods: threaded rod material to MSS SP-58.

.1 Ensure that hanger rods are subject to tensile loading only.

.2 Provide linkages where lateral or axial movement of pipework is anticipated.

.7 Pipe attachments: material to MSS SP-58.

.1 Attachments for steel piping: carbon steel.

.2 Attachments for copper piping: copper plated black steel.

.3 Use insulation shields for all piping.

.4 Oversize pipe hangers and supports to accommodate thermal insulation. Provide 1.5 mm (16 gauge) saddles.

.8 Adjustable clevis: material to MSS SP-58 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.

.1 Ensure "U" has hole in bottom for rivetting to insulation shields.

2.3 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping:

.1 64 kg/m² (13.12 lbs/ft²) density insulation plus insulation protection shield to: MSS SP-69, galvanized sheet carbon steel. Length designed for maximum 3 m (10') span.

.2 Insulated hot piping:

.1 Curved plate 300 mm (12") long, with edges turned up, welded-in centre plate for pipe sizes NPS 300 mm (12") and over, carbon steel to comply with MSS SP-58.

2.4 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of miscellaneous metals, specified herein. Submit calculations with shop drawings.

2.5 OTHER EQUIPMENT SUPPORTS

.1 From structural grade steel meeting requirements of structural steel section specified herein.

.2 Submit structural calculations with shop drawings.

2.6 MANUFACTURER

.1 Acceptable Manufacturers:

.1 Grinnell

.2 Anvil

.3 Myatt

.4 Taylor

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with:

.1 Manufacturer's instructions and recommendations.

.2 Clamps on riser piping:

.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

.2 Bolt-tightening torques to be to industry standards.

.3 Steel pipes: Install below coupling or shear lugs welded to pipe.

.4 Cast iron pipes: Install below joint.

.3 Clevis plates:

.1 Attach to concrete with 4 minimum concrete inserts at each corner.

.4 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

3.2 HANGER SPACING

.1 Plumbing piping: most stringent requirements of Canadian Plumbing Code, Provincial Code, or authority having jurisdiction.

.2 Copper piping: up to NPS 15 mm (1/2"): every 1.5 m (5').

.3 Within 300 mm (12") of each elbow and:

Maximum Pipe Size: NPS	Spacing Steel	Maximum Spacing Copper
up to 32 mm (1 1/4")	2.1 m (7')	1.8 m (6')
40 mm (1 1/2")	2.7 m (9')	2.4 m (8')
50 mm (2")	3.0 m (10')	2.7 m (9')
65 mm (2 1/2")	3.6 m (12')	3.0 m (10')
80 mm (3")	3.6 m (12')	3.0 m (10')
90 mm (3 1/2")	3.9 m (13')	3.3 m (11')
100 mm (4")	4.2 m (14')	3.6 m (12')
125 mm (5")	4.8 m (16')	
150 mm (6")	5.1 m (17')	

3.3 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

.4 Do “NOT” support piping, ductwork and equipment from roof deck, on bottom chord of floor and/or roof joist and/or from OWSJ bridging. Provide structural member between joist.

3.4 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4mm (5/32") from vertical.

.2 Where horizontal pipe movement is less than 15 mm (1/2"), offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.5 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:

.1 Hammer jaw firmly against underside of beam.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND AS-BUILT DRAWINGS

.1 Conform to General Requirements Section for shop drawings and as-built drawings requirements.

1.2 INSTALLATION INSPECTION AND EQUIPMENT VERIFICATION

.1 The Plumbing Contractor shall co-ordinate with the Consultant who will inspect the plumbing installation.

.2 The Plumbing Contractor shall complete the equipment verification forms for each piece of equipment. The forms shall be included in the operating and maintenance manual. The equipment data shall include:

- Manufacturers name, address and telephone number
- Distributors name, address and telephone number
- Make, model number and serial number
- Pumps - RPM, impeller sizes, rated flow
- Electrical - volts, amps, fuse size, overload size
- Any other special characteristics.

1.3 PLUMBING AND DRAINAGE SYSTEM TESTING

.1 The plumbing and drainage system shall be tested in accordance with the Plumbing Code under the Ontario Water Resources Act and the specification.

.2 The Mechanical Contractor shall notify the Building Inspector when systems are available for testing. The Mechanical Contractor shall document all tests performed and shall arrange for the Building Inspector to sign for tests completed. The forms shall be forwarded to the Consultant.

1.4 THE CONTRACTOR'S TESTING OF PIPING SYSTEMS

.1 Test all piping systems in accordance with all applicable plumbing codes and General Requirements section.

.2 All tests for the systems shall be performed in the presence of the Consultant or Commissioning Consultant. Complete the testing forms and forward to the Consultant.

1.5 THE INDEPENDENT CONTRACTORS TESTING AND BALANCING OF WATER SYSTEMS

.1 Conform with the specification section, Testing, Adjusting and Balancing.

.2 The Independent Contractor shall be hired by the plumbing contractor and shall report to the Commissioning Consultant.

1.6 CLOSEOUT SCHEDULE

.1 The Plumbing Contractor shall include the schedule for all tests and equipment start-up tests in the construction schedule.

.2 All testing forms and reports associated with the plumbing systems shall be directed to the Consultant with copies to the Owner and Consultant.

.3 The forms and reports to be issued shall include:

- Shop drawings, issued and accepted
- Equipment verification forms
- Testing forms
- Reports resulting from tests
- Testing schedule
- Equipment Start-up Forms

1.7 OPERATION AND MAINTENANCE MANUAL

.1 Conform to General Requirements section for the Operating and Maintenance Manual requirements.

1.8 OPERATOR TRAINING

.1 Conform to General Requirements section for requirements for Instruction to Operating Staff.

.2 The training shall be conducted in a classroom and at the equipment or system.

.3 Training will begin when the operating and maintenance manuals have been delivered to The Owner and approved by the Consultant.

.4 Each training session shall be structured to cover:

The operating and maintenance manual

- Operating procedures
- Maintenance procedures
- Trouble-shooting procedures
- Spare parts required
- Submit a course outline to the Consultant before training commences. Provide course documentation for up to eight people.

.5 The training sessions shall be scheduled and co-ordinated by the Plumbing Contractor.

1.9 PLUMBING SYSTEM DEMONSTRATION AND TURNOVER

.1 Refer to General Requirements section, Mechanical Project Completion.

.2 The system demonstration and turnover to The Owner shall occur when:

- The installation is complete
- The acceptance test conducted by the Mechanical Consultant has been completed successfully
- Training has been completed
- Operating and Maintenance Manuals have been accepted
- Shop-drawings have been updated
- As-built drawings have been completed

.3 The systems demonstration shall be conducted by the Mechanical Contractor and the manufacturers. The demonstration shall cover a demonstration of equipment installation and operation.

1.10 WARRANTIES

.1 Equipment and system warranties shall not begin until the system demonstration and turnover has been conducted successfully and accepted by The Owner.

.2 The Mechanical Contractor shall fill out the warranty form listing the equipment and systems and the start and finishing dates for warranty.

.3 Refer to the general conditions specification section for the requirements during the warranty period.

1.11 CLOSEOUT PROCESS ALLOCATION

.1 The mechanical contractor closeout process shall be as follows:

.1 3% for the first $500,000 of contract value.

.2 1% of the contract value for value between $500,000 to $5,000,000.

.3 0.5% of contract value for the value in excess of $5,000,000.

.4 Minimum Allocation for Close Out Documents is $5,000.

.2 The Mechanical Contractor shall submit all test and verification forms. The Consultant will use these forms to calculate percentage complete.

.3 The monies shall not be paid out until the performance testing, O & M manuals, systems demonstration, and training including all required paperwork have been completed to the satisfaction of the consultant. Refer to General Requirements section for contract breakdown.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 Canadian General Standards Board (CGSB)

.1 ASTM C553, Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.2 CGSB 51-GP-52Ma, Vapour Barrier Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.3 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketing Sheet, for Insulating Pipes, Vessels and Round Ducts.

.3 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.4 American Society for Testing and Materials (ASTM)

.1 ASTM C547, Type I and IV, Standard Specifications for Mineral Fibre Pipe Insulation.

.2 ASTM C 335, Test Method for Steady State Heat Transfer Properties of Pipe Insulation.

.3 ASTM C177, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Proprieties by Means of the Guarded Hot-Plate Apparatus.

.4 ASTM C518, Standard Test Method for Steady-State Thermal Transmission Proprieties by Means of the Heat Flow Meter Apparatus.

.5 ASTM C 921, Practice for Determining the Properties Jacketing Materials for Thermal Insulation.

.6 ASTM C1695, Standard Specification for Fabrication of Flexible, Removable, and Reusable Blanket Insulation for Hot Service.

.7 ASTM C1729 Standard Specification for Aluminium Jacketing for Insulation.

.5 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

.1 ASHRAE Standard 90.1.

.6 Manufacturer's Trade Associations

.1 Thermal Insulation Association of Canada (TIAC), North American Commercial and Industrial Insulation Standards.

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with general requirements.

.2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for pipe, fittings, valves, and jointing recommendations.

.3 Submit properly completed detail plates from the North American Commercial and Industrial Insulation Standards manual, applicable to installation types required by this specific section.

1.3 INSTALLATION INSTRUCTIONS

.1 Submit manufacturer's installation instructions in accordance with general requirements.

.2 Installation instructions to include procedures to be used, installation standards to be achieved.

1.4 QUALIFICATIONS

.1 Installer to have successfully completed apprenticeship program.

.2 Installer to be specialist in performing work of this section and have at least three (3) years successful experience in this size and type of project, qualified to standards of TIAC.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Protect from weather, construction traffic.

.3 Protect against damage from any source.

.4 Store at temperatures and conditions required by manufacturer.

1.6 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

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

.3 "ASJ+" – All Service Jacket – vapor retarder laminate of aluminium foil inner layer, reinforced with fiberglass scrim, bonded to a bleached kraft paper, with outer poly film leaving no paper exposed.

.4 "ASJ" – All Service Jacket (no outer film) – vapor retarder laminate of aluminium foil inner layer, reinforced with fiberglass scrim, bonded to a bleached kraft paper outer layer.

Part 2 Products

2.1 MATERIAL LIMITATIONS

.1 Products shall not contain formaldehyde, asbestos, lead, mercury or mercury compounds or PBDE fire retardants.

2.2 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.3 INSULATION

.1 Mineral fibre as specified herein includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C (75°F) mean temperature when tested in accordance with ASTM C335, ASTM C177 or ASTM C518.

.3 Type A-1: Rigid moulded or wound mineral fibre with factory applied vapour retarder jacket.

.1 Mineral fibre: to ASTM C547 Type I and IV.

.2 Jacket: to ASTM C1136, Type I, II, III, IV, X.

.3 Maximum "k" factor: to ASTM C547.

.4 Materials:

.1 All materials must be supplied by the same manufacturer.

.2 Acceptable Manufacturers:

.1 Johns Manville
.2 Knauf
.3 Manson
.4 Owens Corning

2.4 INSULATION SECUREMENT

.1 Tape: Self-adhesive, aluminum, reinforced, 50 mm (2") wide minimum.

.2 Contact adhesive: Quick setting.

.3 Canvas adhesive: Washable.

2.5 CEMENT

.1 Thermal insulating and finishing cement:

.1 Hydraulic setting or Air drying on mineral wool, to ASTM C 449M.

2.6 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.7 INDOOR VAPOUR RETARDER FINISH

.1 Compatible with insulation.

2.8 JACKETS

.1 Polyvinyl Chloride (PVC):

.1 Minimum thickness: 20 mm (0.020")

.2 One-piece moulded type [and sheet] to CAN/CGSB-51.53 with pre-formed shapes as required.

.3 Colours: white.

.4 Minimum service temperatures: -29°C (-20°F).

.5 Maximum service temperature: 65°C (150°F).

.6 Moisture vapour transmission: 0.05 perm.

.7 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.

.2 Tacks are not to be used below ambient temperature (cold) operating systems.

.3 Pressure sensitive vinyl tape of matching colour.

2.9 CAULKING FOR JACKETS

.1 Caulking: Silicone clear caulking.

Part 3 Execution

3.1 PRE-INSTALLATION REQUIREMENT

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed, and certified.

.2 Surfaces to be clean, dry, free from foreign material.

3.2 INSTALLATION

.1 Install in accordance with TIAC, North American Commercial and Industrial Insulation Standards.

.2 Apply materials in accordance with manufacturers' instructions and this specification.

.3 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Hangers, supports to be outside vapour retarder jacket.

.4 Supports, Hangers:

.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

.5 Below ambient/chilled water installation:

.1 All pipes, valves, strainers, flanges, unions, and other pipe system components and spec must be properly insulated with correctly completed vapor retarder applied.

.2 All insulation material must have properly installed and sealed vapor retarding jacket, including circumferential and longitudinal seams.

.3 All penetrations, tears, and punctures must be repaired and sealed with a vapor retarding material with a 0.02 or lower perm rating.

.4 Vapor stops must be installed at 18' intervals at all pipe insulation termination points including fittings, flanges, and other changes in direction or other types of piping specialties.

.5 All fitting insulation must be of the same type, thickness, and density of the pipe insulation, be premoulded insulation covers or fabricate from the same material as the pipe insulation. Full thickness must be maintained over all fitting surfaces. Blanket insulation with a factory applied vapor retarder facing is unacceptable.

.6 A complete vapor retarder must be installed on insulation over fittings before applying final finish. Vapor retarder must extend onto and be sealed to the vapor retarder of the pipe insulation.

.7 Additional fitting covers, PVC, or metal must have a vapor retarder seal applied to all longitudinal and circumferential seams in addition to the vapor retarder applied to the fitting insulation.

.8 Additional field applied to jackets must not use staples, screws, tacks, or rivets for attachment to avoid puncturing vapor retarder underneath.

.9 Insulating support inserts are to be high compressive strength insulation with a rigid shield. No calcium silicate is to be used for insulation on below-ambient operation piping.

3.3 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: At expansion joints, valves, primary flow measuring elements, flanges, and unions at equipment.

.2 Flexible removable blanket insulation covers are not acceptable for below-ambient (cold) operation piping systems. Rigid removable insulation jackets that are vapor retarder exterior material, that can be vapor sealed at the seams, are acceptable on below-ambient (cold) operation piping systems.

.3 Design: To permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

.4 Insulation:

.1 Insulation, fastenings and finishes: same as system.

.2 Jacket: As per adjacent insulation.

3.4 INSTALLATION OF ELASTOMERIC INSULATION

.1 Insulation to remain dry at all times. Overlaps to manufacturers instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.5 PIPING INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges, and fittings unless otherwise specified.

.2 Install insulator and jackets to applicable TIAC codes.

.3 Insulate ends of capped piping with type and thickness indicated for capped service.

.4 Thickness of insulation to be as listed in following table:

.1 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

.2 All storm piping including all vertical and horizontal piping shall be insulated.

Application	Type	Pipe sizes through (NPS) and insulation thickness mm (")				
		to 25 (1")	32 (1¼") 40 (1½")	50 (2") 80 (3")	105 (4") 150 (6")	200 (8") & over
Domestic Water Piping	A-1	25 (1")	25 (1")	40 (1½")	40 (1½")	40 (1½")
Storm Piping	A-1/A-5	25 (1")	25 (1")	25 (1")	25 (1")	25 (1")
Cooling Coil cond. Drain	A-1	25 (1")	25(1")	25 (1")	25 (1")	25 (1")
Roof Drain sumps	A-2/A-5	25 (1")	25 (1")	25 (1")	25 (1")	25 (1")
Diesel Generator Exhaust system	A-4	65 (2½")	65 (2½")	80 (3")	90 (3½")	90 (3½")
Horizontal Cast Iron Sanitary Piping	A-1/A-5	N/A	N/A	25 (1")	25 (1")	25 (1")
Trap Primer Piping	A-1	15 (½")	15 (½")	25 (1")		

.5 Finishes: Conform to the following table:

Application	Piping	Valves & Fittings
Exposed indoors	PVC	PVC
Concealed indoors	N/A	PVC

.6 Connection: To appropriate TIAC code.

.7 Finish attachments: SS bands, @ 150 mm (6") oc. seals: closed.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 ASTM B32, Specification for Solder Metal.

.3 ASTM B306, Specification for Copper Drainage Tube (DWV).

.4 ASTM C564, Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.5 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.

.6 CAN/CSA-B125.3, Plumbing Fittings.

Part 2 Products

2.1 COPPER TUBE AND FITTINGS

.1 Above ground sanitary, and vent, maximum 65 mm (2½") Type DWV copper to: ASTM B306.

- .1 Fittings.
  - .1 Cast brass: to CAN/CSA B125.3.
  - .2 Wrought copper: to CAN/CSA B125.3.
- .2 Solder: tin-lead, 50:50, to ASTM B32, type 50A.

2.2 VENT FLASHINGS

.1 Thaler or equal spun aluminum complete with insulation, cap, and rubber gasket.

Part 3 Execution

3.1 APPLICATION

.1 Install copper or cast iron drainage on first 10'-0" (3.0m) of all fixtures discharging waste above 110°F.

3.2 INSTALLATION

.1 Install in accordance with Provincial Plumbing Code and local authority having jurisdiction.

.2 Install above ground piping parallel and close to walls and ceilings to conserve headroom and space, and to grade as indicated.

.3 Place Cleanouts

.1 Where shown on Drawings and near bottom of each stack and riser.

.2 At every 90 degree change of direction for horizontal lines.

.3 Every 15 m (50') of horizontal run.

.4 Extend clean out to accessible surface. Do not place cleanouts in carpeted floors. In such locations, use wall type cleanouts.

.4 Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have a seal trap in connection with a complete venting system so gases pass freely to atmosphere with no pressure or syphon condition on water seal.

.5 Vent entire waste system to atmosphere.

.1 Discharge 500 mm (20") above roof. Join lines together in fewest practicable number before projecting above roof.

.2 Set back vent lines so they will not pierce roof near an edge or valley.

.3 Venting shall be 7.5 m (25'-0") from any outdoor air intakes.

.4 Provide copper vent piping through roof as per detail.

.6 Use torque wrench to obtain proper tension in cinch bands when using hubless cast iron pipe. Butt ends of pipe against centering flange of coupling.

.7 Flash pipes passing through roof with 453 g (16 oz) sheet copper flashing fitted snugly around pipes and caulk between flashing and pipe with flexible waterproof compound.

.1 Flashing base shall be at least 600 mm (24") square.

.2 Flashing may be a 24 kg/m^2 (5 lb/ft^2) lead flashing fitted around pipes and turned down into pipe 15 mm (½") with turned edge hammered against pipe wall.

.8 Before piping is covered, conduct tests in presence of Consultant and correct leaks or defective work. Conduct test prior to placing floor slab but after backfill is placed.

.1 Do not caulk threaded work.

.2 Fill waste and vent system to roof level [a minimum of 3,100 mm - (10')] with water and show no leaks for 2 hours.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 ASTM D2235, Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

.3 ASTM D2564, Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.

.4 CAN/CSA-B181.1, ABS Drain, Waste and Vent Pipe and Pipe Fittings.

.5 CAN/CSA-B181.2, PVC and CPVC Drain, Waste and Vent Pipe and Pipe Fittings.

.6 CAN/CSA-B182.1, Plastic Drain and Sewer Pipe and Pipe Fittings.

Part 2 Products

2.1 PIPING AND FITTINGS

.1 Above grade sanitary and vent piping:

.1 80 mm (3") and smaller: IPEX: PVC-XFR drain waste and vent pipe to CAN/CSA-B181.2.

.2 100 mm (4") and larger: IPEX: PVC-XFR drain waste and vent pipe to CAN/CSA-B181.2.

.3 Vent piping: any size, IPEX: PVC-XFR plastic drain and sewer pipe and fittings CAN/CSA-B181.2.

.2 Where piping pierces a fire separation an approved fire stop system to the approval of authority having jurisdiction shall be used.

2.2 JOINTS

.1 Solvent weld for PVC: to ASTM D2564.

.2 Solvent weld for ABS: to ASTM D2235.

2.3 EXPANSION

.1 Provide solvent welded expansion joints as required by manufacturer’s recommendations.

2.4 VENT FLASHINGS

.1 Thaler Stack Jack spun aluminum complete with insulation, cap, and rubber gasket.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with Provincial Plumbing Code and local authority having jurisdiction. Install in accordance with manufacturer's instructions.

.2 Installation of underground pipe

- .1 Provide all excavation, bedding, backfill, and compaction.
- .2 Install materials in accordance with Manufacturer's instructions.
- .3 Use jacks to make-up gasketed joints.
- .4 Stabilize unstable trench bottoms.
- .5 Bed pipe true to line and grade with continuous support from firm base.
  - .1 Bedding depth - 100 mm to 150 mm (4" to 6").
  - .2 Material and compaction to meet ASTM standard noted above.
- .6 Excavate bell holes into bedding material so pipe is uniformly supported along its entire length. Blocking to grade pipe is forbidden.
- .7 Trench width at top of pipe -
  - .1 Minimum 450 mm (18") or diameter of pipe plus 300 mm (12"), whichever is greater.
  - .2 Maximum - Outside diameter of pipe plus 600 mm (24").
- .8 Piping and joints shall be clean and installed according to manufacturer's recommendations. Break down contaminated joints, clean seats and gaskets and reinstall.
- .9 Do not use back hoe or power equipment to assemble pipe.
- .10 Initial backfill shall be 300 mm (12") above top of pipe with material specified in referenced ASTM standard.

.3 Place Cleanouts

- .1 Where shown on Drawings and near bottom of each stack and riser.
- .2 At every 90 degree change of direction for horizontal lines.
- .3 Every 15 m (50') of horizontal run.
- .4 Extend clean out to accessible surface. Do not place cleanouts in carpeted floors. In such locations, use wall type cleanouts

.4 Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have a seal trap in connection with a complete venting system so gases pass freely to atmosphere with no pressure or syphon condition on water seal.

.5 Before piping is covered, conduct tests in presence of Consultant and correct leaks or defective work. Conduct test prior to placing floor slab but after backfill is placed.

- .1 Fill waste and vent system a minimum of 1.8 m (6') above finished floor with water and show no leaks for 2 hours.
- .2 Conduct ball test in presence of consultant to ensure proper grade and clear of obstructions.

.6 Install solvent welded expansion joints as per manufacturer's recommendation. Care is to be taken to accommodate ambient temperatures at time of install.

.7 Vent entire waste system to atmosphere.

.1 Discharge 350 mm (14") above roof. Join lines together in fewest practicable number before projecting above roof.

.2 Set back vent lines so they will not pierce roof near an edge or valley.

.3 Venting shall be 7.5 m (25'-0") from any outdoor air intakes.

.8 Flash pipes passing through roof with Thaler insulated Stack Jack flashing.

.1 Flashing base shall be at least 600 mm (24") square.

.9 Install above ground piping parallel and close to walls and ceilings to conserve headroom and space, and to grade as indicated.

END OF SECTION

Part 1 General

1.1 GENERAL PROVISIONS

.1 This section covers items common to all sections of Heating, Ventilation, and Air Conditioning (HVAC) Division.

.2 Conform to Division 1 General Conditions.

.3 Furnish labour, materials, and equipment necessary for completion of work as described in contract documents.

.4 Unless specifically indicated, all materials and equipment provided under this contract shall be new and shall be manufactured in the project year.

.5 The term “Mechanical Contractor” shall remain active and shall mean a “single contractor” performing plumbing, drainage, heating, cooling, ventilation, and control services.

.6 When quoting as a subcontractor this building contractor shall explicitly state the services they are providing i.e. Mechanical (all services), Plumbing (water and drainage systems) or HVAC (including hydronic and air systems).

.7 Contractors shall be explicit to identify whether Fire Protection is included or omitted from the mechanical scope.

1.2 INTENT

.1 Mention herein or indication on Drawings of articles, materials, operations or methods requires: supply of each item mentioned or indicated, of quality, or subject to qualifications noted; installation according to conditions stated: and performance of each operation prescribed with furnishing of necessary labour, equipment, and incidentals for HVAC work.

.2 Where used, words “Section” and “Division” shall also include other Subcontractors engaged on site to perform work to make building and site complete in all respects.

.3 Where used, word “supply” shall mean furnishing to site in location required or directed complete with accessory parts.

.4 Where used, word “install” shall mean secured in place and connected up for operation as noted or directed.

.5 Where used, word “provide” shall mean supply and install as each is described above.

1.3 REGULATIONS, PERMITS, AND FEES

.1 All materials and quality of work shall meet all current and latest Provincial, Municipal and Fire Marshall requirements, regulations, codes, and by-laws in force in the area of the project.

.2 Each contractor shall give all necessary notices, obtain all necessary permits, and pay all fees in order that the work shown or specified may be carried out. Each contractor shall furnish any certificates necessary as evidence that the work installed conforms with the laws and regulations of all authorities having jurisdiction.

.3 In the event that changes, or alterations are required on completed work by authorized inspectors, these changes shall be made at the contractor's expense.

.4 Special equipment which does not have a standard CSA label shall be inspected by the local electrical authority having jurisdiction and the Approval Certificate shall be submitted to the Consultant as soon as possible. All costs and fees for inspections shall be borne by this contractor.

1.4 DRAWINGS

.1 The drawings and this specification have been assembled together as a responsibility of the consultant. The same is true for the other consultants, i.e. architect, structural engineer, civil engineer, fire protection engineer, electrical engineer, etc.

.2 The drawings and specifications are not assembled together for responsibility/division between subcontractors. The division of work between subcontractors remains the responsibility of the buildings' contractor (also known as the prime contractor or general contractor).

.3 All subcontractors are encouraged to perform work amicably utilizing all of the drawings and specifications published by all of the consultants.

.4 Plumbing and HVAC Drawings do not show structural and related details. Take information involving accurate measurements of building from building drawings, or at building. Make, without additional charge, any necessary changes, or additions to runs of piping, conduits, and ducts to accommodate structural conditions. Location of pipes, ducts, conduits and other equipment may be altered by Consultant without extra charge provided change is made before installation and does not necessitate major additional material.

.5 As work progresses and before installing piping, ductwork, heating units, registers, diffusers, fixtures and any other fittings and equipment which may interfere with interior treatment and use of building, provide detail drawings, or obtain directions for exact location of such equipment and fitments.

.6 Plumbing and HVAC drawings indicate general location and route of pipes, ducts and conduits which are to be installed. Where required work is not shown or only shown diagrammatically, install same at maximum height in space to conserve head room (minimum 2200 mm (88") clear) and interfere as little as possible with free use of space through which they can pass. Follow building lines, conceal piping, conduits and ducts in furred spaces, ceilings and walls unless specifically shown otherwise. Install work close to structure so furring will be small as practical.

.7 Install piping and ductwork to clear structural members and any fireproofing. Locate HVAC work to permit installation of specified insulation. Do not remove or damage structural fireproofing. Leave space to permit fireproofing and insulation to be inspected and repaired.

.8 Before commencing work, check and verify all sizes, locations, grade and invert elevations, levels, and dimensions to ensure proper and correct installation. Verify existing/municipal services.

.9 Locate all HVAC and electrical equipment in such a manner as to facilitate easy and safe access to and maintenance and replacement of any part.

.10 In every place where there is indicated space reserved for future or other equipment, leave such space clear, and install piping and other work so that necessary installation and connections can be made for any such apparatus. Obtain instructions whenever necessary for this purpose.

.11 Relocate equipment and/or material installed but not co-ordinated with work of other Sections and/or installed incorrectly as directed, without extra charge.

.12 Where drawings are done in metric and product not available in metric, the corresponding imperial trade size shall be utilized.

1.5 INTERFERENCE AND COORDINATION DRAWINGS

.1 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the constructed spaces provided.

.2 Prepare drawings to indicate co-ordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus, and connections are coordinated.

.3 Ensure that clearances required by jurisdictional authorities and clearances for proper maintenance are indicated on drawings.

.4 Upon consultant's request submit copies of interference drawings to consultant.

.5 Due to the nature of the building and the complexity of the building systems provide the following:

.1 Interference drawings, showing coordination of architectural, structural, plumbing, HVAC, and electrical systems for the consultant's review prior to fabrication.

.2 Detailed layout drawings, clearly showing fasteners and hangers.

.6 Provide CAD drawings (minimum file version AutoCAD 2013) in addition to hard copies.

1.6 QUALITY ASSURANCE

.1 Perform work in accordance with applicable provisions of local plumbing code, gas ordinances, and adoptions thereof for all HVAC systems. Provide materials and labor necessary to comply with rules, regulations, and ordinances.

.2 In case of differences between building codes, provincial laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Consultant in writing of such differences.

1.7 ALTERNATES AND SUBSTITUTIONS

.1 Throughout HVAC Divisions are lists of "Alternate and equal Equipment" manufacturers acceptable to Consultant if their product meets characteristics of specified described equipment.

.2 Each bidder may elect to use "Alternate or equal Equipment" manufacturers from lists of Alternates where listed. Include for any additional costs including all costs for revisions to electrical contract to suit Alternate used. Prices are not required in Tender for Alternates listed except where specifically noted as "Separate Price" in which case contractor will complete the Supplementary Tender Form.

.3 It is responsibility of this Division to ensure “Alternate Equipment” fits space allocated and gives performance specified. If an “Alternate Equipment” nor “equal” specified product unit is proposed and does not fit space allotted in Consultant’s opinion, supply of specified described equipment will be required without change in Contract amount. Should electrical characteristics for “alternate” or “equal” equipment differ from equipment specified it shall be the responsibility of the equipment manufacturer to pay all costs associated with the revisions to the electrical contract. Only manufacturers listed will be accepted for their product listing. All other manufacturers shall be quoted as substitution stating conditions and credit amount.

.4 If pipe or item, of size or weight indicated, is unobtainable, supply next larger size or heavier weight without additional charge.

1.8 EXAMINATION

.1 Site Reviews

.1 Examine premises to understand conditions which may affect performance of work of this Division before submitting proposals for this work.

.2 No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

.2 Drawings

.1 Plumbing and HVAC Drawings show general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.

.2 Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Plumbing, HVAC, and Fire Protection Drawings.

.3 Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories, which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.

.3 Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.

1.9 SEQUENCING SCHEDULING AND COORDINATION

.1 It is understood that while Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for installation of systems according to the true intent and meaning of Contract Documents. Anything not clear or in conflict will be explained by making application to Consultant. Should conditions arise where certain changes would be advisable, secure Consultant's approval of these changes before proceeding with work.

.2 Coordinate work of various trades in installing interrelated work. Before installation of HVAC items, make proper provision to avoid interferences in a manner approved by Consultant. Each Contractor shall refer to all sections of the specification for their responsibilities with other trades. Changes required in work specified in HVAC Division caused by neglect to do so shall be made at no cost to Owner.

.3 Arrange pipes, ducts, and equipment to permit ready access to valves, unions, traps, starters, motors, control components, and to clear openings of doors and access panels.

.4 Furnish and install inserts and supports required by HVAC Division unless otherwise noted. Furnish sleeves, inserts, supports, and equipment that are an integral part of other Divisions of the Work to Sections involved in sufficient time to be built into construction as the Work proceeds. Locate these items and see that they are properly installed. Expense resulting from improper location or installation of items above shall be borne by HVAC Division.

.5 Be responsible for required excavation, backfilling, cutting, and patching incident to work of this Division and make required repairs afterwards to satisfaction of Consultant. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.

.1 Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.

.2 Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.

.3 Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.

.6 Adjust locations of pipes, ducts, equipment, fixtures, etc., to accommodate work from interferences anticipated and encountered. Determine exact route and location of each pipe and duct prior to fabrication.

.1 Make offsets, transitions, and changes in direction of pipes, ducts, and electrical raceways as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.

.2 Furnish and install traps, air vents, sanitary vents, pull boxes, etc., as required to effect these offsets, transitions, and changes in direction.

.7 Slots and openings through floors, walls, ceilings, and roofs shall be provided by this contractor but performed by a trade specializing in this type of work. This Division shall see that they are properly located and do any cutting and patching caused by its neglect to do so.

1.10 REQUEST FOR INFORMATION (RFI) PROCEDURES

.1 RFIs shall be submitted to the consultant minimum two (2) weeks prior to answer being required. Failure to submit an RFI in a timely manner will forfeit delay claims and schedule extension requests by the contractor.

.2 All RFIs will be submitted with the following information:

.1 RFI number
.2 Name of project
.3 Date of initiation
.4 Date response required by (minimum two (2) weeks)
.5 Subject
.6 Submitter's name
.7 Drawing/specification reference
.8 Photograph of the issue (if applicable)
.9 Description of the issue
.10 Contractor's proposed resolution

1.11 CONTRACT BREAKDOWN

.1 Provide breakdown of Contract exclusive of HST to acceptance of consultants prior to first draw submission.

.2 Provide labour and material cost for each item.

.3 Breakdown shall indicate total contract amount.

.4 Contract breakdown shall be as follows as a minimum.

.1 Mobilization and shop drawings (max. $2,000.00)
.2 Demolition
.3 Unit Ventilator
.4 Condensing Unit
.5 Ductless Splits
.6 Heating piping
.7 Piping insulation
.8 Ductwork
.9 Duct insulation
.10 Grilles and diffusers
.11 Fire stopping
.12 Fans and equipment
.13 HVAC system commissioning
.14 Building automation systems
.15 Testing, adjusting, and balancing
.16 Refrigeration piping
.17 HVAC contractor closeout requirements (min. of 3% for the first $500,000.00, 1% from $500,000.00 to $5,000.000.00, and 0.5% beyond. Shall not be less than $5,000.00).

.5 Progress claims, when submitted are to be itemized against each item of the contract breakdown, this shall be done in table form showing contract amount, work complete to date, previous draw, amount this draw and balance.

.6 Mobilization amount may only be drawn when all required shop drawings have been reviewed by the consultant.

1.12 SHOP DRAWINGS AND PRODUCT DATA

.1 Furnish complete catalog data for manufactured items of equipment to be used in the Work to Consultant for review within 14 days after award of Contract.

.2 Upon receipt of reviewed shop drawing, product is to be ordered immediately.

.3 Provide a complete list of shop drawings to be submitted prior to first submission.

.4 Before submitting to the Consultant, review all shop drawings to verify that the products illustrated therein conform to the Contract Documents. By this review, the Contractor agrees that it has determined and verified all field dimensions, field construction criteria, materials, catalogue numbers, and similar data and that it has checked and coordinated each shop drawing with the requirements of the work and of the Contract Documents. The Contractor's review of each shop drawings shall be indicated by stamp, date and signature of a qualified and responsible person possessing by the appropriate authorization.

.5 If material or equipment is not as specified or submittal is not complete, it will be rejected by Consultant.

.6 Additional shop drawings required by the contractor for maintenance manuals, site copies etc., shall be photocopies of the "reviewed" shop drawings. All costs to provide additional copies of shop drawings shall be borne by the contractor.

.7 Submit all shop drawings for the project as a package. Partial submittals will not be accepted.

.8 Catalog data or shop drawings for equipment, which are noted as being reviewed by Consultant or their Engineer shall not supersede Contract Documents.

.9 Review comments of Consultant shall not relieve this Division from responsibility for deviations from Contract Documents unless Consultant's attention has been called to such deviations in writing at time of submission, nor shall they relieve this Division from responsibility for errors in items submitted.

.10 Check work described by catalog data with Contract Documents for deviations and errors.

.11 Shop drawings and product data shall show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances. e.g., access door swing spaces.

.12 Shop drawings and product data shall be accompanied by:

- .1 Detailed drawings of bases, supports, and anchor bolts.
- .2 Acoustical sound power data, where applicable.
- .3 Points of operation on performance curves.

.4 Manufacturer to certify as to current model production.

.5 Certification of compliance to applicable codes.

.13 State sizes, capacities, brand names, motor HP, accessories, materials, gauges, dimensions, and other pertinent information. List on catalog covers page numbers of submitted items. Underline applicable data.

.14 Shop drawings shall be submitted electronically as per the following directions:

.1 Electronic Submissions:

.1 Electronically submitted shop drawings shall be prepared as follows:

.1 Use latest software to generate PDF files of submission sheets.

.2 Scanned legible PDF sheets are acceptable. Image files are not acceptable.

.3 PDF format shall be of sufficient resolution to clearly show the finest detail.

.4 PDF page size shall be standardized for printing to letter size (8.5"x11"), portrait with no additional formatting required by the consultant. Submissions requiring larger detail sheets shall not exceed 11"x17".

.5 Submissions shall contain multiple files according to section names as they appear in Specification.

.6 File names shall include consultant project number and description of shop drawing section submitted.

.7 Each submission shall contain an index sheet listing the products submitted, indexed in the same order as they appear in the Specification. Include associated PDF file name for each section.

.8 On the shop drawing use an “electronic mark” to indicate what is being provided.

.9 **Each file shall bear an electronic representation of the “company stamp” of the contractor. If not stamped the file submission will not be reviewed.**

.2 Email submissions shall include subject line to clearly identify the consultant’s project number and the description of the shop drawings submitted.

.3 Electronic attachments via email shall not exceed 10MB. For submissions larger than 10MB, multiple email messages shall be used. Denote related email messages by indicating “1 of 2” and “2 of 2” in email subject line for the case of two messages.

.4 Electronic attachments via web links (URL) shall directly reference PDF files. Provide necessary access credentials within link or as username/password clearly identified within body of email message.

.5 On site, provide one (1) copy of the "reviewed" shop drawings in a binder as noted above.

.6 Contractor to print copies of "reviewed" shop drawings and compile into maintenance manuals in accordance with requirements detailed in this section.

1.13 EQUIPMENT NAMEPLATE DATA

.1 Between the manufactures design published literature, the shop drawing submission literature, and the nameplate data on the equipment, they can all read differently.

.2 Most of the confusion and differences are coming out of the electrical power installation.

.3 The contractors installing and connecting the equipment are responsible for the coordination of this data through the construction period.

.4 The contractors shall share and/or request this information through out the project and monitor/make adjustments, provide recommendations accordingly based on any discrepancies.

.5 The contractors are responsible for any cost associated with the changing data.

.6 The final installation must meet the "Nameplate Data" on the equipment on site.

1.14 OPERATION AND MAINTENANCE MANUAL

.1 Provide operation and maintenance data for incorporation into manual as in submittals' requirements.

.2 Operation and maintenance manual to be approved by, and final copies deposited with, Consultant before final inspection.

.3 Submit one (1) copy of Operation and Maintenance Manual to Consultant for review and approval. Submission of individual data will not be accepted unless directed by Consultant. Submission can be done electronically in PDF format or as a hard copy.

.1 Electronic submission/PDF file is required to be bookmarked. Any submission received without bookmarking will be immediately returned as unacceptable.

.2 Hard copy submission shall be in a three-ring binder (minimum 50 mm (2") ring) and labelled as 'Operation and Maintenance Manual' with project name and location. Dividers are to be used for binder organization.

.4 Make changes as required and re-submit as directed by Consultant.

.5 Operation data to include:

.1 Control schematics for each system including environmental controls.

.2 Description of each system and its controls.

.3 Description of operation of each system at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for each system and each component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.8 Spare parts equipment list.

.9 Manufacturers standard or extended warranty information.

.6 Maintenance data shall include:

.1 Servicing, maintenance, operation, and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.7 Performance data to include:

.1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified elsewhere.

.4 Testing, adjusting, and balancing reports as specified in Testing, Adjusting, and Balancing Section.

.5 Copy of all substantial performance final certificates.

.8 Miscellaneous data to include:

.1 Letter of contractor’s warranty and guarantee.

.2 WRDSB Project Asset and Warranty Card for all assets replaced, newly installed, and removed.

.3 Index sheet.

.4 Tabbed format for each section.

.5 Manufacturers approved shop drawings.

.6 Spare parts list and source.

.7 List of Manufacturers and suppliers address for each piece of equipment.

.9 Final Submittals:

.1 Upon acceptance of Operation and Maintenance Manual by the Consultant, provide the following:

.1 Provide**,** two (2) copies of final Operation and Maintenance Manuals, as well as a PDF file of the entire approved manual on a USB stick. Only one (1) USB stick is to be provided containing both the approved manual and as-built drawings.

1.15 AS-BUILT DRAWINGS

.1 Site records:

.1 Contractor shall provide two (2) sets of reproducible HVAC drawings. Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include changes to existing HVAC systems, control systems, and low voltage control wiring.

.2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection at all times.

.2 As-built drawings submittal for TAB and review:

.1 Prior to start of Testing, Adjusting, and Balancing (TAB), finalize production of as-built drawings.

.2 Identify **each drawing** in lower right-hand corner in letters at least 3 mm (1/8") high as follows: - "AS-BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW HVAC SYSTEMS AS INSTALLED" (Company Name) (Signature of Contractor) (date).

.3 TAB to be performed using as-built drawings.

.4 Submit copy to Consultant for review and approval. When returned, make corrections as directed.

.3 As-built drawings final submittal:

.1 Once approved, submit completed, reproducible paper as-built drawings as well as a scanned PDF file copy on USB stick with Operation and Maintenance Manuals.

1.16 WARRANTIES

.1 In addition to guarantee specified in General Conditions, guarantee heating, cooling, and plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.

.2 Provide certificates of warranty for each piece of equipment made out in favor of Owner. Clearly record "start-up" date of each piece of equipment on certificate. Include certificates as part of Operation and Maintenance Manual.

.3 Contractor shall rectify any installation deficiencies in the boiler or pressurized other systems identified by a TSSA Inspector for a period of three (3) years from ready for takeover.

.4 Warranty period shall start from date of ready for takeover. Warranty period shall start from date of ready for takeover. Warranty start date based on shipment date, start up date, substantial completion date, etc. are not applicable.

.5 Warranty Duration:

.1 Two (2) year warranty period applies unless otherwise noted.

.6 Warranty Coverage:

.1 Applies to parts and labour.

1.17 READY FOR TAKEOVER

.1 Complete the following to the satisfaction of the consultant prior to request for ready for takeover.

.1 As-built Drawings

.2 Maintenance Manuals

.3 System Start up

.4 TAB Reports

.5 HVAC System Commissioning

.6 Instructions to Owners

1.18 REVISION TO CONTRACT

.1 Provide the following:

.1 Itemized list of material with associated costs.

.2 Labour rate and itemized list of labour for each item.

.3 Copy of manufacturers/supplier's invoice if requested.

1.19 DELIVERY, STORAGE, AND HANDLING

.1 Follow Manufacturer's directions in delivery, storage, and protection of equipment and materials. Contractor to include all costs associated with delivery storage and handling in tender price.

.2 Deliver equipment and material to site and tightly cover and protect against dirt, water, and chemical or environmental damaging conditions but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in dry, heated space.

.3 Remove any damaged materials from the site.

1.20 DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS

.1 If designated substances and/or hazardous materials are suspected or identified cease all work in the immediate area in accordance with OHSA and notify consultant.

.2 Each contractor and on site employee of the contractor shall have "asbestos awareness training".

.3 The Contractor shall ensure that employees who may come into contact with designated substances and/or hazardous materials due to the nature of the work that they perform, have received training that enables them to recognize designated substances and/or hazardous materials and that enables them to react in accordance with the Occupational Health and Safety Act and regulations thereto should contact with designated substances and/or hazardous materials occur during the course of their work.

.4 It is the responsibility of the contractor to review the designated substances and/or hazardous materials book in the building prior to starting any work.

.5 Existing occupied buildings (depending upon their age) may contain designated substances and/or hazardous materials in thermal insulating materials and some manufactured products, such as vinyl asbestos floor tile. Any insulating materials, on pipes, fittings, boilers, tanks, ductwork, etc. may contain designated substances and/or hazardous materials and shall not be disturbed.

.6 A survey of each building documenting the location and condition of designated substances and/or hazardous materials -containing materials is available for your mandatory review prior to commencing any work on premises.

1.21 TSSA INSPECTION

.1 Prior to final completion of the project, this contractor shall make application, arrange, and pay for a TSSA inspection of all piping systems and equipment installations, including, but not limited to medical gasses, refrigeration, fuel piping, compressed air, heating plant, cooling plant, and associated equipment installed under the contract.

.2 Provide a copy of the TSSA report in the maintenance manuals for each system.

1.22 CONFINED SPACES

.1 Certain areas of the building may be defined as a “Confined Space”. Any personnel working in these areas must have confined space training, appropriate equipment and undertake all work in conformance with appropriate codes and standards.

.2 Refer to building documentation for any spaces deemed “Confined Space”.

1.23 ENERGY EFFICIENCY

.1 The HVAC systems of this building must achieve the energy efficiency levels by conforming to ANSI/ASHRAE/IESNA 90.1 “Energy Standard for Buildings Except Low-Rise Residential Buildings” and Chapter 2 of Division 3 of SB-10 prescriptive method from the Ontario Building Code.

.2 All equipment, products, and installations must conform to the Codes and Standards.

END OF SECTION

Part 1 General

1.1 TESTS

.1 Give 48 hours' written notice of date for tests.

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

.3 Conduct tests in presence of Consultant.

.4 Bear costs including retesting and making good.

.5 Piping:

- .1 General: Maintain test pressure without loss for 4 h unless otherwise specified.
- .2 Hydraulically test steam and hydronic piping systems at 1-1/2 times system operating pressure or minimum 860 kPa, whichever is greater.
- .3 Test natural gas systems to CSA-B149.1-00, TSSA requirements and requirements of authorities having jurisdiction.

.6 Equipment: Test as specified in relevant sections.

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

1.2 SYSTEM START UP

.1 Provide adjusting testing and start up of all equipment prior to testing and balancing (TAB) specified elsewhere.

.2 Provide Consultant with written notice verifying all equipment operation and installation is complete.

.3 Start up shall be in presence of the following: Owner or Representative, Contractor, Building Automation Systems (BAS) Contractor, and Manufacturer's Representative. Each person shall witness and sign off each piece of equipment. Consultant's attendance will be determined by Consultant.

.4 Simulate system start up and shut down and verify operation of each piece of equipment.

.5 Arrange with all parties and provide 72 hours' notice for start up procedure.

.6 Arrange with building automation systems contractor to sequence all components and ensure system operation.

1.3 COMMISSIONING

.1 Co-ordinate and direct each step of the commissioning process and recommend acceptance or non-acceptance to the Owner/Owner's Representative.

