Waterloo Region
District School Board

REQUEST FOR TENDER

TENDER #23-7367-RFT

King Edward Public School Accessibility Upgrade including Elevator and Washrooms

ISSUE DATE: April 5, 2023

ELECTRONIC SUBMISSIONS will be received by the Bidding System no later than **2:00 p.m. local time, on Thursday April 21, 2023.**

DIVISION 00 – BIDDING AND CONTRACT DOCUMENTS

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

00 21 13 – Instructions to Bidders

1. Single Point of Contact

Rebecca Witteman
Procurement Specialist
Waterloo Region District School Board
rebecca_witteman@wrdsb.ca

Bidders shall not communicate with any employee or agent of the Board; Any member of the Board's governing body (such as Board of Trustees, or advisors); Any employee, consultant or agent of the Board's Clients, including Advisory Group members, other than the Single Point of Contact listed above. Any attempt by a Bidder to bypass or influence the procurement process may result in disqualification of the Bid.

2. Communication

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 Bid Solicitation. Addenda will be issued accordingly.

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

3. Blackout Period

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

4. Architect/Consultant

The Board has hired the following architect/consultant to assist in the preparation of this Tender: +VG Architects.

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

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

5. Vendor Registration

If not currently registered, the Board encourages Bidders to complete the Vendor Registration form prior to the submission of any Bid. In order to be considered for

award, Bidders shall complete the form and be accepted by the Board in the appropriate goods and services categories, met by their experience and qualifications.

Bidders can obtain the form by visiting this link: Vendor Registration Form

6. About the Waterloo Region District School Board

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

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 Board at any time.

DESCRIPTION	DATE
Issue Date	APRIL 5, 2023
Non-Mandatory Pre-Bid Site Examination	APRIL 11, 2023, 3:30pm King Edward Public School, 709 King St. W, Kitchener, ON, N2G 1E3 MAIN OFFICE
Deadline for Questions	APRIL 17, 2023
Closing Date and Time	APRIL 21, 2023, 2:00 pm local time
Anticipated Contract Start / Work begins	JULY 04, 2023
Substantial Completion Date	JULY 26, 2024
Ready for Takeover	AUGUST 2, 2024
Deemed Complete Date	AUGUST 9, 2024

8. Pre-Bid Site Examination

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

Bidders shall attend the site meeting at their own risk and hold the Board harmless

for any issues or damages arising out of their attendance of the site meeting.

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

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

9. Secondary Site Examinations

Bidder may request a secondary site examination through the Bidding System by clicking on the “Submit a Question” button found within the bid details page of that Procurement. Include the contact’s name and email of the person who will visit the site.

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

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

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

10. Public Health Safety Protocol

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

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

11. Addenda

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

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

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

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

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

Addenda cannot be acknowledged after the Closing Date and Time.

12. Brand Name and Requesting Approved Equivalents

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

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

Bidders shall request through the Bidding System by clicking on the “Submit a Question” button found within the bid details page of that Procurement that a proposed product be considered an approved equivalent prior to the Deadline for Questions in the Anticipated Project Schedule.

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

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

The Board/Consultant will endeavor to complete a review and make a decision prior to the Closing Date, and, if required, the Board reserves the right to extend the Closing Date to complete its review. However, in the event additional time is

required beyond a suitable extension to the Closing Date, the request will be pending until the product is thoroughly vetted, therefore, it may not be approved for this particular Procurement.

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

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

13. Compliance with Laws, Acts and Regulations

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

i. Broader Public Sector Accountability Act, 2010
ii. Construction Act
iii. Architect Act
iv. Canada Revenue Agency (CRA) regulations
v. Accessibility for Ontarians with Disabilities Act (AODA)
vi. Workplace Safety and Insurance Act (WSIB)
vii. Occupational Health and Safety Act
viii. Trade Agreements (CETA/CFTA)
ix. Education Act
x. WRDBS Procurement Services Policies website
xi. WRDSB Policies and Procedures

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

14. No Lobbying

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

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

15. No Collusion

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

16. Conflict of Interest

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.

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.

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.

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.

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."

17. Incurred Costs

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

18. Examination of Site and Work

i) Bidders will accept the site conditions, and the requirements of the Work, as is. No modifications to the Bid will be accepted after the Closing Time.

ii) No claim for extras will be allowed for Work or difficulties encountered due to conditions of the site which were visible, knowable, or reasonably inferable, prior to the time of submission of Bid. Bidders shall accept sole responsibility for any error or neglect on their part in this regard.

iii) Before submitting a Bid, each Bidder shall:

a. carefully examine this entire Bid Solicitation Document to determine the extent of the Work, and various provisions including the maps, drawings, reports and specifications;
b. immediately report all discrepancies between the various documents and site conditions;
c. provide subcontractors, sub-consultants, and suppliers to whom the Bidder intends to sublet a portion or portions of the Work with complete information as to the requirements of the Work. This is to include maps, drawings, reports, specifications, and all requirements of the Bid Solicitation Document including any addenda.

iv) In the event of discrepancies between the maps, drawings, reports, and the specifications with regard to quantity or quantities of materials or items, and in the absence of Addenda in clarification of said discrepancies, the Bidder is to include for the larger quantity or quantities.

v) No additional payments will be made for any costs incurred through failure of the Bidder to abide by provisions stipulated in all of the articles and sub-articles of this item.

vi) Any soils investigation, environmental, geotechnical or other reports prepared or obtained with respect to the Place of the Work (collectively the "Reports") are available from the Consultant. Where the Work involves existing buildings, structures, facilities, plant or equipment, any reports, data or as-built drawings concerning such buildings, structures, facilities, plant or equipment (collectively the "Data") are available from the Consultant. The Reports should not be considered a representation of the site conditions of

the entire Place of the Work, and the Reports and Data are provided for general information and guidance purposes only. Neither the Owner nor the Consultant guarantees the accuracy or completeness of the Reports or the Data, nor does either assume any responsibility for any interpretations or conclusions that bidders may make or draw from the Reports or the Data.

vii) Each Bidder is solely responsible, at its own cost and expense, to carry out its own independent research and due diligence, or to perform any other investigations considered necessary by the Bidder to satisfy itself as to all existing conditions. The Bidders' obligations set out in this paragraph apply irrespective of any Reports, Data or any information contained in the Bid Documents.

viii) No allowances will be made for additional costs and no claims will be entertained in connection with conditions which could reasonably have been ascertained by investigation or other due diligence undertaken prior to the Submission Deadline, and/or in connection with Work which is required and which is reasonably inferable from the Bid Documents, the Reports and/or Data as being necessary.

19. Designated Substances

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

i) Asbestos

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

Should the Contractor encounter asbestos, not noted in the above AAU Report, that would be disturbed during the course of the Work they should

stop the work in that immediate area and report the same to the Board Contact.

All asbestos work must be conducted by contractors approved by the Board as vendor of record, 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, contractors must be certified as Asbestos Abatement Workers AAW (Trade code 253W) and Asbestos Abatement Supervisors AAS (Trade code 253S) by The Ministry of Training, Colleges and Universities as prescribed by Section 20 of O. Reg. 278/05.

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

ii) Lead

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

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

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

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

The classification of typical lead-containing construction tasks is based on presumed airborne concentrations obtained from the U.S. Occupational

Safety and Health Administration (OSHA), the Ontario Ministry of Labour, and published research studies. The classification of Type 1, Type 2, or Type 3 operations are grouped based on the following concentrations of airborne lead

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

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

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

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

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

any information included in the Bid Solicitation Document or in any data, materials, or documents provided or required by the Board.