.2 Prepare, in writing, documentation of any deficiencies discovered during the commissioning process. Submit to Consultant and Owner/Owner's Representative.

.3 The Commissioning Process is detailed in *ASHRAE Guideline 1-1996 HVAC Commissioning Process.* The commissioning plan may be modified to reflect the actual construction schedule and design.

.4 Provide a pre-functional test of all HVAC system and sub-system elements, including control devices, shall be checked for the following:

.1 Verify that each element has been properly installed, properly identified, and that all connections (including electrical) have been made correctly.

.2 Verify that each element has been checked for proper lubrication, drive rotation, belt tension, control sequence, flow direction, or other conditions which may cause damage or reduce system performance.

.3 Verify that tests, meter readings, and specific HVAC/electrical performance characteristics agree with those required by equipment or system manufacturer.

.4 Controls calibration to be completed in accordance with the specification.

.5 The TAB shall be done in accordance with the specifications.

.5 A functional performance testing shall be done during two separate periods – one during the cooling season and one during the heating season. The first (cooling) testing period shall occur as soon after completion of installation as practical. The heating testing period shall occur as soon as weather conditions make it practical to test warm-up, zone heating and economizer functions. These tests ensure that all equipment and systems operate in accordance with design intent. The tests are dynamic tests and test the systems through all possible modes of operation.

.6 Reports:

.1 The Contractor shall be responsible for recording, documenting, and maintaining detailed inspection and testing data on the test documentation reports. The data record shall be comprehensive and concise.

.2 All data must be recorded as soon as possible during the course of the inspection and testing.

.3 All documentation shall have the date, time, and names of persons participating in the inspection and testing.

.4 All test instruments shall be documented for valid calibration.

.5 The recording work sheets, inspection check lists, and Performance Testing plans must all be approved by the Engineer and the Owner's Representative prior to the start of the testing.

.6 Include all commissioning documentation in the maintenance manuals.

.7 HVAC System Execution:

.1 Operate equipment and systems shall be tested in the presence of the Owner's Representative and the Consultant to demonstrate compliance with specified requirements. To minimize the time of Commissioning Team members, testing shall be done in four seasonal single blocks of time insofar as possible.

.2 Notify the consultant, in writing, fourteen (14) days prior to tests scheduled under requirements of this Section.

.3 Testing shall be conducted under specified design operating conditions as recommended or approved by the Consultant.

.4 All elements of systems shall be tested to demonstrate that total systems satisfy all requirements of these Specifications. Testing shall be accomplished on hierarchical basis. Test each piece of equipment for proper operation, followed by each sub-system, followed by entire system, followed by any inter-ties of other major systems.

.5 All special testing materials and equipment shall be provided by the appropriate contractor.

.6 Provide three copies of all test reports and records to the Consultant.

.8 The verification testing procedures shall address all operating characteristics of all HVAC equipment and systems, including:

Equipment Checklist
Heat Recovery Unit(s)
Controllers/Valves/Dampers
Unit Ventilators
Relays/Sensors/Transducers
System Checklist
Unit Ventilators

1.4 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTION

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, troubleshooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 HVAC Contractor to schedule and coordinate the demonstration all on the same day, starting at a pre-approved time and continuing consequently until complete.

.3 Where specified elsewhere in HVAC Division, qualified manufacturers' representatives who are knowledgeable about the project to provide demonstrations and instructions.

.4 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.

.5 Instruction duration time requirements as specified in appropriate sections.

.6 Where deemed necessary, Consultants may record these demonstrations on video tape for future reference.

1.5 TRIAL USAGE

.1 Consultant or Owner may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to following equipment and systems:

.1 Exhaust air

.2 Hydronic water systems

.3 Control systems

1.6 DEFICIENCIES

.1 During the course of construction, the Consultants will monitor construction and provide written reports of work progress, discussions, and instruction to correct work.

.2 Instruction to correct work shall be done within the work period before the next review.

.3 The Contractor shall not conceal any work until inspected.

.4 The Contractor shall expedite 100% complete rough-in work and have inspected prior to concealing services and equipment especially above ceiling.

.5 Upon completion of the project, the Consultant will do a final review. Upon receiving the final inspection report, the Contractor must correct and sign back the inspection report indicating the deficiencies are completed. A re-inspection will only be done once Consultant receives this in writing.

1.7 EQUIPMENT INSTALLATIONS

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

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

.3 Equipment drains: Pipe to floor drains.

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

1.8 ANCHOR BOLTS AND TEMPLATES

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

1.9 PROTECTION OF OPENINGS

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

1.10 ELECTRICAL

.1 Electrical work to conform to Electrical Division including the following:

.1 Supplier and installer responsibility and related HVAC responsibility is indicated in Equipment Schedule on HVAC and/or electrical drawings,

.2 Power wiring and conduit is specified in Electrical Division except for conduit, wiring and connections below 50 V which are related to control systems specified in HVAC Division. Follow Electrical Division for quality of materials and workmanship.

.3 Electrically operated equipment shall be C.S.A. approved label. Special Inspection Label of Provincial Authority having jurisdiction will be accepted in lieu of C.S.A. approval. Each motor shall have an approved starter. Starter will be supplied and installed by Electrical Division unless otherwise indicated.

1.11 CONTROL WIRING

.1 Furnish and install all components, devices, and control wiring for all HVAC equipment, HVAC systems, lighting, and other electrical loads to make all equipment operable to satisfaction of Owner and Consultant and to manufacturer's requirements and recommendations.

.2 All electrical wiring, HVAC wiring and installations shall comply with local and national electrical and HVAC codes.

.3 Supply and install wiring as required for all devices and systems. Install wiring in EMT conduit and otherwise comply with all requirements of the Electrical Division. Approved plenum wire may be used for sensor and network communication wiring where it complies with appropriate building codes and regulatory authorities.

.4 All wiring concealed in walls and chases, and all exposed wiring shall be run in conduit.

.5 Provide recessed conduit and backer boxes where controls are wall mounted. Surface mounted boxes and conduit are acceptable in service rooms.

.6 Free-run plenum rated cable shall be run in cable hangers where provided by electrical division or tied neatly to pipe and duct hangers in the ceiling. Avoid wiring that droops. Follow building lines and do not run wiring "as the crow flies".

1.12 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to equipment unless specified or indicated otherwise. Coordinate with block coursing (if applicable).

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install equipment at following heights unless indicated otherwise.

.1	Thermostats (Operable, Barrier Free)	1200 mm (47.2")
.2	Thermostats (Non Barrier Free)	1500 mm (59")

.4 Also follow direction of architectural drawings and where discrepancies occur clarify prior to rough-in.

1.13 MOTORS

.1 Provide high efficiency motors for HVAC equipment as specified.

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

.3 Motors under 373 W, (1/2 hp): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, voltage as indicated.

.4 Motors 373 W, (1/2 hp) and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40°C (72°F), 3 phase, voltage as indicated.

1.14 PIPING AND EQUIPMENT SUPPORTS

.1 Equipment supports supplied by equipment manufacturer: Specified elsewhere in HVAC Division.

.2 Piping and equipment supports not supplied by equipment manufacturer: Fabricate from structural grade steel meeting requirements of - Structural Steel Section. Submit structural calculations with shop drawings.

.3 Mount base mounted equipment on chamfered edge housekeeping pads, minimum of 100 mm (4") high and 150 mm (6") larger than equipment dimensions all around. Concrete specified elsewhere.

.4 Where housekeeping pads incorporate existing pads provide 10 mm dowels into existing pads. New pad height shall match existing.

1.15 SLEEVES

.1 Pipe sleeves: at points where pipes pass through masonry, concrete or fire rated assemblies and as indicated. Grout sleeves in place.

.2 Schedule 40 steel pipe.

.3 Sleeves with annular fin continuously welded at midpoint:

.1 Through foundation walls.

.2 Where sleeve extends above finished floor.

.3 Through fire rated walls and floors.

.4 Sizes: minimum 6 mm (1/4") clearance all around, between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25 mm (1") above other floors.

.6 Fill voids around pipes:

.1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof fire retardant non-hardening mastic.

.2 Where sleeves pass through walls or floors, provide space for firestopping. Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.

.3 Ensure no contact between copper tube or pipe and ferrous sleeve.

.4 Fill future-use sleeves with lime plaster or other easily removable filler.

.5 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CGSB 1-GP-181M+Amdt-Mar-78.

.7 Provide minimum 20 gauge duct sleeves where ducts pass through masonry concrete or fire rated assemblies. Maintain minimum 25 mm clearance all around or to the requirements of the authority having jurisdiction. Seal at wall as indicated.

1.16 FIRE STOPPING

.1 This contractor shall work with all other contractors on the project in providing one common method of fire stopping all penetrations made in fire rated assemblies.

.2 Approved fire stopping and smoke seal material in all fire separations and fire ratings within annular space between pipes, ducts, insulation and adjacent fire separation and/or fire rating.

.3 Do not use cementitious or rigid seals around penetrations for pipe or ductwork where penetrating through walls, floors, ceilings, etc.

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

.5 Provide materials and systems capable of maintaining effective barrier against flame, smoke and gases. Ensure continuity and integrity of fire separation.

.6 Comply with the requirements of CAN4-S115-M35, and do not exceed opening sized for which they have been tested.

.7 Systems to have an F or FT rating (as applicable) not less than the fire protection rating required for closures in a fire separation. Provide “fire wrap” blanket around services penetrating fire walls. Extent of blanket must correspond to ULC recommendations.

.8 The fire stopping materials are not to shrink, slump or sag and to be free of asbestos, halogens and volatile solvents.

.9 Firestopping materials are to consist of a component sealant applied with a conventional caulking gun and trowel.

.10 Fire stop materials are to be capable of receiving finish materials in those areas which are exposed and scheduled to receive finishes. Exposed surfaces are to be acceptable to consultant prior to application of finish.

.11 Firestopping shall be inspected and approved by local authority prior to concealment or enclosure.

.12 Install material and components in accordance with ULC certification, manufacturers instructions and local authority.

.13 Submit product literature and installation material on fire stopping in shop drawing and product data manual. Maintain copies of these on site for viewing by installers and consultant.

.14 Manufacturer of product shall provide certification of installation. Submit letter to the consultant.

.15 Acceptable Alternate Manufacturers to approval of local authority:

- .1 Minnesota Mining and Manufacturing
- .2 Fryesleeve Industries Inc.
- .3 General Electric Pensil Firestop Systems
- .4 International Protective Coatings Corp.
- .5 Rectorseal Corporation (Metacaulk)
- .6 Proset Systems

.7 3M

.8 AD Systems

.9 Hilti

.16 Ensure firestop manufacturer representative performs onsite inspections and certifies installation. Submit inspection reports/certification at time of substantial completion.

1.17 ESCUTCHEONS

.1 On pipes and ductwork passing through walls, partitions, floors and ceilings in exposed finished areas and on water and drain pipes inside millwork and cabinets.

.2 Chrome or nickel plated brass or Type 302 stainless steel, one piece type with set screws.

.3 Outside diameter to cover opening or sleeve.

.4 Inside diameter to fit around finished pipe.

1.18 PAINTING

.1 Refer to Section Interior Painting and specified elsewhere.

.2 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.

.3 Apply two coats of paint to exposed piping service in service room, base colour as specified in HVAC Identification Section.

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

.5 Restore to new condition, or replace equipment at discretion of consultant, finishes which have been damaged too extensively to be merely primed and touched up.

1.19 SPARE PARTS

.1 Furnish spare parts in accordance with general requirements and as follows:

.1 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

.2 Provide list of equipment in maintenance manuals indicating corresponding spare parts required. List of spare parts to be signed off by receiving personnel.

1.20 SPECIAL TOOLS

.1 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Maintenance Materials Special Tools and Spare Parts.

1.21 ACCESS DOORS

.1 Provide access doors to concealed HVAC equipment for operating, inspecting, adjusting and servicing.

.2 Flush mounted 600 x 600 mm (24" x 24") for body entry and 300 x 300 mm (12" x 12") for hand entry unless otherwise noted. Doors to open 180°, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.

.3 Material:

.1 Special areas such as tiled or marble surfaces: Use stainless steel with brushed satin or polished finish as directed by Consultant.

.2 Remaining areas: Use prime coated steel.

.3 Fire rated areas: Provide ULC listed access doors.

.4 Washrooms or high moisture area ceilings: Aluminum with mill finish suitable for painting.

.4 Installation:

.1 Locate so that concealed items are accessible.

.2 Locate so that hand or body entry (as applicable) is achieved.

.5 Acceptable Manufacturers:

.1 Le Hage

.2 Zurn

.3 Acudor

.4 Nailor Industries Inc.

1.22 DIELECTRIC COUPLINGS

.1 General:

.1 To be compatible with and to suit pressure rating of piping system.

.2 Where pipes of dissimilar metals are joined.

.2 Pipes NPS 50 mm (2") and under: Isolating unions.

.3 Pipes NPS 65 mm (2 1/2") and over: Isolating flanges.

1.23 DRAIN VALVES

.1 Locate at low points and at section isolating valves unless otherwise specified.

.2 Minimum NPS 20 mm (3/4") unless otherwise specified: bronze, with hose end male thread and complete with cap and chain.

.3 Drain valves on potable water systems shall be complete with vacuum breaker.

1.24 REPAIRS, CUTTING, AND RESTORATION

.1 Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.

.2 Each Section of this Division shall bear expense of cutting, patching, and repairing to install their work and/or replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.

.3 Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.

.4 All patching, painting and making good of the existing walls, floors, ceilings, partitions and roof will be at the expense of this Contractor, but performed by the Contractor specializing in the type of work involved unless otherwise noted.

1.25 EXISTING SYSTEMS

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

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

1.26 CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units prior to turn over to owner.

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

1.27 DISCONNECTION AND REMOVAL

.1 Disconnect and/or remove equipment, piping, ductwork, etc. as indicated.

.2 Cap and conceal all redundant and obsolete connections.

.3 Provide a list of equipment to be removed to the owner, for his acceptance of same. Remove all equipment from site, which the owner does not retain.

.4 Store equipment to be retained by owner on site where directed by consultant.

1.28 OWNER SUPPLIED EQUIPMENT

.1 Connect to equipment supplied by the owner and make operable.

1.29 DEMOLITION

.1 The general requirements are indicated on the drawings and on the outline specification in Division 1.

.2 The general execution of the demolition is to be carried out in a clean and efficient manner.

.3 Demolition of existing ceiling, walls etc., to facilitate removal of existing services or equipment or installation of new to be kept to a minimum and then restored to match existing.

.4 All openings or holes created by removal of existing HVAC systems which are not being reused are to be patched with the same material surrounding surfaces.

.5 All new holes and openings to facilitate HVAC systems are to be patched to match surrounding surfaces.

.6 Protect all existing furnishings, materials, and equipment. Any damage occurring as a result of the work of this Division shall be repaired or replaced at the expense of this Division.

.7 Where work involves breaking into or connecting to existing services, carry out work at times directed by the Owners in an expedient manner with minimum disruption to the facility and systems downtime.

.8 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.

.9 Where the location of any services has been shown on the plans, such information is not guaranteed. It is this Division's responsibility to verify locations, invert elevations, etc., immediately after moving on site. Should for any reason the information obtained necessitate changes in procedure or design, advise the Consultant at once. If verification of existing conditions is not done at the outset and any problems arise, the responsibility for same is entirely this Division's.

1.30 CONFINED SPACES

.1 Certain areas of the building may be defined as a "Confined Space". Any personnel working in these areas must have confined space training, appropriate equipment and undertake all work in conformance with appropriate codes and standards.

.2 Refer to building documentation for any spaces deemed "Confined Space".

1.31 TSSA INSPECTION

.1 Prior to final completion of the project, this contractor shall make application, arrange, and pay for a TSSA inspection of all piping systems and equipment installations, including, but not limited to medical gasses, refrigeration, fuel piping, compressed air, heating plant, cooling plant, and associated equipment installed under the contract.

.2 Provide a copy of the TSSA report in the maintenance manuals for each system.

1.32 INTEGRATED LIFE SAFETY SYSTEMS TESTING

.1 HVAC systems in this building, including but not limited to smoke control dampers, smoke control fans, high speed low velocity ceiling fans, makeup air units, and heat tracing for fire protection systems may be subject to Integrated Life Safety Systems testing.

.2 The HVAC Contractor shall co-ordinate with the Integrated Life Safety Systems Testing Agent as follows:

.1 Confirm which HVAC systems are to be included as part of the testing process.

.2 Verify in writing to the Integrated Life Safety Systems Testing Agent that HVAC commissioning of the affected systems/devices is complete prior to the scheduled testing date(s).

.3 Participate in the Integrated Life Safety Systems Testing to confirm proper operation of all associated systems.

.4 This contractor shall work with the Integrated Life Safety Systems Testing Agent to reset all systems back to normal operating mode after the testing is complete.

.3 Include all costs associated with Integrated Life Safety System Testing in the tender value.

.4 Refer to Division 1/Division 26 Integrated Life Safety Systems Testing specifications for additional information/requirements.

1.33 REFRIGERANT CONTAINING EQUIPMENT

.1 A2L refrigerants are classified as mildly flammable. CSA B52-2023 has specific safety clauses related to the use of refrigerants with this classification within buildings.

.2 This Contractor shall be responsible to ensure that the installation requirements of CSA B52-2023 are met.

.3 Throughout this specification various pieces of equipment have been specified with refrigerant leak detection systems. Field wiring of the alarm status of this system to various downstream system components is required under Annex P of the standard and is the responsibility of this Contractor. These devices include the following:

.1 Open all zone dampers connected to the affected system.

.2 Disable electric reheat coils within the affected system.

.3 Activate field installed safety shut off valves on the affected refrigeration systems.

.4 De energize any potential sources of ignition with the ductwork system of the affected system.

.5 Energize fans within the ductwork system.

.6 Activate any designated refrigeration leak ventilation systems.

1.34 FREEZE PROTECTION

.1 Do not run lines in outside walls, or locations where freezing may occur. Piping next to outside walls shall be in furred spaces with insulation between the piping and the outside wall. Insulation of piping shall not be considered freeze protection.

1.35 SCAFFOLDING, RIGGING, AND HOISTING

.1 Provide all scaffolding, rigging, hoisting, and services necessary for erection and delivery into the premises of any equipment and apparatus furnished; remove same from premises when no longer required. Conform to OSHA requirements and standards.

1.36 COOPERATION WITH OTHER TRADES

.1 Give full cooperation to other trades and furnish in writing to other trades, with copies to the engineer, any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay.

.2 Where plumbing work will be installed in close proximity to, or will interfere with work of other trades, assist in working out space conditions to make a satisfactory adjustment. Prepare composite working drawings and sections at a suitable scale, not less than ¼ inches = 1-foot – 0-inches, clearly showing how the HVAC work is to be installed in relation to the work of other trades. If work is installed before coordinating with other trades, or if it causes any interference with work of other trades, make the necessary changes in the work to correct the conditions and bear all costs.

.3 Furnish to other trades necessary templates, patterns, setting drawings, and shop details for the proper installation of work and for coordinating adjacent work.

1.37 WATERPROOFING SEAL MATERIALS

.1 Modular, compressed seal assemblies consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and pipe sleeve or wall opening, assembled with stainless steel bolts and pressure plates and designed so when bolts are tightened the links expand to seal the opening watertight. Select seal assemblies to suit pipe size and sleeve size or wall opening size.

.2 Standard of quality assurance manufacturers are:

.1 Thunderline Corp. (Power Plant Supply Co.) “Link Seal” Model S-316

.2 The Metraflex Co. “MetraSeal” type ES

.3 Or approved equivalent.

1.38 SLEEVE, CUT, AND FORMED OPENING LOCATION DRAWINGS

.1 Prepare and submit for review, drawings indicating size and location of required sleeves, recesses, and formed openings in poured or precast concrete work.

.2 Such drawings are to be completely and accurately dimensioned and relate sleeve, recesses, and formed openings to suitable grid lines and elevation datum, and are to take into account structural items such as grade beams, column caps, and column drop slabs.

.3 Begin to prepare such drawings immediately upon notification of acceptance of bid and award of Contract.

1.39 SUSTAINABLE CONSTRUCTION

.1 Construction Waste Management:

.1 Recycle all waste materials to avoid land fill sites where possible.

.2 All metal contents shall be recycled.

.3 All cardboard and paper shall be recycled.

.4 All plastic packaging shall be recycled.

.5 All wood shall be directed to the appropriate recycled wood section at the landfill site.

.2 This Contractor is responsible for their own waste management system and cost associated with the disposal. This can be their own on site system, daily removal, back to shop, or a communal system shared with other contractors on site.

.3 In all cases the cost to remove materials on site are the cost of this Contractor.

END OF SECTION

Part 1 General

1.1 GENERAL PROVISIONS

.1 Conform to the General Provisions of General Requirements Section.

.2 This project is one of a retrofit nature in part, and which will require some demolition.

.3 Allow for all remedial work in areas indicated on the drawings and as generally defined in the relevant sections of the specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

.1 Electrical Division.

1.3 SCOPE OF WORK

.1 The scope of work is essentially the selected disconnection and/or removal of services and/or equipment, piping, ductwork, etc. as indicated or required to complete the work.

Part 2 Products

2.1 GENERAL

.1 This Division is to liaise with the Owners or Consultant for equipment being removed that may be suitable for reuse to that specified or handed over to the Owner.

.2 This Division is to take full responsibility for any special tools or equipment required to disassemble or remove material from building.

Part 3 Execution

3.1 GENERAL

.1 The general requirements are indicated on the drawings and on the outline specification in Division 1.

.2 The general execution of the demolition is to be carried out in a clean and efficient manner.

.3 Demolition of existing ceilings, walls, etc., to facilitate removal of existing services or equipment or installation of new to be kept to a minimum and then restored to match existing.

.4 All openings or holes created by removal of existing HVAC systems which are not being reused are to be patched with the same material surrounding surfaces.

.5 All new holes and openings to facilitate HVAC systems are to be patched to match surrounding surfaces.

.6 Protect all existing furnishings, materials, and equipment. Any damage occurring as a result of the work of this Division shall be repaired or replaced at the expense of this Division.

.7 Where work involves breaking into or connecting to existing services, carry out work at times directed by the Owners in an expedient manner with minimum disruption to the facility and systems downtime.

.8 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.

.9 Where the location of any services has been shown on the plans, such information is not guaranteed. It is this Division's responsibility to verify locations, invert elevations, etc., immediately after moving on site. Should for any reason the information obtained necessitate changes in procedure or design, advise the Consultant at once. If verification of existing conditions is not done at the outset and any problems arise, the responsibility for same is entirely this Division's.

.10 Disconnect and/or remove equipment, piping, ductwork, etc. as indicated.

.11 Cap and conceal all redundant and obsolete connections.

.12 Provide a list of equipment to be removed to the Owner, for his acceptance of same. Remove all equipment from site which the Owner does not retain.

.13 Maintain equipment to be retained by Owner on site where directed by Consultant.

.14 Demolition of all parts of the work must be completed within the confines of the work area and in such a way as the dust produced and risk to injury of will not adversely affect the building users.

.15 Demolished areas of the existing building will remain in their current use in some cases. Demolition in these areas must be kept to the minimum required to complete the work.

.16 Demolition shall take place within areas isolated from all other areas with appropriate hoarding, scaffolding, netting, fencing or other means of security between building users and the work.

.17 Co-ordinate making safe electrical devices, capping plumbing and removal of fixtures prior to commencement of demolition.

.18 All piping and equipment to be removed and/or abandoned shall be drained prior to capping and/or abandoning. Disposal of all liquids shall be to the approval of authority of having jurisdiction and/or provincial regulations.

3.2 EXISTING SYSTEM DRAINAGE

.1 Drain all existing piping systems including all related equipment as required to facilitate system renovations.

.2 Disposal of existing system shall be to the requirements of the local and/or provincial regulations.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME)

.1 ANSI/ASME B31.1, Power Piping, (SI Edition).

.3 American Society for Testing and Materials (ASTM)

.1 ASTM A 125, Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A 563, Specification for Carbon and Alloy Steel Nuts.

.4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.1 MSS SP-58, Pipe Hangers and Supports - Materials, Design, Manufacture Selection, Application, and Installation.

1.2 DESIGN REQUIREMENTS

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP-58.

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP-58.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with general requirements.

.2 Submit shop drawings and product data for following items:

.1 All bases, hangers and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

1.4 MAINTENANCE DATA

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

Part 2 Products

2.1 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS-SP-58.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports: to ANSI & ULC requirements

.2 Ensure steel hangers in contact with copper piping are copper plated.

.2 Upper attachment structural: Suspension from upper flange of I-Beam or joist.

.1 Cold piping NPS 50 mm (2") maximum: Ductile iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.

.1 Rod: 10 mm (3/8") UL listed

.2 Cold piping NPS 65 mm (2 1/2") or greater, all hot piping: Malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed & FM approved.

.3 Upper attachment structural: Suspension from upper flange of I-Beam.

.1 Cold piping NPS 50 mm (2") maximum: Ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed.

.2 Cold piping NPS 65 mm (2 1/2") or greater, all hot piping: Malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nuts.

.4 Upper attachment to concrete.

.1 Ceiling: Carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm (1/4") minimum greater than rod diameter.

.2 Concrete inserts: wedge shaped body with knockout protector plate ULC listed. Note: Rapidex and Siporex are <u>not</u> considered concrete. Should one of these systems be encountered, piping/ductwork and/or equipment shall be supported from adjacent walls or from supplemental steel provided by this contractor attached to the adjacent walls/structure.

.5 Shop and field-fabricated assemblies.

.1 Trapeze hanger assemblies: ASME B31.1.

.2 Steel brackets: ASME B31.1.

.6 Hanger rods: threaded rod material to MSS SP-58.

.1 Ensure that hanger rods are subject to tensile loading only.

.2 Provide linkages where lateral or axial movement of pipework is anticipated.

.7 Pipe attachments: material to MSS SP-58.

.1 Attachments for steel piping: carbon steel.

.2 Attachments for copper piping: copper plated black steel.

.3 Use insulation shields for all piping.

.4 Oversize pipe hangers and supports to accommodate thermal insulation. Provide 1.5 mm (16 gauge) saddles.

.8 Adjustable clevis: material to MSS SP-58 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.

.1 Ensure "U" has hole in bottom for rivetting to insulation shields.

2.3 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping:

.1 64 kg/m² (13.12 lbs/ft²) density insulation plus insulation protection shield to: MSS SP-69, galvanized sheet carbon steel. Length designed for maximum 3 m (10') span.

.2 Insulated hot piping:

.1 Curved plate 300 mm (12") long, with edges turned up, welded-in centre plate for pipe sizes NPS 300 mm (12") and over, carbon steel to comply with MSS SP-58.

2.4 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of miscellaneous metals, specified herein. Submit calculations with shop drawings.

2.5 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

2.6 OTHER EQUIPMENT SUPPORTS

.1 From structural grade steel meeting requirements of structural steel section specified herein.

.2 Submit structural calculations with shop drawings.

2.7 MANUFACTURER

.1 Acceptable Manufacturers:

.1 Grinnell

.2 Anvil

.3 Myatt

.4 Taylor

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with:

.1 Manufacturer's instructions and recommendations.

.2 Vibration Control Devices:

.1 Install on piping systems at pumps, boilers, chillers, cooling towers, elsewhere as indicated.

.3 Clamps on riser piping:

.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

.2 Bolt-tightening torques to be to industry standards.

.3 Steel pipes: Install below coupling or shear lugs welded to pipe.

.4 Cast iron pipes: Install below joint.

.4 Clevis plates:

.1 Attach to concrete with 4 minimum concrete inserts at each corner.

.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

3.2 HANGER SPACING

.1 Plumbing piping: most stringent requirements of Canadian Plumbing Code, Provincial Code, or authority having jurisdiction.

.2 Fire protection: to applicable fire code.

.3 Gas and fuel oil piping: up to NPS 15 mm (1/2"): every 1.8 m (6').

.4 Copper piping: up to NPS 15 mm (1/2"): every 1.5 m (5').

.5 Within 300 mm (12") of each elbow and:

Maximum Pipe Size: NPS	Spacing Steel	Maximum Spacing Copper
up to 32 mm (1 1/4")	2.1 m (7')	1.8 m (6')
40 mm (1 1/2")	2.7 m (9')	2.4 m (8')
50 mm (2")	3.0 m (10')	2.7 m (9')
65 mm (2 1/2")	3.6 m (12')	3.0 m (10')
80 mm (3")	3.6 m (12')	3.0 m (10')
90 mm (3 1/2")	3.9 m (13')	3.3 m (11')
100 mm (4")	4.2 m (14')	3.6 m (12')
125 mm (5")	4.8 m (16')	
150 mm (6")	5.1 m (17')	
200 mm (8")	5.7 m (19')	
250 mm (10")	6.6 m (22')	
300 mm (12")	6.9 m (23')	

.6 Pipework greater than NPS 300 mm (12"): to MSS SP-69.

3.3 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

.4 Do “NOT” support piping, ductwork and equipment from roof deck, on bottom chord of floor and/or roof joist and/or from OWSJ bridging. Provide structural member between joist.

3.4 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4mm (5/32") from vertical.

.2 Where horizontal pipe movement is less than 15 mm (1/2"), offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.5 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:

.1 Hammer jaw firmly against underside of beam.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME)

.1 ANSI/ASME B31.1, Power Piping, (SI Edition).

.3 American Society for Testing and Materials (ASTM)

.1 ASTM A 125, Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A 563, Specification for Carbon and Alloy Steel Nuts.

.4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.1 MSS SP-58, Pipe Hangers and Supports - Materials, Design, Manufacture Selection, Application, and Installation.

.5 CSA B272-93 – Prefabricated Self-Sealing Roof Vent Flashings

.6 CRCA (Canadian Roofing Contractor’s Association)

.7 SPRI (Single Ply Roofing Institute)

.8 CUFCA (Canadian Urethane Foam Contractor’s Association) and CGSB-51-GP-46MP, Manual for “Installers of Spray Polyurethane Foam Thermal Insulation”

.9 CSA G40.21-M1987, M350W, and M300W (Structural Quality Steels)

.10 CSA W47.1-1983 (Certificate of Companies for Fusion Welding of Structural Steel)

.11 CSA W59-M1989 (Welded Steel Construction – Metal Arc Welding)

.12 CSA G164-M1981 (Hot Dip Galvanizing of Irregularly Shaped Articles)

1.2 RELATED SECTIONS

.1 Section 03300 – Cast-in-place Concrete

.2 Section 05210 – Steel Joists

.3 Section 05300 – Metal Deck

.4 Section 06100 – Rough Carpentry

.5 Section 07200 – Thermal Protection

.6 Section 07500 – Membrane Roofing

.7 Section 07900 – Joint Sealers

1.3 DESIGN REQUIREMENTS

.1 Construct support systems to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP-58.

.3 Design supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.4 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP-58.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with general requirements.

.2 Submit shop drawings and product data for following items:

.1 All bases, hangers and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

.3 Manufacturer’s installation instruction.

1.5 MAINTENANCE DATA

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

1.6 QUALITY ASSURANCE

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

1.7 SPECIAL WARRANTY

.1 Warrant products installed under this section of work to be free of leaks, condensation, and defects in materials and/or manufacture for a period of twenty (20) years when installed in accordance with the manufacturer’s written instructions.

Part 2 Products

2.1 PIPE/SUPPORT

.1 Pipe/Support:

.1 Adjustable height 6061-T6, hollow aluminum with mill finish, urethane insulated supports, 2" (51 mm) diameter.

.2 Stack Jack Flashing:

.1 Height to suit application.

.2 Fully urethane insulated.

.3 Aluminum construction.

.4 Complete with EPDM triple pressure grommet seal and EPDM base seal and other accessories as required to suit roof type.

.3 Provide appropriate stainless steel mounting hardware to suit supported pipe/equipment.

.4 Provide appropriate system support as specified in this section to suit application.

.1 Single Plain Pipe: Type 304 stainless steel pipe roller assembly to suite actual 0.D pipe.

.2 Double Plain Pipe: Type 304 stainless steel pipe roller assemblies sized to suit actual 0.D pipe.

.3 Single Insulated Pipe: Type 304 stainless steel pipe cradle assembly sized to suit actual 0.D of insulated pipe.

.4 Double insulated Pipe: Type 304 stainless steel pipe cradle assemblies sized to suit actual 0.D of insulated pipe.

.5 Acceptable Manufacturers:

.1 Thaler MERS 600 series.

.2 Acceptable equals if submitted and approved during tender period.

2.2 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

2.3 ROOF CURB MOUNTED EQUIPMENT

.1 Install as per manufacturer's instructions on roof curbs provided by manufacturer as indicated.

.2 Provide all necessary continuous pressure treated wood blocking and 24 gauge metal liner on all exposed wood as required to install roof curb level.

2.4 MANUFACTURED ROOF SUPPORTS

.1 Single piece injection moulded polypropylene support.

.2 Type 3-20 psi extruded polystyrene UV protected base glued to the support.

.3 Minimum base dimension of 300 x 225 (12" x 9") and be 140 mm (5.5") high.

.4 Pull test of 1.4 KN (315 lbs) using two #14-10 screws on pipe strap.

.5 Acceptable Manufacturers:

.1 Quick Block

.2 Erico

2.5 PIPING THROUGH ROOF

.1 Provide Thaler MEF-9 or equal gas piping flashing where pipe and/or relief vent penetrates roof.

2.6 ROOF MOUNTED PIPE SUPPORT

.1 Provide zero penetration pipe support on roof where indicated.

.2 Base shall be made of high density polypropylene with UV protection. Maximum loading shall be 50 lb/sq.ft.

.3 Frames shall be galvanized. All fastenings, rods, nuts, washers, hangers, etc. shall be stainless steel.

.4 Provide shop drawings as specified. Install to manufacturers recommendations.

.5 Acceptable Manufacturers:

.1 Portable pipe hanger

.2 Bigfoot systems

.3 Miro rooftop supports

.4 Walravin BIS Yeti

.5 Ecofoot

Part 3 Execution

3.1 INSTALLATION

.1 Roof support install in accordance with:

.1 Manufacturer's instructions and recommendations.

.2 Provide protection against deterioration due to contact of dissimilar metals.

.2 Flashing Installation:

.1 Install roof support flashing in accordance with manufacturer’s printed instructions.

.3 Vibration Control Devices:

.1 Install as indicated and at all roof mounted equipment that is not internally isolated.

.4 Clevis plates:

.1 Attach to concrete with 4 minimum concrete inserts at each corner.

.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

3.2 PIPE SUPPORT SPACING

.1 Within 300 mm (12") of each elbow and:

Maximum Pipe Size: NPS	Spacing Steel	Maximum Spacing Copper
up to 32 mm (1 1/4")	2.1 m (7')	1.8 m (6')
40 mm (1 1/2")	2.7 m (9')	2.4 m (8')
50 mm (2")	3.0 m (10')	2.7 m (9')
65 mm (2 1/2")	3.6 m (12')	3.0 m (10')
80 mm (3")	3.6 m (12')	3.0 m (10')
90 mm (3 1/2")	3.9 m (13')	3.3 m (11')
100 mm (4")	4.2 m (14')	3.6 m (12')
125 mm (5")	4.8 m (16')	
150 mm (6")	5.1 m (17')	
200 mm (8")	5.7 m (19')	
250 mm (10")	6.6 m (22')	
300 mm (12")	6.9 m (23')	

.2 Pipework greater than NPS 300 mm (12"): to MSS SP-69.

3.3 EXAMINATION

.1 Report to the contractor in writing, defects of work prepared by other trades and other unsatisfactory site conditions. Verify site dimensions. Commencement of work will imply acceptance of prepared work.

3.4 ADJUSTING

.1 Verify that all manufactured units have been installed in accordance with specifications and details and will function as intended. Adjust any items where necessary to ensure proper operation.

3.5 CLEANING

.1 Clean manufactured units using materials and methods approved by manufacturer. Do not use cleaning techniques which could impair performance of the roofing system.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 ASHRAE Handbook (2013) – Noise and Vibration Control chapter.

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with general requirements.

.2 Provide separate shop drawings for each isolated system complete with performance and product data.

.3 Provide detailed engineered shop drawings, outlining the manufacturer's recommended product for each piece of mechanical equipment. Submission shall be specific to the reviewed and returned shop drawings for equipment on the project.

1.3 OPERATION AND MAINTENANCE DATA

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

Part 2 Products

2.1 GENERAL

.1 Size and shape of bases type and performance of vibration isolation to be as indicated.

.2 To be of the same manufacturer for all isolation.

.3 Acceptable materials:

.1 Kinetics Noise Control

.2 Korfund

.3 Mason Industries

2.2 BASE TYPES

.1 Provide Base Type as indicated in Table under section 2.4 of this specification.

.2 Type A: No base, isolators attached directly to equipment. Refer to section 2.3 of this specification for isolator details.

2.3 ISOLATOR TYPES

.1 Provide Isolator Type as indicated in Table under section 2.4 of this specification.

.2 Type 1 (Neoprene and Fiberglass Isolation Pads)

.1 Type A:

.1 Isolation pads shall be single ribbed or crossed, double ribbed elastomer-in-shear pads, in combination with steel shims when required, having minimum static deflections as tabulated. All pads shall be true elastomer-in-shear using alternately higher and lower ribs to provide effective vibration isolation, and shall be molded using 2500 PSI (176 kg/cm2) tensile strength, oil resistant compounds with no color additives. Pads shall be 45 to 65 durometer and designed to permit 60 or 120 PSI (4.2 or 8.4 kg/cm2) loading at maximum rated deflections. When two isolation pads are laminated, they shall be separated by, and bonded to, a galvanized steel shim plate.

2.4 ROOF CURB ACOUSTIC LINING

.1 Design Basis: Kinetics RT-7

.2 Factory laminated acoustic panel. Panels to be sectional and modular, designed for easy and accurate field assembly.

.3 Panels to be minimum 7 – ¼" thick and comprised of alternating fiberglass absorption media and acoustically dampened sheet rock. Integrate additional layers as required to meet required STC rating.

.4 Provide on all HVAC equipment over 4,000 cfm capacity.

.5 Required STC Rating: 60.

2.5 MINIMUM DEFLECTION REQUIREMENTS BASED ON EQUIPMENT TYPE

.1 The following table is to be used to reference required base and isolator types, following the tagging convention outlined in Parts 2.2 and 2.3 above. Reference notes are detailed after the table.

				Equipment Location												
				Slab on Grade			Up to 20 ft (6 m) Floor Span			20 to 30 ft (6-9 m) Floor Span			30 to 40 ft (9-12 m) Floor Span			
Equipment Type	Equipment Category	Horsepower and Other	RPM	Base Type	Isolator Type	Min. Defl., in. (mm)	Base Type	Isolator Type	Min. Defl., in. (mm)	Base Type	Isolator Type	Min. Defl., in. (mm)	Base Type	Isolator Type	Min. Defl., in. (mm)	Reference Notes
Condensing Units	All	All	All	A	1	0.25	A	4	0.75	A	4	1.50	A/D	4	1.50	

Base Types:

A. No base, isolators attached directly to equipment (Note 28)
B. Structural steel rails or base (Notes 29 and 30)
C. Concrete inertia base (Note 31)

Isolator Type:

1. Pad, rubber, or glass fiber
2. Rubber floor isolator or hanger
3. Spring floor isolator or hanger
4. Restrained spring isolator
5. Thrust restraint
6. Air spring

.2 Notes accompanying table:

.1 Cooling Towers: These are normally isolated with restrained spring isolators (type 4) directly under the tower or lower dunnage. High deflection isolators proposed for use directly under the motor-fan assembly must be used with extreme caution ensure stability and safety under all weather conditions. See Note 5.

.2 For large equipment capable of generating substantial vibratory forces and structure borne noise, increase isolator deflection, if necessary, so isolator stiffness is less than one-tenth the stiffness of the supporting structure, as defined by the deflection due to load at the equipment support.

.3 Pumps: Concrete inertia bases (type C) are preferred for all flexible-coupled pumps and are desirable for most close-coupled pumps, although steel bases (type B) can be used. Close-coupled pumps should not be installed directly on individual isolators (type A) because the impeller usually overhangs the motor support base, causing the rear mounting to be in tension. The primary requirements for type C bases are strength and shape to accommodate base elbow supports. Mass is not usually a factor, except for pumps over 55 kW, where extra mass helps limit excess movement due to starting torque and forces. Concrete bases (type C) should be designed for a thickness of one-tenth the longest dimension with minimum thickness as follows: (1) for up to 20 kW, 150 mm; (2) for 30 to 55 kW, 200 mm; and (3) for 75 kW and up, 300 mm. Pumps over 55 kW and multistage pumps may exhibit excessive motion at start-up (“heaving”); supplemental re-straining devices can be installed if necessary. Pumps over 90 kW may generate high starting forces; a vibration specialist should be consulted.

.4 Certain designs cannot be installed directly on individual isolators (type A), and the equipment manufacturer should be consulted on the need for supplemental support (base type).

.5 Wind load conditions must be considered. Provide restrained spring isolators (type 4), supplemental bracing, snubbers, or limit stops.

.6 Compressors: Base-mounted compressors through 5 HP and horizontal tank-type air compressors through 10 HP can be installed directly on spring isolators (type 3) with structural bases (type B) if required, and compressors 15 to 100 HP on spring isolators (type 3) with inertia bases (type C) with a mass 1 to 2 times the compressor mass.

.7 Fans and Air-Handling Equipment:

.1 For fans operating under 300 rpm, select isolator deflection so the isolator natural frequency is 40% or less than the fan speed.

.2 Flexible duct connectors must be installed at the intake and discharge of all fans and air-handling equipment to reduce vibration transmission

.3 Inertia bases (type C) are required for all class 2 and 3 fans and air-handling equipment.

.8 To avoid isolator resonance problems, select isolator deflection so that resonance frequency is 40% or less of the lowest normal operating speed of equipment. Equipment such as variable-frequency drives, and high-speed equipment, such as screw chillers and vane axial fans, contain very-high-frequency vibration. To reduce high-frequency vibration transmission, add a 25 mm thick pad (type 1) to the base plate of spring isolators (type 3).

.9 To limit undesirable movement, thrust restraints (type 5) are required for all ceiling-suspended and floor-mounted units operating at 1500 Pa or more total static pressure.

Part 3 Execution

3.1 INSTALLATION

.1 Install vibration isolation equipment in accordance with manufacturers instructions and adjust mountings to level equipment.

.2 Provide Roof Curb acoustic lining on all HVAC equipment above 4,000 cfm / 10 tonnes capacity.

.3 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.

.4 Unless indicated otherwise, support piping connected to isolated equipment with spring mounts or spring hangers with 25 mm (1") minimum static deflection as follows:

.1 Up to NPS 100 mm (4"): first 3 points of support. NPS 125 mm (5") to NPS 200 mm (8"): first 4 points of support. NPS 250 mm (10") and Over: first 6 points of support.

.2 First point of support shall have a static deflection of twice deflection of isolated equipment, but not more than 50 mm (2").

.5 Where isolation is bolted to floor use vibration isolation rubber washers.

.6 Block and shim level bases so that ductwork and piping connections can be made to a rigid system at the operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

.7 Rooftop Units and Central Air Handling Units

.1 Packaged rooftop units shall be provided with standard curb mounted spring rails.

.2 Central air handling units (10,000 cfm or greater) shall be provided with spring isolation roof curbs.

.8 Spring isolators shall not be used in series to ensure no harmonics issues. This contractor shall review internally isolated equipment against method of spring isolation and ensure no overlap.

3.2 SITE VISIT

.1 Manufacturer to visit site and provide written certification that installation is in accordance with manufacturer's instructions and submit report to Consultant.

.2 Provide Consultant with notice 24 h in advance of visit.

.3 Make adjustments and corrections in accordance with written report.

3.3 TESTING

.1 Experienced and competent sound and vibration testing professional engineer to take vibration measurement for HVAC systems after start up and TAB of systems to Testing Adjusting and Balancing Section.

.2 Vibration measurements shall be taken for equipment-listed below:

.3 Provide Consultant with notice 48 h in advance of commencement of tests.

.4 Establish adequacy of equipment isolation and acceptability of noise levels in occupied areas and where appropriate, remedial recommendations including sound curves.

.5 Submit complete report of test results including sound curves.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3, Identification of Piping Systems.

.3 Canadian Standards Association (CSA).

.1 Natural Gas and Propane Installation Code CSA B149.1.

.4 National Fire Protection Association

.1 NFPA 13, Installation of Sprinkler Systems.

.2 NFPA 14, Standpipe and Systems.

1.2 PRODUCT DATA

.1 Submit product data in accordance with General Requirements.

.2 Product data to include paint colour chips, all other products specified in this section.

1.3 PRODUCT LITERATURE

.1 Submit product literature in accordance with General Requirements.

.2 Product literature to include nameplates, labels, tags, lists of proposed legends.

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic lamicoid nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers to be raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: Manufacturer's name, model, size, serial number, capacity.

.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:

.1 3 mm (1/8") thick laminated plastic, matte finish, with square corners, letters accurately aligned, and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

Size	No. of Sizes mm (")	Height of Line mm (")	Letters mm (")
1	10 x 50 (3/8" x 2")	1 (3/64")	3 (1/8")
2	15 x 75 (1/2" x 3")	1 (3/64")	6 (1/4")
3	15 x 75 (1/2" x 3")	2 (5/64")	3 (1/8")
4	20 x 100 (3/4" x 4")	1 (3/64")	10 (3/8")
5	20 x 100 (3/4" x 4")	2 (6/64")	6 (1/4")
6	20 x 200 (3/4" x 8")	1 (3/64")	10 (3/8")
7	25 x 125 (1" x 5")	1 (3/64")	15 (1/2")
8	25 x 125 (1" x 5")	2 (5/64")	10 (3/8")
9	32 x 200 (1¼" x 8")	1 (3/64")	20 (3/4")

.2 Use maximum of 25 letters/numbers per line.

.4 Locations:

.1 Terminal cabinets, control panels: Use size #5.

.2 Equipment in Mechanical Rooms: Use size #9.

.3 Roof top equipment: use size #9.

.4 Equipment above ceiling: use size #1 riveted to ceiling suspension system.

2.3 FIRE DAMPER/FIRE STOP FLAP NAMEPLATES/FIRE SMOKE DAMPER

.1 Colours:

.1 Black letters, yellow background.

.2 Construction:

.1 Self adhesive 50 mm x 25 mm, matte finish, with round corners.

.3 Locations:

.1 Install on adjacent ceiling grid. Where fire stop flap is installed in gypsum ceiling install on diffuser/grille frame. Where fire damper is installed above gypsum ceiling install on adjacent wall.

2.4 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from Consultant.

.4 Upon completion of this project all references to room names and numbering shall be to the Owner's requirements which may or may 'NOT' be the numbering system used on the drawings. Each contractor shall verify the proper numbering scheme to be used prior to project completion.

.5 All equipment shall be identified in sequence from the existing equipment and "NOT" duplicate numbering of equipment.

2.5 PIPING SYSTEMS GOVERNED BY CODE

.1 Identification:

.1 Natural and propane gas: To CSA B149.1-00 and authority having jurisdiction and as indicated elsewhere.

.2 Sprinklers: To NFPA 13.

.3 Standpipe and hose systems: To NFPA 14.

2.6 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Legend:

.1 Block capitals to sizes and colours listed in CAN/CGSB-24.3.

.3 Arrows showing direction of flow:

.1 Outside diameter of pipe or insulation less than 75 mm (3"): 100 mm (4") long x 50 mm (2") high.

.2 Outside diameter of pipe or insulation 75 mm (3") and greater: 150 mm (6") long x 50 mm (2") high.

.3 Use double-headed arrows where flow is reversible.

.4 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate pictogram, full length of legend and arrows.

.5 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 20 mm (3/4") and smaller: Waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 All other pipes: Pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150°C (300°F) and intermittent temperature of 200°C (395°F).

.6 Colours and Legends:

.1 Where not listed, obtain direction from Consultant.

.2 Colours for legends, arrows: To following table:

Background colour:	Legend:	Arrows:
Yellow	White	Black
Green	White	Black
Red	White	Black

.7 Pictograms:

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

.8 Background colour marking and legends for piping systems:

CONTENTS	**BACKGROUND COLOUR MARKING**	**LEGEND**
Condenser water supply	Green	COND. WTR. SUPPLY
Condenser water return	Green	COND. WTR. RETURN
Chilled water supply	Green	CH. WTR. SUPPLY
Chilled water return	Green	CH. WTR. RETURN
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
High temp HW Htg. Supply	Yellow	HTHW HTG. SUPPLY++
High temp HW Htg. Return	Yellow	HTHW HTG. RETURN++
Make-up water	Yellow	MAKE-UP WTR
Boiler feed water	Yellow	BLR. FEED WTR
Steam [____] kPa (__psi)	Yellow	[_____] kPa (___psi) STEAM
Steam condensate (gravity)	Yellow	ST.COND.RET (GRAVITY)
Steam condensate (pumped)	Yellow	ST.COND.RET (PUMPED)
Safety valve vent	Yellow	STEAM VENT
Intermittent blow-off	Yellow	INT. BLOW-OFF
Continuous blow-off	Yellow	CONT. BLOW-OFF
Glycol heating water supply	Yellow	GLYCOL HEATING WATER SUPPLY
Glycol heating water return	Yellow	GLYCOL HEATING WATER RETURN
Condensate	Green	CONDENSATE
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration hot gas	Yellow	REF. HOT GAS
No.[_____] fuel oil suction	Yellow	#[_____] FUEL OIL
No.[_____] fuel oil return	Yellow	#[_____] FUEL OIL

Engine exhaust	Yellow	ENGINE EXHAUST
Lubricating oil	Yellow	LUB. OIL
Hydraulic oil	Yellow	HYDRAULIC OIL
Gasoline	Yellow	GASOLINE
Natural gas	Yellow	NATURAL GAS
Propane		to Codes
Gas regulator vents		to Codes
Conduit for low voltage Control wiring	White	CONTROL WIRING___VOLTS

2.7 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm (2") high stencilled letters and directional arrows 150 mm (6") long x 50 mm (2") high.

.2 Colours: Black, or co-ordinated with base colour to ensure strong contrast.

2.8 VALVES, CONTROLLERS

.1 Brass tags with 15 mm (1/2") stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

.3 Provide adhesive coloured tab (max. size 15 mm) indication on ceiling to locate valves/equipment above. Same applies to grid. Colour to be approved by consultant.

2.9 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

.3 Provide equipment identification and/or indication on ceiling to locate devices/equipment above ceiling. Install identification on grid. Colours to be approved by consultant.

2.10 LANGUAGE

.1 Identification to be in English.

Part 3 Execution

3.1 TIMING

.1 Provide identification only after all painting specified has been completed.

3.2 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and/or CSA registration plates as required by respective agency.

3.3 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection

.1 Do not paint, insulate or cover in any way.

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels not more than 1.7 m (5'-8") intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, other confined spaces, at entry and exit points, and at each access opening.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification to be easily and accurately readable from usual operating areas and from access points.

.1 Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.5 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Consultant. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively. Where existing numbering system is installed start new numbering system at 100.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do all other work as specified in this section including all air handling systems and equipment, all plumbing systems and equipment and all temperature controls system, building automation systems and equipment.

.2 This contractor must co-ordinate their work with that of the TAB contractor.

1.2 QUALIFICATIONS OF TAB AGENCIES

.1 Names of all personnel it is proposed to perform TAB to be submitted to and approved by Consultant within 30 days of start of work.

.2 Provide documentation confirming qualifications, successful experience.

.3 Only the following NEBB (National Environmental Balancing Bureau) TAB contractors may quote:

.1 Air Audit Inc.
110 Turnbull Court, Unit 11
Cambridge, ON N1T 1K6
(519) 740-0871

.2 Air Velocities Control Ltd.
206 Lawlor Avenue
Toronto, ON M4E 3M1
(905) 279-4433

.3 Flowset Balancing Ltd.
431 Willis Drive .
Oakville, ON L6L 4V6
(416) 410-9793

.4 Clark Balancing Ltd.
8094 Esquesing Line
Milton, ON L9T 2X9
(905) 693-1518

.5 Dynamic Flow Balancing Ltd.
1200 Speers Road, Unit 36
Oakville, ON L6L 2X4
(905) 338-0808

.6 Airwaso Canada Inc. (WRDSB)
3365 Paulpeel Avenue
London, ON N6L 0A4
(519) 652-4040

1.3 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average (95% design) and low (75% of design) loads using actual or simulated loads. TAB contractor to perform equipment evaluation upon start up and once during each season in the first year of operation.

.2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with all other related systems under all normal and emergency loads and operating conditions. Confirm all equipment interlocks and functions of associated systems.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges and temperatures. Refer to BAS for system operating functions.

1.4 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to be to satisfaction of authority having jurisdiction.

1.5 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems. Co-ordinate with other trades to ensure all systems are interlocked as indicated elsewhere prior to TAB.

1.6 PRE-TAB REVIEW

.1 Review contract documents before project construction is started and confirm in writing to Consultant adequacy of provisions for TAB and all other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Consultant in writing all proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of all TAB devices, equipment, accessories, measurement ports and fittings.

.4 During construction indicate all tolerances of piping, ductwork etc conforms to specifications.

1.7 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in the Mechanical Division.

1.8 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by Consultant for verification of TAB reports.

1.9 START OF TAB

.1 Notify Consultant in writing 3 days prior to start of TAB.

.2 Start TAB only when building is essentially completed, including:

.1 Installation of ceilings, doors, windows, other construction affecting TAB.

.2 Application of weather-stripping, sealing, caulking.

.3 All pressure, leakage, other tests specified elsewhere in the Mechanical Division.

.4 All provisions for TAB installed and operational.

.5 Start-up, verification for proper, normal and safe operation of all mechanical and associated electrical and control systems affecting TAB including but not limited to:

.1 Proper thermal overload protection in place for electrical equipment.

.2 Air systems:

.1 Filters in place, clean.

.2 Duct systems clean.

.3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.

.4 Correct fan rotation.

.5 Fire, smoke, volume control dampers installed and open.

.6 Coil fins combed, clean.

.7 Access doors, installed, closed.

.8 All outlets installed, volume control dampers open.

.3 Liquid systems:

.1 Flushed, filled, vented.

.2 Correct pump rotation.

.3 Strainers in place, baskets clean.

.4 Isolating and balancing valves installed, open.

.5 Calibrated balancing valves installed, at factory settings.

.6 Chemical treatment systems complete, operational.

.7 Control valves are properly piped.

.8 Coils and radiation are properly piped.

.9 BAS in operation.

1.10 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1 HVAC systems: plus 10%, minus 5%.

.2 Hydronic systems: plus or minus 10%.

1.11 ACCURACY TOLERANCES

.1 Measured values to be accurate to within plus or minus 2% of actual values.

1.12 INSTRUMENTS

.1 Prior to TAB, submit to Consultant list of instruments to be used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 3 months of TAB. Provide certificate of calibration to Consultant.

1.13 SUBMITTALS

.1 Submit, prior to commencement of TAB:

.1 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of Consultant, prior to submission of formal TAB report, sample of rough TAB sheets. Include:

.1 Details of instruments used.

.2 Details of TAB procedures employed.

.3 Calculations procedures.

.4 Summaries.

1.15 TAB REPORT

.1 Format to be in accordance with NEBB, AABC, or SMACNA.

.2 The following additional information shall be provided for all air systems:

.1 Minimum damper position (MAD/Economizer) and the corresponding BAS signal and the voltage to the actuator to meet the full ASHRAE occupied ventilation requirements.

.2 Minimum damper position (MAD/Economizer) and the corresponding BAS signal and the voltage to the actuator to meet the full ASHRAE unoccupied ventilation requirements.

.3 Static pressure reading for each HVAC/AHU unit with VAV/VVT boxes open to 80% of design airflow and bypass damper closed to 0%. Provide reading at normal MAD/economizer damper position, dampers fully closed and dampers fully open.

.3 TAB report to show all results in SI or imperial units as indicated on plans and to include:

.1 Project as-built drawings.

.2 System schematics.

1.16 VERIFICATION

.1 All reported results subject to verification by Consultant.

.2 Provide manpower and instrumentation to verify up to 30% of all reported results.

.3 Number and location of verified results to be at discretion of Consultant.

.4 Bear costs to repeat TAB as required to satisfaction of Consultant.

1.17 SETTINGS

.1 After TAB is completed to satisfaction of Consultant, replace drive guards, close all access doors, lock all devices in set positions, ensure sensors are at required settings. Replace all ceiling tile etc.

.2 Permanently mark all settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

1.18 COMPLETION OF TAB

.1 TAB to be considered complete only when final TAB Report received and approved by Consultant.

1.19 AIR SYSTEMS

.1 Standard: TAB to be to most stringent of TAB standards of NEBB, AABC, SMACNA, ASHRAE.

.2 Do TAB of all systems, equipment, components, controls specified in the Mechanical Division including but not limited to following:

.1 Air handling systems and equipment

.2 Duct testing to SMACNA standards.

.3 Qualifications: personnel performing TAB to be current member in good standing of NEBB.

.4 Quality assurance: Perform TAB under direction of qualified supervisor.

.5 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

.6 Locations of equipment measurements: To include, but not be limited to, following as appropriate:

.1 Inlet and outlet of each damper, filter, coil, humidifier, fan, and other equipment causing changes in conditions.

.2 At each controller, controlled device.

.7 Locations of systems measurements to include, but not be limited to, following as appropriate: Each main duct, main branch, sub-branch, grille, register or diffuser.

1.20 HYDRONIC SYSTEMS

.1 Definitions: for purposes of this section, to include low pressure hot water heating, chilled water, condenser water, glycol systems.

.2 Standard: TAB to be the most stringent of TAB standards of NEBB, AABC, SMACNA, ASHRAE.

.3 Do TAB of all systems, equipment, components, controls specified in Mechanical Division including but not limited to hydronic equipment testing.

.4 Qualifications: personnel performing TAB to be current member in good standing of NEBB.

.5 Quality assurance: perform TAB under direction of qualified supervisor.

.6 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: Flow rate, static pressure, pressure drop (or loss), temperature, specific gravity, density, RPM, electrical power voltage, noise, vibration.

.7 Locations of equipment measurement: To include, but not be limited to, following as appropriate:

.1 Inlet and outlet of each heat exchanger (primary and secondary sides), boiler, chiller, coil, humidifier, cooling tower, condenser, pump, PRV, control valve, other equipment causing changes in conditions.

.2 At each controller, controlled device.

.8 Locations of systems measurements to include, but not be limited to, following as appropriate: Supply and return of each primary and secondary loop (main, main branch, branch, sub-branch of all hydronic systems, inlet connection of make-up water.

1.21 DUCT LEAKAGE TESTING

.1 Co-ordinate leakage testing with the sheet metal contractor. TAB contractor will be responsible for all duct testing.

.2 Duct to be tested in accordance with SMACNA HVAC Duct Leakage Test Manual and as indicated.

1.22 OTHER PLUMBING SYSTEMS

.1 This contractor shall test, adjust, and record the domestic water (in 1.24 change read “plumbing”) system after the plumbing contractor has completed their work.

.1 Pressure booster systems: test for capacity and pressures under all conditions and at all times.

.2 This contractor shall test, adjust, and record the domestic water (in 1.24 change read “plumbing”) system after the plumbing contractor has completed their work.

.1 Recirculating Systems: pump flows and pressures

.2 Pumped sanitary and storm water systems: test for proper operation at all possible flow rates.

1.23 OTHER TAB REQUIREMENTS

.1 General requirements applicable to all work specified this paragraph:

.1 Qualifications of TAB personnel: as for air systems specified this section.

.2 Quality assurance: as for air systems specified this section.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 The Mechanical Contractor shall provide the labour and material to conduct the closeout process as outlined in this specification section.

.2 The mechanical contractor shall perform the closeout requirements specified in conjunction with the independent commissioning consultant (CC) retained by the owner.

Part 2 Products

2.1 GENERAL

.1 The mechanical contractor and manufacturers shall provide all instrumentation and equipment necessary to conduct the tests specified. The Mechanical Contractor shall advise the Mechanical Consultant of instrumentation to be used and the dates the instruments were calibrated.

Part 3 Execution

3.1 THE CONTRACT CLOSE OUT PROCESS

.1 The mechanical contractor close out process shall consist of:

- Shop Drawings and As-built Drawings
- Installation inspection and equipment verification
- Plumbing and drainage system testing
- Testing of piping systems
- Independent contractor balancing of water systems
- Testing of air systems
- Independent contractor balancing of air systems
- Testing of equipment and systems
- BAS Commissioning
- Verification of refrigeration leak detection systems
- Operating and maintenance manuals
- Training
- Systems Demonstration and turnover
- Testing forms
- Warranties
- Contractor to provide list of equipment maintenance including schedule of maintenance parts, quantities, and model fixtures, etc.

3.2 SHOP DRAWINGS AND AS-BUILT DRAWINGS

.1 Conform to General Requirements Section for shop drawings and as-built drawings requirements.

3.3 INSTALLATION INSPECTION AND EQUIPMENT VERIFICATION

.1 The Mechanical Contractor shall co-ordinate with the Consultant who will inspect the mechanical installation.

.2 The Mechanical Contractor shall complete the equipment verification forms for each piece of equipment. The forms shall be included in the operating and maintenance manual. The equipment data shall include:

- Manufacturers name, address and telephone number
- Distributors name, address and telephone number
- Make, model number and serial number
- Pumps - RPM, impeller sizes, rated flow
- Fans - belt type and size, shive type and size
- Electrical - volts, amps, fuse size, overload size
- Any other special characteristics.

3.4 THE CONTRACTOR'S TESTING OF PIPING SYSTEMS

.1 Test all piping systems in accordance with all applicable plumbing codes and General Requirements section.

.2 All tests for the systems shall be performed in the presence of the Consultant or Commissioning Consultant. Complete the testing forms and forward to the Consultant.

3.5 THE INDEPENDENT CONTRACTORS TESTING AND BALANCING OF WATER SYSTEMS

.1 Conform with the specification section, Testing, Adjusting and Balancing.

.2 The Independent Contractor shall be hired by The Mechanical Contractor and shall report to the Commissioning Consultant.

3.6 THE CONTRACTORS TESTING OF AIR SYSTEMS

.1 Conform with the specification section, Testing, Adjusting and Balancing.

.2 All tests shall be performed in the presence of the Mechanical Consultant or the Commissioning Consultant. Complete the testing forms and forward to the Consultant.

3.7 THE INDEPENDENT CONTRACTORS TESTING AND BALANCING OF AIR SYSTEMS

.1 Conform with specification section, Testing, Adjusting and Balancing.

.2 The Independent Contractor shall be hired by The Mechanical Contractor and shall report to the Commissioning Consultant.

3.8 TESTING OF EQUIPMENT AND SYSTEMS

.1 General:

.1 The Mechanical Contractor shall hire the services of the manufacturers technicians to test the equipment and associated systems. The technician shall record the results of the tests on the testing forms. The tests shall be witnessed by the Consultant or Owners representative. When the tests have been completed satisfactorily the technician and witnessing authority shall sign the forms. A copy of the forms shall be forwarded to the Consultant. The original shall be inserted into the operating and maintenance manual.

.2 Should equipment or systems fail a test, the test shall be repeated after repairs or adjustments have been made. The additional tests shall be witnessed.

.3 Tests which have not been witnessed shall not be accepted and shall be repeated.

.4 The equipment and systems to be tested shall include:

- Heat Pumps
- Condensing Units
- Boilers and Pumps
- Air Handling Units
- Cooling Tower
- Life Safety and Fire Protection Systems
- Water Treatment Systems
- Building Automation Systems (BAS)

.2 BAS Testing:

.1 The BAS Contractor shall test the system as described in General Requirements and/or Controls Sections.

.2 Co-ordinate with the Consultant and submit completed test forms monthly.

.3 Demonstrate to the Owner and Consultant the operation of the BAS when all tests have been completed.

.3 Verification of Refrigeration Leak Detection System Operation:

.1 The commissioning process shall include the verification of the refrigeration leak detection system.

.2 All interlocks between leak detection systems installed and system components, as well as interlocks between field installed detection systems and associated safety system components shall be tested and verified to operate as per the requirements of CSA B52. Specifically, the following shall occur for each independent system on registration of a refrigerant leak:

.1 Open all zone dampers in the affected system.

.2 Disable all electric reheat coils within the affected system.

.3 Activate field installed safety shut off valves within the affected refrigeration system.

.4 Energize all fans within the affected ductwork system.

.5 Activate all refrigerant leak system specific ventilation systems.

.6 De-energize any other potential sources of ignition within the affected system.

3.9 CLOSEOUT SCHEDULE

.1 The Mechanical Contractor shall include the schedule for all tests and equipment start-up tests in the construction schedule.

.2 All testing forms and reports associated with the mechanical systems shall be directed to the Consultant with copies to the Owner and Consultant.

.3 The forms and reports to be issued shall include:

- Shop drawings, issued and accepted
- Equipment verification forms
- Testing forms
- Reports resulting from tests
- Testing schedule
- Equipment Start-up Forms

3.10 OPERATION AND MAINTENANCE MANUAL

.1 Conform to General Requirements section for the Operating and Maintenance Manual requirements.

3.11 OPERATOR TRAINING

.1 Conform to General Requirements section for requirements for Instruction to Operating Staff.

.2 The training shall be conducted in a classroom and at the equipment or system.

.3 Training will begin when the operating and maintenance manuals have been delivered to The Owner and approved by the Consultant.

.4 Each training session shall be structured to cover:

The operating and maintenance manual
- Operating procedures
- Maintenance procedures
- Trouble-shooting procedures
- Spare parts required
- Submit a course outline to the Mechanical Consultant before training commences. Provide course documentation for up to eight people.

.5 The training sessions shall be scheduled and co-ordinated by the Mechanical Contractor.

.6 Training shall be provided for the following systems:

System	Minimum Training Times
Condensing Units	2 hours
Life Safety & Fire Protection Systems	2 hours
Water Treatment Systems	2 hours
Life Safety & Fire Protection	½ hour

.7 The minimum training for the BAS shall be 16 hours. The training shall include:

- A walk through of the installation for the Building Owner to review the installation and equipment
- Operation of the central computer
- Operation of portable terminals
- Control sequences
- Report set-up and generation
- Managing the system
- Maintenance requirements

Refer to Controls specification section for further information.

.8 The training requirement for the mechanical system shall include a walk-through of the building by the Mechanical Contractor. During the walk through the Mechanical Contractor shall:

- Identify equipment
- Identify starters associated with equipment
- Identify valves and balancing dampers
- Identify access doors
- Review general maintenance of equipment
- Review drain points in pipework systems
- Identify maintenance items

.9 When each training session has been completed The Owner shall sign the associated form to verify completion.

3.12 MECHANICAL SYSTEM DEMONSTRATION AND TURNOVER

.1 Refer to General Requirements section, Mechanical Project Completion.

.2 The system demonstration and turnover to The Owner shall occur when:

- The installation is complete
- The acceptance test conducted by the Mechanical Consultant has been completed successfully
- The Commissioning Consultant system performance testing has been completed successfully
- Training has been completed
- Operating and Maintenance Manuals have been accepted
- Shop-drawings have been updated
- As-built drawings have been completed

.3 The systems demonstration shall be conducted by the Mechanical Contractor and the manufacturers. The demonstration shall cover a demonstration of equipment installation and operation.

3.13 TESTING FORMS

.1 The Mechanical Contractor and manufacturers shall provide forms for testing. The forms must be approved by the Consultant and The Owner before they are used.

3.14 WARRANTIES

.1 Equipment and system warranties shall not begin until the system demonstration and turnover has been conducted successfully and accepted by The Owner.

.2 The Mechanical Contractor shall fill out the warranty form listing the equipment and systems and the start and finishing dates for warranty.

.3 Refer to the general conditions specification section for the requirements during the warranty period.

3.15 CLOSEOUT PROCESS ALLOCATION

.1 The mechanical contractor closeout process shall be as follows:

.1 3% for the first $500,000 of contract value.

.2 1% of the contract value for value between $500,000 to $5,000,000.

.3 0.5% of contract value for the value in excess of $5,000,000.

.4 Minimum Allocation for Close Out Documents is $5,000.

.2 The Mechanical Contractor shall submit all test and verification forms. The Consultant will use these forms to calculate percentage complete.

.3 The monies shall not be paid out until the performance testing, O & M manuals, systems demonstration, and training including all required paperwork have been completed to the satisfaction of the consultant. Refer to General Requirements section for contract breakdown.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma-[89], Vapour Barrier Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.3 Underwriters Laboratories of Canada (ULC).

.1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

.4 American Society for Testing and Materials (ASTM).

.1 ASTM C177 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Proprieties by Mean of the Guarded Hot-Plate Apparatus.

.2 ASTM C518 Standard Test Method for Steady-State Thermal Transmission Proprieties by Means of the Heat Flow Meter Apparatus.

.3 ASTM C 449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.4 ASTM C1729 Standard Specification for Aluminum Jacketing for Insulation.

.5 ASTM C1290 Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.

.6 ASTM C1393 Standard Specification for Perpendicularly Oriented Mineral Fiber Roll and Sheet Thermal Insulation for Pipes And Tanks.

.7 ASTM C553, Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.8 ASTM C612, Mineral Fiber Block and Board Thermal Insulation.

.5 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

.1 ASHRAE Standard 90.1.

.6 Manufacturer's Trade Associations.

.1 Thermal Insulation Association of Canada (TIAC)

.2 North American Commercial and Industrial Insulation Standards.

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with general requirements.

.2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

.3 Submit completed detail plates from the North American Commercial and Industrial Insulation Standards manual, applicable to installation types required by this specification section.

1.3 INSTALLATION INSTRUCTIONS

.1 Submit manufacturer's installation instructions in accordance with general requirements.

.2 Installation instructions to include procedures to be used, installation standards to be achieved.

1.4 QUALIFICATIONS

.1 Installer to have successfully completed apprenticeship program.

.2 Installer to be specialist in performing work of this section and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.

.2 Protect from weather and construction traffic.

.3 Protect against damage from any source.

.4 Store at temperatures and conditions required by manufacturer.

1.6 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.

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

.3 "ASJ+" – All Service Jacket – vapor retarder laminate of aluminium foil inner layer, reinforced with fiberglass scrim, bonded to a bleached kraft paper, with outer poly film leaving no paper exposed.

.4 "ASJ" – All Service Jacket (no outer film) – vapor retarder laminate of aluminium foil inner layer, reinforced with fiberglass scrim, bonded to a bleached kraft paper outer layer.

.5 “FSK” – Foil Scrim Kraft – vapor retarder laminate of aluminium foil outer layer, reinforced with fiberglass scrim, bonded to a natural kraft paper inner layer.

.2 Insulation systems - insulation material, fasteners, jackets, and other accessories.

1.7 QUALITY ASSURANCE

.1 Products shall not contain formaldehyde, asbestos, lead, mercury or mercury compounds or PBDE fire retardants.

Part 2 Products

2.1 LIMITATION ON MATERIALS

.1 Products shall not contain formaldehyde, asbestos, lead, mercury or mercury compounds or PBDE fire retardants.

2.2 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.3 INSULATION

.1 Mineral fibre as specified herein includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C (75°F) mean temperature when tested in accordance with ASTM C177 or ASTM C518.

.3 Type C-1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket meeting the requirement of ASTM C1136 Type II and IV (FSK):

.1 Jacket: to ASTM C1136 Type II and IV (FSK)

.2 Maximum "k" value: .033 W/M•°C (.23 BTU•IN/HR•FT^2•°F)

.4 Manufacturers:

.1 All materials must be supplied by the same manufacturer.

.2 Acceptable Manufacturers:

.1 Johns Manville

.2 Knauf

.3 Manson

2.4 ACCESSORIES

.1 Vapour retarder lap adhesive:

.1 Water based, fire retardant type, compatible with insulation.

.2 Indoor Vapour Retarder Finish:

.1 Compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C 449.

.4 ULC Listed Canvas Jacket:

.1 220 g/m^2 (6oz/yd^2) cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.

.5 Tape: self-adhesive, aluminum, reinforced, 75 mm (3") wide minimum.

.6 Contact adhesive: quick-setting Childers CP-82 or equal.

.7 Canvas adhesive: washable.

.8 Tie wire: 1.5 mm (16 gauge) stainless steel.

.9 Facing: 25 mm (1") stainless steel hexagonal wire mesh stitched on one face of insulation

.10 Fasteners: weld pins, length to suit insulation, with 40 mm (1½") diameter clips.

Part 3 Execution

3.1 PRE-INSTALLATION REQUIREMENTS

.1 Pressure testing of ductwork systems to be complete, witnessed, and certified.

.2 Surfaces to be clean, dry, free from foreign material.

3.2 INSTALLATION

.1 Install in accordance with North American Commercial and Industrial Insulation Standards.

.2 Apply materials in accordance with manufacturers instructions and this specification.

.3 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Hangers, supports to be outside vapour retarder jacket.

.4 Supports, Hangers in accordance with general requirements.

.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.5 Fasteners: At 300 mm (12") oc. in horizontal and vertical directions, minimum two rows each side.

.6 Provide rigid insulation for exposed ductwork.

3.3 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thicknesses conform to following table:

Application	Type	Thickness
Rectangular supply air ducts	C-1	25 mm (1")
Supply, return, and fan exhaust ducts exposed (visible) in space being served	None	
Outdoor air intake ductwork and plenums	C-1	50 mm (2")
Exhaust plenums dampers and louvres	C-1	25 mm (1")
Interior acoustically lined ducts	None	
Last 1.5m of exhaust duct	C-1	25 mm (1")

.2 Exposed round ducts 600 mm (24") and larger, smaller sizes where subject to abuse:

.1 Use TIAC code C-1 insulation, scored to suit diameter of duct.

.3 Finishes: Conform to following table:

Application	Rectangular	Round
Indoor, concealed	None	None

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketing Sheet, for Insulating Pipes, Vessels, and Round Ducts.

.3 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.4 American Society for Testing and Materials (ASTM)

.1 ASTM C547, Type I and IV Standard Specification for Mineral Fiber Pipe Insulation.

.2 ASTM C177, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Proprieties by Means of the Guarded-Hot-Plate Apparatus.

.3 ASTM C518, Standard Test Method for Steady-State Thermal Transmission Proprieties by Means of the Heat Flow Meter Apparatus to recognize the correct thermal insulation performance testing for blanket.

.4 ASTM C1393, Standard Specification for Perpendicularly Oriented Mineral Fiber Roll and Sheet Thermal Insulation for Pipes and Tanks

.5 ASTM C1695, Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service.

.6 ASTM C 335, Test Method for Steady State Heat Transfer Properties of Pipe Insulation.

.7 ASTM C 921, Practice for Determining the Properties Jacketing Materials for Thermal Insulation.

.8 ASTM C1729 Standard Specification for Aluminium Jacketing for Insulation.

.9 ASTM C553, Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.10 CGSB 51-GP-52Ma, Vapour Barrier Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.5 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).

.1 ASHRAE Standard 90.1.

.6 Manufacturer's Trade Associations

.1 Thermal Insulation Association of Canada (TIAC)

.2 North American Commercial and Industrial Insulation Standards

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with general requirements.

.2 Submit properly completed detail plates from the North American Commercial and Industrial Insulation Standards manual, applicable to installation types required by this specific section.

.3 Submit for approval manufacturer's catalogue literature related to installation, fabrication for pipe, fittings, valves, and jointing recommendations.

1.3 INSTALLATION INSTRUCTIONS

.1 Submit manufacturer's installation instructions in accordance with general requirements.

.2 Installation instructions to include procedures to be used, installation standards to be achieved.

1.4 QUALIFICATIONS

.1 Installer to have successfully completed apprenticeship program.

.2 Installer to be specialist in performing work of this section and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Protect from weather, construction traffic.

.3 Protect against damage from any source.

.4 Store at temperatures and conditions required by manufacturer.

1.6 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

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

.3 "ASJ+" – All Service Jacket – vapor retarder laminate of aluminium foil inner layer, reinforced with fiberglass scrim, bonded to a bleached kraft paper, with outer poly film leaving no paper exposed.

.4 "ASJ" – All Service Jacket (no outer film) – vapor retarder laminate of aluminium foil inner layer, reinforced with fiberglass scrim, bonded to a bleached kraft paper outer layer.

.5 “FSK” – Foil Scrim Kraft – vapor retarder laminate of aluminum foil outer layer, reinforced with fiberglass scrim, bonded to a natural kraft paper inner liner.

.6 "PSK" – Poly Scrim Kraft – vapor retarder laminate of polypropylene outer layer, reinforced with fiberglass scrim, bonded to a natural kraft paper inner layer.

.7 "PVC" – Poly Vinyl Chloride – polymer used to manufacture a non-metallic final protective finish jacket over insulation systems.

1.7 QUALITY ASSURANCE

.1 Products shall not contain formaldehyde, asbestos, lead, mercury or mercury compounds or PBDE fire retardants.

.2 Products shall be Certified UL GREENGUARD Gold or Indoor Advantage Gold and formaldehyde free.

.3 Recycled content: Mineral fiber products will contain a minimum of 50% recycled glass content certified and UL validated and are to be constructed using bio-based thermosetting binder.

Part 2 Products

2.1 MATERIAL LIMITATIONS

.1 Products shall not contain formaldehyde, asbestos, lead, mercury or mercury compounds or PBDE fire retardants.

2.2 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.3 INSULATION

.1 Mineral fibre as specified herein includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C (75°F) mean temperature when tested in accordance with ASTM C335, ASTMC177 or ASTM C518.

.3 Type A-1: Rigid moulded or wound mineral fibre with factory applied vapour retarder jacket.

.1 Mineral fibre: to ASTM C547 Type I and IV.

.2 Jacket: to ASTM C1136, Type I, II, III, IV, X.

.3 Maximum "k" factor: to ASTM C547.

.4 Type A-3: Tubular flexible elastomeric closed cell foam:

.1 Insulation to ASTM C534 Type I.

.2 Maximum "k" factor: to ASTM C534.

.3 To be certified by manufacturer to be free of potential stress corrosion cracking corrodents.

.5 Materials:

.1 All materials must be supplied by the same manufacturer.

.2 Acceptable Manufacturers:

.1 Knauf

.2 Manson

.3 Owens Corning

2.4 INSULATION SECUREMENT

.1 Tape: Self-adhesive, aluminum, reinforced, 50 mm (2") wide minimum.

.2 Contact adhesive: Quick setting.

.3 Canvas adhesive: Washable.

.4 Tie wire: 1.5mm (16 gauge) diameter stainless steel.

.5 Bands: Stainless steel, 20 mm (3/4") wide, 0.5 mm (0.020") thick.

2.5 CEMENT

.1 Thermal insulating and finishing cement:

.1 Air drying on mineral wool, to ASTM C 449M.

.2 Hydraulic setting on mineral wool, to ASTM C165

2.6 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.7 INDOOR VAPOUR RETARDER FINISH

.1 Compatible with insulation.

2.8 OUTDOOR VAPOUR RETARDER FINISH

.1 Compatible with insulation.

.2 Reinforcing fabric: Open weave fibreglass fabric, with maximum weave of 10 x 10 squares per inch.

2.9 JACKETS

.1 Polyvinyl Chloride (PVC):

.1 Minimum thickness: 20mil (0.020")

.2 One-piece moulded type [and sheet] to CAN/CGSB-51.53 with pre-formed shapes as required.

.3 Colours: white.

.4 Minimum service temperatures: -29°C (-20°F).

.5 Maximum service temperature: 65°C (150°F).

.6 Moisture vapour transmission: 0.05 perm.

.7 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.

.2 Tacks (not to be used on below-ambient temperature systems)

.3 Pressure sensitive vinyl tape of matching colour.

.2 Aluminum:

.1 To ASTM C1729.

.2 Thickness: 0.50 mm (0.020") sheet.

.3 Finish: Smooth.

.4 Joining: Longitudinal and circumferential slip joints with 50 mm (2") laps.

.5 Fittings: 0.50 mm (0.020") thick die-shaped fitting covers with factory-attached protective liner.

.6 Metal jacket banding and mechanical seals: stainless steel, 20 mm (3/4") wide, 0.50 mm (0.020") thick at 300 mm (12") spacing.

2.10 CAULKING FOR JACKETS

.1 Caulking: Silicone clear caulking.

Part 3 Execution

3.1 PRE-INSTALLATION REQUIREMENT

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed, and certified.

.2 Surfaces to be clean, dry, free from foreign material.

3.2 INSTALLATION

.1 Install in accordance with North American Commercial and Industrial Insulation Standards.

.2 Provide continuous insulation for complete systems including all valves, air separators, fittings, and other equipment.

.3 Apply materials in accordance with manufacturers' instructions and this specification.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Hangers, supports to be outside vapour retarder jacket.

.5 Supports, Hangers:

.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

.6 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm (3").

.7 Below ambient/chilled water installation:

.1 All pipes, fittings, valves, strainers, flanges, unions, and other pipe system components and specialties must be properly insulated with correctly completed vapor retarded applied.

.2 All insulation material must have properly installed and sealed vapor retarding jacket, including circumferential and longitudinal seams.

.3 All penetrations, tears, and punctures must be repaired and sealed with a vapor retarding material with a .02 or lower perm rating.

.4 Vapor stops must be installed at 18' intervals, at all pipe insulation termination points, including fittings, flanges, and other changes in direction or other types of piping specialities.

.5 All fitting insulation must be of the same type, thickness, and density of the pipe insulation, be premoulded insulation covers or fabricated from the same material as the pipe insulation. Full thickness must be factory-applied, vapor-retarder facing is unacceptable.

.6 A complete vapor retarder must be installed on insulation over fittings before applying final finish. Vapor retarder must extend onto and be sealed to the vapor retarder or pipe insulation.

.7 Additional fitting covers, PVC or metal, must have a vapor retarder seal applied to all longitudinal and circumferential seams in addition to the vapor retarder applied to the fitting insulation.

.8 Additional field applied jackets must not use staples, screws, tacks or rivets for attachment, to avoid puncturing vapor retarder underneath.

.9 Insulating support inserts are to be high compressive strength insulation with a rigid shield. No calcium silicate is to be used for insulation on below-ambient operation piping.

3.3 REMOVABLE, PREFABRICATED, INSULATION AND ENCLOSURES

.1 Application: At expansion joints, valves, primary flow measuring elements, flanges, and unions at equipment.

.2 Flexible removable insulation covers are not acceptable for below-ambient (cold) operation piping systems. Rigid removable insulation jackets that are vapor retarder exterior material that can be vapor sealed at the seams, are acceptable on below-ambient (cold) operation piping systems.

.3 Insulation:

.1 Insulation, fastenings, and finishes: same as system.

.2 Jacket: As per adjacent insulation.

3.4 PIPING INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges, air separators, and fittings unless otherwise specified.

.2 Install insulator and jackets to applicable TIAC codes.

.3 Insulate ends of capped piping with type and thickness indicated for capped service.

.4 Thickness of insulation to be as listed in following table.

.1 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Type	Pipe sizes through (NPS) and insulation thickness mm (")				
		to 25 (1")	32 (1¼") 40 (1½")	50 (2") 80 (3")	105 (4") 150 (6")	200 (8") & over
Hot Water Heating	A-1	40 (1½")	50 (2")	50 (2")	50 (2")	50 (2")
Refrigerant piping	A-3	25 (1")	25 (1")	25 (1")	25 (1")	25 (1")
Cooling Coil cond. Drain	A-1	25 (1")	25(1")	25 (1")	25 (1")	25 (1")

.5 Finishes: Conform to the following table:

Application	Piping	Valves & Fittings
Exposed indoors	PVC	PVC
Exposed in mech. rooms	PVC	PVC
Concealed indoors	N/A	PVC
Exterior refrigerant piping	Aluminum	Aluminum

.6 Connection: To appropriate TIAC code.

.7 Finish attachments: SS bands, @ 150 mm (6") oc. seals: closed.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 Canadian Standards Association (CSA).

.1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.

.3 American Society for Testing and Materials (ASTM).

.1 ASTM A47/A47M, Specification for Ferritic Malleable Iron Castings.

.2 ASTM A278/A278M, Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650°F (350°C).

.3 ASTM A516/A516M, Specification for Pressure Vessel Plates, Carbon Steel, for Moderate - and Lower - Temperature Service.

.4 ASTM A536, Specification for Ductile Iron Castings.

.5 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.

.4 American Society of Mechanical Engineers (ASME).

.1 ANSI/ASME, Boiler and Pressure Vessels Code (BPVC).

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with general requirements.

.2 Indicate on manufacturers' catalogue literature the following:

.1 Sizes, orientation, capacities, performance, etc.

.2 Accessories

1.3 CLOSEOUT SUBMITTALS

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

Part 2 Products

2.1 PIPELINE STRAINER

.1 Pipeline strainer shall provide a means of mechanically removing solids from a flowing fluid. This is accomplished by utilizing a perforated metal mesh.

.2 Strainers shall be installed in pipelines to protect downstream mechanical equipment such as condensers, heat exchangers, pumps, compressors, meters, spray nozzles, turbines, and steam traps from the detrimental effect of sediment, rust, pipe scale, or other extraneous debris.

.3 Types of strainers: Provide strainers that are Y strainer and/or basket strainer.

.4 Strainer end connections shall match the piping specification.

.1 NPS 15 mm to 50 mm (1/2" to 2"): bronze body to ASTM B62, screwed connections.

.2 NPS 65 mm to 300 mm (2 1/2" to 12"): cast steel body to ASTM A278M, Class 30, flanged connections.

.3 NPS 50 mm to 300 mm (2" to 12"): T type with malleable iron body to ASTM A47M, grooved ends.

.5 Strainer components shall include a cover, perforated plate, mesh, wedge wire, gasket, and cover fasteners.

.1 Perforated Plate/Mesh/Wedge Wire: Stainless steel (various grades available).

.2 Gaskets: to suite fluid application.

.3 Fasteners: to match body material.

.6 Mesh sizing:

.1 An extremely important consideration in the selection of a strainer is the size of the perforations, mesh or wire opening used in the fabrication of the straining element. Select holes that are actually needed for the application and specified by the equipment manufacturer's request that is being protected.

.2 The following tables illustrate mesh and their respective straining capability. The main criteria for choosing hole and mesh size is the size and quantity of particles which can pass through downstream equipment without causing damage.

Mesh (Openings/In.)	Wire Diameter (In.)	Opening		Percent Open Area
		Inches	Micron	
10	0.032	0.068	727	56.3
16	0.018	0.045	1130	50.7
18	0.017	0.036	979	48.3
20	0.015	0.035	889.0	49.0
30	0.011	0.0223	566.4	44.8
40	0.009	0.0156	396.2	40.2
50	0.009	0.011	279	30.3
60	0.0065	0.0102	259.1	37.3
80	0.005	0.0075	190.5	36.0
100	0.0045	0.0055	139.7	30.3
120	0.0035	0.0048	123	30.1
150	0.0026	0.0041	103	37.2
170	0.0024	0.0035	79	35.1
200	0.0020	0.0030	76.2	33.6
250	0.0016	0.0024	61	36.0
300	0.0012	0.0021	54.2	29.7
325	0.0012	0.0019	47.7	30.0
400	0.0011	0.0014	35.6	36.0

.7 Capacity: The capacity ratio or open area ratio (OAR) of a strainer influences such operating characteristics as the length of time it can operate without cleaning and the created pressure loss. The OAR is the relationship between internal cross sectional area (flow area) of the pipe and the open flow area of the material which makes up the straining element.

.1 The OAR for wye strainers shall not be less than 2.5:1.

.2 The OAR for basket strainers shall not be less than 7:1.

.3 When considering the OAR of a straining element, there are two accepted methods of analysis used by various specifying agencies and manufacturers. One method maintains “line of sight” reasoning and uses the multiple of the open areas for elements in series. In this method, a 60% open area material in series with a 40% open area material has a resultant combined open area of 24% (i.e. as in accordance with Military Standards). An alternative method allows the open area of the more restrictive element in series to be used. This would be 40% for the example above (i.e. as in accordance with Underwriter Laboratories’ Standards). The method used influences the estimated operating pressure drop, as well as design decisions such as sizing.

.8 Strainers are made with various dimensions and configurations; manufacturers have tested and published pressure drop results.

.1 Provide strainers designed for reasonable velocities that permit approximately 2 psi pressure drop across the strainer.

.2 Provide basket strainers designed for reasonable velocities that permit approximately 0.5 psi pressure drop across the strainer.

.9 To allow the manufacturer to make selection or recommendations for a particular strainer, as much as possible, the following information should be provided by the Contractor to the Supplier:

.1 Physical Characteristics

.1 Pipe size and schedule.

.2 Strainer type required.

.3 End connections.

.4 Material (body, screen, bolting, gaskets).

.5 Pressure rating (design/operating — including shock).

.6 Temperature rating (design, operating, minimum).

.7 Straining element opening size.

.8 Capacity:

.1 Net effective open area required.

.2 Method of net open area calculation.

.9 Special requirements (hinged cover, vent tapping, jacketed, etc.).

.10 Applicable specifications (military specifications, special non-destructive tests or other quality control requirements).

.2 Flow Data

.1 Liquid:

.1 Description of fluid.

.2 Rate of flow – gallons per minute (gpm) or pounds per hour (lbs/hr).

.3 Viscosity – SSU.

.4 Specific gravity or density.

.5 Temperature.

.6 Concentration (if acid or other corrosive).

.10 Blowdown connection: NPS 25 mm (1").

.11 Screens at pumps: stainless steel with 1.19 mm (50 mil) perforations (16 mesh).

.12 Working pressure: 860 kPa (125 psi).

Part 3 Execution

3.1 GENERAL

.1 Install as indicated and to manufacturer's recommendations.

.2 Run drain lines (and blow off connections) to terminate above nearest drain.

.3 Maintain proper clearance to permit service and maintenance.

.4 Should deviations beyond allowable clearances arise, request, and follow Consultant's directive.

.5 Check shop drawings for conformance of all tappings for ancillaries and for equipment operating weights.

3.2 STRAINERS

.1 Install in horizontal or down flow lines.

.2 Ensure clearance for removal of basket.

.3 Install ahead each of the following components:

.1 Temperature control valves

.2 Additional locations where indicated on the drawings.

.4 Provide proper mesh strainers for the proper application.

.5 Provide proper mesh strainers as recommended by the manufacturer’s product being protected.

.6 Provide basket strainers ahead of all plate heat exchanger or equipment with plate heat exchanger when piping is 100 mm (4") and larger.

.7 The strainer must be installed such that the debris chamber is located at the lowest possible position. A Y strainer in vertical piping must be placed with its screen in the downward position to trap the sediment in the debris collection chamber.

.8 Provide with a blowdown so the element can be flushed out by opening and closing the blowdown valve. This shall be accomplished without flow stoppage or disassembling any piping.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 Canadian Standards Association (CSA).

.1 CSA W47.1, Certification of Companies for Fusion Welding of Steel.

.3 American National Standards Institute (ANSI).

.1 ANSI/ASME B16.1, Gray Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800.

.2 ANSI/ASME B16.3, Malleable-Iron Threaded Fittings, Classes 150 and 300.

.4 American Society for Testing and Materials (ASTM).

.1 ASTM A47/A47M, Specification for Ferritic Malleable Iron Castings.

.2 ASTM A53/A53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.

.3 ASTM A536, Specification for Ductile Iron Castings.

.4 ASTM B61, Specification for Steam or Valve Bronze Castings.

.5 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.

.5 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).

.1 MSS-SP-67, Butterfly Valves.

.2 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.

.3 MSS-SP-71, Cast Iron Swing Check Valves, Flanged and Threaded Ends.

.4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.

.5 MSS-SP-85, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with general requirements.

.2 Indicate on manufacturers' catalogue literature the following:

.1 Piping

.2 Valves

.3 Accessories

1.3 CLOSEOUT SUBMITTALS

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

Part 2 Products

2.1 STEEL PIPE

.1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:

.1 NPS 32 mm (1 1/4") and smaller: Schedule 40.