20. Reserved Rights of the Board

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

a) 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, vendor performance evaluations that are below expectations, or claims by or against or otherwise involving either of the Board and the Bidder;

b) waive formalities and accept Bids which substantially comply with the requirements of this tender;

c) accept any Bid in whole or in part;

d) accept, reject or cancel any or all Supplementary pricing;

e) discuss with any Bidders different or additional terms to those contemplated in this Bid Solicitation Document or in any Bid submission;

f) make public the names of any or all Bidders;

g) accept or reject equivalent or alternative brand names;

h) check references other than those provided by any Bidder;

i) 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;

j) disqualify any Bidder:
   i. whose Bid contains misrepresentations or any other, inaccurate, or misleading information, or any qualifications within its Bid,
   ii. who has engaged in conduct prohibited by the Bid Solicitation Document,
   iii. with inadequate credentials or due to unsatisfactory past performance,

k) reject Bid(s) from Bidder who has engaged in lobbying or has contravened any of the terms of the Bid Solicitation Document;

l) reject a Bid on the basis of:
   i. information provided by references or credit check or other due diligence efforts,
   ii. the information provided by a Bidder pursuant to the Board exercising its clarification rights under the procurement process, or
   iii. other relevant information that arises during the procurement process;

m) choose to reject a Bid if only a single Bid is received and cancel the bidding process or enter into direct negotiations with the sole Bidder;

n) accept a Bid other than the lowest or highest scoring and/or to not accept any Bid for any reason whatsoever;

o) 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;

p) no longer consider a Bidder if a satisfactory outcome is not reached as part of negotiation, as determined by the Board in their sole discretion and move to the next highest ranked Bid in such event;

q) select a Bidder other than the Bidder whose Bid reflects the lowest cost to the Board and/or award the Contract to any Bidder;

r) award any business/Work described in this Bid Solicitation to more than one (1) Bidder;

s) not award the Contract if the costs of completing the Work exceed budget funding; or

t) do not respond to all requirements or do not represent fair market value or where necessary internal approvals are not obtained.

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

21. Bid Submission Requirements and Instructions

1. All Bids shall be submitted through the Bidding System only. The onus is on the Bidder to ensure all requirements of the Bid Solicitations are submitted.

2. Bidder shall have a “Vendor account” in the Bidding System and shall ensure the account is created with the Bidders full legal company name and be registered as a “plan taker” for this bid solicitation. Only the plan takers will have access to download bid documents, receive addenda email notifications, download addenda and to submit their bid electronically through the Bidding System.

3. The onus is on the Bidder to ensure that the Bid is received in the Bidding System on or before the Closing Time. The Closing Time shall be determined by the Bidding System’s web clock. The timing of the Bid submission shall be based on when the Bid is received by the Bidding System, not when a Bid is submitted by a Bidder.

4. 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.

5. All prices including supplementary bid pricing, if requested, shall be submitted in the Schedule of Prices forms available through the Bidding System. Supplementary bid pricing including but not limited to:

   i) Itemized, Separate, Alternative and Optional Prices:
   The Owner reserves the right to accept or reject any or all supplementary bid prices submitted, and such prices shall remain in effect for the duration of the Contract. Failure to submit supplementary prices where required may result in the Bid being declared non-compliant.

   ii) Unit Prices:
   The Owner reserves the right to accept or reject any or all unit prices submitted, and such prices shall be in effect for the duration of the Contract and may be used to calculate the cost of additional work under the Contract. Failure to submit a unit price where required may result in the Bid being declared non-compliant

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

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

8. The Board hereby consent to the use of an Electronic Signature for the signing of all documents requested hereunder. Acceptable forms of signatures include, but are not limited to, the typing of the Bidder's authorized signing officer's name or the inclusion of an image of the Bidder's authorized signing officer's signature, so long as the electronic signature is sufficient to identify the Bidder's authorized signing officer. The Bidder's authorized signing officer agrees that whatever form of electronic signature is provided constitutes a signature for the purpose of executing all documents requested hereunder.

9. 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

10. There will be no public opening for this Bid.

22. Bid Prices

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

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

iii. HST is extra and shall not be included in Bid prices.

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

v. Quantities may be estimated, and therefore the Board, at its discretion, may purchase more or less of the commodity based on the unit price bid.

vi. All information required on the forms shall be completed in full including references and subcontractors that it proposes to use for Work described. Changes made to the list of nominated subcontractors after the closing of the Bid, must have prior written approval of the Board's Single Point of Contact.

vii. All price(s) submitted shall be a reasonable price for each particular item as determined by the Board and under no condition will an unbalanced Bid be considered. Submissions containing prices which appear to be so unbalanced as to likely affect the interests of the Board adversely will be clarified and may be rejected.

23. Withdrawal of Bid Submission / Irrevocable Period

Bidders may edit or withdraw a Bid in the Bidding System up until the 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 Submissions will not be considered.

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

24. Bid Irregularities

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

i. Bids that do not comply strictly with all terms and conditions of the Bid Solicitation Document.

ii. Bids that are incomplete, conditional, qualified, or obscure.

iii. Bids that are based upon an unreasonable period of time for completion of the Work.

iv. Bids received from Bidders involved in Claims with either of the Board or banned or on probation with the Board.

v. Bids received from any Bidder deemed to be unskilled or experienced in the work contemplated, or those who have defaulted on, or failed to satisfactorily complete other similar work in the past.

vi. Bids submitted by Bidders that are not prequalified, where applicable.

25. Bid Review

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

b) It is the Bidder's responsibility to satisfy the Board that the Bidder can comply with the requirements contained within this Bid Solicitation Document and that the Bidder possesses the necessary inventory, equipment, facilities, resources and staff to perform the Work specified in this Bid Solicitation Document. Substitution of materials, equipment, or methods different from that outlined in the terms of reference will not be accepted unless provided for within this Bid Solicitation Document or with the written approval from the Board.

c) The Board also reserves the right to examine Bidder's facilities, equipment and visit the subcontractors or sub-consultants proposed or Bidder's existing and past clients. The award decision may be revised based on the above.

d) The Board will not be responsible for travel costs if travel is required. No additional charges will be accepted by the Board for any cost incurred by the Bidder or any other party in participating in the Bid evaluations.

e) The Board may, in their sole discretion, check references, conduct credit checks, review the litigation history and history of professional liability or other insurance claims, and obtain any other type of information that might aid the Board in its selection. The Board reserves the right to consider all or any information received from all available sources, whether internally or externally obtained. The Board may disqualify any Bid from further consideration based on results of reference or credit checks or review of litigation or claim history. The foregoing may include the Board's own experiences with the respective Bidder(s) or any of the subcontractors and sub-consultants proposed in its Bid.

26. 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).

27. Intent to Award Notice

a) Subject to the reserved rights of the Board and availability of funds, the lowest compliant Bid will be recommended for award.

b) There shall be no obligation on the Board as a result of seeking Bids or conducting the procurement process and the Board reserves the right to pursue

other Bidders, cancel the Bid Solicitation, issue a revised request, or to pursue any other course of action which would aid in meeting their needs.

c) Within **twenty-four (24) work day hours** of receiving a request or intent to award from the Board, the Bidder (the "Recommended Bidder") shall provide a list in a Board-provided form of all Subcontractors/Subconsultants that it proposes to use for all Work described in this Procurement including the specification sections.

d) Within **seven (7) calendar days** of receiving a request or intent to award from the Board, the Bidder (the "Recommended Bidder") shall provide the following:

i. Insurance certificate with coverage specified in the Bid Solicitation Document.

ii. WSIB clearance certificate valid on date of award or an exemption letter (if applicable and requested).

iii. Bonding Requirements applicable as specified in the Bid Solicitation Document.

iv. An executed Board issued Form of Agreement, if applicable, and duly signed by the authorized signatory.

v. Any other submittal specified in the Bid Solicitation Document or in the intent to award, as a requirement of award.

vi. 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.

28. Post Award

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

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

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

29. Award Notification

For procurements valued at $100,000 or more, and in accordance with the Broader Public Sector Procurement Directive, once the Board is satisfied that all requirements are met, the project award notification will be posted in the same manner as the procurement documents were posted. The notification will be posted after the purchase order and/or agreement between the successful bidder and the Board has been issued/executed. The award notification will list the name of the successful bidder, agreement start and end dates, and any extension options.

30. Confirmation to Proceed

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

31. Debriefing Requests

For procurements valued at $100,000 or more, and in accordance with the Broader Public Sector Procurement Directive, unsuccessful Bidders are entitled to a debriefing in order to receive feedback with respect to their Bid submission. In order to obtain a debriefing, Bidders shall contact the Single Point of Contact listed in this Bid Solicitation Document in writing with their request within sixty (60) calendar days of the award notification.

32. Warranty and Maintenance

The Successful Bidder, 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. Individual sections may extend warranties beyond the two (2) year time frame. The Successful Bidder is responsible for all required maintenance complete with materials and labour during the warranty period.