.2 Final connection to copper heating elements.

.1 Type “L” copper with 95/5 solder joints and dielectric couplings. Maximum length 600 mm (24").

.3 Pipe Joints

.1 NPS 32 mm (1 1/4") and under: screwed fittings with pulverized lead paste.

.2 NPS 65 mm (2½") and over: welding fittings and flanges to CSA W47.1.

.3 Flanges: plain or raised face, slip-on.

.4 Flange gaskets: suitable for hydronic heating up to 110°C (220°F).

.5 Pipe thread: taper.

.6 Bolts and nuts: to ANSI B18.2.1 and ANSI/ASME B18.2.2.

.4 Fittings

.1 Screwed fittings: malleable iron, to ANSI/ASME B16.3, Class 150.

.2 Pipe flanges and flanged fittings:

.1 Cast iron: to ANSI/ASME B16.1, Class 125.

.2 Steel: to ANSI/ASME B16.5.

.3 Butt-welding fittings: steel, to ANSI/ASME B16.9.

.4 Unions: malleable iron, to ASTM A47/A47M and ANSI/ASME B16.3.

2.2 VALVES

.1 Connections:

.1 NPS 32 mm (1 1/4") and smaller: screwed ends.

.2 NPS 50 mm (2") and smaller: screwed ends.

.3 NPS 65 mm (2 ½") and larger: flanged ends.

.2 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, with chain and cap.

.3 Swing check valves:

.1 NPS 32 mm (1 1/4") and under:

.1 Class 150, swing, with PFTE disc, as specified. Bronze. Jenkins 4475TJ.

.2 NPS 65 mm (2 1/2") and over:

.1 Flanged or Grooved ends, Bronze trim, Cast Iron: Gate, Globe, Check.

.4 Ball valves:

.1 NPS 80 mm (3") and under:

.1 Body and cap: cast high tensile bronze to ASTM B62.

.2 Pressure rating: Class 125, 860 kPa (125 psi) steam, WP = 1.4 MPa (203 psi) WOG.

.3 Connections:

.1 NPS 32 mm (1 1/4") and under screwed ends to ANSI B1.20.1 and with hex. shoulders.

.2 NPS 65 mm (2½") and over flanged or grooved ends.

.4 Stem: stainless steel tamperproof ball drive.

.5 Ball and seat: replaceable stainless steel solid ball and teflon seats.

.6 Operator: removable lever handle.

.7 Extended handles on chilled water valves.

.8 Full port.

.5 All valves shall be of commercial grade and of same manufacturer.

.6 Acceptable Manufacturers:

.1 Newman Hattersley Canada Ltd.

.2 Jenkins/Crane

.3 Milwaukee

.4 Toyo

.5 Kitz

2.3 BALANCING VALVES

.1 Size 15 mm (1/2") to 32 mm (1 1/4"): Bronze body, brass ball, NPT connections and variable orifice.

.2 Size 65 mm (2 1/2") to larger: Cast iron body, raised flange connections, glove style with brass plug.

.3 Differential pressure readout ports with internal EPT inserts and check values, 6 mm (¼")NPT tapped drain/purge ports, memory stop and calibrated nameplate.

.4 Acceptable Manufacturers:

.1 Bell & Gossett Circuit Setters

.2 Armstrong

.3 Taco

.4 Tour & Anderson

.5 Oventrop

2.4 AUTOMATIC AIR VENT

.1 Industrial float vent: cast iron body and NPS 15 mm (1/2") connection and rated at 860 kpa (125 psi) working pressure.

.2 Float: solid material suitable for 115°C (240°F) working temperature.

.3 Plastic vents are not acceptable.

.4 Acceptable Manufacturers:

.1 Maid-O-Mist No. 67

.2 Spirax Sarco

Part 3 Execution

3.1 PIPING INSTALLATION

.1 Installation shall be by a licensed pipe fitter.

.2 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.

.3 Install concealed pipes close to building structure to keep furring space to minimum. Install to conserve headroom and space. Run exposed piping parallel to walls. Group piping wherever practical.

.4 Slope piping in direction of drainage and for positive venting.

.5 Use eccentric reducers at pipe size change installed to provide positive drainage or positive venting.

.6 Provide clearance for installation of insulation and access for maintenance of equipment, valves and fittings.

.7 Ream pipes, clean scale and dirt, inside and outside, before and after assembly.

.8 Assemble piping using fittings manufactured to ANSI standards.

.9 Saddle type branch fittings may be used on mains if branch line is no larger than half the size of main. Hole saw or drill and ream main to maintain full inside diameter of branch line prior to welding saddle.

3.2 VALVE INSTALLATION

.1 Install rising stem valves in upright position with stem above horizontal.

.2 Install butterfly valves on chilled water and condenser water lines only.

.3 Install gate or ball valves at branch take-offs and to isolate each piece of equipment, and as indicated.

.4 Install globe valves for balancing and in by-pass around control valves as indicated.

.5 Provide silent check valves on discharge of pumps and in vertical pipes with downward flow and as indicated.

.6 Provide swing check valves in horizontal lines as indicated.

.7 Install chain operators on valves NPS 65 mm (2½") and over where installed more than 2400 mm (96") above floor in Boiler Rooms and Mechanical Equipment Rooms.

.8 Provide ball valves for glycol service.

3.3 AIR VENTS

.1 Install at high points of systems.

.2 Install ball valve on automatic air vent inlet.

.3 Extend vent lines in Mechanical Room with screwdriver stop at 1.8 m AFF.

3.4 CIRCUIT BALANCING VALVES

.1 Install flow measuring stations and flow balancing valves as indicated.

.1 On return side of all heating devices (convectors, panels, force flows, radiation, coils, etc.).

.2 On return side of all water or glycol cooling coils.

.3 On return side of all reverse return piping loops and/or branch circuits.

.2 Install to manufacturers requirements.

.3 Minimum valve size shall be one pipe size smaller than piping or 20 mm (¾"), whichever is larger.

.4 Refer to Testing Adjusting and Balancing Section for applicable procedures.

3.5 FILLING OF SYSTEM

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

.2 Co-ordinate filling of system with HVAC water treatment contractor.

3.6 TESTING

.1 Test system in accordance with Mechanical General Requirements Section.

.2 For glycol systems, retest with propylene glycol to ASTM E202, inhibited, for use in building system after cleaning. Repair any leaking joints, fittings or valves.

3.7 FLUSHING AND CLEANING

.1 Scope:

.1 **Flush new piping only.**

.2 Refer to Water Treatment Section

3.8 EXISTING SYSTEM DISPOSAL

.1 Disposal of existing system shall be to the requirements of the local and/or provincial regulations.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 ANSI/ASME B16.22, Wrought Copper Alloy and Copper Alloy Solder - Joint Pressure Fittings: Classes 150, 300, 600, 900, 1500, and 2500.

.3 ANSI/ASME B16.24, Cast Copper Pipe Flanges and Flanged Fittings.

.4 ANSI/ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.

.5 ANSI/ASME B31.5, Refrigeration Piping and Heating Transfer Components.

.6 ASTM A307, Specification for Carbon Steel Bolts and Studs, 413.5 mPa (60,000 psi) Tensile Strength.

.7 ASTM B280, Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.8 CSA B52, Mechanical Refrigeration Code.

.9 EPS 1/RA/2, Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

Part 2 Products

2.1 TUBING

.1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.

.1 Hard copper: to ASTM B280, Type ACR-B.

2.2 FITTINGS

.1 Service: design pressure 2070 kPa (300 psi) and temperature 121°C (250°F).

.2 Brazed:

.1 Fittings: wrought copper to ANSI/ASME B16.22.

.2 Joints: silver solder, 45% Ag-15% Cu or copper-phosphorous, 95% Cu-5%P and non-corrosive flux.

.3 Flanged:

.1 Bronze or brass, to ANSI/ASME B16.24, Class 150 and Class 300.

.2 Gaskets: suitable for service.

.3 Bolts, nuts and washers: to ASTM A307, heavy series.

.4 Flared:

.1 Bronze or brass, for refrigeration, to ANSI/ASME 16.26.

2.3 PIPE SLEEVES

.1 Hard copper or steel, sized to provide 6 mm (1/4") clearance all around between sleeve and uninsulated pipe or between sleeve and insulation.

2.4 VALVES

.1 22 mm (7/8") and under: Class 500, 3.5 MPa (500 psi), globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moisture proof seal for below freezing applications, brazed connections.

.2 Over 22 mm (7/8"): Class 375, 2.5 MPa (375 psi), globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and bonnet, moisture proof seal for below freezing applications, brazed connections.

2.5 FILTER-DRIER

.1 On lines 20 mm (3/4") outside diameter and larger, filter-drier shall be replaceable core type with Schraeder type valve.

.2 On lines smaller than 20 mm (3/4") outside diameter, filter-drier shall be sealed type using flared copper fittings.

.3 Size shall be full line size.

.4 Acceptable Manufacturers:

.1 Mueller

.2 Parker

.3 Sporlan

.4 Virginia

2.6 SIGHT GLASS

.1 Combination moisture and liquid indicator with protection cap.

.2 Sight glass shall be full line size.

.3 Sight glass connections shall be solid copper or brass, no copper-coated steel sight glasses allowed.

.4 Acceptable Manufacturers:

.1 Mueller

.2 Henry

.3 Parker

.4 Superior

2.7 SUCTION LINE TRAP

.1 Manufactured standard one-piece traps.

2.8 EXPANSION VALVES

.1 For pressure type distributors, externally equalized with stainless steel diaphragm, and same refrigerant in thermostatic elements as in system.

.2 Size valves to provide full rated capacity of cooling coil served. Co-ordinate selection with evaporator coil and condensing unit.

.3 Acceptable Manufacturers:

.1 Henry

.2 Mueller

.3 Parker

.4 Sporlan

2.9 FLEXIBLE CONNECTORS

.1 Designed for refrigerant service with bronze seamless corrugated hose and bronze braiding.

.2 Approved Manufacturers:

.1 Anaconda “Vibration Eliminators” by Anamet

.2 Vibration Absorber Model VAF by Packless Industries

.3 Vibration Absorbers by Superior Valve Co

.4 Style “BF” Spring-flex freon connectors by Vibration Mountings.

2.10 ROOF FLASHING

.1 Thaler or equal spun aluminum complete with insulation, cap, and rubber gasket.

2.11 PREFABRICATED PIPE ENTRY DOGHOUSE

.1 Dog House and cover shall be fabricated from 2mm thick aluminum with UV protected powder coated finish is also acceptable.

.2 Cover shall be gasketed to ensure air and water tightness.

.3 Mount in curb shall be full insulated and supplied with Doghouse.

.4 Curb shall be 610 mm (24") high with 89 mm (3.5") wide flange pre-punched for securement to roof deck.

.5 Curb shall be insulated with 50 mm (2") thick glass fibre insulation.

.6 Pipe entry openings shall be provided by the pipe entry chase manufacturer and be specifically made for the application. Minimum acceptable standard:

.1 Sigrist Exit Seal

.2 Vault Exit Seal

.7 Cover shall be removable and be fastened to the curb/body with vandal resistant fasteners. Hardware shall be zinc plated or stainless steel.

.8 Size: To suit required penetrations.

.9 Acceptable Manufacturers:

.1 Sigrist Alta Pipe Chase Housing

.2 Vault Roof Penetration Housing

.3 Other Acceptable Manufacturers if approved by Consultant prior to tender close.

2.12 PIPING SUPPORT ASSEMBLY

.1 All channel members shall be fabricated from structural grade steel conforming to one of the following ASTM specifications: A1011/A1011M, A653/A653M.

.2 All fittings shall be fabricated from steel conforming to one of the following ASTM specifications: A575, A36/A36M or A635/A635M.

.3 Electro galvanized cush clamps with shoulder bolt and molded thermoplastic cushion, size to suit pipe.

.4 Acceptable Manufacturers:

.1 Unistrut

.2 Or equal

Part 3 Execution

3.1 GENERAL

.1 Install in accordance with CSA B52, EPS 1/RA/2 and ANSI/ASME B31.5.

.2 Connect to equipment with isolating valves and unions.

.3 Provide space for servicing, disassemble, and removal of equipment and components all as recommended by manufacturer.

.4 Protect all openings in piping against entry of foreign material.

.5 Provide all necessary equipment including thermal expansion valve, sight glass, solenoid valve, filter dryer, etc., for a complete installed system. Pipe system as per manufacturer's recommendation and requirements.

.6 Provide number of refrigerant circuits and appropriate corresponding piping as per manufacturer's recommendations and requirements.

3.2 PIPING THROUGH FLOORS

.1 Refrigerant piping systems containing refrigerants that pass through floors not served by the system shall be installed as per the requirements of CSA B23-2023:

.1 Refrigerant piping shall be installed through a rigid and tight, continuous fire-resisting pipe (stainless steel, cast iron or similar) without openings into any floors not served by the system.

.2 The pipe shall be vented to the floor served by the system.

3.3 BRAZING PROCEDURES

.1 Bleed inert gas into pipe during brazing.

.2 Remove valve internal parts, solenoid valve coils, sight glass.

.3 Do not apply heat near expansion valve and bulb.

3.4 PIPING INSTALLATION

.1 General:

- .1 Hard drawn copper tubing: do not bend. Minimize use of fittings.
- .2 Soft drawn copper: install in a neat manner without excessive bends or twists. Minimize use of fittings.
- .3 Fittings, joints and other connections to equipment shall be minimized in all inaccessible areas, including but not limited to areas above drywall ceilings, shafts etc.
- .4 Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.
- .5 Provide trap at base of risers greater than 2.4m (8') high and at each 7.6m (25'-0") thereafter.
- .6 Provide inverted deep trap at top of each riser.
- .7 Provide double risers for compressors having capacity modulation.
  - .1 Large riser: install traps as specified above.
  - .2 Small riser: size for 5.1 m/s (1000 ft/min) at minimum load. Connect upstream of traps on large riser.

3.5 PRESSURE AND LEAK TESTING

.1 Close valves on factory charged equipment and other equipment not designed for test pressures.

.2 Leak test to CSA B52 before evacuation to 2 MPa (290 psi) and 1 MPa (145 psi) on high and low sides respectively.

.3 Test Procedure: Build pressure up to 35 kPa (5 psi) with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.

.4 Testing shall be completed to the standards of CSA B52, section 5.10 so that the exemption contained in Annex N (N.1.2) allowing areas (such as those above fully enclosed drywall ceilings) to have joints and connections installed within them is met.

3.6 DEHYDRATION AND CHARGING

.1 Close service valves on factory charged equipment.

.2 Ambient temperatures to be at least 13°C (55°F) for at least 12 h before and during dehydration.

.3 Use copper lines of largest practical size to reduce evacuation time.

.4 Use 2-stage vacuum pump with gas ballast on 2nd stage capable of pulling 5 Pa (0.02" WC) absolute and filled with dehydrated oil.

.5 Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.

.6 Triple evacuate all system components containing gases other than correct refrigerant or having lost holding charge as follows:

.1 Twice to 14 Pa (0.056" WC) absolute and hold for 4 h.

.2 Break vacuum with refrigerant to 14 kPa (0.056" WC).

.3 Final to 5 Pa (0.02" WC) absolute and hold for at least 12 h.

.4 Isolate pump from system, record vacuum and time readings until stabilization of vacuum.

.5 Submit all test results to Consultant.

.7 Charging:

.1 Charge system through filter-drier and charging valve on high side. Low side charging not permitted.

.2 With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close charging valve and start up. With unit operating, add remainder of charge to system.

.3 Re-purge charging line if refrigerant container is changed during charging process.

.8 Checks:

.1 Make all checks and measurements as per manufacturer's operation and maintenance instructions.

.2 Record and report all measurements to Consultant.

3.7 INSTRUCTIONS

.1 Post instructions in frame with glass cover in accordance with Operation and Maintenance Manual Section and CSA B52.

3.8 PREFABRICATED PIPE CHASE

.1 Install on prefabricated, insulated roof curb.

.2 Install pipe chase and pipe entry to manufacturers installation instructions.

.3 Provide field installed insulation on roof deck to match roof insulation thickness.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Plumbing Specialties and Accessories.

.2 Hydronic Systems – Steel.

1.2 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 American Society of Mechanical Engineers (ASME).

.3 ANSI/ASME Boiler and Pressure Vessel Code, Section VI.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with general requirements.

1.4 CLOSEOUT SUBMITTALS

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

.2 Include following:

.1 Log sheets as recommended by manufacturer.

.2 Test reports.

Part 2 Products

2.1 MANUFACTURER

.1 Equipment, chemicals, service by one supplier.

.2 Acceptable Manufacturers:

.1 Aquarian Chemicals (905-825-3711)

.2 No alternates.

2.2 WATER TREATMENT FOR HYDRONIC SYSTEMS

.1 Hot water heating system: Existing

2.3 CHEMICALS

.1 Provide 1 year’s supply.

2.4 TEST EQUIPMENT

.1 Provide one set of test equipment for each system to verify performance.

.2 Complete with carrying case, reagents for chemicals, all specialized or supplementary equipment.

2.5 CLEANING CHEMICALS

.1 Provide as required to make system clean.

.2 Cleaner chemical: compatible and of the same manufacturer of the water treatment supplier.

2.6 RECORD MANAGEMENT

.1 Provide cards and card holder mounted on wall adjacent to each pot feeder.

Part 3 Execution

3.1 INSTALLATION

.1 Install HVAC water treatment systems in accordance with ASME Boiler Code Section VII, and requirements and standards of authorities having jurisdiction, except where specified otherwise.

.2 Ensure adequate clearances to permit performance of servicing and maintenance of equipment.

3.2 CHEMICAL FEED PIPING

.1 Install crosses at all changes in direction. Install plugs in all unused connections.

3.3 WATER TREATMENT SERVICES

.1 After entire new system is cleaned as specified elsewhere, provide monthly water treatment monitoring and consulting services for period of one year after system start-up. Provide written report to consultant after each visit. Service to include:

.1 Initial water analysis and treatment recommendations.

.2 System start-up assistance.

.3 On site system testing and recording of treated hydronic system.

.4 Operating staff training.

.5 Visit plant every 7 days during first month of operation and as required until system stabilizes and advise consultant in writing on treatment system performance.

.6 Provide monthly visits with reports after system has stabilized to the satisfaction of the owner.

.7 Provide necessary monthly recording charts and log sheets for one year operation.

.8 Provide necessary laboratory and technical assistance.

.9 Instructions and advice to operating staff to be clear, concise and in writing.

3.4 START-UP

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

3.5 SYSTEM COMMISSIONING AND TRAINING

.1 Commissioning and training shall be provided by installing water treatment sub-contractor and water treatment supplier.

.2 Timing:

- .1 After start-up deficiencies rectified.
- .2 After start-up and before TAB of connected systems.

.3 Pre-commissioning Inspections:

- .1 Verify:
  - .1 Presence of test equipment, reagents, chemicals, details of specific tests to be performed, operating instructions.
  - .2 Suitability of log book.
  - .3 Currency and accuracy of initial water analysis.
  - .4 Required quality of treated water.

.4 Commissioning procedures - applicable to all Water Treatment Systems:

- .1 Establish, adjust as necessary and record all automatic controls and chemical feed rates.
- .2 Monitor performance continuously during commissioning of all connected systems and until acceptance of project.
- .3 Establish test intervals, regeneration intervals.
- .4 Record on approved report forms all commissioning procedures, test procedures, dates, times, quantities of chemicals added, raw water analysis, treated water analysis, test results, instrument readings, adjustments made, results obtained.
- .5 Establish, monitor and adjust automatic controls and chemical feed rates as necessary.
- .6 Visit project at monthly intervals after commissioning is satisfactorily completed to verify that performance remains as set during commissioning (more often as required until system stabilizes at required level of performance).
- .7 Advise Engineer in writing on all matters regarding installed water treatment systems.

.5 Commissioning procedures - Closed Circuit Hydronic Systems:

- .1 Analyse water in system.
- .2 Based upon an assumed rate of loss approved by Engineer, establish rate of chemical feed.
- .3 Record types, quantities of chemicals applied.

.6 Training:

- .1 Commission systems, perform tests in presence of, and using assistance of, assigned O&M personnel.
- .2 Train O&M personnel in softener regeneration procedures.

.7 Certificates:

.1 Upon completion, furnish certificates confirming satisfactory installation and performance.

.8 Commissioning Reports:

.1 To include system schematics, test results, test certificates, raw and treated water analyses, design criteria, all other data required by Consultant.

.9 Commissioning activities during Warranty Period:

.1 Check out water treatment systems on regular basis and submit written report to Consultant.

3.6 CLEANING OF MECHANICAL SYSTEM

.1 Coordinate cleaning of mechanical systems with mechanical contractor.

.2 Provide copy of recommended cleaning procedures and chemicals for approval by Consultant.

.3 Procedure:

.1 Flushing and cleaning should only take place after successful piping pressure testing.

.2 Terminal device (reheat coils, heat pumps, perimeter radiation, heat exchangers etc.), air handling unit coils and their associated control and balancing valves should be bypassed during the preliminary flushing and cleaning process.

.3 Instruments such as flow meters; flow metering valves and orifice plates should only be installed after flushing and cleaning.

.4 Timing:

.1 The overall construction schedule identifies piping flushing and cleaning with realistic time allotments.

.2 The mechanical contractor is required to provide a detailed report outlining the processes and procedures for flushing and cleaning per piping system at least 4 to 6 weeks in advance of work.

.3 As a minimum, at least one piping flushing and cleaning procedure shall be witnessed, by the consultant and/or commissioning agent.

.5 The mechanical contractor shall to utilize a qualified water treatment specialist to supervise the flushing and cleaning process and provide the certified water analysis report certifying that the piping systems are clean.

.6 Coordinate flushing and cleaning of mechanical systems with HVAC water treatment contractor.

.7 Flush and clean new piping system in presence of Owner

.8 Flush after pressure test for a minimum of 4 hrs.

.9 Fill system with solution of water and non-foaming, phosphate-free detergent 3% solution by weight. Circulate for minimum of 8 hrs.

.10 Thoroughly flush all new mechanical systems and equipment with approved cleaning chemicals designed to remove deposition from construction such as pipe dope, oils, loose mill scale and other extraneous materials. Chemicals to inhibit corrosion of various system materials and be safe to handle and use.

.11 During circulation of cleaning solution, periodically examine and clean filters and screens and monitor changes in pressure drop across equipment.

.12 Refill system with clean water. Circulate for at least 2 hours. Clean out strainer screens/baskets regularly. Then drain.

.13 Drainage to include drain valves, dirt pockets, strainers, every low point in system.

.14 Drain and flush systems until alkalinity of rinse water is equal to make-up water. Refill with clean water treated to prevent scale and corrosion during system operation.

.15 Reinstall strainer screens/baskets only after obtaining Owner's approval and approval from HVAC water treatment contractor and board chemical treatment technician.

.16 Repeat system drain and flush as often as necessary to have a clean system.

.17 Disposal of cleaning solutions to be approved by authority having jurisdiction.

.18 Isolate new piping system from existing system as required for system cleaning.

3.7 WARRANTY

.1 Warranty Start Date:

.1 Warranty period starts as of the date of Ready for Takeover.

.2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.

.2 Warranty Duration:

.1 One (1) year warranty period applies.

.3 Warranty Coverage:

.1 Applies to parts and labour.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

.3 SMACNA HVAC Duct Leakage Test Manual.

.4 ASTM A480/A480M, Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

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

.6 ANSI/NFPA 90A, Installation of Air Conditioning and Ventilating Systems.

.7 ANSI/NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section general requirements.

.2 Indicate following:

- .1 Sealants
- .2 Tape
- .3 Proprietary Joints
- .4 Fittings

1.3 CERTIFICATION OF RATINGS

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 DUCTWORK

.1 Galvanized Steel:

.1 Galvanized steel with Z90 designation zinc coating lock forming quality: to ASTM A653/A653M.

.2 Thickness:

Size Type	Class A Gauge	Class B Gauge	Class C Gauge
Square and Rectangular			
Up to 600 mm (24”)	22	24	24
625 mm to 1000 mm (25” to 40”)	20	22	24
1025 mm to 1800 mm (41” to 72”)	18	20	22
1825 mm to 2400 mm (73” to 96")	16	18	20
2450 mm and over (97")	16	16	16
Round and Oval			
Up to 300 mm (12”)	24	24	24
325 mm to 600 mm (13” to 24”)	22	24	24
625 mm to 900 mm (25" to 36")	20	22	24
925 mm to 1200 mm (37” to 48”)	18	20	22
1225 mm (49”) and over	18	18	20
Residential Suite Ductwork:			
Square and Rectangular			
Up to 300 mm (12”) *	26	26	26
Round and Oval Snap Lock *			
Up to 200mm (8”) *	30	30	30

***Following SMACNA for low pressure ductwork.

.3 All ductwork between HVAC unit connections and 3.0 m (10'-0") downstream or to silencers shall be 1.4 mm (18 gauge).

2.2 DUCT CONSTRUCTION

.1 Round and oval:

.1 Ducts: factory fabricated, spiral wound, with matching fittings and specials to SMACNA.

.2 Transverse joints up to 900 mm (36"): slip type with tape and sealants.

.3 Transverse joints over 900 mm (36"): Ductmate or Exanno Nexas Duct System.

.2 Square and rectangular:

.1 Ducts: to SMACNA.

.2 Transverse joints, longest side:

up to and including 750 mm (30"): SMACNA proprietary duct joints.

.3 Ducts with sides over 750 mm (30") to 1200 mm (48"), transverse duct joint system by Ductmate/25, Nexus, or WDCI (Lite) (SMACNA ”E” or “G” Type connection). Weld all corners.

.1 Acceptable Manufacturers:

.1 Ductmate Canada Ltd.

.2 Nexus, Exanno Corp.

.3 WDCI

.4 Ducts 1200 mm (48") and larger, Ductmate/35, Nexus, or WDCI (heavy) (SMACNA “J” Type connection). Weld all corners.

.1 Acceptable Manufacturers:

.1 Ductmate Canada Ltd.

.2 Nexus, Exanno Corp.

.3 WDCII.

2.3 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:

.1 Rectangular: standard radius and or short radius with single thickness turning vanes Centreline radius: 1.5 times width of duct.

.2 Round:

.1 In exposed areas one-piece smooth radius, 1.5 times diameter.

.2 In concealed areas 3-piece adjustable, 1.5 times diameter.

.3 Mitred elbows, rectangular:

.1 To 400 mm (16"): with double thickness turning vanes.

.2 Over 400 mm (16"): with double thickness turning vanes.

.4 Branches:

.1 Rectangular main and branch: with 45º entry on branch.

.2 Round main and branch: enter main duct at 45º with conical connection.

.3 Provide volume control damper in branch duct near connection to main duct.

.4 Main duct branches: with splitter damper.

.5 Diffuser connection to main:

.1 90º round spin in collars with balancing damper and locking quadrant.

.6 Transitions:

.1 Diverging: 20º maximum included angle.

.2 Converging: 30º maximum included angle.

.7 Offsets:

.1 Full short radiused elbows.

.8 Obstruction deflectors: maintain full cross-sectional area.

2.4 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure Pa (" w.c.)	SMACNA Seal Class	Acceptable Leakage Classification (Rectangular)	Acceptable Leakage Classification (Round)
2500 (10")	A	4	2
1500 (6")	A	4	2
1000 (4")	A	4	2
750 (3")	A	8	4
500 (2")	B	16	8
250 (1")	B	16	8
125 (0.5")	C	16	8

.2 Seal classification:

.1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.

.2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant.

.3 Class C: transverse joints and connections made air tight with gaskets, or sealant or combination thereof. Longitudinal seams sealed with foil tape or sealant.

2.5 SEALANT

.1 Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of -30°C (-22°F) to plus 93°C (199°F).

.2 Flame-spread rating not more than 25.

.3 Smoke developed classification not more than 50.

.4 Acceptable Manufacturers:

.1 Duro Dyne S-2

.2 Foster

2.6 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm (2") wide.

.1 Acceptable Manufacturers:

.1 Duro Dyne FT-2

2.7 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Duct Leakage Test Manual.

2.8 FIRESTOPPING

.1 40 mm x 40 mm x 3 mm (1½" x 1½" x 16ga) retaining angles all around duct, on both sides of fire separation.

.2 Firestopping material and installation must not distort duct.

.3 All ductwork passing through partition walls shall be firestopped.

2.9 WATERTIGHT DUCT

.1 Provide watertight duct for:

.1 Fresh air intake.

.2 As indicated.

.2 Form bottom of horizontal duct without longitudinal seams. Solder or weld joints of bottom and side sheets. Seal all other joints with duct sealer.

2.10 HANGERS AND SUPPORTS

.1 Band hangers: use on round and oval ducts only up to 500 mm (20") diameter, of same material as duct but next sheet metal thickness heavier than duct.

.2 Trapeze hangers: ducts over 500 mm (20") diameter or longest side, to ASHRAE and SMACNA.

.3 Hangers: galvanized steel angle with black steel rods to ASHRAE and SMACNA following table:

Duct Size mm (")	Angle Size mm (")	Rod Size mm (")
up to 750 (30)	25 x 25 x 3 (1 x 1 x 1/8)	6 (1/4)
>750 to 1050 (>30 to 42)	40 x 40 x 3 (1½ x 1½ x 1/8)	6 (1/4)
>1050 to 1500 (>42 to 60)	40 x 40 x 3 (1½ x 1½ x 1/8)	10 (3/8)
>1500 to 2100 (>60 x 84)	50 x 50 x 3 (2 x 2 x 1/8)	10 (3/8
>2100 to 2400 (>84 x 96)	50 x 50 x 5 (2 x 2 x 1/8)	10 (3/8)
>2400 (96) and over	50 x 50 x 6 (2 x 2 x ¼)	10 (3/8)

.4 Upper hanger attachments:

.1 For concrete: manufactured concrete inserts.

.1 Acceptable Manufacturers:

.1 Myatt fig. 485

.2 For steel joist: manufactured joist clamp or steel plate washer.

.1 Acceptable Manufacturers:

.1 Grinnell fig. 61 or 60

.3 For steel beams: manufactured beam clamps:

.1 Acceptable Manufacturers:

.1 Grinnell Fig. 60

Part 3 Execution

3.1 GENERAL

.1 The following systems shall conform to these requirements:

System	Pressure	Class	Material
Exhaust Plenum	+/-	A	Galvanized steel
HVAC Supply and Return	+/-	B	Galvanized steel

.2 Do work in accordance with ASHRAE and SMACNA.

.3 Do not break continuity of insulation vapour barrier with hangers or rods.

.4 Support risers in accordance with ASHRAE and SMACNA.

.5 Install breakaway joints in ductwork on each side of fire separation.

.6 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.7 Manufacture duct in lengths to accommodate installation of acoustic duct lining.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with ASHRAE, SMACNA and as follows:

Duct Size mm (")	Spacing mm (")
to 1500 (60")	3000 (120")
over 1500 (60")	2500 (100")

.4 Do not support ductwork over 250 mm x 250 mm (10" x 10") from roof deck.

3.3 SEALING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturers recommendations.

3.4 LEAKAGE TESTS

.1 Co-ordinate leakage testing with TAB contractor. TAB contractor will be responsible for all duct testing.

.2 Duct to be tested in accordance with SMACNA HVAC Duct Leakage Test Manual.

.3 Leakage tests to be done in sections.

.4 Trial leakage tests to be performed as instructed to demonstrate workmanship.

.5 Install no additional ductwork until trial test has been passed.

.6 Test section to be minimum of 15 m (50'-0") long with not less then 3 branch takeoffs and two 90º elbows. Maximum test length and area to be determined by BAS testing equipment. Allow for twelve (12) tests.

.7 Complete test before insulation or concealment.

.8 Provide all necessary end caps and fittings as required for the TAB contractor. Remove same after successful completion of duct test.

.9 Pressure test ductwork to 1½ times operating pressure (minimum pressure 500 Pa (2" wc) all systems).

3.5 CLEANING

.1 Keep ducts clear from dust and debris

.2 Keep duct liner clean from dust, debris, and moisture.

.3 At completion of project vacuum ducts if dirt or dust is present.

.4 Where new systems connect into existing systems the existing systems shall be cleaned and vacuumed prior to reconnection.

.5 Ensure all systems are clean prior to start up.

3.6 INSTALLATION REQUIREMENTS

.1 All ductwork is to be protected from the weather and precipitation. The top and sides of all ductwork are to be completely covered with 6mil poly to the satisfaction of the consultant. Maintain protection of the ductwork until the building is made watertight and hollow cores drained. Tape all joints.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

.3 ANSI/NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.

.4 ANSI/NFPA 96, Ventilation Control and Fire Protection of Commercial Cooking Operations.

.5 CSA B228.1, Pipes, Ducts and Fittings for Residential Type Air Conditioning.

1.2 PRODUCT DATA

.1 Submit product data in accordance with general requirements.

.2 Indicate the following:

.1 Flexible connections.

.2 Duct access doors.

.3 Turning vanes.

.4 Instrument test ports.

1.3 CERTIFICATION OF RATINGS

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 GENERAL

.1 Manufacture in accordance with CSA B228.1.

2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame with fabric clenched by means of double locked seams.

.2 Material:

.1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at -40°C (-40°F) to plus 90°C (194°F), density of 1.3 kg/m.

2.3 ACCESS DOORS IN DUCTS

.1 Non-insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm (25 gauge) thick complete with sheet metal angle frame.

.2 Insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm (24 gauge) thick complete with sheet metal angle frame and 25 mm (1") thick rigid glass fibre insulation.

.3 Gaskets: neoprene

.4 Hardware:

.1 Up to 300 mm (12"): 2 sash locks

.2 301 mm to 450 mm (13" to 18"): 4 sash locks Complete with safety chain.

.3 451 mm to 1000 mm (19" to 40"): piano hinge and minimum 2 sash locks.

.4 Doors over 1000 mm (40"): piano hinge and 2 handles operable from both sides.

.5 Hold open devices.

.5 Acceptable Manufacturers:

.1 Nailor

.2 E. H. Price

.3 Titus

2.4 PREFABRICATED ROOF CURB

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: 1.3 mm (18 gauge) galvanized steel with raised cant and wood nailer.

.3 25 mm (1") insulation 3 lb density.

.4 Acceptable Manufacturers:

.1 Greenheck GPR – 600 mm (24") high

.2 Penn

Part 3 Execution

3.1 INSTALLATION

.1 Flexible connections:

.1 Install in following locations:

.1 Inlets and outlets to supply air units and fans. (Unless internally isolated)

.2 Inlets and outlets of exhaust and return air fans.

.3 As indicated.

.2 Length of connection: 100 mm (4").

.3 Minimum distance between metal parts when system in operation: 75 mm (3").

.4 Install in accordance with recommendations of SMACNA.

.5 When fan is running:

.1 Ducting on each side of flexible connection to be in alignment.

.2 Ensure slack material in flexible connection.

.2 Access doors and viewing panels:

.1 Size:

.1 600 mm x 600 mm (24" x 24") for person size entry.

.2 600 mm x 1000 mm (24" x 40") for servicing entry.

.3 300 mm x 300 mm (12" x 12") for viewing.

.4 As indicated.

.2 Location:

.1 At fire and smoke dampers.

.2 At control dampers.

.3 At devices requiring maintenance.

.4 At locations required by code.

.5 At inlet and outlet of reheat coils.

.6 Elsewhere as indicated.

.7 Inlet and outlet of duct mounted coils.

.3 Turning vanes:

.1 Install in accordance with recommendations of SMACNA and as indicated.

.2 Install on supply ducts only.

3.2 WARRANTY

.1 Warranty Start Date:

.1 Warranty period starts as of the date of Ready for Takeover.

.2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.

.2 Warranty Duration:

.1 One (1) year warranty period applies.

.3 Warranty Coverage:

.1 Applies to parts and labour.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This section applies to operating dampers not specified in Controls Section.

1.2 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

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

1.3 PRODUCT DATA

.1 Submit product data in accordance with general requirements.

.2 Indicate the following:

.1 Performance data.

1.4 MAINTENANCE DATA

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

1.5 CERTIFICATION OF RATINGS

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency.

Part 2 Products

2.1 MOTORIZED DAMPERS

.1 Opposed blade type.

.2 Extruded aluminum, interlocking blades, complete with extruded vinyl seals, spring stainless steel side seals, extruded aluminum frame.

.3 Pressure fit self-lubricated bronze bearings.

.4 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.

.5 Operator: Refer to BAS Section.

.6 Performance:

.1 Leakage: in closed position to be less than 2% of rated air flow at 250 Pa (1" w.c.) differential across damper.

.2 Pressure drop: at full open position to be less than 10 Pa (0.04" w.c.) differential across damper.

.7 Insulated aluminum dampers:

.1 Frames: insulated with extruded polystyrene foam with R factor of 5.0.

.2 Blades: constructed from aluminum extrusions with internal hollows insulated with polyurethane or polystyrene foam, R factor of 5.0.

.3 Use on services to the exterior.

.4 Acceptable Manufacturers:

.1 Honeywell

.2 Johnson

.3 T. A. Morrison

.4 E.H. Price

.5 Tamco

.6 Ruskin

.7 Nailor

.8 Henderson Industrial

.9 Ventex/Alumavent

.10 Pottorff

2.2 BACK DRAFT DAMPERS

.1 Automatic gravity operated, multi leaf, aluminum construction with nylon bearings, centre pivoted or counterweighted, as indicated.

.2 Acceptable Manufacturers:

.1 T.A. Morrison

.2 Tamco Series 7000

.3 Ruskin

.4 Nailor

.5 E.H. Price

.6 Henderson Industrial

.7 Ventex/Alumavent

.8 Pottorff

Part 3 Execution

3.1 INSTALLATION

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.

.3 Seal multiple damper modules with silicon sealant.

.4 Install access door adjacent to each damper. See Duct Accessories Section.

.5 Insulated dampers on all outside air intake and exhaust damper.

.6 Non-insulated dampers on all interior motorized dampers not exposed to outside air.

3.2 WARRANTY

.1 Warranty Start Date:

.1 Warranty period starts as of the date of Ready for Takeover.

.2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.

.2 Warranty Duration:

.1 One (1) year warranty period applies.

.2 Disk type dampers gasket: Ten (10) years warranty.

.3 Warranty Coverage:

.1 Applies to parts and labour.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

.3 ASTM C1071 Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).

.4 ASTM C916 Standard Specification for Adhesive for Duct Thermal Insulation.

.5 ANSI/NFPA 90A, Installation of Air Conditioning and Ventilating Systems.

.6 ANSI/NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.

1.2 PRODUCT DATA

.1 Submit product data in accordance with general requirements.

Part 2 Products

2.1 RECTANGULAR/SQUARE DUCT LINER

.1 General:

.1 Acoustical duct liner to be fibreglass duct liner meeting or exceeding requirements of ASTM C1071, Type I, Flexible or Type II, Rigid, and NFPA 90A/90B.

.2 Bonded with formaldehyde free bio-based binder

.3 Mat faced airstream surface

.4 Factory applied edge coating

.5 Shall not contain formaldehyde, PBDE's, asbestos, mercury, mercury compounds, lead, contain 50% or greater recycled glass content.

.6 Thermal conductivity, ASTM C177/C518/C1114 .24BTU (sf•hr•°F) @ 75°F mean temp).

.7 Noise Reduction Coefficient (NRC) 1.5 PCF 1" = .70, 1 ½ " = .80, 2" =.95
ASTM C423, Type A mounting.

.8 Noise Reduction Coefficient (NRC) 2.0 PCF 1/2" = .50, 1" = .70, 1 ½ " = .85
ASTM C423, Type A mounting

.9 Corrosiveness/corrosion, ASTM C665/C1617. Does not accelerate/pass.

.10 Mold and mildew growth/fungi resistance, ASTM C1338, ASTM G21/G22, UL2824. Pass/resistant to mold.

.11 Maximum service temperature, ASTM C411, 250°F (121°C).

.12 Maximum rate air velocity, ASTM C1071, 6,000 ft./min. (30.5 m/sec.)

.13 Water vapor sorption, ASTM C1104, less than 3%.

.14 Surface burning characteristics, ASTM E84, UL 273, CAN/ULC S102, 20/50 flame spread/smoke development.

.15 Acceptable Manufacturers:

.1 Knauf Atmosphere Duct Liner

.2 Manson

.3 Johns Manville

.4 Owen Corning

.2 Rigid:

.1 Use on flat surfaces.

.2 25 mm (1") thick, to CGSB 51-GP-10M, fibrous glass rigid board duct liner.

.3 Density: 96 kg/m^3 (6 lb/ft^3).

2.2 ADHESIVE

.1 Meet requirements of ASTM C916.

.2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range -29°C (-20°F) to 93°C (200°F).

.3 Acceptable Manufacturers:

.1 Duro Dyne 1A-22

.2 Ductmate

2.3 FASTENERS

.1 Weld pins 2.0 mm (14 gauge) diameter, length to suit thickness of insulation. Metal retaining clips, 32 mm (1¼") square.

.2 Acceptable Manufacturers:

.1 Duro Dyne

.2 Ductmate

2.4 JOINT TAPE

.1 Poly-Vinyl treated open weave fiberglass membrane 50 mm (2") wide.

.2 Acceptable Manufacturers:

.1 Duro Dyne FT2

.2 Ductmate

2.5 SEALER

.1 Meet requirements of ANSI/NFPA 90A and ANSI/NFPA 90B.

.2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range -68°C (-90F) to 93°C (200°F).

.3 Acceptable Manufacturers:

.1 Duro Dyne 1A-94

.2 Ductmate

Part 3 Execution

3.1 GENERAL

.1 Do work in accordance with recommendations of MAIMA Fibrous Glass Duct Liner Standards (FGDLS) or SMACNA duct liner standards.

.2 Line inside of ducts where indicated.

.3 Duct dimensions, as indicated, are clear inside duct lining.

.4 Provide an interior of ductwork from fans from minimum distance of 3 m (10'-0").

3.2 DUCT LINER

.1 Install in accordance with manufacturer's recommendations, and as follows:

.1 Fasten to interior sheet metal surface with 100% coverage of adhesive.

.2 In addition to adhesive, install weld pins not less than 2 rows per surface and not more than 300 mm (12") on centres.

.2 Weld pins are to have cupped or beveled heads to prevent damage to lining surface.

.3 Store foam liners away from sunlight.

3.3 JOINTS

.1 Seal all butt joints, exposed edges, weld pin and clip penetrations and all damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's recommendations, and as follows:

.1 Bed tape in sealer.

.2 Apply 2 coats of sealer over tape.

.2 Replace damaged areas of liner at discretion of Consultant.

.3 Protect leading and trailing edges of each duct section with sheet metal nosing having 15 mm (1/2") overlap and fastened to duct.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 AMCA 99, Standards Handbook.

.3 ANSI/AMCA 210, Laboratory Methods of Testing Fans for Certified Aerodynamics Performance Rating.

.4 AMCA 300, Revised 1987, Reverberant Room Method for Sound Testing of Fans.

.5 AMCA 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

.6 ANSI/ASHRAE 51, Laboratory Methods of Testing Fans for Certified Aerodynamics Performance Rating.

.7 ANSI/NFPA 96 – Ventilation Control and Fire Protection of Commercial Cooking Operations.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with general requirements.

.2 Product data to include fan curves and sound rating data.

1.3 OPERATION AND MAINTENANCE DATA

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

1.4 CERTIFICATION OF RATINGS

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

.2 Provide confirmation of testing.

Part 2 Products

2.1 FANS GENERAL

.1 Capacity: Flow rate, total static pressure Pa, r/min, W (" w.c., r/min, bhp) model and size and sound ratings as indicated on schedule.

.2 Statically and dynamically balanced. Constructed in conformity with AMCA 99.

.3 Sound ratings: Comply with AMCA 301, tested to AMCA 300.

.4 Performance ratings: Based on tests performed in accordance with ANSI/AMCA 210, and ANSI/ASHRAE 51.

.5 Bearings: Sealed lifetime of self aligning type with oil retaining, dust excluding seals and a certified minimum rated life of 80,000 100,000 h in accordance with AFBMA L10 life standard. Bearings to be rated and selected in accordance with AFBMA 9 and AFBMA 11.

.6 Provide vibration isolation hangers/pads for all fans.

.7 Electrical components and motors within the airstream shall be classified for use in a Class I, Zone 2 system (as defined by the Electrical Safety Code) when connected to ductwork systems served by refrigerant containing air handling systems.

.8 Provide factory mounted speed control for all direct drive motors.

.9 Acceptable Manufacturers:

.1 Greenheck
.2 Penn-Barry
.3 Cook
.4 Jenco (S & P)/Jenn
.5 Carnes
.6 Acme
.7 Zonex
.8 Twin-City
.9 Reversomatic
.10 Fantech
.11 Aerovent

2.2 ROOF EXHAUSTERS

.1 Centrifugal V belt or direct driven as indicated.

.1 Housing: Spun aluminum complete with resilient mounted motor and fan.
.2 Impeller: Aluminum non-overloading.
.3 Adjustable motor sheave.
.4 15 mm (1/2") mesh 2.0 mm (79 mil) diameter aluminum birdscreen.
.5 Automatic gasketted aluminum backdraft dampers.
.6 Disconnect switch within fan housing.
.7 Continuous curb gaskets, cadium plated securing bolts and screw, and sound insulating.

.2 Roof curbs: of same manufacturer as fan and built to suit model specified. Roof curbs to be minimum 500 mm (20") high except where indicated otherwise. Roof curbs for NFPA 96 fans are to be vented.

.3 Size, type, and capacity: As indicated.

.4 Power feed shall be through roof curb.

2.3 EXHAUST AIR FANS

.1 Refurbish existing exhaust air fans as follows:

.1 Vacuum entire unit interior.

.2 Lubricate all bearings.

.3 Replace fan belt(s).

.4 Rebalance to capacities indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's instructions.

.2 Provide flexible duct connection for all fans.

.3 Provide backdraft damper at building exterior penetration.

.4 Provide and install vibration isolation.