33. Definitions

Capitalized terms not otherwise defined in this Section or elsewhere in these Instructions to Bidders shall have the meanings ascribed to them in the Contract. All references in these Instructions to Bidders to “Section” or “paragraph” shall, unless specifically indicated otherwise, refer to a Section or paragraph of these Instructions to Bidders.

.1 **“Bid”** means a proposal, quotation or tender submitted in response to a solicitation issued by the Board.

.2 **"Bid Solicitation Document" or "Procurement"** means all documentation related and developed to describe all of the elements of the construction project such as and not limited to include the tender documents, plans, specifications, drawings, appendices, attachments, addenda, reports, Scope of Work, Supplementary Conditions & Amendments to Standard Construction Document CCDC 2-2020 etc. which become the contract between both parties,

.3 **"Bidding System**" means a computer-based system that provides suppliers with access to information related to open competitive procurements.

.4 **"Board" or "Owner"** means the Waterloo Region District School Board.

.5 **"Consultant"** means a person or entity that, under an agreement, other than an employment agreement, provides expert or strategic advice and related services for consideration and decision-making.

.6 **"Contract"** means an obligation, such as an accepted offer in the form of Agreement and/or CCDC 2 – 2020 stipulated price contract, as amended by supplementary conditions, between competent parties upon a legal consideration, to do or abstain from doing some act. It is essential to the creation of a contract that the parties intend that their agreement shall have legal consequences and be legally enforceable. The essential elements of a contract are an offer and an acceptance of that offer; the capacity of the parties to contract; consideration to support the contract; a mutual identity of consent or consensus ad idem; legality of purpose; and sufficient certainty of terms.

.7 **"Project Coordinator"** means the designated Facilities Services Representative employed by the Board for the project.

.8 **"Single Point of Contact"** means the designated Procurement Services Representative employed by the Board and NOT the Consultant.

.9 **"Schedule of Prices"** means all forms where pricing is request within the Bidding System.

END OF SECTION

00 21 14 – Vendors of Record

For more information about Vendor Registration, refer to Section 00 21 13 Instructions to Bidders, sub-section 5. Vendor Registration.

1.0 General Contractor or Prime Contractor

1.1 Only those General Contractors noted below may submit bids.

1.2 Bidders must be a Registered Vendor of Record. Bids received from contractors who have not been registered prior to the closing date will not be accepted.

1.3 The Owner reserves the right to issue an addendum naming additional registered general contractors.

1.4 In the near future, the Board will require General Contractors to have their IHSA - Certificate of Recognition (COR®). Although not mandatory at this time, Bidders may be required to complete a survey in the Bidding System for this tender.

1.5 The following General or Prime Contractors are Vendors of Record with the Board and are invited to submit bids:

Name	Email	Phone
Bestco Construction (2005) Ltd	estimating@bestcoconstruction.com	(905) 304-4597
Caird-Hall Construction Inc.	caird-hall@bell.net	(905) 634-0903
Collaborative Structures Limited	jblackler@collaborativestructures.com	(519) 658-2750
Complete Building Systems Inc.	estimating@completebuildinsystems.ca	(519) 576-5800
CRD Construction	sbock@crdconstruction.on.ca	(519) 822-1801
D. Grant Construction Limited	swillis@dgrantconstruction.com	(519) 652-2949
Dakon Construction	james@dakon.ca	(519) 746-0920
Elgin Contracting and Restoration Ltd.	info@elgincontracting.com	(519) 633-9969
Gateman-Milloy Inc.	info@gatemanmilloy.com	(519) 748-6500
Golden Gate Contracting Inc	estimation@ggcontracting.ca	(905) 844-1122
K&L Construction (Ontario) Ltd	todd.hodgins@kandlconstruction.com	(519) 472-7164
Melloul Blamey Construction	teresa.oreilly@melloul.com	(519) 886-8850
Nith Valley Construction Ltd	mail@nithvalley.com	(519) 662-1324
PM Contracting Ltd	sarahziegler@pm.on.ca	(519) 576-8327
PRE-ENG CONTRACTING LTD.	info@pre-eng.com	(905) 738-6866
Reid & Deleye Contractors Ltd	gregd@reid-deleye.com	(519) 688-2600
RENOKREW	info@renokrew.com	(416) 604-7042
SG Cunningham Ltd	allan@cunningham.on.ca	(519) 886-2730

Sierra Construction	info@sierraconstruction.ca	(519) 421-7413
SPEC Construction Inc.	info@spec-build.com	(519) 650-4030
STM Construction Ltd	robertbox@stmconstruction.com	(519) 756-7030
Struct-Con Construction Ltd.	harpreet@struct-con.ca	(905) 791-5445
Tambro Construction	btami@tambro.com	(519) 766-1234
TRP Construction	info@trpconstruction.ca	(905) 336-1041
Van Horne Construction Ltd	otekin@vanhorne.ca	(905) 677-5150
Zehr Levesque Inc.	estimating@zehrgroup.ca	(519) 576-2233

2.0 Subcontractors/Subconsultants

2.1. Refer to specification sections for products, suppliers and installers that will be required.

2.2. The Subcontractor/Subconsultant list is not required at time of bid submission.

2.3. The Subcontractor/Subconsultant list is mandatory after the bid closing date from the Recommended Bidder **within twenty-four (24) hours** of receiving a request or intent to award from the Board.

2.4. Subcontractor/Subconsultant are not required to complete and/or be a Registered Vendor of the Board.

2.5. The Bidder (the “Recommended Bidder”) shall provide a listing in a Board provided form of Subcontractor/Subconsultant that it proposes to use for all Work described in this Procurement including the specification sections, as per the following:

2.5.1 Bidders shall select experienced and qualified Subcontractor/Subconsultant or Suppliers in their field to perform or supply an item of Work indicated in this Procurement.

2.5.2 The Bidder shall be fully aware of the capability of each Subcontractor/Subconsultant and/or Supplier included in its bid, including but not limited to technical ability, financial stability and ability to maintain the proposed construction schedule.

2.5.3 The Owner reserves the right to reject any nominated Subcontractor/Subconsultant or supplier, based on the following but not limited to unsatisfactory past performance, suspended/removed from a Vendor of Record list and/or outstanding/unresolved corrective action notice issued by the Owner to the Subcontractor/Subconsultant within the last three (3) years.

2.5.4 The Owner reserves the right to obtain information from the Bidder and from third parties respecting the qualifications and experience of the Bidder’s nominated list of Subcontractor/Subconsultant for such item of the Work.

2.5.5 The Board reserves the right to examine Bidder’s facilities, equipment and visit the Subcontractor/Subconsultant’s proposed.

2.5.6 The substitution of any Subcontractor/Subconsultant and/or Suppliers after the list is submitted will not be accepted unless a valid reason is given in writing to and approved by the Owner, whose approval may be arbitrarily withheld.

2.5.7 Where a bidder lists “own forces” in place of a Subcontractor/Subconsultant, the bidder shall carry out such item of the Work with its own forces.

2.5.8 Where “own forces” have been listed by a bidder, the Owner reserves the right to obtain information from the bidder and from third parties respecting the qualifications and experience of the bidder’s “own forces” for such item of the Work.

END OF SECTION

00 21 15 – Scope of Work

Installation of new elevator in the main entrance of the school towards Agnes Street, comprised of all the new architectural elements required (new entrance, new canopy, new exterior ramp. Refer to the drawings for full scope).

Renovation of 2 spaces to separate each one into two offices.

Separation of a Classroom into 1 classroom and 2 separate spaces (cash allowance)

Provide two new Barrier Free Washrooms and two new storage rooms.

Installation of new lighting fixtures in Level 1 (Basement) main corridor.

END OF SECTION

00 31 34 – Subsurface Investigation Report

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 is titled as follows:

.1 Title: **Geotechnical Investigation Proposed Elevator at King Edward Public School. 709 King Street West, Kitchener, Ontario**

.2 Dated: March 28, 2022

.3 Prepared By: Chung & Vander Doelen Engineering LTD.

.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.

.4 The report as prepared primarily for the use of the Consultants.

.5 The recommendations given shall not be construed as a requirement of this Contract unless also contained in the Contract Documents.