.5 Provide and install roof curb for all roof mounted fans.

3.2 WARRANTY

.1 Warranty Start Date:

.1 Warranty period starts as of the date of Ready for Takeover.

.2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.

.2 Warranty Duration:

.1 Two (2) year warranty period applies.

.3 Warranty Coverage:

.1 Applies to parts and labour.

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

.1 Submit product data in accordance with general requirements.

.2 Indicate the following:

- .1 Capacity.
- .2 Throw and terminal velocity.
- .3 Noise criteria.
- .4 Pressure drop.
- .5 Neck velocity.

1.2 MAINTENANCE MATERIALS

.1 Include:

- .1 Keys for volume control adjustment.
- .2 Keys for air flow pattern adjustment.

1.3 MANUFACTURED ITEMS

.1 Grilles, registers, and diffusers of same generic type to be product of one manufacturer.

1.4 CERTIFICATION OF RATINGS

.1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by them from independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 GENERAL

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.

.2 Frames:

- .1 Full perimeter gaskets.
- .2 Plaster frames where set into plaster or gypsum board and as specified.
- .3 Concealed fasteners.

.3 Concealed operators.

.4 Colour and Finish: standard as directed by Consultant.

.5 Acceptable Manufacturers:

.1 E.H. Price
.2 Nailor
.3 Krueger
.4 Titus
.5 Carnes
.6 Seiho
.7 Metalaire
.8 Tuttle and Bailey

2.2 RETURN AND EXHAUST GRILLES

.1 General: with opposed blade dampers as indicated, concealed manual operator and gaskets.

.2 Type, size, and capacity: refer to schedule.

2.3 TOE SPACE GRILLE

.1 Punched steel at 25mm x 25mm (1"x1") spacing with 15m x 15m (1/2"x1/2") hole.

.2 Screw fastening and finish selected by consultant.

.3 Type, size and capacity: as indicated.

.4 Colour: to Consultant's approval

2.4 OPEN MESH SCREEN

.1 15 mm x 15 mm (½"x ½") open mesh screen fastened on 25 mm (1") border, screw fasten.

.2 On all open ends of ductwork and where indicated.

.3 Size: To match ductwork size.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's instructions.

.2 Install with flat head screws in countersunk holes where fastenings are visible.

.3 Bolt grilles, registers and diffusers, in place

.4 Provide concealed safety chain on each grille, register and diffuser in gymnasium, similar game rooms, and on exposed diffusers, and elsewhere as indicated.

.5 Clean grilles upon completion.

.6 Paint ductwork beyond grilles, matte black where visible.

.7 Ensure all grilles, diffusers, etc. match opening sizes as indicated on the drawings and as fabricated on site by the contractor.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 ASTM E90, Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions, and Elements.

1.2 PRODUCT DATA

.1 Submit product data in accordance with general requirements.

.2 Indicate the following:

.1 Pressure drop.

.2 Face area.

.3 Free area.

.4 Colour and finish.

1.3 CERTIFICATION OF RATINGS

.1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

1.4 TEST REPORTS

.1 Submit certified data from independent laboratory substantiating acoustic and aerodynamic performance to ASTM E90.

Part 2 Products

2.1 GRAVITY ROOF OUTSIDE AIR INTAKES AND RELIEF VENTS

.1 Factory manufactured louvred penthouse.

.1 3 mm (1/8") thick stormproof extruded aluminum louvers with mitred corners. Brace and support louvres at 1500 mm (5') intervals.

.2 2 mm (0.081") thick insulated aluminum sheet roof.

.3 Constructed of 50 mm x 50 mm x 6 mm (2" x 2" x ¼") aluminum angles for roof support and corner angle.

.4 15 mm x 15 mm x 0.063 diameter (½" x ½" x 1.6" diameter) intercrimp aluminum screen on back of all sides.

.2 Provide roof curb sized to suit penthouse or flat or sloped roof as required or indicated. Curb to place bottom louvre minimum 900 mm (36") above finished roof.

.3 Maximum throat velocity 3.3 m/s (11 ft/s) intake.

.4 Maximum loss through unit: 15 Pa (0.06" in w.c.) static pressure.

.5 Finish: powder coated. Colour selected by Consultant.

.6 Shape and size as indicated.

.7 Acceptable Manufacturers:

.1 Greenheck WRH

.2 Nailor 1720

.3 Carnes GLAB

.4 Penn Barry

.5 Ventex

.6 Pottorff

2.2 FIXED LOUVRES – ALUMINUM

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: extruded aluminum alloy 6063-T5.

.3 Blade: stormproof pattern with 2" blades, centre watershed in blade, reinforcing bosses and maximum blade length of 1500 mm (60").

.4 Frame, head, sill and jamb: 100 mm (4") deep one piece extruded aluminum, minimum 3 mm (1/8") thick with approved caulking slot, integral to unit.

.5 Mullions: at 1500 mm (60") maximum centres.

.6 Fastenings: stainless steel (Society of Automotive Engineers) SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.

.7 Screen: 15 mm (1/2") exhaust 20 mm (3/4") intake mesh, 2 mm (5/64") diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.

.8 Finish:

.1 Powder coated

.2 Colour: to Consultant's approval.

.9 Acceptable Manufacturers:

.1 United Enertech

.1 Greenheck

.2 Construction Specialties

.3 E.H. Price

.4 Krueger

.5 Ruskin

.6 Ventmaster

.7 Ventex

.8 Nailor

Part 3 Execution

3.1 INSTALLATION

.1 In accordance with manufacturers and SMACNA recommendations.

.2 Reinforce and brace air vents, intakes and goosenecks as indicated.

.3 Anchor securely into opening.

.4 Seal with caulking all around to ensure weather tightness.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 ASTM C553, Mineral Fiber Blanket, Thermal Insulation for Commercial and Industrial Applications.

.3 CSA B52, Mechanical Refrigeration Code.

.4 EPS 1/RA/2, Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with general conditions.

.2 Indicate major components and accessories including sound power levels of units.

.3 Type of refrigerant used.

1.3 OPERATION AND MAINTENANCE DATA

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

Part 2 Products

2.1 GENERAL

.1 System type:

.1 Air flow arrangement: horizontal

.2 Cooling: direct expansion

.3 Condensing: air cooled

2.2 OUTDOOR CONDENSING UNITS (AIR SOURCE HEAT PUMP)

.1 General: Factory-assembled, single piece, air-cooled condensing unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, compressor, refrigerant holding charge, and special features required prior to field start-up. Unit shall be rated in accordance with ARI Standard and be CSA approved.

.2 Unit Cabinet:

.1 Unit cabinet shall be constructed of galvanized steel, bonderized and coated with a prepainted baked enamel finish.

.2 A heavy gage roll-formed perimeter base rail with forklift slots and lifting holes shall be provided to facilitate rigging.

.3 Fans:

.1 Condenser fans shall be direct driven, propeller-type, discharging air horizontally.

.2 Fan blades shall be balanced.

.3 Condenser fan discharge openings shall be equipped with PVC coated steel wire safety guards.

.4 Condenser fan and motor shaft shall be corrosion resistant.

.4 Compressor:

.1 Compressor shall be mounted on vibration isolators.

.2 Compressors shall include overload protection.

.5 Condenser Coil:

.1 Condenser coil shall be air-cooled and circuited for integral subcooler.

.2 Coil shall be constructed of aluminum fins (copper fins optional) mechanically bonded to internally grooved seamless copper tubes which are then cleaned, dehydrated, and sealed.

.6 Refrigeration Components:

.1 Refrigeration circuit components shall include liquid line service valve, suction line service valve, liquid filter drier, a full charge of compressor oil, and a holding charge of refrigerant.

.7 Controls and Safeties:

.1 Minimum control functions shall include:

.1 Control wire terminal blocks.

.2 Five-minute recycle protection to prevent compressor short-cycling.

.3 Compressor lockout on auto-reset safety until reset from thermostat.

.2 Minimum Safety devices which are equipped with automatic reset (after resetting first at thermostat), shall include:

.1 High discharge pressure cutout.

.2 Loss-of-charge cutout.

.8 Electrical Requirements:

.1 As indicated on schedule.

.2 Unit electrical power shall be single-point connection.

.3 Unit control circuit shall contain a 24-v transformer for unit control.

.9 Capacity: Refer to schedules.

.10 Provide the following:

.1 Hail Guard Package.

.2 Winter Start Package.

.11 Acceptable Manufacturers:

.1 Carrier 38AK007

.2 Trane

.3 Lennox.

2.3 4-WAY CEILING CASSETTE UNIT

.1 Unit shall be designed for installation into the ceiling cavity and shall be equipped with a white panel.

.2 Unit shall provide up to four-way air distribution via motorized louvers which can be horizontally and vertically adjusted from 0° to 90°.

.3 Cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation. Units sound pressure shall range from 28 dB (A) to 33 dB(A) at low speed measured at 5 feet below the unit.

.4 Return air shall be through the concentric panel, which shall include a washable, resin net mold resistant filter. Return air thermistor shall be mounted inside concentric opening.

.5 Units shall be provided with condensate drain pumps suitable for 21 inches of lift. Pump shall be located below the coil in the condensate pan with a built in safety alarm.

.6 Cassette units shall be provided with (MERV 8) high efficiency air filters.

.7 Coil shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion. A drip pan under the coil shall have a drain connection for hose attachment to remove condensate. Condensate pan shall have internal trap and auxiliary drip pan under coil header.

.8 Motors shall be open drip-proof, permanently lubricated ball bearing with inherent overload protection. Fan motors shall be 3-speed.

.9 Controls shall consist of a microprocessor based control system which shall control space temperature, determine optimum fan speed, and run self diagnostics. The temperature control range shall be from 18°C to 29°C (64°F to 84°F). The unit shall have the following functions:

.1 All units shall be suitable for interlock to BAS. Provide adapter board where required.

.2 Provide LG PREMTBVC2 (or equal) controller to allow for BAS input/control.

.3 An automatic restart after power failure at the same operating conditions as at failure.

.4 A timer function to provide a minimum 24-hour timer cycle for system Auto. Start/Stop.

.5 Temperature-sensing controls shall sense return-air temperature. Indoor-air high discharge temperature shutdown shall be provided.

.6 Indoor coil freeze protection.

.7 Wall mounted thermostat to enter set points and operating conditions.

.8 Auto Stop features shall have integral setback control.

.9 Automatic airsweep control to provide on or off activation of airsweep louvers.

.10 Diagnostics shall provide continuous checks of unit operation and warn of possible malfunctions. Error messages shall be displayed at the unit.

.11 Fan speed control shall be user-selectable: high, medium, low, or microprocessor automatic operation during all operating modes.

.12 A time delay shall prevent compressor restart in less than three minutes.

.10 Filter track with factory-supplied cleanable filters.

.11 Capacity:

.1 As indicated.

.12 Acceptable materials:

.1 Daikin

.2 Trane

.3 Mitsubishi

2.4 WALL HUNG FAN COIL UNIT

.1 Indoor, direct-expansion, wall mounted fan coil, complete with cooling coil, fan, fan motor, piping connectors, electrical controls, microprocessor control system, and integral temperature sensing. Unit shall be furnished with integral wall-mounting bracket and mounting hardware.

.2 Cabinet discharge and inlet grilles shall be attractively styled, high-impact polystyrene. Cabinet shall be fully insulated for improved thermal and acoustic performance.

.3 Fan shall be tangential direct-drive blower type with air intake at the upper front face of the unit and discharge at the bottom front. Automatic, motor-driven vertical air sweep shall be provided.

.4 Coil shall be copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion. A drip pan under the coil shall have a drain connection for hose attachment to remove condensate. Condensate pan shall have internal trap and auxiliary drip pan under coil header.

.5 Motors shall be open drip-proof, permanently lubricated ball bearing with inherent overload protection. Fan motors shall be 3-speed.

.6 Controls shall consist of a microprocessor based control system which shall control space temperature, determine optimum fan speed, and run self diagnostics. The temperature control range shall be from 18°C to 29°C (64°F to 84°F). The unit shall have the following functions:

.1 An automatic restart after power failure at the same operating conditions as at failure.

.2 A timer function to provide a minimum 24-hour timer cycle for system Auto. Start/Stop.

.3 Temperature-sensing controls shall sense return-air temperature. Indoor-air high discharge temperature shutdown shall be provided.

.4 Indoor coil freeze protection.

.5 Wall mounted thermostat to enter set points and operating conditions.

.6 Auto Stop features shall have integral setback control.

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.9 Fan speed control shall be user-selectable: high, medium, low, or microprocessor automatic operation during all operating modes.

.10 A time delay shall prevent compressor restart in less than three minutes.

.7 Filter track with factory-supplied cleanable filters.

.8 Capacity: Refer to schedules.

.9 Acceptable Manufacturers: To match interior unit manufacturer.

2.5 REFRIGERANT LEAK DETECTION SYSTEM

.1 The maximum charge allowed per circuit is 5lbs. Provide additional compressors/circuits if required to keep charge below this value.

.2 The maximum allowed releasable refrigerant volume is 5lbs. Provide leak detection and solenoid valves to limit release volume from each circuit.

.3 Refrigerant coils with multiple compressors shall be alternate tube circuited in order to distribute the cooling effect over the entire coil face at reduced load conditions. (split face coils are not acceptable). Provision for use of thermal expansion valves must be included for variable air volume applications.

.4 Provide refrigerant leak detectors for installation in served space. Detector shall close refrigeration leak safety valve to limit charge released into space/atmosphere.

.5 The Refrigerant detection system shall meet the requirements of CSA B52 and have the following functionality:

.1 Utilize a set point, nonadjustable in the field, to generate a digital output signal to initiative mitigation actions to both internal safeties and external components in the ductwork (dampers, electric coils etc.). Signal shall be generated in not more than 30 seconds from sensor exposure to refrigerant concentration of 25% LFL (+0$, -1%)

.2 Field calibration of the system is not allowed.

.3 Be capable of detecting the refrigerant used in the system.

.4 Have self diagnostics

.5 Energize circulation fans in the event of a leak detection or failed self-diagnostics.

.6 Have a digital output signal for monitoring by other systems

.7 Activate refrigerant safety shut off valves in the event of a leak being detected.

2.6 REFRIGERANT

.1 Refrigerant shall be A1 or A2L Classified.

.2 Refrigerant holding charge shall be applied at factory.

.3 Refrigeration circuit components shall include liquid line service valve, suction line service valve, liquid filter drier, a full charge of compressor oil, a holding charge of refrigerant and leak mitigation solenoid valves.

Part 3 Execution

3.1 GENERAL

.1 Install as indicated, to manufacturers' recommendations.

.2 Manufacturer to certify installation.

.3 Run drain line from cooling coil condensate drain pan to terminate over nearest floor drain.

.4 Provide concrete pad complete with 100 mm x 100 mm x 20 mm (4" x 4" x 3/4") neoprene type vibration isolation.

3.2 EQUIPMENT

.1 Preparation and Start-Up

.1 Provide services of manufacturer’s authorized factory trained mechanic to set and adjust equipment for operation as specified.

.2 Provide results in operation and maintenance manuals

3.3 WARRANTY

.1 Warranty Start Date:

.1 Warranty period starts as of the date of Ready for Takeover.

.2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.

.2 Warranty Duration:

.1 Two (2) year warranty period applies.

.2 Contractor hereby warrants refrigeration compressors for five (5) years.

.3 Warranty Coverage:

.1 Applies to parts and labour.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 Conform to general provisions for Mechanical Division in General Requirements section.

1.2 SUBMITTAL

.1 Submit shop drawings and product data in accordance with general requirements,

.2 Indicate the following: complete specifications, wiring diagrams (showing all interconnections); weight; performance details.

.3 Provide data for inclusion in the Operating and Maintenance manuals in accordance with general requirements.

1.3 REFERENCES

.1 C.1 CSA B52-2023, Mechanical Refrigeration Code.

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

Part 2 Products

2.1 UNIT VENTILATOR

.1 Exterior cabinet panels shall be constructed of heavy gauge steel. Units shall be constructed such that testing and trouble-shooting can be accomplished in the end pockets of the unit without affecting the normal airflow pattern through the unit.

.2 Floor mounted units shall have an integral pipe tunnel for convenient crossover of piping or electrical wiring in accordance with local and National Electric Codes (NEC). The front surface shall consist of three separate, removable panels. Control compartment must be accessible without removing the entire front panel. Unit discharge grille shall be welded continuous bar type with round edged steel bars placed for a 10° vertical deflection. Adjustable side deflection vanes shall be located beneath the continuous bar grille for easy adjustment by maintenance personnel]. A 6 mm (1/4”) painted galvanized mesh screen shall be furnished and located beneath the discharge grille. Unit top surface shall be supplied with a textured paint surface that resists scuffing and hides fingerprints.

Overall unit depth shall be 550 mm (21 7/8”).

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

.4 Hydronic coils are to be constructed with copper tubes and mechanically bonded aluminum corrugated plate fins. Water coils shall be furnished with a threaded drain plug at the lowest point. A manual air vent shall be provided at the high point of the coil on all floor mounted units. An auto air vent shall be provided at the high point of the coil on all ceiling mounted units. Direct expansion coils (DX) - all DX coils must be supplied with a factory installed thermal expansion valve. The expansion valve must be sized for the manufacturer's matching remote condensing unit.

.5 Air Cooled Condensing Units - The unit ventilator manufacturer shall provide remote air cooled condensing units where indicated on plans. The outdoor unit shall be factory precharged and shall be design matched to the indoor unit.

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

Condensing unit shall have corrosion resistant cabinet, with hermetically sealed compressor with internal spring isolation, external isolation, permanent split capacitor motor and overload protection, copper tube aluminum fin condenser coil, direct drive propeller fan with permanently lubricated ball bearing single phase motor with internal overload protection.

.1 Acceptable manufacturers:

Daikin
Trane
Engineered Air

.6 Microprocessor-based control for each unit ventilator that must be adaptable to future network system. This control must be pre-engineered, preprogrammed and pretested and shall be factory installed before shipment. The microprocessor-based control shall monitor room conditions and automatically adjust unit operations to maintain these requirements. The control sequence shall be on the basis of [ASHRAE Cycle II. The manufacturer shall provide this DDC controller in each unit ventilator. Control shall modulate remote 3-way heating valve and sequence condensing unit to maintain setpoint.

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

.7 Ecomomizer Operation: The unit shall have the capacity for 100% outdoor air when outdoor conditions allow. Provide power vent operation.

.8 Separate room air and outdoor air dampers. The room air damper shall be constructed of aluminum and shall be counterbalanced against back pressure. Outdoor air damper shall be two-piece double wall construction with 15 mm (1/2") thick, 1.5 lb. density fiberglass insulation sandwiched between welded 1.0 mm (20 Ga.) galvanized steel blades for rigidity and to inhibit corrosion. Dampers shall be fitted with blended mohair seals along all the sealing edges. Damper bearings shall be made of nylon or other material which does not require lubrication. Dampers shall be factory mounted complete with modulating spring return damper actuator for proportional damper control.

.9 Integral factory installed face and bypass damper. The face and bypass damper shall be constructed of aluminum and have a dead air space to minimize pickup in the bypass position. The long sealing edges of the damper shall be fitted with silicone rubber impregnated glass cloth seals with blended mohair seals on the ends for long life and positive sealing.

.10 Drain pan constructed of stainless steel and shall be insulated. A drain outlet shall be provided on both ends of the pan with one outlet capped. The drain hand of connection shall be easily field-reversed by relocating the cap to the opposite end.

.11 Filters shall be MERV 13.

.12 External intake louvers will be separately supplied by the mechanical contractor. **Louvers shall have 2" blade centers**.

.13 External decorative aluminum wall grille will be separately supplied by the mechanical contractor. Wall grille shall be of heavy gauge with rectangular holes to match louver blade spacing.

.14 Unit manufacturer shall provide an external wall louvre for the outdoor air intake. The louvre and frame shall be of heavy gauge aluminum with 45 deg. blades. The blade profile shall be designed to prevent water penetration. The louvre shall have ½" birdscreen attached to the inner face and shall have a minimum free area of 1.1 sq. ft. The finish on the louver shall be: mill finish / primer coat / a color as per Architect's instruction.

.15 Unit manufacturer shall provide a decorative exterior aluminum wall grille constructed of heavy gauge aluminum with rectangular holes to match louvre blade spacing to maximize the air opening. Grille to be secured to wall louvre/exterior wall. The grille finish shall match the louvre above.

.16 All internal line voltage wiring shall be by the unit manufacturer.

.1 A suitably rated unfused disconnect switch shall be factory installed within the unit.

.17 Control Components

.1 Provide terminal strip ("digital-ready") for standard electric/mechanical controls per Energy Controls.

.18 Unit capacity: As indicated.

.19 Acceptable manufacturers:

Daikin
Trane
Engineered Air

2.2 REFRIGERANTS

.1 Refrigerant shall be an A1 or an A2L classified refrigerant.

.2 Refrigerant charge shall not exceed 3 kg (6.6 lbs)

.3 For all units with refrigerant charge in excess of 3kg provide a leak detection system as follows:

.1 The Refrigerant detection system shall meet the requirements of CSA B52 and have the following functionality:

.1 Utilize a set point, nonadjustable in the field, to generate a digital output signal to initiative mitigation actions to both internal safeties and external components in the ductwork (dampers, electric coils etc.). Signal shall be generated in not more than 30 seconds from sensor exposure to refrigerant concentration of 25% LFL (+0$, -1%)

.2 Sensor within the equipment, near potential source of leaks.

.3 Field calibration of the system is not allowed.

.4 Be capable of detecting the refrigerant used in the system.

.5 Have self diagnostics

.6 Energize fans upon failure of a self-diagnostic check

.7 Activate refrigerant safety shut off valves in the event of a leak being detected.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's instructions.

.2 Install equipment exposed to finished areas after walls and ceiling are finished and painted. Avoid damage.

.3 Protection: Provide finished cabinet units with protective covers during balance of construction.

.4 Unit Ventilators: Locate as indicated, level and shim units, and anchor to structure. Coordinate with existing wall louvre and radiation cabinet. Adjust existing adjacent surfaces as required for a complete finished installation.

.5 Hydronic Units: Install with shut-off valve on supply and lockshield balancing valve on return piping. If not easily accessible, extend vent to exterior surface of cabinet for easy servicing.

.6 Connect drain pan to condensate drain.

.7 Provide refrigerant piping, refrigerant accessories and refrigerant from condensing unit to DX coil.

.8 The mechanical contractor shall charge the refrigeration system after installation and ensure that the cooling system is operating correctly.

3.2 START UP AND INSTRUCTION

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

3.3 TRAINING

.1 Provide 2 hours training to owner's staff on the care, maintenance and operation of the equipment. Dedicated visit to site is required as it will not be paired with equipment startup.

3.4 WARRANTY

.1 Warranty Start Date:

.1 Warranty period starts as of the date of Ready for Takeover.

.2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.

.2 Warranty Duration:

.1 One (1) year warranty period applies.

.3 Warranty Coverage:

.1 Applies to parts and labour.

END OF SECTION

PART 1 General

1.1 GENERAL REQUIREMENTS

.1 Conform to General Conditions for Mechanical Trades.

.2 Related Work Specified Elsewhere.
- .1 General Conditions for Mechanical Trades
- .2 Plumbing & Drainage
- .3 Heating, Ventilation & Air Conditioning
- .4 Heating, Ventilation & Air Conditioning Equipment
- .5 Electrical

1.2 DESCRIPTION OF SYSTEM

.1 Furnish and install all components, devices and control wiring for a fully integrated Energy Management and Environmental Control System incorporating Direct Digital Control (DDC), and equipment monitoring. The system shall control/monitor HVAC and plumbing equipment and systems as specified in this section. The work shall include but is not limited to the following:
- .1 All necessary hardware, software, control panels, control wiring, field devices, installation, documentation, and owner training as specified.
- .2 The installed system shall incorporate electronic and digital control devices to perform the control sequences and monitoring outlined herein. Specific control sequence requirements are as detailed elsewhere in this Section of the specification.
- .3 Control and monitoring of the equipment and systems shown on the drawings (refer also to 'Sequence of Operation' for additional details).
- .4 Control valves shall be supplied by this Trade but installed in the piping system by the Mechanical Trade complete with transitions and unions as required.
- .5 Testing, debugging, calibrating, adjustment, programming, and confirmation of total system operation.

1.3 MANUFACTURER AND INSTALLING CONTRACTOR

.1 The temperature control/programmable device manufacturer shall be Distech, integrated to the WRDSB TAC Vista server/BAS system automation.

.2 Energy Controls, the local Distech integrator is available at phone 519-893-2638.

.3 Any new building must be a seamless extension of the current Energy Management and Building Control System.
- .1 The existing TAC Vista software is, and shall continue to be, the only head-end BAS server for the entire School Board.
- .2 The head-end server contains the secure Energy Management Settings (i.e. Master Setpoints & Schedules) that are sent to all schools in real-time. The control system must be an extension of the head-end server and be able to be managed exclusively through the Vista head-end server.

.3 Monitoring of all school board control systems are done in real-time and must be presented at the exclusive Vista head-end server as first-priority data.

.4 The Vista head-end server has all the required controller databases and software to be able to centrally maintain and modify network configuration and controller software for the entire School Board. The Vista head-end server is the only system that can access the LacNet programming variables inside the controllers for real-time configuration of setpoint and time scheduling parameters.

.5 The graphics and controller database must be presented inside the Vista head-end server in its native format in order to preserve the real-time speed, integrity and multi-site administration of the entire system.

1.4 SCOPE OF WORK

.1 Refer to drawings and specification for complete scope.
.2 Upgraded master spec programming and upgrades to Niagara server.
.3 Removal of existing pneumatic and/or electric thermostats and TCV's with new DDC thermostats and TCV's in renovation spaces.
.4 Remove any redundant or obsolete pneumatic tubing in the area of construction.
.5 Upgrade existing controls in the area of construction.
.6 Thermostats rough-in by Electrical Contractor.
.7 Ventilation lockout.
.8 Minimum outside air schedule.
.9 CO2 controls
.10 Mechanical cooling 24.5degC (+/- 1degC).
.11 Trending.
.12 Summary page in graphics (fan status, MAT, SAT, CO2, Schedule).
.13 Revision summary control drawings.
.14 Controller locations shown on graphics.
.15 Standby schedule for all systems.
.16 Global humidity used on economizers. Humidity reset of outside air high limit shall be done based on closest three (3) RH sensors.

QUALITY ASSURANCE

.1 The system components shall be listed by Underwriters Laboratories Inc. and Canadian Standards Association.

.2 The system control products shall be stored and handled according to manufacturer' recommendations.

.3 The work shall be performed by skilled technicians all of whom shall be properly trained and qualified for this work.

1.6 SUBMITTALS

.1 Prior to the installation of any equipment, the Contractor shall provide the Consultant with shop drawings and specifications for all devices and equipment used for the complete system installation. Shop drawings shall include the following:

.1 Identified schematic control diagrams for all systems, each diagram indicating or referencing input / output connection points, control components, component catalogue numbers, operation sequence, interlocking and RPU's to which they are connected.

.2 Complete network schematic indicating all programmable controllers and data connections.

.3 Detailed listing of inputs and outputs of each programmable controller.

.4 Control damper schedule indicating damper size, required torque and blade type.

.5 Technical data sheets / manufacturer application manuals of each system component.

.2 Upon completion of the installation and prior to acceptance and Owner training, the Contractor shall furnish the Consultant with three copies of installation and operation manuals for the system. Each manual shall include:

.1 Record drawings, including plan layout indicating major device locations and wiring diagrams as finally installed.

.2 All shop drawings, incorporating all required revisions to reflect as-built conditions.

.3 The Contractor shall also keep one copy of backup programs for the system archived in a software storage vault at their business location.

Part 2 Products

2.1 GENERAL

.1 The control system shall be a Tour Andover (TAC) Xenta/Distech building automation system (BAS).

.2 The system shall integrate the operation of intelligent building management controllers distributed into the network.

.3 The DDC System shall be generally comprised of the following devices to achieve the control functions described in this section:

.1 Xenta/Distech programmable controllers

.2 Distech input/ output programmable I/O modules.

.3 Control relays.

.4 Control dampers and valves.

.5 Sensors, actuators and other input/output devices.

.4 Controllers shall execute the application programs, calculations, and commands to provide the control function specified for that unit. Each controller shall include its own micro-computer controller, power supply, input/output modules, termination modules and real time clock.

.5 Controllers shall be capable of full control functionality and alarm reporting independently or as a part of the DDC network.

.6 The system shall be stored in flash ram so no batteries are required.

.7 Each control device shall be modular and expandable to provide additional inputs and outputs and control functionality for that device.

.8 Each controller shall be able to transfer and receive data via the network for performance of control functions.

.9 The system shall be modular, permitting expansion by adding hardware and software without changes in communication or processing equipment.

.10 The complete system shall be capable of communication over a LonWorks network.

.11 The controllers shall monitor the status of all overrides and include this information in logs and summaries to inform the operator that automatic control has been inhibited.

.12 Controllers shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all subsidiary equipment and provide both local and remote annunciation of any component failures.

.13 Controllers shall activate an orderly shutdown of their operation in the event of loss of normal electrical power. Non-volatile memory shall be incorporated for all controller configuration data. The controllers shall automatically resume full operation without manual intervention.

.14 The controllers shall have sufficient memory to support their own operating system and data bases including:

- .1 control processes
- .2 energy management applications
- .3 alarm management
- .4 trend data
- .5 operator input/output
- .6 remote communications
- .7 manual override monitoring

.15 Controllers shall incorporate the following software features:

- .1 Energy management:
  - .1 Time of Day Scheduling
  - .2 Calendar Based Scheduling
  - .3 Holiday Scheduling

.4 Optimal Start and Stop
.5 Demand Limiting
.6 Heating/Cooling Interlock

.2 Alarm Management:
.1 Alarm Management shall be provided to monitor, buffer and direct alarm reports to operator devices and memory files. The controllers shall perform alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic and prevent alarms from being lost.
.2 All alarm or point change report shall include the points English language description and the time and date of occurrence.
.3 The user shall be able to define the specific reaction for each point, the priority level (3 in total) and ability to inhibit alarm reporting for each point.
.4 The user shall be able to define conditions under which point changes need to be acknowledged by an operator and logged for analysis at a later date.
.5 The user shall be able to print, display or store a unique 60 character alarm message to more fully describe the alarm condition or direct operator response. The message shall be customizable to describe each individual alarm.
.6 In web access applications only critical alarms shall initiate a call to a remote operator device, otherwise call activity shall be minimized by time stamping and saving reports until a manual request is received or until the buffer space (minimum 50 alarms) is full.

.3 Trend Logs:
.1 Controllers shall provide an automatic roll-over trend log, which stores records up to an operator-selected number at an operator-selected sampling rate and then overwrites the oldest record with each new record.
.2 Sample intervals shall be from 1 minute to 24 hours.
.3 Provide graphical and tabular displays.

.4 Runtime Totalization:
.1 The controllers shall automatically accumulate and store runtime hours for binary points with a sampling resolution of 1 minute. The user shall have the ability to define a warning limit to trigger maintenance or user-defined messages.

.5 Custom Programming:
.1 The controllers shall permit user defined custom control processes based on:
.1 any system measured data or status
.2 any calculated data
.3 any results from other processes
.4 Boolean logic
.2 The custom processes may be triggered by:
.1 Time-of-day
.2 calendar date
.3 events (point alarm etc.)

.16 The control strategy for each control loop shall be performed by software within the controller. The sequence of events required for each control loop is described for each system in the control sequence.

.17 Outdoor air temperature indication shall be available at each controller as an integral part of the control strategies for that controller. Should the network transmission of the common outdoor air temperature (or any other common value) fail, then each controller shall use the last good value received.

.18 Controls and Requirements for VVT Systems

.1 Where VVT controls are specified, units are to operate as part of a Variable Volume/Variable Temperature System complete with all necessary controls including zone dampers, temperature sensors, static pressure sensor probes and bypass damper.

2.2 NETWORK ARCHITECTURE

.1 The controllers on the local network shall communicate via a two wire LonTalk TP/FT-10 network.

2.3 CONTROL PANELS

.1 Control panels shall be fully enclosed cabinets with all steel construction. Cabinets shall have a hinged door with locking latch or bolt-on cover plate. All cabinet locks shall be common keyed. Cabinets shall be finished with two coats of paint.

2.4 TEMPERATURE SENSORS

.1 Provide thermistor temperature sensors, not requiring transmitters, to measure temperature.

.2 Accuracy shall be +/-0.2°C from 0 to 70°C.

.3 Temperature sensors shall be Greystone EC200 series.

.4 Space sensors in occupied areas shall be type AE or equal having an integral push button for unoccupied override and an integral slider to adjust set point (LED display not required).

.5 In corridors and where noted on the drawings, provide stainless steel plate type sensors (push button override and LED display not required), type AS.

.6 Duct temperature sensors shall be type B having a stainless steel probe length to suit application and ABS enclosure. Duct averaging temperature sensors shall be type FD having an element length to suit application, copper probe and ABS enclosure.

.7 Immersion temperature sensors shall be type C having a ¼" OD stainless steel probe, 4" long and ABS enclosure. Immersion sensors shall be complete with thermowells. Thermal conductive compound shall be added inside the thermowell to provide optimum thermal transfer from the fluid to sensor. Stainless steel thermowells shall be used for steel pipe and brass thermowells shall be used in copper pipe.

2.5 CARBON DIOXIDE SENSORS

.1 Sensors shall Greystone CDD series or equal having the following features:
- .1 0-2000 ppm factory default detection range, field adjustable.
- .2 Non-dispersive infrared sensing element with self-calibration algorithm.
- .3 Guaranteed 5 year calibration interval.
- .4 Powered by either AC or DC source.
- .5 Accuracy: within 50 ppm or 3% of reading (whichever is greater).
- .6 Operating humidity range: 0-95% RH.
- .7 Operating temperature range: 0 to 50°C or greater.
- .8 Stability: less than 2% full scale in 15 years
- .9 Response time: less than 2 minutes for 90% step change.

.2 Duct mounted sensors shall be complete with ABS enclosure complete with sampling tube.

.3 Space mounted sensors shall be executive space type without LCD display.

2.6 MOTORIZED CONTROL DAMPERS (PROVIDED BY BAS, INSTALLED BY MECH.)

.1 Control dampers shall be the parallel or opposed blade type as below or as scheduled on drawings.
- .1 Outdoor and/or return air mixing dampers and face and bypass (F & BP) dampers shall be parallel blade, arranged to direct air-streams toward each other.
- .2 Other modulating dampers shall be the opposed blade type.
- .3 Two-position shutoff dampers may be parallel or opposed blade type with blade and side seals.

.2 Damper frames shall be 13 gauge galvanized steel channel or 1/8 in. extruded aluminum with reinforced corner bracing.

.3 Damper blades shall not exceed 20 cm (8 in.) in width or 125 cm (48 in.) in length. Blades are to be suitable for medium velocity performance (10 m/s [2000 fpm]). Blades shall be not less than 16 gauge.

.4 Damper shaft bearings shall be as recommended by manufacturer for application, oil impregnated sintered bronze or better.

.5 All blade edges and top and bottom of the frame shall be provided with replaceable butyl rubber or neoprene seals. Side seals shall be spring-loaded stainless steel. The blade seals shall provide for a maximum leakage rate of 50 L/s m^2 (10 cfm per ft^2) at 1000 Pa (4 in. w.g.) differential pressure. Provide air foil blades suitable for a wide-open face velocity of 7.5 m/s (1500 fpm).

.6 Individual damper sections shall not be larger than 125 cm x 150 cm (48 in. x 60 in.). Provide a minimum of one damper actuator per section.

.7 Modulating dampers shall provide a linear flow characteristic where possible.

.8 Dampers shall have exposed linkages.

2.7 WATER CONTROL VALVES

.1 Heating and cooling control valves shall be Belimo CCV series characterized ball valves, complete with chrome plated brass trim and NPT female pipe connections. Radiation valves shall be complete with non-spring return modulating actuators. Control valves for coils heating a portion of outdoor air shall have spring return modulating actuators.

.2 Control valves shall be sized to provide approximately one half the circuit branch pressure drop to obtain good modulation control but they shall be no smaller than two pipe sizes less than the pipe they are installed in.

Part 3 Execution

3.1 INSTALLATION

.1 Installation

.1 All controllers and components in the system and on the network shall be installed according to manufacturer recommendations, general installation standards for digital controls and in accordance with the approved shop drawings.

.2 Locate room sensors in the locations shown on the mechanical drawings. All sensors shall be mounted at barrier free height (3’-11” (1175 mm) above finished floor).

.3 All control components for off site system access shall be located where noted on the drawings. The Electrical Contractor shall provide all required connections / cabling for off site access to the web access components.

.4 All programmable controllers, web access components, relays and other control components shall be located within control panels. Control Panels shall be wall mounted and shall be located within suspended ceiling spaces or other locations approved by the Consultant.

.5 The Electrical Contractor will provide hand-off-auto switches in all starters controlled by the BAS.

.2 Generally duct mount carbon dioxide sensors shall be used where specified for air handling units; but, for gyms and single zone libraries, a wall mount carbon dioxide sensor shall be mounted next to the room temperature sensor.

.3 All carbon dioxide levels which are measured by the carbon dioxide sensors shall be made available to the Owner in the form of trend logs. Record readings at 10 minute intervals and keep them for at least 30 days.

.4 Freeze-stats shall be installed so that their sensing element runs horizontally across the coil face (not diagonally) with no more than 12" vertical drops at the outside coil frame. The full face of the coil shall be covered with no horizontal runs being more than 12" apart. The top and bottom horizontal run shall be within 6" of the coil frame. If more than one freezestat is required they shall be wired in series in order to detect a low temperature in portion of the coil. The sensing elements shall be firmly secured in place to avoid vibration without added air restriction.

3.2 SYSTEM START-UP AND ACCEPTANCE

.1 Upon completion of installation, test, adjust and calibrate controls provided under this Section.

.2 On system completion, a demonstration of complete system operation shall be made to the Owner's authorized representative and Consultant.

.3 The Consultant shall verify through the Owners representatives that the entire system is complete and operating to the satisfaction of the Owner before final acceptance is approved.

3.3 TRAINING

.1 The Contractor shall provide competent instructors to give full instruction to designated personnel in the adjustment, operation and maintenance of the system installed rather than a general training course. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach. All training shall be held during normal work hours of 8:00 a.m. to 4:30 p.m. weekdays as follows:

.2 Provide 4 hours of training for Owner's operating personnel. Training shall include:
- .1 Explanation of drawings, operations, and maintenance manuals
- .2 Explanation of web access program
- .3 Explanation of adjustment procedures
- .4 Trend Analysis

3.4 WARRANTY

.1 Warranty Start Date:
- .1 Warranty period starts as of the date of Ready for Takeover.
- .2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.

.2 Warranty Duration:
- .1 Warrant in writing, all provided equipment, accessories, installations, software and firmware against defects in workmanship and materials for a period of one (1) year commencing from the date of Ready for Takeover.
- .2 Maintain the affected parts operational during repair of defective equipment covered by the warranty.

.3 Provide warranty service at no cost to the owner for the guarantee period, this shall include, but not limited to the following:
- .1 Emergency repair service on regular working hour basis during warranty.
- .2 Replacing defective parts and components as required.
- .3 Servicing by factory trained and employed service representatives of system manufacture.
- .4 System software support.

.4 Supplier shall have an in-place support facility within 32 km (20 miles) of the site with technical staff, spare parts inventory and all necessary test and diagnostic equipment.

.3 Warranty Coverage:
Applies to parts and labour.

3.5 IDENTIFICATION

.1 Provide system identification and provide nameplates identifying the following (nameplates shall be keyed to the wiring diagrams):
- .1 Duct mounted sensors.
- .2 Control panels (identify as to equipment / systems controlled). Each panel shall include an as-built drawing showing all the connected control points.

3.6 TESTING AND BALANCING

.1 During the system testing and balancing by the Testing and Balancing Agency, demonstrate the operation of all controls. During balancing procedures, set controls to a fixed mode (bypass damper locked fully closed and all zone dampers locked fully open) to prevent any changes during the balancing procedure.

3.7 ELECTRICAL WIRING

.1 All wiring shall be installed to the standards specified in the Electrical Division.

.2 Use Echelon recommended jacket cable for all network wiring, colour-coded to WRDSB standards.

.3 Run all wiring in EMT conduit where exposed, where running within new concrete block walls and where required by the Ontario Electrical Code. Plenum rated cable shall be used in return air ceiling plenums.

.4 Control relays necessary for BAS operation shall be provided by the Temperature Control Contractor but all contactors and their power supplies handling power wiring to the equipment shall be by the Electrical Contractor.

Part 4 Sequence of Operation

4.1 GENERAL

.1 All setpoints shall be adjustable.

.2 Outdoor air temperature shall be broadcasted to all controllers.

.3 Heating mode: Heating is enabled between October 15 and April 15 or if the outdoor air temperature is below 10°C. This heating mode is used in all controllers for the building.

.4 Cooling Mode: Mechanical cooling is enabled if the outdoor air temperature is above 18°C.

.5 Occupancy mode shall be determined by a weekly schedule with an annual holiday schedule. Each system shall have this schedule but there shall be provision for operating under a general (to the building) schedule as well. An adjustable parameter shall be available to select the local or general schedule for each system.

.6 Lead/lag: Devices designed for lead lag operation shall operate in automatic lead/lag mode to equalize run time. If the lead unit fails the lag shall automatically start and an alarm shall be generated. The lead unit shall be advanced through the series of devices in sequence every Tuesday at noon.

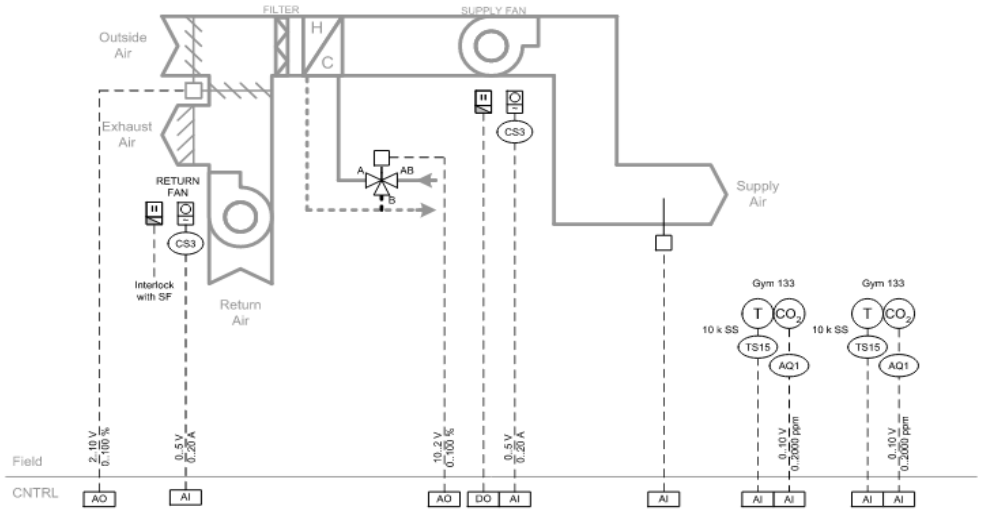
.7 Guidance Office heating:
- First stage heat: perimeter radiation
- First stage heating through RTU: supply air discharge temperature set to 20degC (lock out on cooling)
  -heat provided from heatpump down to 5 deg C
  -below 5 deg C heat is provided by 2 stages of gas heat.

4.2 EQUIPMENT SERVICES

.1 See the graphical sequence of operations attached (for reference only) at the end of this specification for equipment and systems. Please note that this is not a complete representation of all equipment and systems. Controls contractor to review all drawings and specifications and provide complete controls and sequence.

END OF SECTION

EXISTING GYMNASIUM INDOOR/OUTDOOR? UNIT



Unit	Serves	Comments	
HV-1	General Purpose Room	need site visit for details	

	Job:	Owner: Waterloo Region District School Board	Drawn By:	Title: **HV-01 Control Schematics**	1
	Job Name: Breslau Public School BAS Upgrades		Revision Date: February 23, 2026		

SEQUENCE OF OPERATION:

Unoccupied Mode:

- Mode is active usually between 11:00 p.m. to 7:00 a.m. Monday to Friday and 24 hours Saturday and Sunday. The system will be in Unoccupied Mode when not in Morning Warmup, Occupied or Standby modes. The system will cycle between Idle State, Heating State and Pushbutton Override States to meet the demands from each state and return to the Idle State when the demands are satisfied.
- Idle State: The supply fan is off, the return fan is off (where applicable), the power exhaust fan is off (where applicable), Global Ventilation
- Schedule is disabled, the outdoor air mixing dampers are in the 0 % outdoor air position, the heating is disabled.
- Heating State: System cycles on a call for unoccupied heating. A full call for (all stages or full heat modulation where applicable) heating until
- setpoint is reached. Heating temperature nominally 16.0 °C space temperature setpoint with an increased space temperature setpoint to 17.0 °C at -10.0 °C OAT or lower and 18.0 °C at -20.0 °C OAT or lower. (each adjustable)
- Free Cooling is disabled. Global Ventilation Schedule is disabled.
- Push Button Override State: If the override pushbutton is pressed, at any room sensor, the associated system will switch to the Occupied Mode for 2 hours (adjustable). With outdoor air ventilation and cooling enabled.

Morning Warmup Mode:

- An optimized start, based on the time of day schedule, outdoor air temperature and the indoor zone temperature is provided for heating.
- The global Global Ventilation Schedule is disabled. The supply fan is on, the return fan is on (where applicable), the outdoor air mixing dampers are in the 0 % outdoor air position and heating is enabled at full capacity.
- The optimized start program is to begin up to 105 minutes (adjustable) before the occupancy schedule to allow for morning warm up to bring the lowest space temperature up to occupancy setpoint.