.6 The report, by its nature, cannot reveal all conditions that exist or can or might occur on the subject site. Should subsurface conditions be found or be a concern thereto, or to vary substantially from the investigation report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to the Owner.

END OF SECTION

Appendix 00 31 34A – Soil Report

CHUNG & VANDER DOELEN
ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1
519-742-8979

March 28, 2022
File No.: G22396

Waterloo Region District School Board (WRDSB)
c/o The Ventin Group Ltd. Architects
7818 Wellington Road 12
Arthur, Ontario
N0G 1A0

Attention: Mel Lavoie, Project Coordinator

Re: Geotechnical Investigation
Proposed Elevator at King Edward Public School
709 King Street West, Kitchener, Ontario

CHUNG & VANDER DOELEN ENGINEERING LTD. has been retained by the Waterloo District School Board (WRDSB) c/o The Ventin Group Ltd. Architects to carry out a subsurface investigation required for the proposed elevator to be designed and constructed at King Edward Public School located at 709 King Street West in Kitchener, Ontario.

It is understood that a new elevator is to be constructed as part of a 2-storey renovation on the east side on King Edward Public School. The elevator is to be constructed within the area of the existing canopy covered entrance and lobby area. The proposed renovation foundations are proposed to match that of the existing school building. Existing building drawings/footing elevations and finalized building addition designs were not available at the time of reporting.

The purpose of this investigation was to determine the subsurface conditions at the site and, based on the findings, to make geotechnical recommendations for:

- Foundation design recommendations;
- Excavation condition;
- Groundwater control during and after construction;
- Backfilling recommendations;
- Slab-on-grade floor construction;
- Foundation soil classification for seismic design per OBC 2012; and
- Foundation walls and retaining wall design.

FIELD AND LABORATORY WORK

To investigate the subsurface conditions at the site, one (1) borehole was drilled and sampled to a depth of 6.35 m below existing grade at the locations shown on Drawing No. 1, Borehole Location Plan. The field work for this project was carried out on March 16, 2022, under the supervision of a member of our engineering team, who logged the boreholes in the field, effected the subsurface sampling and monitored the groundwater conditions. The ground surface elevation at the borehole is assumed to be 100.00 m.

The borehole was advanced to the sampling depths using a portable drilling rig, equipped with continuous flight augers. Penetration tests were carried out at frequent intervals of depth using a 70-hammer. "N"-values were corrected to SPT values and the results are shown on the borehole log. The compactness condition of the soil strata has been inferred from these test results.

Soil samples obtained from the in-situ tests were examined in the field and subsequently brought to our laboratory for visual and tactile examination to confirm field classification. Moisture content determination of all retrieved samples occurred. In addition, one (1) grain size distribution analysis was performed on the major soil deposits to confirm field identification.

SUBSURFACE CONDITIONS

The subsurface conditions encountered in the borehole are detailed on the Borehole Log Sheet, Enclosure 1, inclusive. The following notes are intended to amplify and comment on the subsurface data.

The stratigraphic boundaries shown on the borehole log is inferred from non-continuous sampling conducted during advancement of the borehole drilling procedures and, therefore, represent transitions between soil types rather than exact planes of geologic change. The subsurface conditions will vary between and beyond the borehole locations.

Concrete Slab

A concrete slab was encountered at the ground surface at Borehole 1 with a measured concrete thickness of 380 mm and Granular "A" base thickness of 100 mm.

Fill

A layer of fill materials was encountered underlying the concrete slab which extended to a depth of 1.15 m below existing grade. The fill comprised of sand and silt with traces of gravel.

The SPT "N"-value measured within the fill was 5 blows per 300 mm of penetration, indicating a loose compactness condition. The natural moisture content was measured at 9%, indicating a moist moisture condition.

Fine Granular Deposits

Fine granular deposits were encountered underlying the fill at Borehole 1 which extended to a depth of 3.40 m below existing grade. The fine granular deposits ranged in composition from sand and silt to silt with trace sand. Traces of gravel and clay and occasional wet sand seams were encountered within the silt deposit.

The SPT "N"-values measured within the deposits ranged from 5 to 30 blows per 300 mm of penetration, indicating a loose to dense compactness condition. Natural moisture contents were measured between 12 and 18%, indicating a moist moisture condition.

Sand

A sand deposit was encountered underlying the fine granular deposits at Borehole 1. Borehole 1 was terminated within the sand deposit which extended to a depth of 6.35 m below existing grade. The deposit contained trace to some silt and occasional silt pockets. The deposit became silty below 6.0± m depth. Results of one (1) grain size distribution analysis from Borehole 1 are shown graphically on Enclosure 2.

The SPT "N"-values measured within the deposits ranged from 30 blows per 300 mm to 50 blows per 85 mm of penetration, indicating a dense to very dense compactness condition. Natural moisture contents were measured between 1 and 9%, indicating a damp to moist moisture condition.

Groundwater

Groundwater conditions were monitored during and following completion of borehole sampling. Upon withdrawal of the drilling augers, groundwater was not encountered. Borehole 1 experienced a dry cave-in to a depth of 4.55 m below existing grade. The groundwater level is inferred below a depth of 6.35 m below existing grade.

It is noted that the observed groundwater table will fluctuate seasonally and in response to major weather events.

DISCUSSION AND RECOMMENDATIONS

General

It is understood that a new elevator is to be constructed as part of a 2-storey renovation on the east side on King Edward Public School. The elevator is to be constructed within the area of the existing canopy covered entrance and lobby area. The proposed renovation foundations are proposed to match that of the existing school building. Existing building drawings/footing elevations and finalized building addition designs were not available at the time of reporting.

Foundations

The proposed renovation/elevator foundations are to match that of the existing school building. The proposed elevator can be supported on conventional strip and spread footing foundations. Footing foundations constructed on competent native soil deposits can be designed using a Geotechnical Reaction at SLS and Factored Geotechnical Resistance at ULS as outlined in the table below.

The following table summarizes the recommended highest founding depth and elevation at the borehole location.

Borehole No.	Existing Ground Elevation (m)	Highest Founding Depth (m)	Highest Founding Elevation (m)
SLS = 150 kPa; ULS = 250 kPa			
1	100.00	1.50	98.50
SLS = 200 kPa; ULS = 300 kPa			
1	100.00	2.40	97.60

The maximum total and differential settlements of footings designed to the above recommended soil bearing pressure are expected to be less than 25 and 12 mm, respectively, and these are considered tolerable for the structures being contemplated.

In addition, the footings should be founded below any existing fill materials, building foundations and utility trenches, on competent native undisturbed soils. Spacing between adjacent footing steps should not be steeper than 10H to 7V. If underpinning the existing footing is required for the construction of the elevator pit, the underpinning should be carried out in alternating short panels so as not to undermine the existing footings

Footings are to be provided with a soil cover of not less than 1.2 m or equivalent thermal insulation for adequate frost protection. The founding subgrade soils must be protected from frost penetration during winter construction.

It is recommended that a lean concrete mat be placed over approved footing subgrade in wet to saturated areas to prevent further disturbance to the bearing soils resulting from construction activities.

CVD recommends that the footing excavations be inspected by the geotechnical engineer to ensure adequate soil bearing and proper excavation and subgrade preparation.

Construction and Groundwater Control

Excavations are expected to be in the order of 1.5± to 2.4± m deep for foundations which are to match that of the existing school building. The excavations will penetrate the concrete slab, loose fill materials and native loose to compact fine granular soils.

These materials are considered to be Type 3 Soils in accordance with the latest Occupational Health and Safety Act. Excavations in the Type 3 Soils are expected to remain stable during the construction period provided that side slopes are cut to 1H : 1V from the bottom of the excavation. Where seepage or groundwater is encountered, side slopes should be cut to more stable angles of 3H : 1V. The side slopes should be suitably protected from erosion processes.

Uncontrollable groundwater flows are not expected to be encountered within the anticipated construction excavations. Subsurface seepage and surface water runoff into the excavations may be handled by conventional filtered sump pumping techniques, as and where required.

Earthquake Consideration

In accordance with The Ontario Building Code 2012 (OBC), the proposed structure should be designed to resist earthquake load and effects as per OBC Subsection 4.1.8.

Based on the soils condition encountered at the boreholes and our experience with the top 30 m of soil condition in the general area of the site, the site can be classified as a Site Class C as per OBC Table 4.1.8.4.A (Page B4-24).

Floor Slab Construction

The floor slab for the proposed elevator can be constructed as conventional slab-on-grade the native fine granular soils. The exposed subgrade should be compacted in conjunction with an inspection by the geotechnical engineer at the time of floor slab construction. Any soft and/or unstable areas detected should be replaced with granular fill which should be compacted to at least 98% SPMDD.

It is recommended that a minimum 150 mm thick layer of OPSS Granular “A” be placed and compacted to at least 100% SPMDD beneath the concrete floor slab to provide uniform support.

The floor slab should be separated structurally from the columns and foundation walls. Sawcut control joints should be provided at regular spacing (less than 30 times the concrete slab thickness) and to depths between one-third to one-quarter of the slab thickness.

Care should be taken to ensure that the backfill against foundation walls, interior piers/columns and concrete pits are placed in thin layers and each layer compacted to at least 98% SPMDD. These types of confined areas should be backfilled with imported granular soils such as OPSS Granular B Type I.

Lateral Earth Pressure

The unbalanced foundation walls and any other soil retaining structures should be designed to resist the lateral earth pressure acting against these walls. The following formula may be used to calculate the unfactored earth pressure distribution. The factored resistance can be calculated by using a factor of 0.8.

$$P = K (\gamma H + q)$$

where:

P =	Lateral earth pressure	kPa
K =	earth pressure coefficient, 0.5 for non-yielding foundation wall earth pressure coefficient, 0.3 for yielding retaining wall	
γ =	unit weight of granular backfill, compacted to 95% SPMDD	21 kN/m^3
H =	unbalanced height of wall	m
q =	surcharge load at ground surface	kPa

The backfill for the foundation walls and retaining walls should be free-draining granular materials which should have less than 8% silt particles (OPSS Granular “B” Type I). The backfill should be placed in thin layers and compacted to 95% SPMDD. Over-compaction adjacent to the foundation/retaining walls should be avoided. Weeping tiles leading to a frost-free outlet or weep holes should be installed to effect drainage behind the retaining wall.

The sliding resistance of the retaining wall footings should be checked. The unfactored horizontal resistance against sliding between cast-in-place concrete and the various soils can be calculated using a friction coefficient as follows:

Soil	Unit Weight (kN/m^3)	Friction Coefficient
Well-compacted granular backfill	21	0.45
Sand and Silt, Silt	20	0.30

CLOSURE

The Limitations of Report, as quoted in Appendix "A", is an integral part of this report.

We trust this report is sufficient for your immediate requirements. If you have any questions, please do not hesitate to contact the undersigned.

Yours truly,
CHUNG & VANDER DOELEN ENGINEERING LTD.

Joseph van der Zalm
Geotechnical Engineering Intern

Eric Y. Chung, M.Eng., P. Eng.
Principal Engineer

encls.

APPENDIX A

Limitations of Report

APPENDIX "A"

LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on information determined at the testhole locations. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Soils Engineer be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the testholes.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of testholes and their respective depths may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusion as to how the subsurface conditions may affect their work.

The benchmark and elevations mentioned in this report were obtained strictly for use in the geotechnical design of the project and by this office only, and should not be used by any other parties for any other purposes.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. CHUNG & VANDER DOELEN ENGINEERING LIMITED accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, we recommend that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

This report does not reflect the environmental issues or concerns unless otherwise stated in the report.

ENCLOSURES

FILE No: G22396

BOREHOLE No. 1

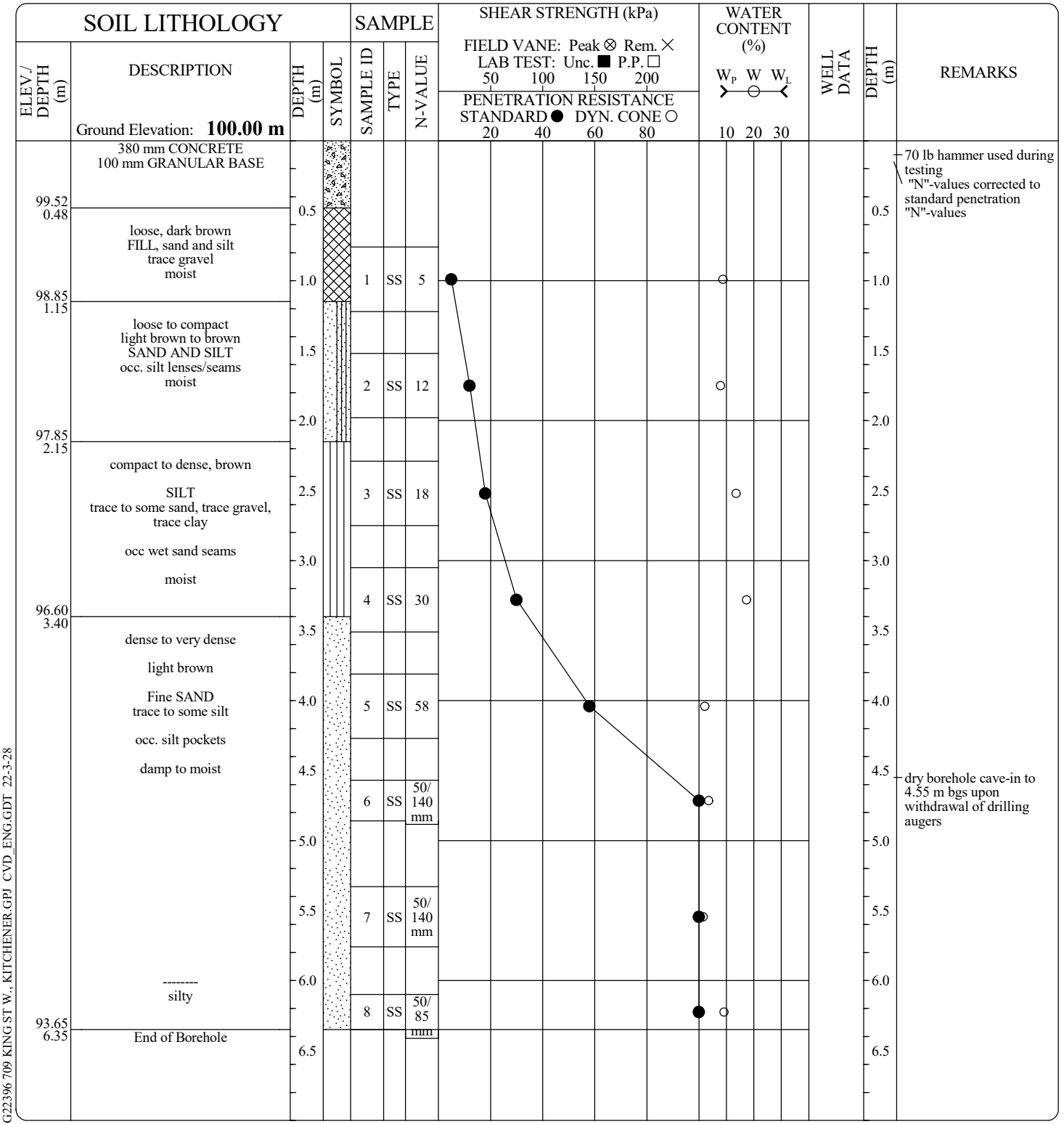
Client: **Waterloo Region District School Board c/o The Ventin Group Ltd. Architects**