Occupied Mode:

- Time of day schedule, which starts the unit along with an Optimum Start program usually between 7:00 a.m. and 4:00 p.m. Monday to Friday, when not overridden by a Holiday Schedule, Standby Occupancy Mode or Unoccupied Mode. Global Ventilation Schedule is enabled.
- HV unit fan status confirmed by current sensing device(s) or VFD feedback.
- For modulating burners, (where applicable) 0 % signal (0 Volts) heating discharge temperature setpoint is at minimum discharge temperature (typically set on the HV unit to 17 °C). A 100 % signal (10 Volts) heating discharge temperature setpoint is at maximum discharge temperature setpoint (typically set on the HV unit to 35 °C).
- Fan operation: The supply fan and return fan (where applicable) run continuously.
  - Room heating temperature nominal: 21.5 °C +/- 1.0 °C (adjustable, 2.0 °C for gyms)
  - Room Free Cooling Enabled temperature nominal 22.0 °C +/-1.0 °C (adjustable, 2.0 °C for gyms)

Standby Occupancy Mode:

- Time of day schedule starts the unit(s) usually between 4:00 p.m. and 11:00 p.m. Monday to Friday. Minimum Outdoor Air is set to zero when the Global Ventilation Schedule is off. Supply fan and associated exhaust fan (where applicable) runs only on a call from heating. Ventilation normally set to zero (with a future provision to adjust).
  - Heating temperature setpoint nominal: 21.5 °C +/- 1.0 °C (adjustable)
  - Free Cooling is disabled. Global Ventilation Schedule is disabled

	Job: Job Name: Breslau Public School BAS Upgrades	Owner: Waterloo Region District School Board	Drawn By: Revision Date: February 23, 2026	Title: **HV-01 Sequence of Operation**	2

SEQUENCE OF OPERATION: (continued)

Heating Sequence:

- Outdoor Air Temperature used to determine Heating Enabled Mode: A set of thresholds that are user adjustable at a Global (board wide) or Local (site specific) level, triggers the heating enable mode based on the outdoor air temperature below the threshold. The threshold is further adjusted by a calendar schedule. Typical default values are: 16 °C from September to May and 5 °C from June to August.
- Default Setpoint: When the Heating Mode is active, the default room temperature setpoint remains unchanged.
- Call for Heating: Heating is used until the heating calls (from room controller PID or unoccupied heating thresholds) are satisfied.
- For modulating burners: (where applicable) 0 % signal (0 Volts) heating discharge temperature setpoint is at minimum discharge temperature (typically set on the rooftop unit to 17 °C). A 100 % signal (10 Volts) heating discharge temperature setpoint is at maximum discharge temperature setpoint (typically set on the rooftop unit to 35 °C).
- The room temperature sensor regulates heating output to maintain the occupied heating setpoint. Local setpoint adjustment is provided. The power exhaust fan or relief fan (if applicable) cycles based on the rooftop economizer position..

Economizer Operation (and CO2 Demand Control Ventilation):

- During Occupied Mode, economizer operation will be substituted for mechanical cooling when the outdoor air temperature and relative humidity are below the Free Cooling Setpoint Sequence of Operation. If the outdoor air temperature is below this free cooling setpoint the mixing dampers will be modulated open on a call for cooling to provide 'free' cooling.
- Minimum outdoor air damper position signal may exceed the economizer signal. A typical value for minimum outdoor air damper position is 5 % outdoor air, which can vary based on use case of the occupied space based on ASHRAE 62.1 net occupiable floor area outdoor air rate.
- For HV units with power exhaust, the exhaust fan runs when the outdoor air damper is more than 50 % open.
- During morning warm-up, the outdoor air minimum position is set to zero.
- During Unoccupied Mode and Standby Occupancy Mode, free cooling is unavailable.
- During Occupied Mode, If the outdoor air temperature and relative humidity are above the Free Cooling Setpoint Sequence of Operation, the mixing dampers will be set to the minimum outdoor air threshold unless otherwise required under ASHRAE 62.1 Ventilation Rate Procedure - net occupiable floor area outdoor air rate (w/ CO2 demand controlled ventilation reset).
- Each return air duct-mounted or space mounted CO2 sensor acts as a high limit and will increase the amount of minimum outdoor air, to a maximum of 40 % outdoor air as the CO2 level increases from 1100 ppm (1000 ppm to 1200 ppm over a ramped 15 minute period).

Gym Partition Switch:

- The gym partition position switch (where applicable for multiple gyms) indicates whether the dividing wall is open or closed. If the wall is open, the two rooftop units (where applicable) control to an average room temperature setpoint. If the wall is closed, the two rooftop units (where applicable) operate autonomously. Gym partition switch to be provided by the Building Automation Contractor.

SEQUENCE OF OPERATION: (continued)

Limits and Safeties:

- The maximum outdoor air damper position is limited based on the outdoor air temperature to prevent excessively low supply air temperature during startup. At -20 °C outdoor air temperature, and below, the maximum outdoor air damper position will be 0 % open and at 10 °C outdoor air temperature the maximum outdoor air damper position will be 100 %.
- The mixed air temperature sensor acts as a low limit to ensure temperature does not fall below setpoint (typically 11°C).
- The supply air temperature sensor acts as a high limit for each stage of heating (for stage 1: disable above 60 °C , and enable below 50 °C, for stage 2: disable above 55 °C and enable below 45 °C) and a low limit for each stage of cooling (for stage 1: disable DX1 below 5 °C and enable DX1 above 10 °C, for stage 2: below 8 °C disable DX2 and above 13 °C enable DX2).
- The duct mounted supply air temperature sensor acts as a software freezestat (triggered below 1 °C, restored above 5 °C), 1 minute delay, auto reset after 5 minute delay).
- The supply fan has a delay-off time of 90 seconds.
- Gas heating is disabled when the outdoor air temperature is above the global heating disable setpoint (typically 18 °C) or when the fan is off.
- Stage 1 gas heating (where applicable for staged heating) has a minimum run time of 3 minutes.
- Minimum outdoor air is provided when enabled by the global minimum outdoor air time schedule. The minimum outdoor air is adjustable from the graphic and is typically a default of 10 % open outdoor damper position.
- The return air carbon dioxide sensor acts as a high limit to increase the amount of minimum outdoor air damper position from 0 % to 40 % as the return air carbon dioxide reading increases from 1000 ppm to 1200 ppm.
- During Occupied Mode, and the outdoor air is above -1 °C, heating stage 2 (where applicable) has a delay-on time of 15 minutes, except when the outdoor air temperature is below -3 °C with a +2 °C deadband.
- The default space setpoint is increased by 2 °C when free cooling is enabled (providing heating is disabled). The standard cooling setpoint will be limited to a minimum of 23.5°C.
- When the ventilation lockout switch (usually located at the custodial office) is engaged, the outdoor air dampers close, free cooling is disabled, and the system switches to standby mode of operation.
- Minimum outdoor air is set to zero when the global ventilation schedule is off (standby occupancy).
- Discretionary Fire Alarm Shutdown Mode to be enabled on the fire alarm status.

Alarms:

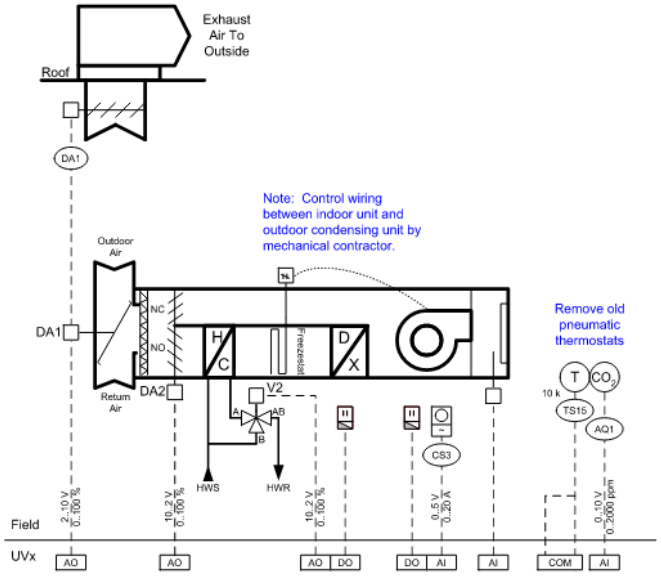
An alarm will be generated upon any of the following conditions:

- Fan status does not match the start/stop signal.
- Mixed air temperature too high alarm (triggered above 50 °C restored below 48 °C) or too low alarm (triggered below 5 °C and restored above 7 °C). Supply air temperature too high alarm (triggered above 65 °C and restored below 63 °C) or too low alarm (triggered below 5 °C and restored above 7 °C)
- Space temperature too high alarm (triggered above 42 °C and restored below 40 °C) for non-cooling systems, (triggered above 38 °C and restored below 36 °C) for cooling systems.
- Space temperature too low alarm (triggered below 14 °C and restored above 16 °C).
- Weekly fan runtime limit exceeded.
- Return air CO2 too high alarm (triggered above 1700 ppm and restored below 1650 ppm) or too low alarm (triggered below 250 ppm and restored above 300 ppm).
- Software freezestat tripped

	Job:	Owner: Waterloo Region District School Board	Drawn By:	Title: **HV-01 Sequence of Operation**	4
	Job Name: Breslau Public School BAS Upgrades		Revision Date: February 23, 2026		

NEW HORIZONTAL AND CEILING UNIT VENTILATORS

DAIKIN UAVS9-H10 - 2.5 tons, 1000 CFM



14 Systems As Shown					
UVx	PHx	Room	Htg (MBh)	Rad	Notes
UV-01	PH-1	Classroom 1	68.9	No	Horizontal
UV-02	PH-2	Classroom 2	68.9	No	Horizontal
UV-03	PH-3	Classroom 3	68.9	No	Horizontal
UV-04	PH-4	Classroom 4	68.9	No	Horizontal
UV-05	PH-5	Classroom 5	68.9	No	Horizontal
UV-06	PH-6	Classroom 6	68.9	No	Horizontal
UV-07	PH-7	Classroom 7	68.9	No	Horizontal
UV-08	PH-8	Classroom 8	68.9	No	Horizontal
UV-09	PH-9	Classroom 9	68.9	No	Ceiling
UV-10	PH-10	Classroom 10	68.9	No	Ceiling
UV-11	PH-11	Classroom 12	68.9	No	Ceiling
UV-12	PH-12	Classroom 13	68.9	No	Ceiling
UV-13	PH-13	Classroom 14	68.9	No	Ceiling
UV-14	PH-14	Classroom 15	68.9	No	Ceiling

Notes:
1) 120V power for controls is provided by Div. 16.
2) Freezestat is factory wired to shut down fan, open heating valve and close outside air damper.
3) DA1: Belimo actuator supplied with unit (SR) "A1", 2 V = OA closed
4) DA2: Belimo actuator supplied with unit (NSR) "A2", 2 V = bypass, 10 V = open to coil.
5) TS9: Supply air sensor supplied with unit (10 k).
6) 3-speed ECM fan motor set to medium speed.

	Job:	Owner: Waterloo Region District School Board	Drawn By:	Title: **UV-01 to UV-14 Control Schematics**	5
	Job Name: Breslau Public School BAS Upgrades		Revision Date: February 23, 2026		

SEQUENCE OF OPERATION:

Unoccupied Mode:

- The system will be in Unoccupied Mode when not in Morning Warmup, Occupied or Standby modes. The system will cycle between Idle State, Heating State and Pushbutton Override States to meet the demands from each state and return to the Idle State when the demands are satisfied.
- Idle State: Mode is active usually between 11:00 p.m. to 7:00 a.m. Monday to Friday and 24 hours Saturday and Sunday. The supply fan is off, associated exhaust fan is off (where applicable), the Global Ventilation Mode is off, the outdoor air mixing dampers are in the 0% outdoor air position, the heating is off and the cooling is off (where applicable). The face and damper is in the face position. The associated relief dampers (where applicable) are closed.
- Heating State: System cycles on a call for unoccupied heating. The face and bypass dampers go to face position to obtain room temperature setpoint. Heating temperature nominally 16.0 °C space temperature setpoint with an increased space temperature setpoint to 17.0 °C at -10.0 °C Outdoor Air Temperature or lower and 18.0 °C at -20.0 °C Outdoor Air Temperature or lower (each adjustable).
  - Mechanical Cooling: Disabled (where applicable)
  - Free Cooling: Disabled
  - Global Ventilation Schedule: Disabled
- Push Button Override State: If the override pushbutton is pressed, at any room sensor, the associated system will switch to the Occupied Mode for 2 hours (adjustable). With outdoor air ventilation and cooling enabled.

Morning Warmup Mode:

- An optimized start routine for heating advances the system start time when morning warm-up is required. An optimized start, based on the time of day schedule, outdoor air temperature and the room temperature is provided for heating. The global ventilation schedule is off.
- The supply fan is on, the associated exhaust fan is off (where applicable), the outdoor air mixing dampers are in the 0 % outdoor air position, the heating at full capacity is on and the cooling is off (where applicable).
- The face and bypass damper(s) start in the face position. The associated exhaust dampers (where applicable) start in the closed position.
- The optimized start program is to begin up to 105 minutes before the occupancy schedule to allow for morning warm up to bring the lowest zone temperature up to occupancy setpoint.

Occupied Mode:

- Time of day schedule, which starts the unit along with an Optimum Start program usually between 7:00 a.m. and 4:00 p.m. Monday to Friday, when not overridden by a Holiday Schedule, Standby Occupancy Mode or Unoccupied Mode. The Global Ventilation Schedule is on. Fan status indication is from the current sensing device(s). The supply fan and return fan (where applicable) run continuously.
  - Heating temperature nominal: 21.5 °C +/- 1.0 °C (adjustable)
  - Mechanical cooling temperature nominal 24.5 °C +/- 1.0 °C (adjustable)
  - Free cooling enabled temperature nominal 22.5 °C +/-1.0 °C
  - Global Ventilation Schedule: Enabled

Standby Occupancy Mode:

- Time of day schedule starts the unit(s) usually between 4:00 p.m. and 11:00 p.m. Monday to Friday. Minimum Outdoor Air is set to zero when the Global Ventilation Schedule is off. Supply fan and associated exhaust fan (where applicable) runs only on a call from heating or cooling only. Ventilation normally set to zero (with a future provision to adjust).
  - Heating temperature setpoint nominal: 21.5 °C +/- 1.0 °C (adjustable)
  - Mechanical Cooling temperature setpoint nominal 24.5 °C +/- 1.0 °C (adjustable) (where applicable)
  - Free Cooling: Disabled
  - Global Ventilation Schedule: Disabled

	Job:	Owner: Waterloo Region District School Board	Drawn By:	Title: **UV-01 to UV-14 Sequence of Operation**	6
	Job Name: Breslau Public School BAS Upgrades		Revision Date: February 23, 2026		

SEQUENCE OF OPERATION: (continued)

Heating Sequence:

- Outdoor Air Temperature used to determine Heating Enable Mode: A set of thresholds that are user adjustable at a global (board wide) or local (site specific) level, triggers the heating enable mode based on the outdoor air temperature below the threshold. The threshold is further adjusted by a calendar schedule. Typical default values are 16 °C from September to May and 5 °C from June to August.
- Default Setpoint: When the Heating Mode is active, the default room temperature setpoint remains unchanged.
- Call for Heating: The room temperature sensor modulates the face & bypass damper with heat pump or hydronic heating to maintain the temperature setpoint.
- When in heating mode, the mixing dampers are in minimum position and cooling is off. Mechanical heating is used until the heating calls (from room controller PID or Unoccupied Heating thresholds) are satisfied. The room temperature sensor regulates heating output to maintain the occupied heating setpoint. Local setpoint adjustment is provided. Where there is a zone served by radiation, the radiation valve opens (where applicable) as the first stage of heating. For Heating Valve, (where applicable) 0 % signal (10 Volts) closes the heating valve. A 100% signal (below 2 Volts) opens the heating valve.

Cooling Sequence:

- Outdoor Air Temperature used to determine cooling enable mode: A set of thresholds that are user adjustable at a global (board wide) or local (site specific) level, triggers the cooling enable mode based on the Outdoor Air Temperature exceeding the threshold. The threshold is further adjusted by a calendar schedule. Typical default values are: 18 °C from September to May and 21 °C from June to August.
- Default Setpoint: When the cooling enable mode is active, the default room temperature setpoint is raised by 2 °C.
- Call for Cooling: When free cooling is available, and a demand for cooling is in place, free cooling will be used first, and if the demand for cooling is still in place, mechanical cooling will be used until the cooling calls (from room controller PID) are satisfied. The room temperature sensor also modulates the mixing dampers (for free cooling) to maintain the occupied free cooling setpoint.
- Cooling setpoint is maintained at 3 °C higher than the default room setpoint and will not go below 23.5 °C.
- The room temperature sensor modulates the mixing dampers in sequence with DX cooling (where applicable) and face and bypass dampers in face position, to maintain the cooling temperature setpoint. When mechanical cooling is on, heating is off.

Economizer Operation (and CO2 Demand Control Ventilation):

- During Occupied Mode, economizer operation will be substituted for first stage mechanical cooling when the outdoor air temperature and relative humidity are below the Free Cooling Setpoint Sequence of Operation. If the outdoor air temperature is below this Free Cooling Setpoint the mixing dampers will be modulated open on a call for cooling to provide 'free' cooling.
- Minimum outdoor air damper position signal may exceed the economizer signal. A typical value for minimum outdoor air damper position is 5 % outdoor air, (0 % when an associated stand alone ERV is present) which can vary based on use case of the occupied space based on ASHRAE 62.1 net occupiable floor area outdoor air rate. For units with an associated exhaust, the exhaust fan runs when the outdoor air damper is more than 50 % open.
- During morning warm-up, the outdoor air minimum position is set to zero.
- During Unoccupied Mode and Standby Occupancy Mode, free cooling is unavailable.
- During Occupied Mode, If the outdoor air temperature and relative humidity are above the Free Cooling Setpoint Sequence of Operation, the mixing dampers will be set to the minimum outdoor air threshold unless otherwise required under ASHRAE 62.1 Ventilation Rate Procedure - net occupiable floor area outdoor air rate (w/ CO2 demand controlled ventilation reset).
- Each return air duct-mounted or space mounted CO2 sensor acts as a high limit and will increase the amount of minimum outdoor air, to a maximum of 40 % outdoor air as the CO2 level increases from 1100 ppm (1000 ppm to 1200 ppm over a ramped 15 minute period).

SEQUENCE OF OPERATION: (continued)

Ventilation Lockout:

- When the ventilation lockout switch, usually located in the Custodial Office, is engaged, all outdoor air dampers close, free cooling is disabled, and the system switches to Standby Occupancy Mode of operation.

Limits and Safeties:

- If the outside air temperature exceeds the Global Free Cooling Setpoint, the mixing dampers return to the minimum position.
- Mixed air damper minimum position control is provided when the Global Ventilation Schedule is on (initially 10 %OA).
- The exhaust air damper (if applicable) opens from 0 to 100 % as the outdoor air damper opens from minimum position to maximum position.
- The minimum outdoor damper position is ramped from minimum to 40 % as the room sensor CO2 increased from 1000 ppm to 1200 ppm over a 15 minute period.
- The fan must be running before the mixing dampers, face and bypass dampers, heat pump (if applicable) and DX cooling will operate.
- The economizer is limited to 60 % because of the intake louver dimensions. (if applicable)
- The supply air sensor acts as a low limit to ensure temperature does not fall below setpoint (initially 16 °C, reset to 13 °C on a call for free cooling).
- The duct/unit mounted supply air temperature sensor acts as a software freezestat (triggered below 1 °C after 3 minutes, restored above 5 °C after 3 minutes, and auto reset after 5 minute delay).
- If the hard-wired freezestat trips, the fan shuts down, the heat pump shuts down (if applicable), the outside air damper closes, the heating valve opens and an alarm is generated at the BAS.
- DX cooling is disabled when the outside air temperature falls below the global mechanical cooling disable setpoint (initially 14 °C). (where applicable)
- DX cooling has a minimum off time of 5 minutes. (where applicable)
- DX cooling has a supply air temperature low limit (disabled below 6 °C and enabled above 12 °C). (where applicable)
- The face & bypass damper is in the face position and the heating valve is closed when DX cooling is operating. (where applicable)
- Heating is disabled when the outside air temperature is above the global heating disable setpoint (typically 16 °C).
- The heating valve minimum position increases from 0 to 60% as the outside air temperature falls from 3 °C to -3 °C to reduce the likelihood of coil freeze.

Alarms:

An alarm will be generated upon any of the following conditions:

- Fan status does not match the fan start/stop signal.
- Room temperature is too high (triggered above 36 °C and restored below 34 °C) or too low (triggered below 14 °C and restored above 16 °C).
- Supply air temperature too high (triggered above 65 °C and restored below 60 °C) or too low (triggered below 8 °C and restored above 13 °C).
- Software or hard-wired freezestat tripped.
- Fan runtime exceeded weekly runtime setpoint.
- CO2 level too high (triggered above 1700 ppm and restored below 1650 ppm) or too low (triggered below 250 ppm and restored above 300 ppm).

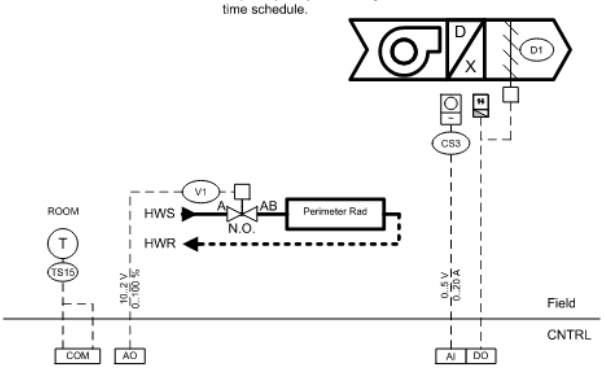
SEMINAR C 11 HEATING AND COOLING

LG LCN188HV4 - 1.5 tons, 60 CFM



Install wall controller (if available) high on the wall near the indoor unit (for service use only). Set local controls for low setpoint (19°C) with "always on" time schedule.

Control wiring between indoor unit and outdoor unit by refrigeration contractor.



SEQUENCE OF OPERATION

- Non adjustable room temperature plate sensor or room temperature sensor with local setpoint adjust and pushbutton override is provided where indicated.

Perimeter Convector Heaters:
Room sensor modulates the valve for heating to maintain room temperature setpoint, which is reduced during unoccupied hours.

Ductless Split Cooling:

- Zone temperature sensor cycles the ductless split to maintain the occupied cooling setpoint.

Limits and Safeties:

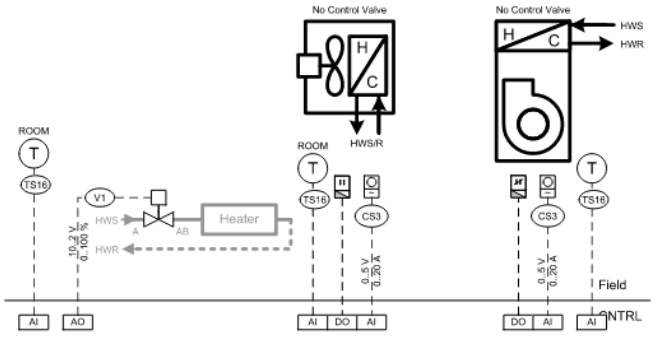
- Hydronic heating control valves are to fail open to heat.
- The Ductless Split unit is disabled when the outside air temperature is below the global mechanical cooling disable setpoint (initially 12/14°C). A minimum off-time of 5 minutes is provided.

Alarms:
An alarm is generated at the BAS when:

- The space temperature is too low (triggered below 14 °C and restored above 16 °C) or too high (triggered above 38 °C and restored below 36 °C)
- Low temperature alarm to be integrated through security to On-Call Response

	Job: Job Name: Breslau Public School BAS Upgrades	Owner: Waterloo Region District School Board	Drawn By: Revision Date: February 23, 2026	Title: **Seminar C 11 Room Controls**	9

EXISTING PERIMETER RADIATION, UNIT HEATERS, AND EXHAUST FANS



1. Ex-EF for Corridor 814 Classroom
2. ???



Other Upgrades:

- Program M1A as RPU1 and rename to C1
- Replace RPU2 with ECL203 and rename to C2
- Replace RPU3 with ECL203 and rename to C3
- Replace RPU4 with ECL403 and rename to C4
- Provide Damper Actuators for units in the Upper Floor Mechanical Rooms - (need damper sizes)
- Replace 5 3-way Valves in Boiler Room

SEQUENCE OF OPERATION

- Non adjustable room temperature plate sensor or room temperature sensor with local setpoint adjust and pushbutton override is provided where indicated.

Perimeter Convector Heaters:

- Room sensor modulates the valve for heating to maintain room temperature setpoint, which is reduced during unoccupied hours.

Cabinet Unit Heaters:

- Space sensor cycles unit heater for heating to maintain setpoint.

Limits and Safeties:

- Hydronic heating control valves are to fail open to heat.

Alarms:

An alarm is generated at the BAS when:

- The space temperature is too low (triggered below 14 °C and restored above 16 °C) or too high (triggered above 38 °C and restored below 36 °C)
- Low temperature alarm to be integrated through security to On-Call Response

	14 Systems as Shown					
Name	Room	Valve (MBh)	Stat	Valve	CNTRL	Notes
RAD-01	Washroom 139	10.3	TS16	V1		Ex Rad
RAD-02	Boys Change room 138	22.8	TS16	V1		Ex Rad
RAD-03	Stage 124	22.7	TS16	V1		Ex Rad
RAD-04	Corridor 811	22.3	TS16			w ild rad?
RAD-05	Corridor 810 Upper	22.8	TS16			w ild rad?
RAD-06	Corridor 810 Low er	22.8	TS16			w ild rad?
RAD-07	Vestibule 809	22.8	TS16			w ild rad?
RAD-08	Corridor 806 South	22.8	TS16			w ild rad?
RAD-09	Corridor 806 North	22.8				w ild rad?
RAD-10	Vestibule 805	22.8	TS16			w ild rad?
	Corridor 814 Upper		TS16			stat only?
	Corridor 814 Low er		TS16			stat only?
UH-01	Mechanical Room A	23	TS16			
UH-02	Mechanical Room B	23	TS16			

	Job:	Owner: Waterloo Region District School Board	Drawn By:	Title: **Miscellaneous Controls**	10
	Job Name: Breslau Public School BAS Upgrades		Revision Date: February 23, 2026		

Division 26 Common Requirements for Electrical

26 00 11 Electrical Specification Index

Common Contract Requirements for Electrical

26 01 16 Electrical Contract General Requirements
26 01 17 Demolition and Renovation
26 01 21 Electrical Occupancy Requirements

Common Work Results for Electrical

26 05 19 Wires and Cables
26 05 20 Splitters, Junction, and Pull Boxes
26 05 21 Outlet Boxes, Conduit Boxes, and Fittings
26 05 22 Wire and Box Connectors – 0 –1000 V
26 05 33 Conduits, Conduit Fastenings, and Conduit Fittings
26 05 74 Short Circuit/Coordination Study Arc Flash Hazard Analysis
26 05 75 Auxiliary Systems

Low-Voltage Transformers

26 22 13 Dry Type Transformers

Panelboards

26 24 16 Panelboards
26 24 17 Moulded Case Circuit Breakers

Low-Voltage Distribution Equipment

26 27 26 Wiring Devices

Low-Voltage Circuit Protective Devices

26 28 16 Disconnect Switches

Lighting

26 51 13 Lighting Equipment
26 51 16 Digital Occupancy & Daylight Control Systems

Division 28 Electronic Safety and Security

Fire Detection and Alarm

28 31 26 Fire Alarm System (Renovation)

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This Section covers items common to Electrical Division 26, as well as Division 27 and Division 28.

.2 This section supplements requirements of Division 1.

.3 Furnish labour, materials, and equipment necessary for completion of work as described in contract documents.

1.2 INTENT

.1 Mention herein or indication on Drawings of articles, materials, operations, or methods requires: supply of each item mentioned or indicated, of quality, or subject to qualifications noted; installation according to conditions stated: and, performance of each operation prescribed with furnishing of necessary labour, equipment, and incidentals for electrical work.

.2 Where used, words “Section” and “Division” shall also include other Subcontractors engaged on site to perform work to make building and site complete in all respects.

.3 Where used, word “supply” shall mean furnishing to site in location required or directed complete with accessory parts.

.4 Where used, word “install” shall mean secured in place and connected up for operation as noted or directed.

.5 Where used, word “provide” shall mean supply and install as each is described above.

1.3 TENDERS

.1 Submit tender based on specified described equipment or Alternates listed.

.2 State in Tender, names of all Subcontractors proposed for work under this Division.

1.4 LIABILITY INSURANCE

.1 This contractor must maintain and produce at the request of the consultant proof of proper insurance to fully protect the owner, the consultant and the contractor from any and all claims due to accidents, misfortunes, acts of God, etc.

1.5 ELECTRICAL SAFETY AUTHORITY

.1 The contractor is to determine general inspection fees with Electrical Safety Authority and include as part of tender.

1.6 DRAWINGS

.1 Electrical Drawings do not show structural and related details. Take information involving accurate measurement of building from building drawings, or at building. Make, without additional charge, any necessary changes or additions to runs of conduits and ducts to accommodate structural conditions. Location of conduits and other equipment may be altered by the consultant without extra charge provided change is made before installation and does not necessitate major additional material.

.2 As work progresses and before installing fixtures and other fittings and equipment which may interfere with interior treatment and use of building, provide detail drawings or obtain directions for exact location of such equipment and fitments.

.3 Electrical drawings are diagrammatic. Where required work is not shown or only shown diagrammatically, install same at maximum height in space to conserve head room (minimum 2200 mm (88") clear) and interfere as little as possible with free use of space through which they can pass. Conceal wiring, conduits and ducts in furred spaces, ceilings and walls unless specifically shown otherwise. Install work close to structure so furring will be small as practical.

.4 Before commencing work, check and verify all sizes, locations, grades, elevations, levels and dimensions to ensure proper and correct installation. Verify existing/municipal services.

.5 Locate all electrical equipment in such a manner as to facilitate easy and safe access to and maintenance and replacement of any part.

.6 In every place where there is indicated space reserved for future or other equipment, leave such space clear, and install services so that necessary installation and connections can be made for any such apparatus. Obtain instructions whenever necessary for this purpose.

.7 Relocate equipment and/or material installed but not co-ordinated with work of other Sections as directed, without extra charge.

.8 Where drawings are done in metric and product not available in metric, the corresponding imperial trade size shall be utilized.

1.7 INTERFERENCE AND CO-ORDINATION DRAWINGS

.1 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the constructed spaces provided.

.2 Prepare drawings to indicate co-ordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus, and connections are co-ordinated.

.3 Ensure that clearances required by jurisdictional authorities and clearances for proper maintenance are indicated on drawings.

.4 Upon consultant’s request submit copies of interference drawings to the consultant.

.5 Due to the nature of the building and the complexity of the building systems provide the following:

.1 Interference drawings, showing coordination of architectural, structural, mechanical, and electrical systems for the consultant's review prior to fabrication.

.2 Detailed equipment room drawings clearly showing all distribution equipment.

.3 Detailed layout drawings clearly showing conduit/feeder runs 78mm diameter or larger, including hangers or tray.

.6 Provide CAD drawings (minimum file version AutoCAD 2013) in addition to hard copies.

1.8 QUALITY ASSURANCE

.1 The installations of the division must conform to the latest edition of the Electrical Safety Code as well as its supplemental bulletins and instructions. Provide materials and labour necessary to comply with rules, regulations, and ordinances.

.2 Complete underground systems in accordance with CSA C22.3 No. 7-94 except where specified otherwise.

.3 Abbreviations for electrical terms: to CSA Z85-1983.

.4 In case of differences between building codes, provincial laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify consultant in writing of such differences.

1.9 ALTERNATES AND SUBSTITUTIONS

.1 Throughout these sections are lists of "Alternate Equipment" manufacturers acceptable to consultant if their product meets characteristics of specified described equipment.

.2 Each bidder may elect to use "Alternate Equipment" from lists of Alternates where listed. Include for any additional costs to suit Alternated used. Prices are not required in Tender for Alternates listed except where specifically noted as "Separate Price". Complete the Supplementary Tender Form.

.3 When two or more suppliers/manufacturers are named in the Bid Documents, only one supplier/manufacturer of the products named will be acceptable; however, it is the responsibility of this Division to ensure "Alternate Equipment" fits space allocated and gives performance specified. If an "Alternate Equipment" unit is proposed and does not fit space allotted nor equal specified product in consultant's opinion, supply of specified described equipment will be required without change in Contract amount. Only manufacturers listed will be accepted for their product listing. All other manufacturers shall be quoted as substitution stating conditions and credit amount.

.4 If item of material specified is unobtainable, state in Tender proposed substitute and amount added or deducted for its use. Extra monies will not be paid for substitutions after Contract has been awarded.

1.10 EXAMINATION

.1 Site Reviews

.1 Examine premises to understand conditions, which may affect performance of work of this Division before submitting proposals for this work.

.2 No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

.2 Drawings

.1 Electrical Drawings show general arrangement of fixtures, power devices, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.

.2 Consider Architectural, Mechanical, and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Electrical Drawings.

.3 Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories, which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings and accessories required to meet conditions.

.3 Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.

1.11 SEQUENCING AND SCHEDULING

.1 It is understood that while Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for installation of systems according to the true intent and meaning of Contract Documents. Anything not clear or in conflict will be explained by making application to consultant. Should conditions arise where certain changes would be advisable, secure consultant's approval of these changes before proceeding with work.

.2 Coordinate work of various trades in installing interrelated work. Before installation of electrical items, make proper provision to avoid interferences in a manner approved by consultant. Changes required in work specified in these sections caused by neglect to do so shall be made at no cost to owner.

.3 Arrange fixtures, conduit, ducts, and equipment to permit ready access to junction boxes, starters, motors, control components, and to clear openings of doors and access panels.

.4 Furnish and install inserts and supports required by these sections unless otherwise noted. Furnish sleeves, inserts, supports, and equipment that are an integral part of other Divisions of the Work to Sections involved in sufficient time to be built into construction as the Work proceeds. Locate these items and see that they are properly installed. Expense resulting from improper location or installation of items above shall be borne by the electrical trade.

.5 Adjust locations of ducts, conduits, equipment, fixtures, etc., to accommodate work from interferences anticipated and encountered. Determine exact route and location of each conduit and duct prior to installation.

.1 Make offsets, transitions, and changes in direction of ducts, and electrical raceways as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.

.2 Supply and install pull boxes, etc., as required to affect these offsets, transitions, and changes in direction.

1.12 REQUEST FOR INFORMATION (RFI) PROCEDURES

.1 RFIs shall be submitted to the consultant minimum two (2) weeks prior to answer being required. Failure to submit and RFI in a timely manner will forfeit delay claims and schedule extension requests by the contractor.

.2 All RFIs will be submitted with the following information:

.1 RFI number

.2 Name of project

.3 Date of initiation

.4 Date response required by (minimum two (2) weeks)

.5 Subject

.6 Submitter’s name

.7 Drawing/specification reference

.8 Photograph of the issue (if applicable)

.9 Description of the issue

.10 Contractor’s proposed resolution

1.13 DRAW BREAKDOWN

.1 This contractor MUST submit a breakdown of the tender price into classifications to the satisfaction of the consultant, with the aggregate of the breakdown totaling the total contract amount. **Each item must be broken out into material and labour costs.** Progress claims, when submitted are to be itemized against each item of the draw breakdown. This shall be done in table form showing contract amount, amount this draw, total to date, % complete and balance.

.2 Breakdown shall be as follows:

.1 Permits and fees
.2 Mobilization (maximum 1%)
.3 Demolition
.4 Panelboards and miscellaneous distribution equipment
.5 Feeder conduits
.6 Branch conduits
.7 Feeder cables
.8 Branch wiring
.9 Lighting fixtures (interior)
.10 Emergency lighting
.11 Fire alarm system verification
.12 Starters, contactors, and control devices
.13 Wiring for mechanical equipment
.14 Commissioning (minimum 3%)
.15 Electrical contractor closeout requirements (minimum of 3% but not less than $3,000.00)

.3 The breakdown must be approved by the consultant prior to submission of the first draw.

.4 Breakdowns not complying to the above will not be approved.

.5 Breakdown must indicate total contract amount.

.6 Mobilization amount may only be drawn when all required shop drawings have been reviewed by the consultant.

1.14 SHOP DRAWINGS AND PRODUCT DATA

.1 General

.1 Furnish complete catalog data for manufactured items of equipment to be used in the work to consultant for review within 14 days after award of Contract.
.2 Upon receipt of reviewed shop drawing, product is to be ordered immediately.
.3 Provide a complete list of shop drawings to be submitted prior to first submission.
.4 Before submitting to the consultant, review all shop drawings to verify that the products illustrated therein conform to the Contract Documents. By this review, the contractor agrees that it has determined and verified all field dimensions, field construction criteria, materials, catalogue numbers, and similar data and that it has checked and coordinated each shop drawing with the requirements of the work and of the Contract Documents. The contractor's review of each shop drawings shall be indicated by stamp, date and signature of a qualified and responsible person possessing by the appropriate authorization.
.5 If material or equipment is not as specified or submittal is not complete, it will be rejected by consultant.

.6 Additional shop drawings required by the contractor for maintenance manuals, site copies etc., shall be photocopies of the "reviewed" shop drawings. All costs to provide additional copies of shop drawings shall be borne by the contractor.

.7 **Submit all shop drawings for the project as a package. Partial submittals will not be accepted**.

.8 Catalog data or shop drawings for equipment, which are noted as being reviewed by consultant or his engineer shall not supersede Contract Documents.

.9 Review comments of consultant shall not relieve this Division from responsibility for deviations from Contract Documents unless consultant's attention has been called to such deviations in writing at time of submission, nor shall they relieve this Division from responsibility for errors in items submitted.

.10 Check work described by catalog data with Contract Documents for deviations and errors.

.11 Shop drawings and product data shall show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances. e.g. access door swing spaces.

.12 Shop drawings and product data shall be accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Manufacturer test data where requested.

.3 Manufacturer to certify as to current model production.

.4 Certification of compliance to applicable codes.

.13 State sizes, capacities, brand names, motor HP, accessories, materials, gauges, dimensions, and other pertinent information. List on catalog covers page numbers of submitted items. Underline applicable data.

.14 If a shop drawing is returned "reviewed as noted" this contractor must provide written indication that the comments have been complied with.

.15 A partial list of shop drawings includes:

.1 Panelboards and transformers

.2 Luminaires and drivers

.3 Emergency battery units, exit signs, and fixtures

.4 Starters, contactors, and control devices

.5 Firestopping materials

.6 Surface raceways

.7 Wiring devices

.8 Lighting controls

.9 Co-ordination study and arc flash hazard analysis

.2 Submissions shall be submitted electronically as per the following directions:

.1 Electronic Submissions:

.1 Electronically submitted shop drawings shall be prepared as follows:

.1 Use latest software to generate PDF files of submission sheets.

.2 Scanned legible PDF sheets are acceptable. Image files are not acceptable.

.3 PDF format shall be of sufficient resolution to clearly show the finest detail.

.4 PDF page size shall be standardized for printing to letter size (8.5"x11"), portrait with no additional formatting required by the consultant. Submissions requiring larger detail sheets shall not exceed 11"x17".

.5 Submissions shall contain multiple files according to section names as they appear in Specification.

.6 File names shall include consultant project number and description of shop drawing section submitted.

.7 Each submission shall contain an index sheet listing the products submitted, indexed in the same order as they appear in the Specification. Include associated PDF file name for each section.

.8 On the shop drawing use an “electronic mark” to indicate what is being provided.

.9 **Each file shall bear an electronic representation of the “company stamp” of the contractor. If not stamped the file submission will not be reviewed.**

.2 Email submissions shall include subject line to clearly identify the consultants’ project number and the description of the shop drawings submitted.

.3 Electronic attachments via email shall not exceed 10MB. For submissions larger than 10MB, multiple email messages shall be used. Denote related email messages by indicating “1 of 2” and “2 of 2” in email subject line for the case of two messages.

.4 Electronic attachments via web links (URL) shall directly reference PDF files. Provide necessary access credentials within link or as username/password clearly identified within body of email message.

.5 On site, provide one (1) copy of the “reviewed” shop drawings in a binder as noted above.

.6 Contractor to print copies of “reviewed” shop drawings and compile into maintenance manuals in accordance with requirements detailed in this section.

1.15 CARE, OPERATION AND START-UP

.1 Instruct consultant and operating personnel in the operation, care and maintenance of equipment.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation and ensure that operating personnel are conversant with all aspects of its care and operation.

1.16 VOLTAGE RATINGS

.1 Operating voltages: to CAN3-C235-83.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.17 PERMITS, FEES, AND INSPECTION

.1 A submission has been made (if required by this scope of project) by the consultant to the Electrical Safety Authority for review of this project. The payment of the required review costs will be co-ordinated by the consultant. A copy of the Electrical Safety Authority review report will be forwarded to the successful contractor for information and action.

.2 The contractor is required to include in his tender all required inspection costs by the Electrical Safety Authority. Permit application is the responsibility of the contractor.

.3 Reproduce drawings and specifications required by Electrical Safety Authority at no cost.

.4 Notify consultant of changes required by Electrical Safety Authority prior to making changes.

.5 Furnish Certificates of Acceptance to consultant from Electrical Safety Authority and other authorities having jurisdiction upon completion of work.

.6 This contractor must furnish any certificates required to indicate that the work completed conforms with laws and regulations of authorities having jurisdiction.

1.18 ADDITIONAL INSTALLED EQUIPMENT

.1 The electrical contractor is to review all specification sections forming part of the electrical bid documents and include additional equipment or components, as well as all associated installation costs and testing costs as noted, in the electrical bid price.

1.19 MATERIALS AND EQUIPMENT

.1 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Safety Authority.

.2 Factory assemble control panels and component assemblies.

1.20 ELECTRIC MOTORS, EQUIPMENT, AND CONTROLS

.1 Supplier and installer responsibility is indicated in the Equipment Wiring Schedule on electrical drawings.

.2 Control wiring and conduit is specified in the Electrical specifications except for conduit, wiring and connections below 50 V, which are related to control systems specified in the Mechanical specifications.

1.21 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor electrical equipment "equipment green" finish.

.2 Paint indoor switchgear and distribution enclosures light grey.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks, fastenings, and conduits etc. to prevent rusting.

1.22 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.2 Nameplates:

.1 Lamicoid 3 mm (1/8") thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

NAMEPLATE SIZES

Size 1	9 mm x 50 mm (3/8" x 2")	1 line	3 mm (1/8") high letters
Size 2	12 mm x 70 mm (1/2" x 2 1/2")	1 line	5 mm (3/16") high letters
Size 3	12 mm x 70 mm (1/2" x 2 1/2")	2 lines	3 mm (1/8") high letters
Size 4	20 mm x 90 mm (3/4" x 3 1/2")	1 line	9 mm (3/8") high letters
Size 5	20 mm x 90 mm (3/4" x 3 1/2")	2 lines	5 mm (3/16") high letters
Size 6	25 mm x 100 mm (1" x 4")	1 line	12 mm (1/2") high letters
Size 7	25 mm x 100 mm (1" x 4")	2 lines	6 mm (1/4") high letters

.3 Wording on nameplates labels to be approved by consultant prior to manufacture.

.4 Allow for average of twenty-five (25) letters per nameplate.

.5 Identification to be English.

.6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.7 Nameplates for disconnects, starters and contactors must indicate equipment being controlled and voltage.

.8 Nameplates for transformers must indicate transformer label as indicated and capacity, primary, and secondary voltages.

1.23 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour code: to CSA C22.1.

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

1.24 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m (45') intervals.

.3 Colour bands must be 25 mm (1") wide.

	Prime
Up to 208 V	yellow
209 to 600 V	white
Voice system	green
Data system	orange
Security	brown
Public address	black
Cable TV	blue
Fire alarm	red

.4 This contractor must paint all system junction boxes and covers in conformance with the above schedule.

1.25 PROTECTION OF OPENINGS

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

1.26 WIRING TERMINATIONS

.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.27 MANUFACTURERS AND CSA LABELS

.1 All labels must be visible and legible after equipment is installed.

1.28 WARNING SIGNS

.1 To meet requirements of Electrical Safety Authority and consultant.

.2 Provide porcelain enamel signs, with a minimum size of 175 mm x 250 mm (7" x 10").

1.29 LOCATION OF OUTLETS

.1 Do not install outlets back-to-back in wall; allow minimum 150 mm (6") horizontal clearance between boxes.

.2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3 m (10'), and information is given before installation.

.3 Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

1.30 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise. Coordinate with block coursing (if applicable).

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.

.1 Local switches: 1100 mm (43.3").

.2 Wall receptacles:

.1 General: 400 mm (16").

.2 Above top of continuous baseboard heater: 200 mm (8").

.3 Above top of counters or counter splash backs: 100 mm (4").

.4 In mechanical rooms: 1200 mm (48").

.3 Panelboards: as required by Code or 1400 mm (56").

.4 Voice/Data outlets: At height of adjacent outlet or at 400 mm (16").

.5 Fire alarm stations: 1200 mm (3'-11").

.6 Fire alarm visual and signal devices: 2250 mm (88 ½").

.7 Television outlets: 400 mm (16").

.8 Thermostat: 1200 mm (3'-11").

.9 Clocks: 2100 mm (84").

.10 Heaters: 200 mm (8" AFF) to bottom of heater.

.11 Emergency call switches and/or pushbuttons: 900 mm (36").

1.31 LOAD BALANCE

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Submit, at completion of work, report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

1.32 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete shall be schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm (2") beyond either side.

.2 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

1.33 FIELD QUALITY CONTROL

.1 Conduct and pay for following tests:

.1 Power distribution system including phasing, voltage, grounding, and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Lighting and its control.

.4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.5 Systems: fire alarm system, communications, security.

.2 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.

.3 Insulation resistance testing.

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing.

.4 Carry out tests in presence of consultant.

.5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.6 Submit test results for consultant's review.

1.34 EQUIPMENT NAMEPLATE DATA

.1 Refer to the Equipment Wiring Schedule, Distribution Diagram(s) and Panel Schedules for information regarding the designed electrical connections for all equipment to be connected to the electrical distribution system.