Project: **Proposed Elevator at King Edward Public School**

Location: **709 King Street West, Kitchener, Ontario**

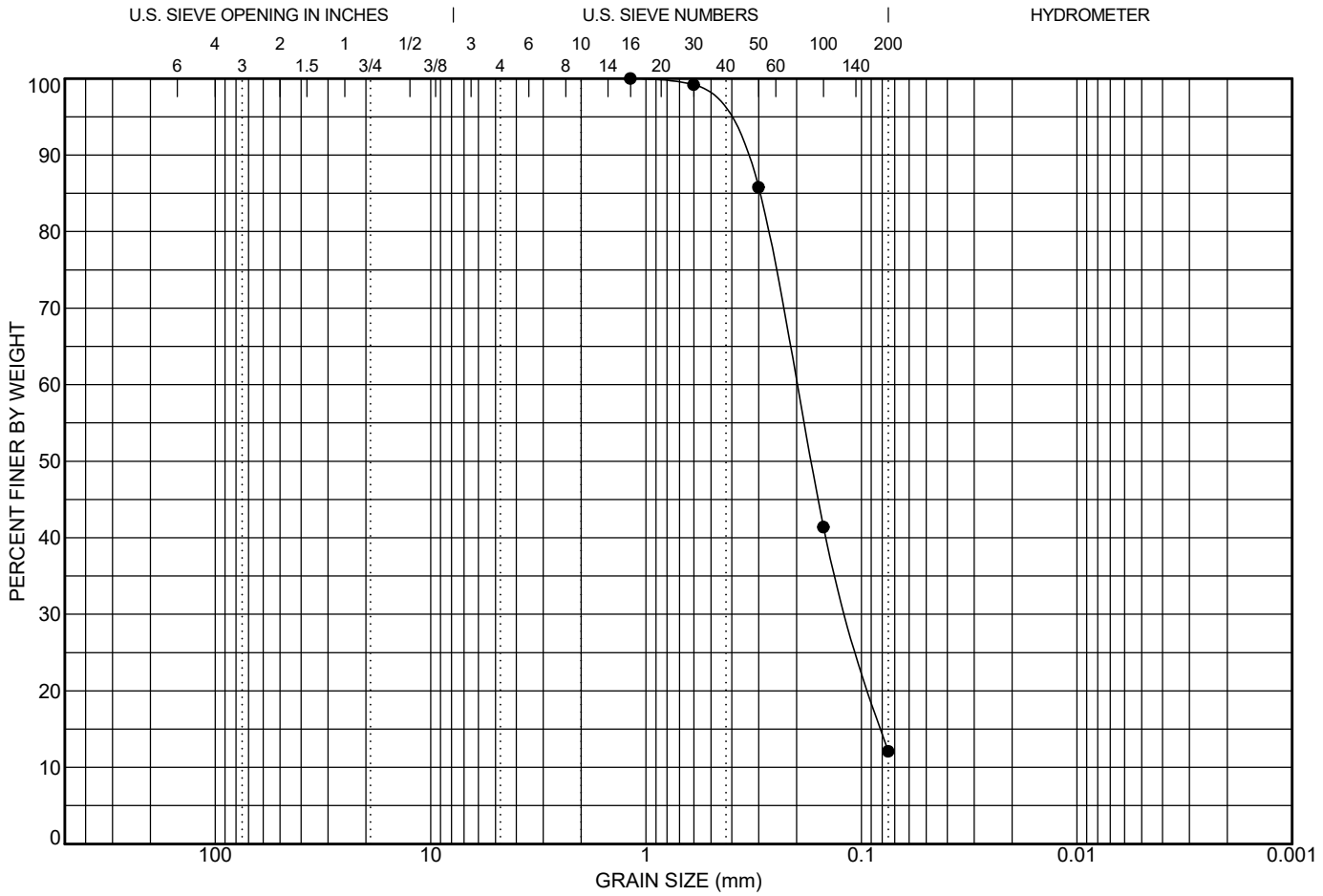
EQUIPMENT DATA

Machine: **Big Beaver**
Method: **Hollow Stem Auger**
Size: **83 mm I.D.**
Date: **Mar 16 - 22** TO **Mar 16 - 22**



PROJECT MANAGER: **JV**

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
ph. (519) 742-8979, fx. (519) 742-7739



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LL	PL	PI	Cc	Cu	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
			0.92	2.81	1.18	0.201	0.115		0.0	87.9	12.1	

Date: Mar. 23 - 2022
Client: Waterloo Region District School Board c/o The Ventin Group Ltd. Architects
Source:
Sampled From: BH 1 - SA 5; 3.80 to 4.25 m depth
Sample No.: 1-5
Date Sampled: Mar. 16 - 2022
Sampled By: DO
Lab No.: 0175
Date Tested: Mar. 17 - 2022
Type of Material: Sand, some silt

Sieve Size (mm)	Percent Passing (%)	No Specifications

CHUNG & VANDER DOELEN ENGINEERING LTD.
311 Victoria Street North
Kitchener, Ontario N2H 5E1
Telephone: 519-742-8979
Fax: 519-742-7739
e-mail: info@cvdengineering.com

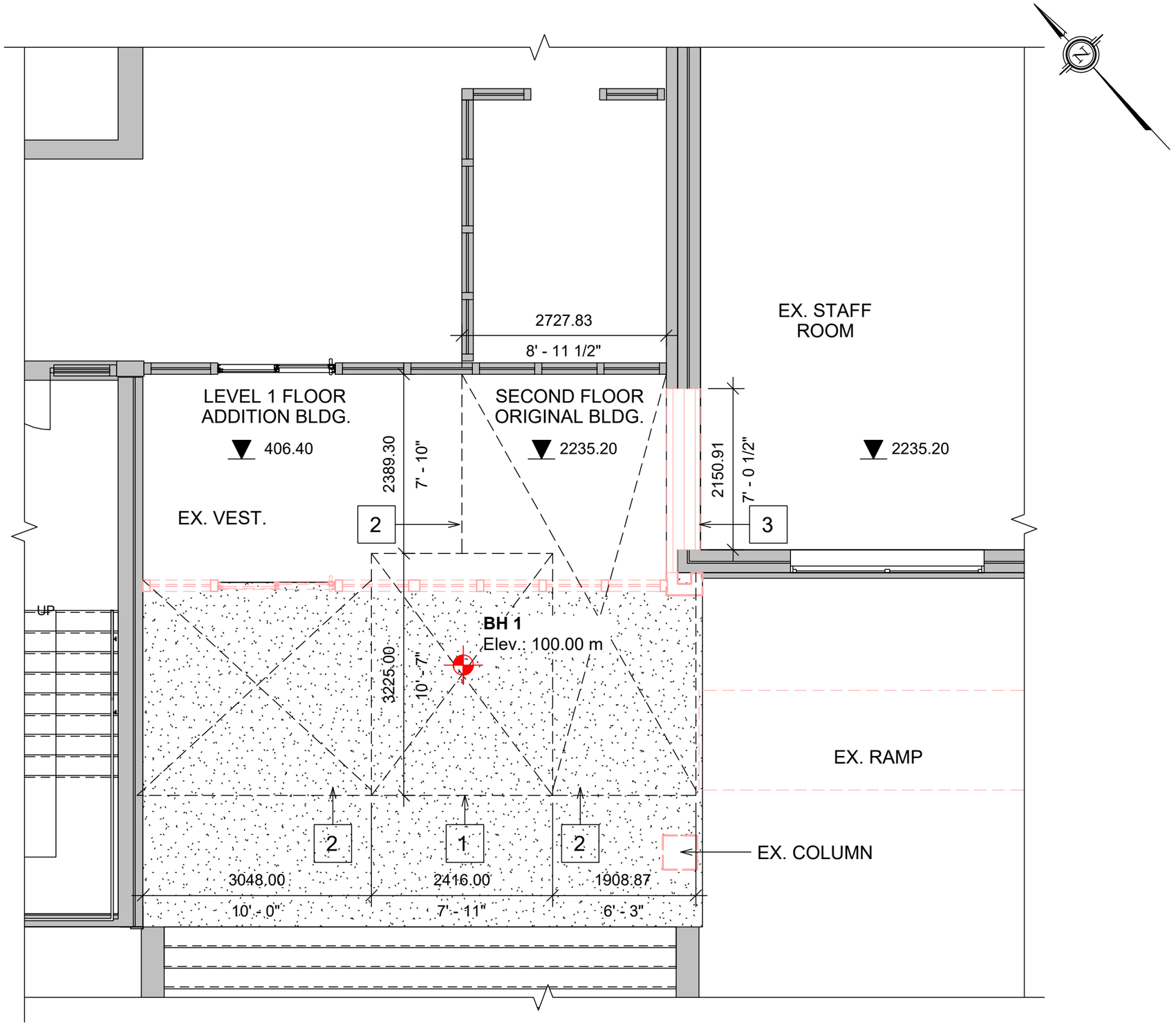
GRAIN SIZE DISTRIBUTION

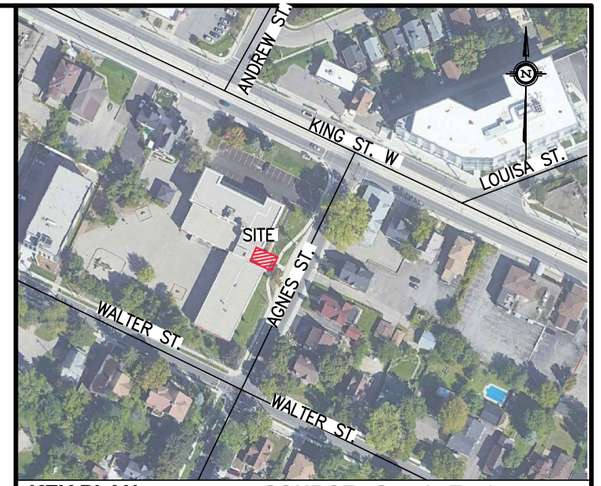
Project: Proposed Elevator at King Edward Public School