.2 Refer to the shop drawing submissions of all project divisions and coordinate with all trades and equipment manufacturers throughout the construction period for equipment connection requirements.

.3 This electrical trade shall be responsible to coordinate any discrepancies on equipment minimum circuit ampacity, maximum overcurrent protection, voltage and phase, between the equipment manufacturer published literature, the equipment shop drawing submission, the project design drawings equipment wiring schedule, and the nameplate data on the equipment. The contractors installing and connecting all equipment shall be responsible for the coordination of this data through the construction period.

.4 Equipment shall not be connected where the specified maximum overcurrent protection and minimum circuit ampacity values do not meet the requirements of the equipment nameplate data on site.

.5 Electrical distribution equipment shop drawings shall not be submitted prior to approval of equipment to be connected including, but not limited to, mechanical units, pumps, elevators, etc. Electrical distribution equipment shall not be released into production until all connected equipment requirements are confirmed and included in approved shop drawings.

.6 Where nameplate data of equipment on site varies from that data listed in the approved equipment shop drawings, the consultant shall be notified in writing, and the equipment shall not be connected until the equipment connection details are confirmed. The final installation must meet the nameplate data of the equipment on site.

.7 No subsequent allowance for time or money for changes to breakers, wiring and conduit, or equipment sizes will be considered for any consequence related to failure by the electrical trade to coordinate final equipment connection requirements with nameplate data and electrical distribution equipment shop drawings.

1.35 CO-ORDINATION OF PROTECTIVE DEVICES

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

.2 Electrical connections to all equipment requiring connection to the electrical distribution system as part of this electrical tender have been specified according to the anticipated equipment manufacturer electrical requirements and the applicable sections of the OESC. This contractor must coordinate electrical connections to all equipment specified to be connected as part of this electrical tender.

.3 Prior to submitting electrical distribution shop drawings to the consultant, review all shop drawings for all equipment specified for connection to the electrical distribution system to verify that the product electrical connection requirements listed by the manufacturer conform to the equipment electrical connections specified on the electrical design drawings and specifications. Make necessary revisions to breaker ratings associated with the review of all product shop drawings and identify such changes as part of the electrical distribution equipment shop drawing submission.

.4 Prior to making final equipment connections, this electrical contractor shall examine equipment nameplates at the project site to confirm voltage and phase requirements, minimum circuit ampacity and maximum overcurrent protection values, and bring to the attention of the consultant in writing any connection requirements which may vary from the designed connections or approved electrical distribution shop drawings. No subsequent allowance for time or money for changes to breaker or wire and conduit sizes will be considered for any consequence related to failure to examine site conditions.

1.36 GUARANTEE AND WARRANTY

.1 At ready for takeover of this project this Contractor must provide a written guarantee indicating that any defects, not due to ordinary wear and tear or improper use which occur within the first **TWO** years from the date of ready for takeover will be corrected at the contractor's expense.

.2 If the electrical sub-contractor's office is 50 kilometers (30 miles) or more from the project site, the sub-contractor is to provide a service/warranty work agreement for warranty period with a local electrical sub-contractor approved by consultant. Include copy of service/warranty agreement in warranty section of operation and maintenance manual.

.3 Warranty period shall start from date of ready for takeover completion.

.4 Refer to individual specification sections for information on any special manufacturer's equipment warranties.

1.37 SYSTEM START UP

.1 Provide consultant with written notice verifying all equipment operation and installation is complete prior to scheduled start-up period.

.2 Start up shall be in presence of the following: owner or representative, contractor, and manufacturer's representative. Each person shall witness and sign off each piece of equipment. Consultant's attendance will be determined by consultant.

.3 Arrange with all parties and provide 72 hours notice for start up procedure.

.4 Simulate system start up and shut down and verify operation of each piece of equipment.

.5 These tests are to demonstrate that the systems and equipment installed are operational as specified.

.6 The contractor must describe during the start up session the required maintenance for each piece of equipment according to the manufacturer.

.7 The contractor must provide all necessary tools (including a digital multimeter) to successfully complete the start up procedure.

1.38 OPERATION AND MAINTENANCE MANUAL

.1 Provide operation and maintenance data for incorporation into manual as specified in other Sections of this Division.

.2 Operation and maintenance manual to be approved by, and final copies deposited with, consultant before final inspection.

.1 Submit one (1) copy of Operation and Maintenance Manual to consultant for review and approval. Submission of individual data will not be accepted unless so directed by consultant. Submission can be done electronically in PDF format or as a hard copy.

.1 Electronic submission/PDF file is required to be bookmarked. Any submission received without bookmarking will be immediately returned as unacceptable.

.2 Hard copy submission shall be in a three-ring binder (minimum 50 mm (2") ring) and labelled as 'Operation and Maintenance Manual' with project name and location. Dividers are to be used for binder organization.

.2 Make changes as required and re-submit as directed by consultant.

.3 Each manual must include (in "tabbed" sections) the following:

.1 Index

.2 List of General, Mechanical, Electrical Contractors and all associated sub-contractor names, addresses and contact numbers.

.3 List of suppliers and equipment wholesalers local to the project.

.4 Letter of contractor's warranty and guarantee for all parts, equipment and workmanship.

.5 WRDSB Project Asset and Warranty Card for all assets replaced, newly installed, and removed.

.6 List of manufacturers, spare parts list and source.

.7 Copy of typewritten schedules for all new and renovated panels.

.8 Copy of all substantial performance final certificates.

.9 Copy of electrical shop drawings which have been stamped and reviewed by consultant.

.10 Electrical As-built drawings including contractor company's as built stamp.

.11 Coordination study/Arc flash hazard study shop drawings

.12 Any special warranties on equipment required (i.e. LED lighting, digital lighting control).

.13 System commissioning certificate and report.

.4 Final Submittals:

.1 Upon acceptance of Operation and Maintenance Manual by the consultant, provide the following:

.1 Provide two (2) copies of final Operation and Maintenance Manuals, as well as a PDF file of the entire approved manual on a USB stick. Only one (1) USB stick is to be provided containing both the approved manual and as-built drawings.

1.39 AS-BUILT DRAWINGS

.1 Site records:

.1 Contractor shall provide two (2) sets of reproducible electrical drawings. Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include field and contract changes to electrical systems.

.2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection at all times.

.2 As-built drawings submittal for review:

.1 Identify **each drawing** in lower right-hand corner in letters at least 3 mm (1/8") high as follows: - "AS-BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW ELECTRICAL SYSTEMS AS INSTALLED" (Company Name) (Signature of Contractor) (date).

.2 Submit copy to consultant for approval. When returned, make corrections (if any) as directed.

.3 As-built drawings final submittal:

.1 Once approved, submit completed, reproducible paper as-built drawings as well as a scanned PDF file copy on USB stick with Operation and Maintenance Manuals.

1.40 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Manufacturers or their representatives are to provide demonstrations and instructions.

.3 Use operation and maintenance manual, As-built drawings, audio visual aids, etc. as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

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

1.41 READY FOR TAKEOVER

.1 Complete the following to the satisfaction of the consultant prior to request for ready for takeover.

.1 As-built Drawings

.2 Maintenance Manuals

.3 System Start up

.4 Instructions to Owners

.5 Coordination Study / Arc Flash Hazard (including photos of each breaker)

.6 Lighting Control System

.7 Outlet cover circuit labels

1.42 TRIAL USAGE

.1 Consultant or owner may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

1.43 REVISION TO CONTRACT

.1 Provide the following for each item in a given change notice:

.1 Itemized list of material with associated costs.

.2 Labour rate and itemized list of labour for each item.

.3 Copy of manufacturers/suppliers invoice if requested.

1.44 EQUIPMENT SUPPORTS

.1 Equipment supports supplied by equipment manufacturer: shall be installed by the electrical contractor.

.2 Equipment supports not supplied by equipment manufacturer: fabricate from structural grade steel meeting requirements of - Structural Steel Section. Submit structural calculations with shop drawings if necessary.

.3 Mount base mounted equipment on chamfered edge housekeeping pads, minimum of 100 mm (4") high and 150 mm (6") larger than equipment dimensions all around. This installation of this pad shall be the responsibility of the electrical contractor.

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

1.45 SLEEVES

.1 Pipe sleeves: at points where pipes pass through masonry, concrete, or fire rated assemblies and as indicated.

.2 Schedule 40 steel pipe.

.3 Sleeves with annular fin continuously welded at midpoint:

.1 Through foundation walls.

.2 Where sleeve extends above finished floor.

.4 Sizes: minimum 6 mm (1/4") clearance all around, between sleeve and conduit.

.5 Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25 mm (1") above other floors.

.6 Through foundation walls PVC sleeves are acceptable.

.7 Fill voids around pipes:

.1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof fire retardant non-hardening mastic.

.2 Where sleeves pass through walls or floors, provide space for firestopping. Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.

.3 Fill future-use sleeves with easily removable filler.

1.46 FIRESTOPPING

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

.2 Provide materials and systems capable of maintaining effective barrier against flame, smoke, and gases.

.3 Comply with the requirements of CAN4-S115-M35, and do not exceed opening sized for which they have been tested.

.4 Systems to have an F or FT rating (as applicable) not less than the fire protection rating required for closures in a fire separation.

.5 Provide “firewrap” blanket around services penetrating firewalls. Extent of blanket must correspond to ULC recommendations. In general wrap individual conduits with approved firewrap materials on each side of firewall. Refer to architectural drawings for FT ratings. Provide 1 and/or 2 layers of firewrap with transverse and longitudinal seams overlapped and/or butted (second layer offset from first layer). Cut edges are to be sealed with aluminum foil tape. Provide 50 mm stainless steel banding at 200 mm intervals. Install firewrap to manufacturers’ recommendations for proper FT rating. Acceptable manufacturers are 3M Firemaster ductwrap or approved equal.

.6 The firestopping materials are not to shrink, slump or sag and be free of asbestos, halogens and volatile solvents.

.7 Firestopping materials are to consist of a component sealant applied with a conventional caulking gun and trowel.

.8 Firestop materials are to be capable of receiving finish materials in those areas, which are exposed and scheduled to receive finishes.

.9 Firestopping shall be inspected and approved by local authority prior to concealment or enclosure.

.10 Install material and components in accordance with ULC certification, manufacturers instructions and local authority.

.11 Submit product literature and installation material on firestopping in shop drawing and product data manual.

.12 Acceptable manufacturers:

.1 Rectorseal Corporation (Metacaulk)

.2 Proset Systems

.3 3M

.4 Hilti

.5 STI Firestop

Note: Fire stop material must conform to requirements of local authorities having jurisdiction. Contractor to confirm prior to application and ensure material used is compatible with that used by other trades on site.

1.47 PAINTING

.1 Refer to Section Interior Painting and specified elsewhere.

.2 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.

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

.4 Restore to new condition, or replace equipment at discretion of consultant, finishes which have been damaged too extensively to be merely primed and touched up.

1.48 ACCESS DOORS

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

.2 Flush mounted 600 mm x 600 mm (24" x 24") for body entry and 300 mm x 300 mm (12" x 12") for hand entry unless otherwise noted. Doors to open 180º, have rounded safety corners, concealed hinges, screwdriver latches, and anchor straps.

.3 Material:

.1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by consultant.

.2 Remaining areas: use prime coated steel.

.3 Fire rated areas: provide ULC listed access doors

.4 Installation:

.1 Locate so that concealed items are accessible.

.2 Locate so that hand or body entry (as applicable) is achieved.

.3 Installation is specified in applicable sections.

.5 Acceptable materials:

.1 Le Hage

.2 Zurn

.3 Acudor

.4 Nailor Industries Inc.

1.49 DELIVERY, STORAGE, AND HANDLING

.1 Follow Manufacturer's directions in delivery, storage, and protection, of equipment and materials. Contractor to include all costs associated with delivery storage and handling in tender price.

.2 Deliver equipment and material to site and tightly cover and protect against dirt, water, and chemical or mechanical injury, but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in dry, heated space.

1.50 REPAIR, CUTTING, CORING, AND RESTORATION

.1 Be responsible for required digging, cutting, and patching incident to work of this Division and make required repairs afterwards to satisfaction of consultant. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.

.2 Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.

.3 Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.

.4 Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.

.5 Slots, cores and openings through floors, walls, ceilings, and roofs shall be provided by this contractor but performed by a trade specializing in this type of work. This Division shall see that they are properly located and do any cutting and patching caused by its neglect to do so.

1.51 EXISTING SYSTEMS

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

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

1.52 CLEANING

.1 Clean interior and exterior of all electrical equipment provided including light fixture lenses.

.2 In preparation for final acceptance, clean and refurbish all equipment and leave in operating condition.

1.53 DISCONNECTION AND REMOVAL

.1 Disconnect and/or remove equipment as indicated.

.2 Cap and conceal all redundant and obsolete connections.

.3 Provide a list of equipment to be removed to the owner, for his acceptance of same. Remove all equipment from site, which the owner does not retain.

.4 Store equipment to be retained by owner on site where directed by consultant.

1.54 OWNER SUPPLIED EQUIPMENT

.1 Connect to equipment supplied by the owner and make operable.

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

1.55 ENCLOSURES

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

Part 2 Not Used

Part 3 Not Used

END OF SECTION

Part 1 General

1.1 GENERAL PROVISIONS

.1 Conform to the General Provisions of Division 1 and Electrical General Requirements Section.

.2 This project is one of a retrofit nature in part, and which will require extensive demolition.

.3 Allow for all remedial work in areas indicated on the drawings and as generally defined in the relevant sections of the specifications.

1.2 SCOPE OF WORK

.1 The scope of work is essentially the selected disconnection and/or removal of services and/or equipment, devices etc. as indicated or required to complete the work.

Part 2 Products

2.1 GENERAL

.1 This Division is to liaise with the Owners or Consultant for equipment being removed that may be suitable for reuse to that specified or handed over to the owner.

.2 This Division to take full responsibility for any special tools or equipment required to disassemble or remove material from building.

Part 3 Execution

3.1 GENERAL

.1 The general requirements are indicated on the drawings and on the outline specification in Division 1.

.2 The general execution of the demolition is to be carried out in a clean and efficient manner.

.3 Demolition of existing ceiling, walls etc., to facilitate removal of existing services or equipment or installation of new to be kept to a minimum and then restored to match existing.

.4 All openings or holes created by removal of existing electrical systems which are not being reused are to be patched with the same material surrounding surfaces.

.5 All new holes and openings to facilitate electrical systems are to be patched to match surrounding surfaces.

.6 Protect all existing furnishings materials and equipment. Any damage occurring as a result of the work of this Division shall be repaired or replaced at the expense of this Division.

.7 Where work involves breaking into or connecting to existing services, carry out work at times directed by the Owners in an expedient manner with minimum disruption to the facility and systems downtime.

.8 Where unknown services are encountered immediately advise Consultant and confirm findings in writing.

.9 Where the location of any services has been shown on the plans, such information is not guaranteed. It is this Division's responsibility to verify locations, etc., immediately after moving on site. Should for any reason the information obtained necessitates changes in procedure or design, advise the Consultant at once. If verification of existing conditions is not done at the outset and any problems arise, the responsibility for same is entirely this Division's.

.10 Disconnect and/or remove equipment, devices, cabling, services, etc. as indicated.

.11 Remove all redundant and obsolete systems, connections, and wiring.

.12 Provide a list of equipment to be removed to the owner, for their acceptance of same. Remove all equipment from site that the owner does not retain.

.13 Maintain equipment to be retained by owner on site where directed by consultant.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This Section covers items common to Electrical Division 26, as well as Division 27 and Division 28.

.2 This section supplements requirements of Division 1.

1.2 OCCUPANCY REQUIREMENTS

.1 The contractor shall provide the following documentation to the consultant's satisfaction prior to receiving occupancy. Failure to provide the proper documentation will result in the occupancy not being granted. List of required documentation:

.1 Final Certificates (required prior to consultant's release of conformance letter).

.1 Electrical Safety Authority.

.2 Emergency Lighting.

.3 Fire Alarm Verification Certificate.

Part 2 Not Used

Part 3 Not Used

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA C22.2 No.0.3-92, Test Methods for Electrical Wires and Cables.

.2 CAN/CSA-C22.2 No.131-M89(R1994), Type TECK 90 Cable.

.3 CAN/ULC S319 (latest edition), Standard for Fire Test for Circuit Integrity of Fire-Resistive Power, Instrumentation, Control, and Data Cables.

.4 CSA C22.2 No. 123 (latest edition), Metal Sheathed Cables.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger.

.2 Minimum size: 12 AWG.

.3 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material 90°C (194ºF) rated T90 for indoor above grade installations and RW90 for below grade installations.

2.2 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No.131.

.2 Conductors:

- .1 Grounding conductor: Copper.
- .2 Circuit conductors: Copper, size as indicated.

.3 Inner jacket: Polyvinyl chloride material.

.4 Armour: Aluminum.

.5 Overall covering: Polyvinyl chloride material.

.6 Fastenings:

- .1 One hole steel zinc straps to secure surface cables 50 mm (2") and smaller. Two-hole steel straps for cables larger than 50 mm (2").
- .2 Channel type supports for two or more cables at 1500 mm (60") centres.
- .3 Threaded rods: 6 mm (1/4") diameter to support suspended channels.

.7 Connectors must be suitable for:

- .1 Installed environment and approved for use with TECK cable.

2.3 ARMOURED CABLES

.1 Conductors: insulated, copper minimum size as indicated above.

.2 Type: AC90 (minimum size 12 AWG).

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Connectors must be suitable for installed environment and approved for use with armoured cable.

2.4 FIRE RATED CABLES

.1 Cable: to CAN/ULC S319 and CSA C22.2 No. 123.

.2 Conductors: insulated, copper minimum size as indicated above.

.3 Type: Fire-resistive 2-hour certified cable MC/RC90 or Mineral Insulted type MI (minimum size 12 AWG unless otherwise noted).

.4 Armour MC/RC90: Seamless, smooth metal sheath, or seamless, corrugated metal sheath applied over one or more insulated conductors.

.5 Armour MI: Magnesium oxide powder copper sheath applied over one or more insulated conductors, corrosion resistant.

.6 Connectors must be suitable for installed environment and approved for use with fire rated cable type.

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring from source to load through raceways as specified.

.2 Provide separate neutral conductors for all lighting circuits and circuits originating from surge protected panels. Size raceways accordingly.

3.2 INSTALLATION OF TECK CABLE 0 - 1000 V

.1 Group cables wherever possible on channels.

.2 Terminate cables in accordance with Wire and Box Connectors - 0 - 1000 V Section.

3.3 INSTALLATION OF FIRE RATED CABLES

.1 Group cables wherever possible.

.2 Terminate cables in accordance with manufacturer’s recommended installation instructions.

.3 Cables are to be installed as a single continuous run to maintain fire rating integrity.

.4 Support cables horizontally or vertically every 1219 mm (48") intervals and on each side of a bend.

.5 Provide thermoplastic barrier at all mounting locations as per manufacturer’s installation instructions.

3.4 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

.2 Terminate cables in accordance with Wire and Box Connectors - 0 - 1000 V Section.

.3 These cables are to be installed in concealed locations only. These concealed locations are considered to be stud walls and “drops” to stud walls, lighting fixtures, and ceiling mounted devices.

.4 These “drops” shall not be permitted to exceed 2.4 m (8'-0"). To limit these “drops” to lengths noted above provide additional branch wiring in conduit.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data for cabinets in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 MATERIALS

.1 Splitters must conform to CSA C22.2 No. 76 (latest edition).

.2 Junction and pull boxes must conform to CSA C22.2 No. 40 (latest edition)

2.2 SPLITTERS

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 At least three spare terminals on each set of lugs in splitters less than 400 A.

.4 Splitter length must match arrangement of equipment unless indicated otherwise.

2.3 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm (1") minimum extension all around, for flush-mounted pull and junction boxes.

Part 3 Execution

3.1 SPLITTER INSTALLATION

.1 Install splitters and mount plumb, true and square to the building lines on 21 mm (3/4") painted plywood backboards.

3.2 JUNCTION AND PULL BOXES INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Install junction and pull boxes so as not to exceed 30 m (100') of conduit run between pull boxes and in conformance with the Electrical Safety Code.

3.3 IDENTIFICATION

.1 Provide equipment identification in accordance with General Electrical Requirements Section.

.2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Outlet boxes, conduit boxes, and fittings must conform to CSA C22.2 No. 18 (latest edition).

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm (4") square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 347 V outlet boxes for 347 V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 mm x 50 mm x 64 mm (3" x 2" x 2½") or as indicated. 102 mm (4") square outlet boxes when more than one conduit enters one side with extension and plaster rings as required. Iberville 1104 Series.

.2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit **in utility rooms**, minimum size 102 mm x 57 mm x 38 mm (4" x 2¼" x 1½"). Iberville 1110 Series.

.3 102 mm (4") square or octagonal outlet boxes for lighting fixture outlets.

.4 102 mm (4") square outlet boxes with extension and plaster rings for flush mounting devices in finished tile walls.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

.1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 FLOOR BOXES

.1 Flush floor boxes where indicated shall be complete with the following features:

2.6 CONDUIT BOXES

.1 Cast FS or FD feraloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle **in areas (other than utility rooms) where surface conduit is used.**

2.7 FITTINGS- GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 32 mm (1- 1/4") and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm (1/4") of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

.5 Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA C22.2 No.65-1956(R1965) Wire Connectors.

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as indicated.

.2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Clamps or connectors for armoured cable, mineral insulated cable, and flexible conduit, as required.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

- .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
- .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
- .3 Install fixture type connectors and tighten. Replace insulating cap.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

- .1 CAN/CSA C22.2 No.18-92, Outlet Boxes, Conduit Boxes, and Fittings.
- .2 CSA C22.2 No.45-M1981(R1992), Rigid Metal Conduit.
- .3 CSA C22.2 No.56-1977(R1977), Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No.83-M1985(R1992), Electrical Metallic Tubing.
- .5 CSA C22.2 No.211.2-M1984(R1992), Rigid PVC (Unplasticized) Conduit.
- .6 CAN/CSA C22.2 No.227.1, Nema TC-13, Flexible Nonmetallic Tubing.

Part 2 Products

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No.45, aluminum threaded.

.2 Epoxy coated conduit: to CSA C22.2 No.45, with zinc coating and corrosion resistant epoxy finish inside and outside.

.3 Electrical metallic tubing (EMT) with couplings: to CSA C22.2 No.83.

.4 Rigid PVC conduit: to CSA C22.2 No.211.2.

.5 Flexible metal conduit: to CSA C22.2 No.56, aluminum and liquid-tight flexible metal.

.6 Flexible PVC conduit: to CAN/CSA C22.2 No.227.1 and Nema TC-13, Electrical nonmetallic tubing (ENT).

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 53 mm (2") and smaller. Two hole steel straps for conduits larger than 53 mm (2").

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 1.5 m (5'-0") oc.

.4 Threaded rods, 6 mm (1/4") diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

.1 EMT fittings shall be set screw style (zinc alloy).

.2 Flexible metal conduit fittings shall be screw-in type.

.3 Liquid type flexible metal conduit fittings shall be sealtite type.

.4 PVC fittings shall be PVC type complete with PVC adaptors at all boxes.

.5 Rigid conduit and mineral insulated conduit fittings shall be threaded type.

.6 Coating: same as conduit.

.7 Factory "ells" where 90° bends are required for 27 mm (1") and larger conduits.

.8 Where bushings are noted to be provided they must be “screwed” type fastened to a conduit connector. Push-fit or glued in place bushings will NOT be accepted.

2.4 FISH CORD

.1 Nylon twine.

Part 3 Execution

3.1 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical/ electrical service rooms and in unfinished areas.

.3 Where devices are to be installed on existing walls in finished area, which cannot be “fished”, install feeds in a surface metal raceway equal to Wiremold V700 series. Coordinate surface installations with Consultant prior to rough-in, unless otherwise noted.

.4 Use electrical metallic tubing (EMT) for all branch circuits unless specified otherwise.

.5 Electrical nonmetallic tubing (ENT) may be used only for branch circuits in non-combustible buildings, in framed wall construction for residential suites, within block walls, and in precast or cast in place walls and floors. **Use of ENT for direct burial, plenum ceilings, or outdoor environments will not be accepted.**

.6 Use rigid aluminum threaded conduit where specified and up to 2.1 m (7'-0") above finish floor where exposed to mechanical injury.

.7 Use rigid PVC conduit underground and in kitchen areas.

.8 Use flexible metal conduit for connection to motors in dry areas, connection to recessed fixtures without a prewired outlet box, connection to surface or recessed fixtures, work in movable metal partitions.

.9 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations and for connections to kitchen equipment.

.10 Conduits terminating at electrical equipment in sprinklered areas are to be provided rain-tight insulated compression style connectors.

.11 **Minimum conduit size for branch circuits shall be 21 mm (3/4").** Single drops from ceiling mounted junction boxes down to a light switch or duplex receptacle may be reduced to 16 mm (½").

.12 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.13 Mechanically bend steel conduit over 27 mm (1") diameter.

.14 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.15 Install fish cord in empty conduits.

.16 Run 2- 27 mm (1") spare conduits up to accessible ceiling space from each flush panel. Terminate these conduits in 152 mm x 152 mm x 102 mm (6" x 6" x 4") junction boxes in ceiling space.

.17 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.18 Dry conduits out before installing wire.

.19 Do not install, store, or handle ENT in cold temperatures below -20°C(-4°F). Do not store ENT outside.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m (5') clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended or surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm (3") parallel to steam or hot water lines with minimum of 25 mm (1") at crossovers.

.7 Do not fasten surface conduit to roof deck. Provide standoffs or supports as manufactured by Caddy or use unistrut trapeze fastened to structure.

3.3 CONCEALED CONDUITS

.1 Do not install horizontal runs in masonry walls.

.2 Do not install conduits in terrazzo or concrete toppings.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The studies must be submitted to the Consultant prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment for manufacturing. If formal completion of the studies may cause delay in equipment manufacturing, approval from the Consultant may be obtained for a preliminary submittal of sufficient study data to ensure that the selection of device ratings and characteristics will be satisfactory.

.2 The studies shall include all portions of the electrical distribution system from the normal power source or sources down to and including the smallest adjustable trip circuit breaker in the distribution system, **as well as mechanical unit equipment.** Normal system connections and those, which result in maximum fault conditions, shall be adequately covered in the study.

.3 The firm should be currently involved in high- and low-voltage power system evaluation. The study must be performed, stamped and signed by a registered professional engineer in the Province of Ontario. Credentials of the individual(s) performing the study and background of the firm shall be submitted to the Consultant for approval prior to start of the work. A minimum of five (5) years experience in power system analysis is required for the individual in charge of the project.

.4 The firm performing the study should demonstrate capability and experience to provide assistance during start up as required.

1.2 DATA COLLECTION FOR THE STUDY

.1 The Contractor shall provide the required data for preparation of the studies. The Consultant performing the system studies shall furnish the Contractor with a listing of the required data immediately after award of the contract.

.2 The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to release of the equipment for manufacturing.

.3 Data collected for the study, including correspondence with local utility, shall be included with study report.

Part 2 Products

2.1 SHORT CIRCUIT AND PROTECTIVE DEVICE EVALUATION AND COORDINATION STUDY

.1 The short-circuit study shall be performed with the aid of a digital computer program and shall be in accordance with the latest applicable IEEE and ANSI standards.

.2 In the short-circuit study, provide calculation methods and assumptions, the base per unit quantities selected, one-line diagrams, source impedance data including power company system characteristics, typical calculations, tabulations of calculation quantities and results, conclusions, and recommendations. Calculate short-circuit interrupting and momentary (when applicable) duties for an assumed 3-phase bolted fault at each supply switchgear lineup, unit substation primary and secondary terminals, low-voltage switchgear lineup, switchboard, motor control center, distribution panelboard, pertinent branch circuit panelboard, and other significant overcurrent protective device locations throughout the system. Provide a ground fault current study for the same system areas, including the associated zero sequence impedance data. Include in tabulations fault impedance, X to R ratios, asymmetry factors, motor fault contribution, short circuit kVA, and symmetrical and asymmetrical fault currents.

.3 In the protective device coordination study, provide time-current curves graphically indicating the coordination proposed for the system, centered on conventional, full-size, log-log forms. Include with each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered by that particular curve sheet. Include a detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics. Tabulate recommended device tap, time dial, pickup, instantaneous, and time delay settings.

.4 Include on the curve sheets power company relay and fuse characteristics, medium-voltage equipment protective relay and fuse characteristics, low-voltage equipment circuit breaker trip device characteristics, pertinent transformer characteristics, pertinent motor and generator characteristics, and characteristics of other system load protective devices. In addition, include all devices down to the largest branch circuit and largest feeder circuit breaker in each motor control center, and main breaker in branch panelboards.

Include all adjustable settings for ground fault protective devices. Include manufacturing tolerance and damage bands in plotted fuse characteristics. Show transformer full load currents, transformer magnetizing inrush, ANSI transformer withstand parameters, and significant symmetrical fault currents. Terminate device characteristic curves at a point reflecting the maximum symmetrical fault current to which the device is exposed.

.5 Select each primary protective device required for a delta-wye connected transformer so that its characteristic or operating band is within the transformer characteristics, including a point equal to 58 percent of the ANSI withstand point to provide secondary line-to-ground fault protection. Separate transformer primary protective device characteristic curves from associated secondary device characteristics by a 16 percent current margin to provide proper coordination and protection in the event of secondary line-to-line faults. Separate medium-voltage relay characteristic curves from curves for other devices by at least a 0.4-second time margin.

.6 Include complete fault calculations as specified herein based on contract documents.

.7 Submit qualifications of individual(s) who will perform the work for approval prior to commencement of the studies. Provide studies in conjunction with equipment submittals to verify equipment ratings required. Submit the study to Consultant for review prior to delivery of the study to the Owner. Make all additions or changes as required by the reviewer.

.8 Utilize equipment load data for the study obtained by the Contractor from contract documents, including contract addendums issued prior to bid openings.

.9 Include fault contribution of all motors in the study. Notify the Consultant in writing of circuit protective devices not properly rated for fault conditions.

.10 When emergency generator is provided, include phase and ground coordination of the generator protective devices. Show the generator decrement curve and damage curve along with the operating characteristic of the protective devices. Contractor shall obtain the information from the generator manufacturer and include the generator actual impedance value, time constants and current boost data in the study. Do not use typical values for the generator.

.11 Evaluate proper operation of the ground relays in 4-wire distributions with more than one main service circuit breaker, or when generators are provided, and discuss the neutral grounds and ground fault current flows during a neutral to ground fault.

.12 For motor control circuits, show the MCC full-load current plus symmetrical and asymmetrical of the largest motor starting current and time to ensure protective devices will not trip during major or group start operation.

2.2 ARC FLASH HAZARD ANALYSIS

.1 The contractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E – Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D and CSA Z462-(latest edition).

.2 The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2004, Annex D.

.3 When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Alternative methods shall be presented in the proposal.

.4 The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.

.5 The Arc-Flash Hazard Analysis shall include all significant locations in 240 volt and 208 volt systems fed from transformers equal to or greater than 125 kVA.

.6 Safe working distances shall be specified for calculated fault locations based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm2.

.7 The Arc Flash Hazard analysis shall include calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume a minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

.8 Arc Flash computation shall include both line and load side of main breaker calculations, where necessary.

.9 Arc Flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584-latest edition section B.1.2.

.10 Arc Flash computation shall include arc flash current magnitude at each circuit breaker 1200A or higher (ARMS capable) to allow the Arc Flash Reduction Maintenance System pickups to be set based on multiples of the per unit secondary arc current monitored by the trip unit.

2.3 STUDY REPORT

.1 The results of the power system study shall be summarized in a final report. Submit report in accordance with Electrical General Requirements Section as a shop drawing.

.2 The report shall include the following sections:

.1 Descriptions, purpose, basis, and scope of the study.

.2 Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short-circuit duties, and commentary regarding same.

.3 Tabulations of mechanical unit equipment ratings as identified on equipment shop drawings versus calculated short-circuit, and commentary regarding same. Short-circuit calculations for mechanical equipment shall be based on unit MCA with conductor sizes as identified on electrical design drawings and not based on equipment MOCP.

.4 Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.

.5 Fault current calculations including a definition of terms and guide for interpretation of computer printout.

.6 Incident energy and flash protection boundary calculations

.1 Arcing fault magnitude

.2 Device clearing time

.3 Duration of arc

.4 Arc flash boundary

.5 Working distance

.6 Incident energy

.7 Hazard Risk Category

.8 Recommendations for arc flash energy reduction

.9 Recommendations for Personal Protection Equipment (PPE) level.

Part 3 Execution

3.1 POWER COMPANY APPROVAL

.1 Copies of the final report must be submitted to the power company for their review and approval. Approved copies of the report shall be submitted to the Consultant.

3.2 FIELD SETTINGS

.1 The Contractor shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. The settings shall be in accordance with the approved short-circuit study, protective device evaluation study, and protective device coordination study.

.2 Necessary field settings of devices and adjustments and minor modifications to equipment to accomplish conformance with the approved short-circuit and protective device coordination study shall be carried out by the Contractor at no additional cost to the Owner.

.3 At the completion of the project, configure settings and install equipment labels. On company letterhead, the contractor is to prepare a certification letter indicating at minimum:

.1 Project

.2 Date

.3 Device designation

.4 Certification of correct settings

.5 Certification of correct device labels

.6 Certification of arc flash hazard equipment labels

.7 Digital image of each breaker indicating final settings and placement of labels

3.3 ARC FLASH WARNING LABELS

.1 The vendor shall provide a 3.5 in. x 5 in. thermal transfer type label of high adhesion polyester for each work location analyzed.

.2 The label shall have an orange header with the wording, “WARNING, ARC FLASH HAZARD”, and shall include the following information:

.1 Location designation

.2 Nominal voltage

.3 Flash protection boundary

.4 Hazard risk category

.5 Incident energy

.6 Working distance

.7 Personal Protection Equipment (PPE) level

.8 Engineering report number, revision number and issue date.

.3 Labels shall be machine printed, with no field markings.

.4 Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings.

.1 For each 600, 480 and applicable 208 volt panelboards, one arc flash label shall be provided.

.2 For each motor control center, one arc flash label shall be provided.

.3 For each low voltage switchboard, one arc flash label shall be provided.

.4 For each switchgear, one flash label shall be provided.

.5 For medium voltage switches one arc flash label shall be provided

.5 Labels shall be field installed by the firm providing the Arc Flashing Hazard Analysis.

3.4 SERIES RATING LABELS

.1 Provide lamacoid labels where recommended by study. **Labels for series rating with panelboards or equipment shall be indicated on feeder breaker as "SERIES RATING BREAKER" and at the panelboard or equipment as "SERIES RATING EQUIPMENT". Refer to section 26 24 16.**

3.5 ACCEPTABLE TESTING FIRMS

.1 MVA Engineering (519) 668-4698

.2 GT Woods (905) 272-1696

.3 Brosz & Associates (905) 472-6660

.4 K-Tek Electro-services Ltd. (905) 640-0660 ext. 228

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS

.1 Submit shop drawings for each system in Conformance with The Electrical General Requirements Section.

1.2 PRODUCT/MAINTENANCE DATA

.1 Submit product/maintenance data for each system for inclusion in maintenance manual conforming to The General Electrical Requirements Section.

1.3 SCOPE

.1 The scope of this Section will include the following systems.

- .1 Auxiliary systems rough-in.
- .2 Security and access control rough-in.
- .3 Telecommunication network system rough-in.
- .4 Public address system rough-in.
- .5 Line voltage power packs and low voltage occupancy sensors.

Part 2 Products

2.1 AUXILIARY SYSTEMS ROUGH-IN

.1 Outlets where noted shall be single gang boxes unless specified otherwise.

.2 Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.

.3 Coordinate final outlet locations, quantities, etc. with respective system vendor and owner's representative.

2.2 SECURITY AND ACCESS CONTROL ROUGH-IN

.1 Provide conduit from device and outlet locations to cable management systems as noted on drawings.

.2 Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.

.3 Provide grounding of equipment as noted on drawings.

.4 Security and access control systems installation shall be by Owner's approved vendor as part of separate tender.

2.3 TELECOMMUNICATION NETWORK SYSTEM ROUGH-IN

.1 Outlets where noted shall be single gang flush mounted in wall or surface raceways.

.2 Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.

.3 Provide a #6 insulated green ground conductor from main service ground to voice equipment backboard located on drawings.

.4 Telecommunication Network installation shall be by Owner's approved vendor as part of separate tender.

2.4 PUBLIC ADDRESS SYSTEM ROUGH-IN

.1 Provide conduit from device and outlet locations to cable management systems as noted on drawings.

.2 Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.

.3 Provide grounding of equipment as noted on drawings.

.4 Public address system installation shall be by Owner's approved vendor as part of separate tender.

2.5 LINE VOLTAGE POWER PACKS AND LOW VOLTAGE OCCUPANCY SENSORS

.1 Line voltage power packs and occupancy sensors shall be one manufacturer throughout the project.

.2 Line Voltage Power packs shall be provided to match the room lighting load, control requirements, and lighting voltage. Power packs shall have the following features:

.1 Mount to standard junction box.

.2 Simple replacement. It shall be capable to replace the unit without requiring any configuration or set-up.

.3 Plenum rated

.4 120VAC or 347V, 60HZ operation.

.5 Acceptable materials:

.1 Sensorswitch Cat. #PP20 Series

.2 Legrand Cat. #BZ-250 Series

.3 Greengate Cat. #SP15 Series

.3 Low voltage / analog occupancy sensors shall be complete with the following features:

.1 Coverage pattern to suit room ceiling height.

.2 Suitable to detect minor and medium motion patterns within rooms less than 2000 sq. ft.

.3 Mount to standard junction box.

.4 Simple replacement. It shall be capable to replace the unit without requiring any configuration or set-up.

.5 Relays shall not be integrated within the occupancy sensor. Relays shall be provided within separate power pack.

.6 Acceptable materials

.1 Sensorswitch Cat. #CM-PDT Series

.2 Legrand Cat. #CI-205

.3 Greengate Cat. #OAC-DT-2000

Part 3 Execution

3.1 AUXILIARY SYSTEMS ROUGH-IN

.1 Provide backboard for each system use as noted complete with ground buss connection as specified.

.2 Outlets are to be installed complete with minimum 21 mm (3/4") conduit to accessible ceiling space or as otherwise detailed.

.3 Conduits terminated into ceiling spaces must be within 3m (10') of zone conduits when noted.

.4 Provide insulated bushings on all conduits terminated in ceiling space.

.5 Ensure specified zone or riser conduits are installed back to equipment backboard.

3.2 SECURITY AND ACCESS CONTROL ROUGH-IN

.1 Outlets are to be provided for devices with conduit as detailed on drawings.

.2 Conduits terminated into ceiling spaces must be within 1m of cable management of tray.

3.3 TELECOMMUNICATION NETWORK SYSTEM ROUGH-IN

.1 Install incoming service ducts and terminate as noted.

.2 Provide backboard as noted complete with ground connection to main service ground.

.3 Conduits terminated into ceiling spaces must be within 3m (10') of zone conduits (if applicable).

.4 Ensure specified zone conduits are installed back to service backboard.

.5 Outlets are to be installed complete with 25 mm (1") conduit to corridor ceiling space or nearest zone conduit (if applicable).

.6 Provide insulated bushings on all conduits terminated in ceiling space.

.7 A 25mm (1") conduit is to be installed from elevator machine room to voice service backboard.

3.4 PUBLIC ADDRESS SYSTEM ROUGH-IN

.1 Conduits terminated into ceiling spaces must be within 1m (10') of cable management tray.

.2 Outlets are to be installed complete with 25 mm (1") conduit to corridor ceiling space or nearest cable management tray.

.3 Provide insulated bushings on all conduits terminated in ceiling space.

.4 Electrical contractor shall obtain speaker back boxes from School Board vender for installation into ceiling tiles, block walls, etc.

3.5 LINE VOLTAGE POWER PACKS AND LOW VOLTAGE OCCUPANCY SENSORS

.1 Install power packs in accessible maintenance areas.

.2 Provide access doors if power packs are installed above drywall ceilings.

.3 Sensors installed in areas of high abuse shall be complete with wire guards.

.4 It shall be the contractor's responsibility to locate and aim sensors in the correct location required for complete and proper coverage within the range of coverage as per the manufacturer's recommendations. The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective rooms.

.5 It is the contractor's responsibility to arrange a pre-installation meeting with the manufacturer's factory authorized representative, at the facility, to verify placement to sensors and installation criteria.

.6 The contractor shall also provide the on-site training necessary to familiarize the owner's personnel with the operation, use, adjustment and problem solving diagnosis of the occupancy sensing devices systems.

.7 Upon completion of the installation, the system shall be completely commissioned by the manufacturer's factory authorized technician who will verify all adjustments and sensor placement to ensure a trouble-free occupancy-based lighting control. Submit commissioning report with closeout documents.

.8 **All lighting controls shall be provided with functional testing and documentation conforming to Ashrae 90.1, latest adoption. This cost shall be included in the Tender Price.**

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Dry type transformers must conform to CSA C22.2 No.47 and C9 (latest edition).

.2 **Dry type transformers must conform to CSA C802 (latest edition).**

.3 Dry type transformers must be in accordance with Ontario Green Energy Act 2018 (NRCan 2018) DOE 2016.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 TRANSFORMERS

.1 Transformers to be of one manufacturer throughout project.

.2 Ratings and characteristics shall be as indicated on riser diagrams.

.3 Aluminum winding.

.4 Transformers are to be ventilated dry type style with 4-2½% taps (2 F.C.B.N. and 2 F.C.A.N.)

.5 Maximum permissible sound levels shall be as follows:

Transformer Rating (KVA)	Sound Level (dBA)
≤50	45
51 to 150	50
151 to 300	55
301 to 500	60

.6 All transformers with a K factor of 4 or above must be electro-static shielded.

.7 Transformers with a K-factor of 4 or above must include a secondary neutral bus that is sized at twice the rated secondary phase current.

.8 Transformer enclosure shall be EEMAC/NEMA 3R ventilated complete with removable front panel.

.9 Provide vibration isolators equal to Korfund R series, Mason ND-B, or approved equal. "Colour" of vibration isolators shall be based on weight of transformers.

Transformer Weight (lbs)	Approximate Rating	Colour (Korfund)
540	15 – 75 kVA	Blue (RD2)
680	112.5 kVA	Black (RD2)
960	150 kVA	Red (RD2)
1,520	300 kVA	Green (RD2)
2,200	500 kVA	Gray (RD3)

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Electrical General Requirements Section.

.2 Label must indicate:

.1 transformer "tag" as per riser diagram

.2 primary and secondary voltage and phase.

2.3 ACCEPTABLE MANUFACTURERS:

.1 Acceptable manufacturers are as follows:

.1 Hammond

.2 Rex

.3 Delta

.4 Acme

.5 Bemag

Part 3 Execution

3.1 INSTALLATION

.1 Primary and secondary feeders are to be connected using flexible conduit.

.2 Transformers with a rating up to and including 75 KVA are permitted to be wall mounted provided mounting method is a suitably sized angle iron frame secured to structure (i.e. masonry wall, steel columns, etc. NOT metal siding).

.3 The above rating of transformers may also be suspended from **structure only** on a unistrut trapeze as detailed.

.4 Transformers above 75 KVA must be floor mounted.

.5 Floor mounted transformers are to be mounted/secured to a concrete pad suitably sized to suit the transformer. This pad is the responsibility of this contractor and must be provided in conformance with the standard of Division 1 specifications for poured in place concrete.

.6 All transformers must be mounted on vibration isolators selected based on transformer weight.

.7 Ensure adequate clearance around transformer for ventilation as per the Electrical Safety Code.

.8 Loosen isolation pad bolts until no compression is visible.

.9 Install transformers in level upright position.

.10 Remove shipping supports only after transformer is installed and just before putting into service.

.11 Make primary and secondary connections in accordance with wiring diagram.

.12 Energize transformers after installation is complete.

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

.1 Submit product data in accordance with Electrical General Requirements Section.

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

Part 2 Products

2.1 PANELBOARDS

.1 Panel boards must conform to CSA C22.2 No. 29 (latest edition).

.2 Panelboards: product of one manufacturer.

.3 Install circuit breakers in panelboards before shipment.

.4 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand. **Series rating is acceptable – submit information with shop drawings. Provide lamicoid label on feeder breaker. Lamicoid label to state "Series Rating Breaker." Lamicoid label to be size 2.**

.5 Bus and breakers must be rated for [10,000] A (symmetrical) interrupting capacity or as indicated.

.6 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.7 Panelboard mains, number of circuits, and number and size of branch circuit breakers as indicated.

.8 Two keys for each panelboard and key panelboards alike.

.9 Aluminum bus with neutral of same ampere rating as mains.

.10 Mains must be suitable for bolt-on breakers. Provide main (if applicable) and branch breakers as bolt-on style.

.11 Trim with concealed front bolts and hinges.

.12 Trim and door finish must be baked grey enamel.

.13 All panels regardless of voltage and amperage must be provided with a lockable door.

.14 Branch circuit panelboards (250 AMP or smaller) must be one of the following:

- .1 Eaton Cat # POW-R-LINE-C PRL-1 or PRL-2
- .2 Schneider Electric Cat # NQ Series for up to 240V or NF Series for up to 600V
- .3 Siemens Cat #Sentron P1 Series

.15 Power distribution circuit breaker panelboards (400 AMP or larger) must be one of the following:

.1 Eaton CAT# POW-R-Line-C PRL-3A or PRL-4A

.2 Schneider Electric CAT# I-Line Series (Bolt-On)

.3 Siemens CAT# P2 Series (up to 600A mains and maximum 100A-3P branch breakers)

.4 Siemens CAT# S5 Series (up to 1200A mains with branch breakers above 100A-3P)

2.2 BREAKERS

.1 Breakers: to Moulded Case Circuit Breakers Section.

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

.3 Main breaker (as specified) must be separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for fire alarm, stairway, exit and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Electrical General Requirements Section.