Location: 709 King Street West, Kitchener, Ontario

File No.: G22396

Enclosure No.: 2





KEY PLAN **SOURCE:** Google Earth

LEGEND

Borehole Location

Elev.: *Ground surface elevation at the borehole is assumed to be 100.00 m*
DWG. Ref.: *+VG Architects (The Ventin Group Ltd.); DWG. No.: D2.0, "Demolition Plans" dated 1/28/2022.*

BOREHOLE LOCATION PLAN

Proposed Elevator at King Edward Public School

709 King Street West
Kitchener, Ontario

CHUNG & VANDER DOELEN ENGINEERING LTD.

311 VICTORIA STREET NORTH
KITCHENER / ONTARIO / N2H 5E1 / 519-742-8979

Drawn By: DO	Date: March, 2022	File No.: G22396
Checked By: JV	Scale: N.T.S	Drawing No.: 1

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 41 73 – Supplementary Bid Information

1. General Contractor

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. Personnel will be subject to approval by the Board and cannot be changed without prior written approval from the Board.

2. Itemized Price Form

Such Work and amounts ARE included in the Bid Price.

The Board reserves the right to modify the Scope of Work and reduce the contract price accordingly, based upon the prices indicated.

3. Identified Price Form

Such work and amounts ARE included in the Bid Price.

The Board has requested these prices for information purposes only and does not intend to modify any Scope of Work based on the prices indicated.

4. Alternative Price Form

Such Alternative Work and amounts are NOT included in the Bid Price.

5. Separate Price Form

Such optional Work and amounts are NOT included in the Bid Price.

The Board has requested these separate prices and reserves the right for Work to be added to the base price if selected by the Owner.

6. Unit Price Form

These amounts are NOT included in the Base Bid Price and may or not be required for completion of the Work called for under the Contract. The Board has requested these unit prices separately and the Board reserves the right to utilize none, one or all of the listed line items contingent on current needs and budget availability.

The necessity for the items, and subsequent quantities will be determined by the Board. Should any of these items be required, the Bidder will be compensated on the basis of the unit prices(s) quoted. In the event that Supplemental items are deleted or quantities are less than estimated, no adjustment or compensation will be awarded to the Bidder by the Board for loss of revenue or for any other reason.

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 – Terms and Conditions

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

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

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

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

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

   If required by the Board, the Vendor will provide to the Board, or designate, a Criminal Background check for pertinent individuals covering offences under the Criminal Code, the Controlled Drugs and Substances Act, and any other offences

which would be revealed by a search of the automated Criminal Records Retrieval System.

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

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

4. Bonding Requirements

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

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

i. Bid Amount

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

ii. Bid Deposit Bond & Agreement to Bond

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

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

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

Bids that do not contain the bid deposit(s) in the required amount will be declared non-compliant and will be rejected. A scanned PDF copy of bonds or original

certified cheque, bank draft, money order, etc. are not acceptable as Bid deposit and will result in your Bid being rejected.

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

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

iii. Performance and Labour & Materials Bonds

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

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

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

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

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

5. Insurance

The successful Bidder shall provide, maintain, and pay for the insurance coverages below. 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 successful Bidder 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.

Certificates of Insurance evidencing renewal or replacement of policies shall be uploaded through the Bidding System within 72 hours of the expiration or replacement of the current policies, without demand by the Board.

i) 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.

ii) 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.

6. Workplace Safety Insurance Board (WSIB) Certificate

The Board requires all 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 commencing the services covered by this Bid Solicitation, the Vendor will provide to the Board's a copy of certificates of good standing with the Workplace Safety and Insurance Board ("WSIB Certificates") stating that the consultant and all of its sub 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 Vendor is exempt from registration with the WSIB, the Vendor must provide evidence of such by way of written confirmation from WSIB.

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

7. Responsibilities of the Vendor

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

The Vendor shall:

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

b. act in a professional manner at all times when dealing with Board staff, with the public, and while working on site;

c. not, except with the consent of the Board in writing, release information relating to any subsequent order for advertising, promotional or technical purposes or otherwise give it publicly in any fashion, nor shall the name of either of the Board be used for, or in connection with, any advertising or promotional purpose of the Vendor;

d. treat information gained while working with the Board confidentially and not use it for any other project and return it to the Board if requested;

e. 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

f. provide necessary information if they wish to receive payment by Electronic Funds Transfer (EFT).

8. Compliance with Laws

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

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

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

9. Indemnification

The Bidder will indemnify and save harmless and defend the Board, and their respective elected officials, officers, employees, agents and their respective successors and assigns, from and against all actions claims and demands whatsoever which may be brought against or made upon any of the Indemnified Parties and against all losses, liability, judgments, claims, costs, demands or expenses which the Indemnified Parties may sustain, suffer, or be put to resulting from or arising out of the Bidder’s failure to exercise reasonable care, skill or diligence in the performance or rendering of any Work or service required hereunder to be performed or rendered by the Bidder, its agents, servants, employees or 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.

10. Non-Assignment

It is mutually agreed and understood that the Bidder shall not assign, transfer, convey, sublet or otherwise dispose of its agreement or its right, title or interest therein, or their power to execute the Contract, to any other person, firm, Bidder or corporation without the previous written consent of the Board.

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

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

11. Waiver

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

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

12. Volume and Exclusivity

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

13. Payment Terms

The payment terms shall be net twenty-eight days (28) days after receipt of proper invoice where the Construction Act is applicable, unless otherwise agreed by the Board in writing. All other payment terms will reflect Net 30. An early payment discount, if offered, may be considered on a mutual agreement basis. Payment may be delayed if the invoice is incorrect or the goods, equipment and/or services are not acceptable to the Board. The Board will not pay any interest, penalty, or late fee for delayed payments. The Board preferred payment method is Credit Card or EFT, however alternate payment methods may be approved. Vendors are required to invoice promptly, without delay.

14. Delay Claims

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

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

15. Invoice Requirements

All invoices shall be sent to finance-ap@wrdsb.ca.

Invoices must contain the following information and the Proper Invoice Requirements, as per the Construction Act, R.S.O. 1990, c. C.30,Part I.1 Prompt Payment, in order to be deemed complete:

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.

16. Ownership of Work

For the purposes of this paragraph:

" Deliverables " means all material prepared by the Vendor 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 Vendor and the Board acknowledge and agree that the development of the Deliverables and the provision of the Work may result in the creation or development of new intellectual property and may contain or utilize the existing intellectual property of the Vendor or of third parties. Accordingly, the Vendor and the Board agree as follows.

(a) Except as set out in paragraph (b) below, the Vendor hereby assigns and

agrees to assign to the Board all right, title and interest, including all Intellectual Property Rights, in and to each Deliverable from the moment of creation, and will cause its Personnel to assign the same. The Vendor will cause its Personnel to waive all moral rights they may have in each Deliverable.

(b) To the extent that a Deliverable contains or utilizes the intellectual property of the Vendor or a third party ("Retained Materials"), and the Vendor expressly identifies such Retained Materials, the Vendor and the applicable third party will, subject to the following sentence, retain all of 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 Vendor hereby grants to each of the Board a royalty-free, irrevocable, perpetual, world-wide, non-exclusive license to make, use, sell, modify, prepare derivative works, disclose, publish, sublicense, copy and communicate by electronic means such Retained Materials.