.2 Nameplate for each panelboard size 4 engraved description as indicated. In finished areas install label on inside of panel, and in service areas install label on exterior of panel.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved “name of load” as indicated.

.4 Complete circuit directory with typewritten legend showing location of each circuit. **Include a copy of the directories in the maintenance manuals.**

Part 3 Execution

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard. Plywood shall be 21mm (3/4”) fire rated or painted with intumescent fire block paint having a minimum of 1h rating, unless noted otherwise.

.3 Mount panelboards to height specified in Electrical General Requirements Section or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus.

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

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

.1 Submit product data in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Moulded case circuit breakers must conform to CSA C22.1 No.5.1-M91 (latest edition.)

.2 Bolt-on moulded case circuit breaker quick-make, quick-break type, for manual and automatic operation.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Unless otherwise indicated moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated complete with all necessary mounting hardware and filler panels if necessary.

.2 Provie lamicoid labels for series rating breakers. Lamicoid label to state “Series Rating Breaker.” Lamicoid to be size 2.

.3 Provie lamicoid labels for ARMS capable breakers. Lamicoid label to state “Arc Flash Reduction Maintenance System Breaker.” Lamicoid to be size 2.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Electrical General Requirements Section.

Part 2 Products

.1

2.2 RECEPTACLES

.1 Receptacles, plugs, and other similar wiring devices must conform to CSA 22.2 No 42 (latest edition).

.2 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, with following features (20A where noted):

.1 Urea molded housing (Colour by architect).

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and rivetted grounding contacts.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

.5 Acceptable materials:

.1 Tamper resistant

.1 Tamper resistant ground fault protected receptacle: Hubbell Cat. #GFTR15

.2 Tamper resistant ground fault protected T-slot receptacle: Hubbell Cat. #GFTR20

.3 Tamper resistant duplex receptacle complete with dual USB ports: Hubbell Cat. #USB15XXX

.4 Automatically Controlled Tamper Resistant Receptacles (Green): Hubbell Cat. #BR15C2GNTR

.6 Acceptable alternate manufacturers include:

.1 Pass & Seymour

.2 Leviton

2.3 COVER PLATES

.1 Cover plates from one manufacturer throughout project.

.2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.3 Stainless steel, brushed, 1 mm (1/32") thick cover plates for wiring devices mounted in flush-mounted outlet box.

.4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.5 Weatherproof cover plates complete with gaskets and “heavy-duty in use” covers in conformance with the Electrical Safety Authority. Provide product equal to Intermatic Cat. #WP5100C.

.6 Where noted on plans for exterior weatherproof GFCI receptacles at grade, provide extra-duty single gang horizontal die cast receptacle covers. NEMA 3R rated complete with lockable hasp and reinforced hinge. Suitable for use with 12-gauge cord sets. Intermatic Cat. # WP1010HMXD or equal.

.7 Where noted on plans for exterior weatherproof cover plates at GFCI receptacles on residential balconies above grade, within 760mm of balcony railing, to avoid climbing hazard provide product equal to Intermatic Cat. #WP7000 (low-profile, in-use, extra-duty).

.8 Provide p-touch labels on cover plates for all receptacles. Labels shall include source panel and branch circuit, including switch leg indicator as applicable for automatically controlled receptacles.

Part 3 Execution

3.1 INSTALLATION

.1 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height specified in Electrical General Requirements Section or as indicated.

.3 Where split receptacle has one portion switched mount vertically and switch upper portion.

.2 Occupancy sensors:

.1 Occupancy sensors shall be set to 5 minutes “delay to off” unless otherwise noted.

.3 Occupancy sensors and dimmers:

.1 Switches with occupancy sensors and dimmers shall be programmed as follows:

.1 5 minutes “delay to off” unless otherwise noted.

.2 “Auto on” to 50% dimming level.

.4 Cover plates:

.1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.2 Install suitable common cover plates where wiring devices are grouped.

.3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

.5 Dimmer:

.1 Dimming Switches

.1 Mount devices at height as specified in Electrical General Requirements Section.

.2 Install in upright position as per manufacturer's installation instructions.

.3 Provide class II 0-10V control wiring from 0-10V dimming switch to each fixture driver in 21mmC.

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

.1 Submit product data in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 DISCONNECT SWITCHES

.1 Enclosed manual air break switches must conform to CSA C22.1 No.4 (latest edition).

.2 Fuseholder assemblies must conform to CSA C22.2 No.39 (latest edition).

.3 Fusible, and/or non-fusible, horsepower rated disconnect switches, size as indicated.

.4 Provision for padlocking in off switch position by three locks.

.5 Mechanically interlocked door to prevent opening when handle in ON position.

.6 Fuses: size as indicated, to Fuses - Low Voltage Section.

.7 Fuseholders: relocatable and suitable without adaptors, for type and size of fuse indicated.

.8 Quick-make, quick-break action.

.9 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Electrical General Requirements Section.

.2 Indicate name of load controlled on size 4 nameplate.

2.3 ACCEPTABLE MANUFACTURERS

Manufacturer	General Purpose	Weather Proof
Eaton	IHD Series	3HD Series
Schneider Electric	Type A Series	Type R Series
Siemens	ID Series	NFR/FR Series

Part 3 Execution

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

.2 Disconnect switches mounted on mechanical rooftop equipment shall be installed minimum 750 mm (30") above finished roof to be protected against damage and weather (snow build up).

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE C62.41- 1991, Recommended Practices for Surge Voltages in Low-Voltage AC Power Circuits.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM F1137- 88 (1993), Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.3 United States of America, Federal Communications Commission (FCC)

.1 FCC (CFR47) EM and RF Interference Suppression.

.4 IESNA LM-79-08, IES Electrical Method for the Electrical and Photometric Measurements of Solid State Lighting Products.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with Electrical General Requirements Section for all light fixtures supplied under this contract.

.2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Consultant.

.3 Photometric data to include: VCP Table spacing criterion.

1.3 SCOPE

.1 This contractor is responsible to supply and install all lighting fixtures as scheduled and/or indicated including lamp and those accessories required for a complete lighting system. This contractor must coordinate lighting installations with all other Divisions of this project.

.2 All fixtures must be CSA approved or approved at this contractor's expense by the Special Inspection Division of the Electrical Safety Authority.

1.4 GUARANTEE

.1 Guarantees for materials replacement shall be as follows from date of ready for takeover.

.1 LED lamps: 3 months

.2 LED fixtures, and driver: 5 years.

.2 The labour required to replace these ballasts, lamps or drivers must be included in the above guarantee, however only for the extent of the contract guarantee and warranty period as noted in Electrical General Requirements.

1.5 EXISTING FIXTURE BALLAST REMOVAL AND DESTRUCTION

.1 Scope

.1 This Contractor is responsible for contracting with an approved company for the dismantling, disposal and removal of all existing fluorescent ballasts and lamps from this project. This process must include but is not limited to the following:

.1 Removal of existing ballasts from fixtures by this contractor.

.2 This contractor is to compare the ballast number to the PCB ballast identification booklet provided by the disposal company.

.3 If the ballast is not contaminated it is to be disposed of by normal means.

.4 If the ballast is contaminated provide:

.1 Approved interm on site storage area.

.2 Approved interm on site storage containers.

.3 Any and all necessary on site inspections.

.4 All necessary approval certificates (include copies in maintenance manuals).

.5 Full dismantling, complete destruction and disposal of all ballasts components.

.2 Approved Disposal Companies

.1 PCB Containment Technology Inc.
75 Wanless Court
Ayr, ON N0B 1E0
Phone: (519) 740-1333 / Fax: (519) 740-2320

.3 Payment Procedures

.1 Cost of complete services of this sub-contractor shall be paid for by this Section. Refer to Allowances and Fees Section for allowance to be carried for this work.

Part 2 Products

2.1 FIXTURE CONSTRUCTION

.1 Fixtures must be constructed of 20 gauge (minimum) cold rolled steel. All metal edges require smooth finish.

.2 Light leaks must be prevented by providing gasketting, stops, and barriers.

.3 Fixtures must be finished in high reflective baked white enamel. This surface must have a reflectance of not less than 85%.

.4 All fixtures operating on 347 Volts must be provided with an integral disconnecting means.

2.2 FIXTURE LENS

.1 Unless otherwise noted fixture lenses shall be as follows:

.1 Lens thickness: 3.2 mm (1/8")

.2 Material: injection moulded clear prismatic virgin acrylic

.3 Frame: hinged, latched, steel.

2.3 LED FIXTURES

.1 Fixture LEDs must be tested in conformance with IESNA LM80 standard.

.2 LEDs must be selected using a binning algorithm to ensure colour and lumen output of a given fixture are consistent, as well as meet or surpass ANSI C78.377 specification for the rated lifetime of the fixture. Colour accuracy between products must be within a 2-step MacAdam ellipse.

.3 Luminaires must be tested to IESNA LM79 by an independent approved laboratory.

.4 Luminaires must be tested prior to shipping.

.5 Luminaires must be ULC certified and approved for use in Canada.

.6 Fixtures must maintain a minimum of 90% of their initial light output for 60,000 hours. Submit test results upon request.

.7 Lumen values indicated for fixtures in the project documents are to be considered as “absolute” or “delivered” values.

.8 Other than for specialty fixtures, and unless otherwise indicated, the maximum driver current is to be 750 mA.

2.4 STANDARD EXIT LIGHTING UNITS

.1 Exit lighting units must conform to CSA C860, CSA 22.2 No. 141 (latest edition).

.2 Housing: extruded aluminum housing, white finish.

.3 Face and back plates: extruded aluminum.

.4 Lamps: 2W LED.

.5 Operation: 25 year.

.6 Units are to be provided with three (3) pictogram legends indicating “left from here”, “straight from here”, and “right from here”.

.7 Face plate to remain captive for relamping.

2.5 SELF-POWERED COMBINATION EXIT/EMERGENCY LIGHTING UNITS

.1 Exit lighting units must conform to CSA C860, CSA 22.2 No. 141 (latest edition).

.2 Housing: Extruded aluminum housing. White Finish.

.3 Face and back plates: Extruded aluminum.

.4 Lamps 2W LED (EXIT).

.5 Operation: 25 year life.

.6 Units are to be provided with three (3) pictogram legends indicating “left from here”, “straight from here”, and “right from here”.

.7 Face plate to remain captive for relamping.

.8 Supply voltage: As noted on drawings.

.9 Output voltage: 12 V DC.

.10 Battery: Sealed maintenance free 10 year life.

Note: Battery must be capable of supplying the wattage indicated for a minimum of 30 minutes.

.11 Charger: Solid state, voltage/current regulated, inverse temperature compensated, short circuit protected, with regulated output of plus or minus 0.01 V for plus or minus 10% V input variation.

.12 Solid state transfer circuit.

.13 Signal lights: “AC Power On” condition and “charging” condition.

.14 Lamp heads: Integral on unit, 345º horizontal and 180º vertical adjustment. Lamp type: minimum 4 watt LED.

.15 Mounting: Suitable for universal mounting directly on junction box and complete with knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.16 Cabinet: finish: White.

.17 Auxiliary equipment:

.1 Test switch.

2.6 EMERGENCY LIGHTING UNITS

.1 Emergency lighting units must conform to CSA C22.2 No 141 (latest edition).

.2 Supply voltage: As noted on drawings.

.3 Output voltage: 12 V DC.

.4 Battery: Sealed, maintenance free, 10 year life.

Note: Battery units must be capable of supplying the wattage indicated for a minimum of 90 minutes.

.5 Charger: Solid state, multi rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.

.6 Solid state transfer circuit.

.7 Low voltage disconnect: Solid state, modular, operates at 80% battery output voltage.

.8 Signal lights: “AC Power ON” condition and “charging” condition.

.9 Lamp heads: Integral on unit, 345º horizontal and 180º vertical adjustment. Lamp type: minimum 4 watt LED.

.10 Cabinet suitable for direct of shelf mounting to wall and complete with knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.11 Auxiliary equipment:

.1 Test switch.

.2 Ac input and DC output terminal blocks inside cabinet.

.3 Shelf.

.4 Cord and plug connection for AC. **(Not applicable on 347 V units)**.

2.7 ACCEPTABLE LIGHTING MANUFACTURERS

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

Part 3 Execution

3.1 INSTALLATION

.1 Locate and install luminaires as indicated. Luminaires are not to be supported from the roof deck. Provide additional unistrut support channel and/or support from structure. Co-ordinate with consultant on site.

.2 Ball align hangers must be provided for rod suspended fixtures.

.3 Fixtures surface mounted to suspended ceilings must be secured through ceiling assembly to cross member supports. These supports are to be steel channels or angles independently secured **to structure** using # 12 “jack” chain. Each chain must be secured so no fixture weight is added to the ceiling assembly.

.4 Plaster frames/flange kits must be provided by this Division for fixtures recessed in plaster and/or drywall ceilings.

.5 Where specified, fixtures to be chain hung shall be hung using “jack” chain with a capacity to suit the fixture weight. Branch circuit wiring feeding these fixtures shall be AC90 cable “ty-wrapped” at 900 mm (36") intervals along length of drop. Final appearance must be neat and professional.

.6 Install exit lighting units with illuminated faces and chevrons/arrows indicating path(s) of exit as indicated. Unless otherwise noted install exit fixtures at 2400 mm (8'-0") above finished floor.

.7 Install emergency lighting units and associated remote mounted fixtures as indicated.

.8 Install emergency lighting units and remote fixtures at 300 mm (12") below finished ceiling, unless indicated otherwise.

.9 Provide a 15 A 120 V duplex receptacle (connected to circuit indicated) adjacent to unit. **Not applicable on 347 V units. This receptacle connection is to be no lower than 8'-0" (2400 mm) AFF.**

.10 Special installation: Secure fixtures to structure to conform to the Electrical Safety Code using “jack chain” NOT ceiling suspension wire. Where coreslab is used, suspension point must be independent of the one used for suspension of the ceiling assembly. As an alternate to jack chain the contractor may use a pre-manufactured aircraft cable suspension and fastening system as manufactured by Gripple (Gripple Cat. #HF02-10F2). Provide minimum 2 per fixture.

.11 All battery units are to be provided with a visible lamicoid label indicating the unit number as per drawings.

3.2 WIRING

.1 Connect luminaires to lighting circuits as indicated.

.2 Connect exit fixtures to exit lighting circuits and unit equipment (if applicable).

.3 Connect unit equipment to circuits as indicated.

.4 All wiring of remote emergency fixtures shall be minimum #10 T90 for each circuit and run in conduit. Wiring must be sized in conformance with manufacturer's recommendations for distances required.

3.3 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.4 DELIVERIES

.1 Fixtures are to be completely assembled at the manufacturer's plant and delivered to the project site in original unitized containers. Ensure that a dry, protected and secure space is available for proper storage before scheduling delivery of fixtures.

3.5 TESTING/CERTIFICATION

.1 At the completion of the project and in the presence of the consultant, test all exit and emergency fixtures. On company letterhead, the contractor is to prepare a chart indicating:

.1 Project

.2 Date

.3 Equipment type

.4 Certification of correct connection

.5 Certification of correct operation

.6 Duration of test in minutes (minimum 90)

.7 Actual period of testing (time of day)

3.6 ADDITIONAL INSTALLED EXIT SIGNS

.1 The electrical contractor is to include in their bid the cost to add two (2) additional standard exit lighting units to be installed and tested in locations as directed by the consultant. Note: This installation and test will be occurring after the initial testing/certification testing is complete.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE).

.2 Underwriter Laboratories of Canada (ULC).

.3 International Electrotechnical Commission.

.4 International Organization for Standardization (ISO).

.5 National Electrical Manufacturers Association (NEMA).

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with Section 26 01 16.

.2 Submit composite wiring diagrams and control schedule for each room control circuit type as proposed to be installed. Include load type, sequence of operation, sensor parameters, time delays, sensitivities and daylighting set points.

.3 Catalog cut sheets with performance specifications demonstrating compliance with specified requirements.

1.3 SCOPE

.1 This contractor is responsible to supply and install all equipment and control wiring as specified for the digital occupancy and daylight control systems. This contractor must coordinate these control systems with the lighting fixtures being supplied for the project to ensure intended function as specified.

.2 Control Intent: Control Intent includes, but is not limited to:

.1 Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.

.2 Initial sensor and switching zones.

.3 All equipment must be CSA approved or approved at this contractor's expense by the Special Inspection Division of the Electrical Safety Authority.

.4 Reference section 26 51 13 for Lighting information.

.5 Reference section 26 05 75 for line voltage occupancy sensors and switches (hard wired analog).

1.4 SYSTEM DESCRIPTION AND OPERATION

.1 The Digital Lighting Control (room level) as defined under this section covers the following equipment:

- .1 Digital Room Controllers – Self-configuring, digitally addressable one, two or three relay controllers.
- .2 Digital Occupancy Sensors – Self-configuring, digitally addressable and calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.
- .3 Digital Switches – Self-configuring, digitally addressable pushbutton switches, dimmers, and scene switches with two-way active infrared (IR) communications.
- .4 Digital Photosensors – Single-zone closed loop sensors with two-way active infrared (IR) communications can provide switching or dimming control for daylight harvesting.
- .5 Configuration Tools – Handheld remote for room configuration provides two-way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from an accessible location.

1.5 LIGHTING CONTROL APPLICATIONS

.1 Provide a minimum application of intended lighting control functions as detailed on design drawings and specified herein. Control functions shall include the following:

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

1.6 WARRANTY

.1 Provide a five-year complete manufacturer's warranty on all products to be free of manufacturers' defects.

.2 The labour required to replace these products must be included in the above warranty, however only for the extent of the contract guarantee and warranty period as noted in Electrical General Requirements.

1.7 QUALITY ASSURANCE

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

Part 2 Products

2.1 MANUFACTURERS

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

.1 Cooper Controls (Wavelinx).

.2 Acuity Controls (nlight).

.2 Substitutions:

.1 All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 7 working days prior to the bid date and must be made available to all bidders.

.2 By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring.

2.2 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR SYSTEM

.1 Wall or ceiling mounted (to suit installation) passive infrared (PIR), ultrasonic or dual technology digital (passive infrared and ultrasonic) occupancy sensor. Furnish the Company's system which accommodates the square-foot coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors and accessories which suit the lighting and electrical system parameters.

.2 Digital Occupancy Sensors shall provide calibration and electronic documentation for the following features:

.1 Digital calibration and pushbutton programming for the following variables:

.1 Sensitivity – 0-100% in 10% increments

.2 Time delay – 1-30 minutes in 1 minute increments

.3 Test mode – Five second time delay

.4 Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.

.5 Walk-through mode

.6 Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.

.2 Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.

.3 Device Status LEDs including:

.1 PIR Detection

.2 Ultrasonic detection

.3 Configuration mode

.4 Load binding

.4 Manual override of controlled loads.

.5 One or two RJ-45 port(s) for connection to DLM local network.

.3 Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

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

2.3 DIGITAL WALL SWITCHES

.1 Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5, and 8 button configuration; colour per architect, compatible with wall plates with decorator opening. Wall switches shall include the following features:

.1 Two-way infrared (IR) transceiver for use with personal and configuration remote controls.

.2 Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.

.2 Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.

.3 The following switch attributes may be changed or selected using a wireless configuration tool:

.1 Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).

.2 Individual button function may be configured to Toggle, On only or Off only.

.3 Individual scenes may be locked to prevent unauthorized change.

.4 Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.

.4 Two RJ-45 ports for connection to DLM local network.

.5 Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.

.6 WattStopper product numbers: LMSW-101, LMSW-102, LMSW-103, LMSW-104, LMSW-105, LMSW-108, LMDM-101.

2.4 DIGITAL POWER PACKS (ROOM CONTROLLERS)

.1 Room Controllers automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room Controllers shall be provided to match the room lighting load and control requirements. The controllers will be simple to install and will not have, dip switches, potentiometers or require special configuration. The control units will include the following features:

.1 Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.

.2 Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.

.3 Device Status LEDs to indicate:
  .1 Data transmission
  .2 Device has power
  .3 Status for each load
  .4 Configuration status
.4 Quick installation features including:
  .1 Standard junction box mounting
.5 Plenum rated
.6 Manual override and LED indication for each load
.7 120 VAC, 60 Hz operation.
.8 Zero cross circuitry for each load.

.2 On/Off Room Controllers shall include:
  .1 One or multiple relay configuration to suit control details
  .2 Efficient 150 mA switching power supply
  .3 Sufficient sensor connection points to suit indicated function without the requirement for additional hardware
  .4 Discrete model listed for connection to receptacles, for schedule-based control of plug loads within the space.
    .1 One relay configuration only.
    .2 Automatic-ON/OFF configuration.
    .3 Optional Network Bridge for BACnet MS/TP communications
  .5 Three RJ-45 DLM local network ports.
  .6 WattStopper product numbers: LMRC-101, LMRC-102, LMPL-101, LMPL-201.

.3 On/Off Room/Dimming enhanced Room Controllers shall include:
  .1 One or multiple relay configuration to suit control details.
  .2 Efficient 250 mA switching power supply.
  .3 One 0-10 volt analog output per relay for control of compatible ballasts and LED drivers.
  .4 The following dimming attributes may be changed or selected using a wireless configuration tool:
    .1 Establish preset level for each load from 0-100%.
    .2 Set high and low trim for each load.
    .3 Set lamp burn in time for each load up to 100 hours.
  .5 Four RJ-45 DLM local network ports.
  .6 Optional Network Bridge for BACnet MS/TP communications.
  .7 WattStopper product numbers: LMRC-211, LRMC-212, LRMC-213, LMPL-201, LMRC-311, LMRC-312, LMRC-313.

2.5 DIGITAL ROOM CONTROL SYSTEMS

.1 Digital occupancy and daylight control system designed to control a small area of a building (room level). Digital devices connect to the room controller(s) using CAT 5e cables (LMRJ) with RJ-45 connectors which provide both data and power to room devices. Features of the system shall include:

.1 Plug n' Go automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.

.2 Simple replacement of any device in the system with a standard off the shelf unit without requiring commissioning, configuration or setup.

.3 Push n' Learn configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices which are part of the local system.

.4 Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.

2.6 CONFIGURATIONS TOOLS

.1 A configuration tool facilitates optional customization of digital lighting control system featuring infrared communications.

.2 Features and functionality of the wireless configuration tool shall include:

.1 Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.

.2 Read, modify and send parameters for occupancy sensors, daylighting sensors, room controllers and buttons on digital wall switches.

.3 Save up to nine occupancy sensor setting profiles and apply profiles to selected sensors.

.3 WattStopper Product Numbers: LMCT-100, LMCI-100/LMCS-100

Part 3 Execution

3.1 INSTALLATION

.1 Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated.

.2 When using wire for connections other than the DLM local network (LMRJ Cat 5e with RJ-45 connectors), provide detailed point to point wiring diagrams for every termination. Provide wire specifications and wire colors to simplify contactor termination requirements.

.3 Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings.

.1 Adjust time delay so that controlled area remains lighted for 5 minutes after occupant leaves area.

.4 Install power packs in accessible maintenance areas unless noted otherwise. Provide access doors if power packs are installed above drywall ceilings.

.5 Install sensors in gym where noted on plan at mid-height of wall.

.6 It shall be the contractor's responsibility to locate and aim sensors in the correct location required for complete and proper coverage within the range of coverage as per the manufacturer's recommendations. The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective rooms.

.7 Provide written or computer-generated documentation on the commissioning of the system including room by room description including:

.1 Sensor parameters, time delays, sensitivities, and daylighting setpoints.

.2 Sequence of operation, (e.g. manual ON, Auto OFF. etc.)

.3 Load Parameters (e.g. blink warning, etc.)

.8 Re-commissioning – After 30 days from occupancy re-calibrate all sensor time delays and sensitivities to meet the Owner's Project Requirements. Provide a detailed report to the Architect / Owner of re-commissioning activity.

3.2 FACTORY COMMISSIONING

.1 Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.

.2 The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the system startup and adjustment date.

.3 Upon completion of the system commissioning the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

.4 Factory commissioning shall include functional testing and documentation of the control system conforming to the "Functional Testing" requirements included in the current ASHRAE standard. This cost shall be included in the Tender Price.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CAN/ULC-S524 (latest edition), Installation of Fire Alarm Systems.

.2 ULC-S525 (latest edition), Audible Signal Appliances for Fire Alarm Systems.

.3 CAN/ULC-S526 (latest edition), Visual Signal Appliances, Fire Alarm.

.4 CAN/ULC-S527 (latest edition), Control Units, Fire Alarm.

.5 CAN/ULC-S528 (latest edition), Manual Pull Stations.

.6 CAN/ULC-S529 (latest edition), Smoke Detectors.

.7 CAN/ULC-S530 (latest edition), Heat Actuated Fire Detectors, Fire Alarm.

.8 CAN/ULC-S531 (latest edition), Smoke Alarms.

.9 CAN/ULC-S536 (latest edition), Inspection and Testing of Fire Alarm Systems.

.10 CAN/ULC-S537 (latest edition), Verification of Fire Alarm Systems.

.11 CAN/ULC-S552 (latest edition), Inspection, Testing and Maintenance of Smoke Alarms.

.12 CAN/ULC-S553 (latest edition), Installation of Smoke Alarms.

.13 OBC-2024, Ontario Building Code Compendium.

1.2 DESCRIPTION OF EXISTING SYSTEM

.1 The existing addressable system includes :

.1 An addressable control panel as manufactured by **Edwards – EST3X** to carry out fire alarm and protection functions including receiving alarm signals, initiating general alarm, supervising system continuously, actuating zone annunciators, and initiating trouble signals.

.2 Trouble signal devices.

.3 Power supply facilities.

.4 Addressable manual alarm stations.

.5 Addressable automatic alarm initiating devices.

.6 Audible and visual signal devices.

.7 End-of-line devices.

.8 Annunciator(s).

.9 Ancillary devices.

.10 Interface and zone modules.

.11 Remote trouble indicator.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

.1 This system is subject to review by local building department officials, local fire department officials. **Therefore, submission of verification certificate and field technician device verification sheets is required prior to inspection by these officials. Schedule accordingly.**

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Electrical General Requirements Section.

.2 Include:

.1 New components.

.2 Complete wiring diagram for control panel replacements.

1.5 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for Fire Alarm System for incorporation into manual specified in Electrical General Requirements Section.

.2 Include:

.1 Operation and maintenance instructions for complete fire alarm system to permit effective operation and maintenance.

.2 Technical data - illustrated parts lists with parts catalogue numbers.

.3 Copy of approved shop drawings.

.4 List of recommended spare parts for system.

1.6 TRAINING

.1 Arrange and pay for on-site demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system. **Obtain written receipt of training session and include in maintenance manual.**

1.7 SYSTEM OPERATION

.1 The system shall be configured for single stage operation as outlined on the design drawings to match existing system operation.

.2 The existing Fire Alarm Sequence of Operation shall remain as currently programmed and to include new devices and zones per design drawings.

.3 Refer to Fire Alarm Sequence of Operation for specific fire alarm sequence functions which generally include the following:

.1 Activation of audible and visual signal devices.

.2 Cause alarm and supervisory zone of alarm device to be indicated on control panel and remote annunciator(s).

.3 Cause system trouble indications.

.4 Activate auxiliary functions.

.5 Transmit signal to fire department via monitoring station.

.6 Log the alarm in the historical alarm log file.

.7 System silence parameters.

.8 System reset parameters.

1.8 PERFORMANCE CRITERIA

.1 These specifications describe the minimum functional requirements for an electronically supervised, microprocessor based, fully integrated system. The initial installation shall include all the necessary electronic hardware, software and memory for a completely operable system in accordance with these specifications.

1.9 QUALITY ASSURANCE

.1 Each and all items of the fire alarm system shall be listed as the products of a single manufacturer under the appropriate category by the Underwriter's Laboratories of Canada and shall bear the "U.L.C." label.

.2 Each and all items of the fire alarm system shall be covered by a one year parts and labour warranty covering defects resulting from faulty workmanship and materials. The warranty shall be deemed to begin on the date the system is accepted by the Project Manager on issuance of the substantial performance certificate for the project.

.3 All control equipment must have Transient Protection Devices to comply with U.L.C. requirements.

Part 2 Products

2.1 GENERAL

.1 It is the intention of this renovation to maintain the existing addressable fire alarm system control panel and remote annunciator, as well as existing signal and detection devices, while expanding the system to include additional control panel components, additional signal devices, and additional detection devices as shown on design drawings to suit the project scope.

.2 For information & coordination purposes, the following fire alarm manufacturer representative contact information is provided to the bidding trade:

.1 Troy Life & Fire Safety Ltd. (Edwards)
Ross McKay (519)-778-5839

2.2 INTELLIGENT DETECTORS-GENERAL OPERATION

.1 Addressable devices shall use simple to install and maintain decade, numbered 0 to 9, address switches. Detectors that have expanded addressing will have decade switch numbered from 0 to 15 for the most significant digit to allow detector addressing from 1 to 250.

.2 Device addressing shall be accomplished by either an electrical or mechanical means.

.3 Detectors shall be intelligent (analog) and addressable and shall connect with two wires to the fire alarm control panel signalling line circuits.

.4 Addressable smoke detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.

.5 The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity shall be automatically adjusted by the panel on a time-of-day basis.

.6 Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance.

.7 The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature.

.8 The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.

.9 Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (PHOTO, THERMAL).

.10 Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.

.11 Detectors shall provide address-setting means using decimal switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. LEDs shall be provided that shall flash under normal conditions, indicating that the device is operational and is in regular communication with the control panel.

.12 Addressable devices shall provide address-setting means using decimal switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. LED(s) shall be provided that shall flash under normal conditions, indicating that the device is operational and is in regular communication with the control panel.

.13 The sensors shall be of a low profile design and ULC listed for both ceiling and wall mount applications.

.14 Automatic smoke sensors shall be equipped with a dust cover, which shall be removed at the time of verification to prevent dust and dirt entering the smoke chamber during construction.

.15 A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.

2.3 INTELLIGENT MULTI-DETECTOR

.1 The intelligent multi-detector shall be an addressable device, which is designed to monitor photoelectric, ionization, and thermal technologies in a single sensing device. This detector shall utilize advanced electronics which react to smaller products of combustion found in fast flaming fires (ionization), slow smouldering fires (photoelectric), and heat (thermal) all within a single sensing device.

.2 The multi-detector shall include two bicolor LEDs, which flash green in normal operation and turn on steady red in alarm.

.3 Detectors are to be provided with relay base where noted on the drawings.

.4 Separately mounted photoelectric ionization and heat detectors in the same location are not acceptable alternatives.

2.4 FIXED TEMPERATURE HEAT DETECTOR

.1 These heat detectors shall have a low mass thermistor heat sensor and operate at a fixed temperature. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the/ time required to process an alarm. The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. The heat detector shall have a nominal alarm point rating of 57ºC (1 35ºF). The heat detector shall be rated for ceiling installation at a minimum of 21.3m (70') centres and be suitable for wall mount applications.

2.5 FIXED TEMPERATURE / RATE OF RISE HEAT DETECTOR

.1 These heat detectors shall have a low mass thermistor heat sensor and operate at a fixed temperature and at a temperature rate-of-rise. It shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm, The integral microprocessor shall determine if an alarm condition exists and initiate an alarm based on the analysis of the data. Systems using central intelligence for alarm decisions shall not be acceptable. The intelligent heat detector shall have a nominal fixed temperature alarm point rating of 57ºC (135ºF) and a rate-of-rise alarm point of 9ºC (15ºF) per minute. The heat detector shall be rated for ceiling installation at a minimum of 21.3m (70') centres and be suitable for wall mount applications.

2.6 PHOTOELECTRIC SMOKE DETECTOR

.1 The intelligent photoelectric detector shall utilize a light scattering type photoelectric smoke sensor to sense changes in air samples from its surroundings. The integral microprocessor shall dynamically examine values from the sensor and initiate an alarm based on the analysis of data. The detector shall continually monitor any changes in sensitivity due to the environmental affects of dirt, smoke, temperature, aging, and humidity. The photo detector shall be rated for ceiling installation at a minimum of Soft (Olin) centres and be suitable for wall mount applications.

.2 The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 1.0% to 3.5%. The photo detector shall be suitable for operation in the following environment:

.1 Temperature: 0ºC to 49ºC (32ºF to 120ºF)

.2 Humidity: 0-93% RH, non-condensing

.3 Elevation: no limit

.3 Detectors are to be provided with relay base where noted on the drawings.

2.7 STANDARD DETECTOR MOUNTING BASES

.1 Provide standard detector mounting bases suitable for mounting on North American 1-gang, 85mm (3 ½ ") or 100 mm (4") octagon box and 100 mm (4") square box. The base shall, contain no electronics, support all detector types and have the following minimum requirements:

.1 Removal of the respective detector shall not affect communications with other detectors.

.2 Terminal connections shall be made on the room side of the base. Bases which must be removed to gain access to the terminals shall not be acceptable.

2.8 INTELLIGENT DUCT SMOKE DETECTOR

.1 The smoke detector housing shall accommodate an intelligent photoelectric detector (as noted above) that provides continuous analog monitoring and alarm verification from the panel.

.2 When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

.3 Duct smoke detector sensor assemblies shall be complete with duct housing, photoelectric smoke detector, and sampling tubes as required. The duct-housing base shall come complete with an auxiliary set of form C dry contacts rated at 120 VAC, 3 Amps.

.4 The system shall automatically indicate when an individual duct sensor needs cleaning.

2.9 CONVENTIONAL AUTOMATIC ALARM INITIATING DEVICES

.1 Thermal fire detectors: fixed temperature, non-restorable, rated 57°C (135ºF) or 88°C (194ºF) as indicated.

.2 Thermal fire detectors, combination fixed temperature and rate of rise, non-restorable fixed temperature element, self-restoring rate of rise, fixed temperature 57°C (135ºF) or 88°C (194ºF), rate of rise 8.3°C (15ºF) per minute.

.3 Smoke detector: ceiling mounted, photo electric type, visual alarm indicator, complete with relay base where noted.

.4 Smoke detector: photo electric type air duct type with sampling tubes with protective housing.

.1 Plug-in type with fixed base.

.2 Wire-in base assembly with integral red alarm LED, and terminals for remote alarm LED.

2.10 AUDIBLE/VISUAL SIGNAL DEVICES

.1 150 mm (6") Bells: surface mounted bell, vibration type 24Vdc, 150 mm (6"), 92dBA rating at 3 m (10'), red finish, FM and ULC listed.

.2 250 mm (10") Bells: surface mounted bell, vibration type 24Vdc, 250 mm (10"),94dBA rating at 3 m (10'), red finish, FM and ULC listed.

.3 Strobe: semi-recessed, 24Vdc operation, complete with selectable 15/30/75/110 candela output (unless otherwise noted set at 75 cd), synchronized strobe, red finish, FM and ULC listed. Suitable for mounting on a single gang box.

NOTES:

.1 Signal devices with integral strobe lights in high abuse areas (i.e. gymnasium, change rooms, etc.) must be provided with protective wireguards.

.2 Any surface mounted signal devices must be provided with suitable backboxes supplied by the manufacturer.

.3 Provide synchronization modules to suit signal devices (if required by manufacturer).

.4 Set signal devices in classrooms to LOW setting.

2.11 END OF LINE RESISTORS

.1 End-of-line resistors for signalling circuits shall be sized to ensure the correct supervisory current flows in each circuit.

.2 End-of-line resistors shall be mounted on a stainless steel plate for mounting on a standard single gang box and bear the ULC label.

2.12 INTELLIGENT MODULES – GENERAL OPERATION

.1 The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished coverplate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes, which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment:

.1 Temperature: 0ºC to 49ºC (32ºF to 120ºF).

.2 Humidity: 0-93% RH, non-condensing.

2.13 MONITOR MODULE

.1 The monitor modules shall have the following operating characteristics:

A flashing LED indicates that the module is in communication with the control panel. The LED latches steady on alarm (subject to current limitations on the loop).

.2 The monitor modules shall have the following features:

Nominal operating voltage:	15 to 32 VDC.
Maximum current draw:	5.1 mA (LED on)
Average operating current:	400 uA (LED flashing)
EOL resistance:	47K ohms.
Temperature range:	0°C to 49°C (32°F to 120°F)
Humidity range:	10% to 93% noncondensing
Dimensions:	114.3 mm (4.5") high x 101.6 mm (4") wide x 31.75 mm (1.25") deep. Mounts to a 101.6 mm (4") square x 53.975 mm (2.1/8") deep box.

2.14 ISOLATOR MODULE

.1 Fault isolator modules shall be provide to automatically isolate wire-to-wire short circuits on an SLC loop. The fault isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop. If a wire-to wire short occurs, the fault isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the fault isolator module shall automatically reconnect the isolated section of the SLC loop. The fault isolator module shall not require any address-setting, and its' operations shall be totally automatic. It shall not be necessary to replace or reset a fault isolator module after its normal operation. The fault isolator module shall mount in a standard 10.16 cm (4") deep electrical box, in a surface-mounted backbox, or in the fire alarm control panel. It shall provide a single LED which shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

2.15 CONTROL MODULE

.1 Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay.

.2 The control module NACs may be wired for Style Z or Style Y (Class A/B) with up to 1 Amp of inductive A/V signal, or 2 Amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to ensure that 100% or all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

.3 The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 Amps at 30 VDC.

2.16 DOOR HOLD OPEN DEVICES

.1 Units to be complete with the following features:

.1 Wall mounted style.

.2 Long life electromagnet.

.3 Low current operation.

.4 Completely silent operation.

.5 25 lbf (111N) minimum holding force.

.6 Adjustable swivel contact plate.

.7 Brushed zinc finish.

.8 Maintenance free operation.

.9 Water resistant design.

.10 ULC, CSA, and FM approved.

2.17 SPRINKLER AND SUPERVISED VALVE CONNECTIONS

.1 Sprinkler and standpipe system contacts shall be provided by the mechanical/sprinkler contractor but connected into the fire alarm system by this Division.

2.18 REMOTE TROUBLE INDICATOR

.1 A system remote trouble indicator where noted on the drawings shall be provided complete with the following features:

.1 Flush mounted in a double gang box.

.2 Trouble LED.

.3 Trouble buzzer.

2.19 SYSTEM WIRING

.1 Replace existing device wiring where noted on drawings for replacement devices.

.2 The system wiring must be FSA rated in conformance with the Electrical Safety Code to suit the type of installation.

.3 Wiring shall be minimum #18 AWG twisted shielded pair in conduit. “Securex 2” armoured cable will be permitted to be used for “drops” to devices on accessible ceilings.

.4 As indicated on system riser diagram initiating device wiring shall be run in a loop with a home run from the last device to the control panel (Class ‘A’ configuration). Wiring from the “loop” module to conventional devices must be supervised, run in conduit, and conform to the standards of the Electrical Safety Code.

.5 Signal wiring is to be cross connected in a class ‘B’ configuration.

.6 Install isolator modules and end of line resistors in service rooms no higher than 2.4 M AFF. Provide location of these devices at the time of shop drawing submission.

.7 **These are the basic wiring requirements for system operation. Prior to tender close manufacturer and contractor are to confirm all necessary wiring specifications and requirements.**

2.20 APPROVED EQUIPMENT

DEVICE	**EDWARDS**
Control Panel	
	EST 3X
Intelligent Devices	
Addressable Multi-Sensor	SIGA2-PS
Addressable Base	SIGA-SB
Addressable Base c/w Relay	SIGA-RB
Heat Sensor	SIGA2-HRS or SIGA2-HFS
Smoke Detectors	SIGA-PS
Duct Type Smoke Detector (c/w Air Sampling Tubes)	SIGA-SD c/w SIGA-PS
Monitor Module	SIGA-CT Series
Control Module	SIGA-CR
Isolator Module	SIGA-IM
Conventional and Auxiliary Devices	
150 mm (6”) Bells	439D Series or MB Series
250 mm (10)” Bells	439D Series or MB Series
Door Holder	1500 Series
Strobe	G1R-VM

Part 3 Execution

3.1 INSTALLATION

.1 Install new and replacement components in accordance with CAN/ULC-S524 (latest edition) and approved manufacturers manuals and wiring diagrams. The contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation, All wiring shall be of the type recommended by

the Electrical Safety Code, approved by local authorities having jurisdiction for the purpose, and shall be installed in dedicated conduit throughout.

.2 Disruption of fire alarm coverage for the building shall be kept to a minimum. Coordinate with owner and consultants required system shutdowns, periods of bypass, etc. to suit the required scope of renovation and replacement work.

.3 Locate and install detectors and connect to alarm circuit wiring. **Do not mount detectors within 1 m (39") of air outlets.** Maintain at least 600 mm (24") radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.

.4 Connect alarm circuits to main control panel.

.5 Locate and install signal devices and connect to signalling circuits.

.6 Connect signalling circuits to main control panel.

.7 Install end-of-line devices at end of applicable alarm and signalling circuits.

.8 Locate and install door releasing devices.
Note: Door holders must release by way of local smoke detector and signal from main control panel. Provide additional relays to suit.

.9 Locate and install remote relay units to control fan shut down.

.10 Sprinkler system: wire alarm and supervisory switches and connect to control panel.

.11 Provide 120V power and fire alarm connections to all fire smoke dampers c/w integral smoke detector. Connect all fire / smoke damper integral detector outputs to monitor modules for alarm condition and for monitoring of AC power to smoke damper as trouble condition at fire alarm panel based on module address. Coordinate exact location and connection requirements with mechanical contractor prior to rough-in. All fire smoke dampers c/w integral smoke detectors shall be provided and installed by mechanical contractor.

3.2 PROTECTION

.1 Contractor is to ensure all fire protection system detectors are protected from dust, dirt, humidity, and water at all times during construction. This applies to detectors installed, stored on site or stored in storage containers. Any detectors that are damaged or dirty shall be replaced at the contractor’s expense.

3.3 FIELD QUALITY CONTROL

.1 The system shall be installed and fully tested under the supervision of trained manufacturer’s representative. The system shall be demonstrated to perform all the functions as specified.

3.4 ACCEPTABLE INSTALLER

.1 The fire alarm / life safety system specified herein shall be installed by an Authorized Electrical Contractor who is CFAA certified.

3.5 EXAMINATION

.1 Prior to the commencement of any of the work detailed herein, an examination and analysis of the area(s) where the Fire Alarm / Life Safety System and all associated components are to be installed shall be made.

.2 Any of these area(s) which are found to be outside the manufacturers' recommended environments for the particular specified products shall be noted on a Site Examination Report which shall be given to the Building Owners Representative, and the Consultant.

.3 Any shorts, opens, or grounds found on existing wiring shall be corrected prior to the connection of these wires to any panel component or field device.

3.6 DEMONSTRATION

.1 Each of the intended operations of the installed Fire Alarm / Life Safety System shall be demonstrated to the Building Owners' Representative and the Consultant.

3.7 SYSTEM TEST

.1 It is the intention of this renovation to have the entire system, including existing, fully tested and verified.

.2 Perform tests in accordance with General Electrical Requirements Section and CAN/ULC-S537-(latest edition) Standard for the Verification of Fire Alarm Systems.

.3 Fire alarm system:

.1 Test each device and alarm circuit to ensure noted devices transmit alarm to control panel and actuate general alarm and ancillary devices.

.2 Check annunciator panels to ensure zones are shown correctly.

.3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.

.4 Class A circuits.

.1 Test each conductor on all circuits for capability of providing alarm signal on each side of single open-circuit fault condition imposed near middlemost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.2 Test each conductor on all circuits for capability of providing alarm signals during ground-fault condition imposed near middlemost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.5 Class B circuits

.1 Test each conductor on all circuits for capability of providing alarm signal on line side of single open-circuit fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.4 The control panel shall continuously perform as automatic self-test routine on each sensor, which will functionally check the sensor electronics and ensure the accuracy of the valves being transmitted to the control panel.

.5 Automatic testing will occur at a rate of one sensor every four minutes.

.6 The sensor's average analogue value is the average of the last 2000 recorded analogue entries of its chamber.

.7 Any sensor that fails this test shall indicate a '**SELF-TEST ABNORMAL'** trouble condition with the sensor's address at the control panel.

.8 The system shall automatically indicate when an individual sensor needs cleaning. When the sensor's average value reaches a predetermined value, a **'DIRTY SENSOR'** trouble condition shall be audibly and visually indicated at the local control panel for that sensor. IF a **'DIRTY SENSOR'** indication is left unattended and its average value increases to a second predetermined value, an **'EXCESSIVELY DIRTY SENSOR'** trouble condition shall be indicated at the local control panel for that sensor. To prevent false alarms, these **'DIRTY'** conditions shall in no way decrease the amount of smoke obscuration necessary to generate an alarm condition.

.9 An operator having a proper access level, shall have the capability to manually access the following information from the control panel:

.1 Primary Status

.2 Device Type

.3 Present Average Value

.4 Present Sensitivity Selected*

.5 Highest Peak Detection Values (HVP)*

.6 Sensor Range (Normal, Dirty, Excessively Dirty)

* Values shall be in 'percent of smoke obscuration' format so that no interpretation is required by the operator.

3.8 AUDIBILITY TESTING

.1 It is the intention of this renovation to have the audibility tested in portions of the building within the scope of the project as indicated on drawings.

.2 Audibility Testing:

.1 The contractor is to coordinate an audibility test prior to occupancy of the facility. The test is to be performed by the representatives of the fire alarm manufacturer in the presence of the consultant. The test report is to be in chart form indicating:

.1 Project

.2 Date of test

.3 Room name and number

.4 Ambient dB level

.5 Alarm dB level

.6 Name of testing technician

.2 The test results are to be submitted to the consultant for review prior to issuing to owner's representatives and/or authorities having jurisdiction.

3.9 ADDITIONAL INSTALLED FIRE ALARM SYSTEM COMPONENTS

.1 The electrical contractor is to include in their bid the cost to add two (2) additional signaling devices to be installed and verified in locations as directed by the consultant. Note: This installation and verification and subsequent audibility test will be occurring after the initial audibility testing is complete.

.2 The electrical contractor is to include in their bid the cost to add one (1) additional fire smoke damper connection and 120V loss of power trouble signal with associated module and including two (2) additional isolation modules to be installed and verified as directed by the consultant.

END OF SECTION