(c) The Vendor agrees to cooperate fully at all times, and will cause its Personnel to cooperate fully at all times, with respect to signing such documents and doing such acts and other things reasonably requested by the Board to confirm the transfer of ownership rights in the Deliverables.

17. Records, Inspection, Audits

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

18. Performance

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

ii. If the deficiency is not corrected within the time specified, or there is a further instance of deficient performance, the Board may issue a written notice to the Vendor, identifying the deficiency in performance and setting a final date or time period for its correction.

iii. If corrective steps are not taken by the final date or within that time, the Board may terminate the Contract and take corrective action.

iv. Termination of any Contract can be immediate depending on the severity of the default.

v. The Vendor shall have no right to perform the services contemplated under this agreement beyond the time when such services become unsatisfactory to the

Board; and in the event that Vendor shall be discharged before all the services contemplated hereunder have been completed, or the services are for any reason terminated, stopped or discontinued because of the inability of the Vendor to serve under this agreement they shall be paid only for that portion of the Work which shall have been satisfactorily completed at the time of termination.

vi. Where deemed appropriate, a performance evaluation shall be completed by the Board. The evaluation report shall be reviewed with Procurement Services, and a copy of the completed evaluation forwarded to the Vendor for their records.

19. Default

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

The Vendor 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.

20. Termination

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

a) The Board may terminate the contract without further notice, and exercise its rights to the Contract security provided by the Vendor;
b) The Board may withhold any payment due to the Vendor hereunder until the Vendor has remedied its failure;
c) The Board may engage the services of another Vendor to remedy the Vendor's failure, and obtain reimbursement therefore from the Vendor. The said reimbursement may be obtained either through deduction from any amounts owing to the Vendor hereunder, or through any other legal means available to the Board; or
d) The Board may assert any other remedy available to it in law or equity.

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

21. Termination for Convenience

The Board may terminate the Contract, in whole or in part, whenever the Board

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

22. Termination for Lack of Funding

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

23. 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 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."

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)

If in the reasonable opinion of either party to this Contract that performance of the Contract is made impossible by force majeure, then either party shall notify the other in writing and the Board shall either terminate the Contract forthwith without any future payments being made or authorize the Vendor 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.

24. Suspension of Bidders

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

25. Bankruptcy

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

26. Dispute Resolution

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

27. Standard of Behaviour

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

The Board expects that all employees and Vendors act within the parameters of the Administrative Procedure 4360 Principles of Business Conduct for Board Employees

28. No Smoking and Scent-Free Environment

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

29. Sustainable Purchasing

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

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

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

SC1.1	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 23rd day of August in the year 2024. .2 (if applicable) *Occupancy* by the 1st day of August in the year 2024, and .3 *Ready-for-Takeover* by the 1st day of September in the year 2024"

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*." 10.3 The Contractor shall pay to the Owner compensation for all additional costs and damages borne by the Board to cover costs incurred due to delay beyond contract timelines, until Ready-for-Takeover is achieved and certified pursuant to the terms of the Contract. Liquidated damages will be assessed as incurred and amounts will be payable directly to the Board. Additional costs may include, but are not limited to: temporary classrooms, temporary washrooms, additional staff, etc.
SC6.2		

DEFINITIONS

Revisions to Existing Definitions		
SC5.1	Consultant	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*."

"

***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 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: 5.3.2 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.

		5.3.7 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 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*. 8.2.8 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 <u>delete</u> the words “under paragraphs 13.2.1 or 13.2.3” and <u>replace</u> them with “under paragraph 13.2.1” -and- change both instances of the words “the party” to “the *Contractor*”. Change the word “claim” to “Claim” in all instances in the paragraph.

***NEW* <u>PART 14 OTHER PROVISIONS</u>**

SC58.1	14.1	<u>Add</u> new PART 14 – OTHER PROVISIONS as follows: “**PART 14 OTHER PROVISIONS** **GC 14.1 OWNERSHIP OF MATERIALS** 14.1.1 Unless otherwise specified, all materials existing at the *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	<u>Add</u> 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).	$5,000.00
2	Independent Testing & Inspection (soil, concrete, mortar, structural steel, air barrier, paving, painting) (As directed by the Consultant)	$5,000.00
3	Window coverings (Additional window coverings not addressed elsewhere in the specification).	$5,000.00
4	**Changes to especial education classroom in level 1 – 1906 building & changes to classroom 2. (Refer to Drawings).**	$125,000.00
5	**Door hardware**	$25,000.00
6	Temporary relocation of Access Control & Intrusion Detection Systems – data (security systems – Safe Welcome system) (Where not otherwise identified in the Contract Documents and including all cabling)	$10,000.00
	Total of All Allowances:	**$175,000.00**

END OF SECTION

01 31 00 – Project Managing And Coordination

1.0 GENERAL

1.1. RELATED SECTIONS

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

1.2. PROJECT COORDINATION

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

1.3. SITE SUPERVISOR AND PROJECT MANAGER

.1 If requested, the Contractor shall provide the Consultant, in writing, the name of the Project Manager and Site Supervisor, and proof of competent experience in similar projects.
.2 Performance of the Contractors Project Manager and Site Supervisor
    .1 If the Board and or the Consultant become concerned with any of: Site Safety, Project Schedule, or general compliance with the tender

documents due to the performance of the Site Supervisor or Project Manager, the Consultant and or the Board will identify the concerns in writing to the Contractor.

.2 The Contractor shall respond in writing to the Board and Consultant with a corrective action for each item within 24 hours.

.3 If it is found that any of the corrections are not immediately implemented, the Consultant and the Board shall meet with the General Contractor to review the credentials including curriculum vitae and comparable experience of a replacement Site Supervisor and or Project Manager proposed by that Contractor.

.4 All outstanding concerns initiating the replacement of the personnel will be immediately addressed to the satisfaction of the Consultant and the Board.

.3 If the Board and or the Consultant become concerned with site safety, project schedule or general compliance with the tender documents due to the performance of the Site Supervisor or the Project Manager, the Consultant or the Board will issue the concerns in writing to the Contractor. The Contractor shall respond in writing within 24 hours to the Consultant and the Board. If any of the corrections are not immediately implemented, the Consultant or the Board will schedule a meeting with the Consultant, General Contractor and the Board. At this meeting the Contractor will introduce the new Project Manager, and or Site Supervisor and present the Curriculum Vitae for each showing proof of comparable experience in similar projects. The Contractor will then address the outstanding concerns to the satisfaction of the Consultant and the Board.

.4 The Project Manager, and/or Site Supervisor shall not be replaced by the Contractor without prior written approval from the Board and the Consultant.

1.4. PERMITS

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

1.5. CONSTRUCTION DOCUMENTS

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

1.6. PRE-CONSTRUCTION MEETING

.1 Immediately prior to construction and upon notification by the Consultant of a time and date, the Contractor shall attend the preconstruction meeting at a location as determined by the Consultant, along with authoritative representatives of certain key subcontractors as specifically indicated in the conference notice. Agenda to include following:

.1 Appointment of official representative of participants in Work.

.2 Project communications procedures

.3 Schedule of Work, progress scheduling (including long lead items, cash allowance items) as specified in Section 01 32 00.

.4 Schedule of submission of shop drawings, samples, colour chips as specified in Section 01 33 00.

.5 Requirements for temporary facilities, washrooms, refuse bin, site sign, offices, storage sheds, utilities, fences as specified in Section 01 53 00.

.6 Delivery schedule of specified equipment as specified in Section 01 61 00.

.7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.

.8 Owner furnished products.

.9 Record drawings as specified in Section 01 78 10.

.10 Maintenance material and data as specified in Section 01 78 10.

.11 Take-over procedures, acceptance, and warranties as specified in Section 01 78 10.

.12 Monthly progress claims, administrative procedures, photographs, and holdbacks.

.13 Appointment of inspection and testing agencies

.14 Insurances and transcript of policies.

.15 Review Vendor Performance Evaluation for the Contractor and Subcontractors

.16 Hot Work Permit Process

.17 Security Access, Fire Alarm shutdown procedures

.18 Any other items as required by the owner, contractor, or Consultant.

1.7. ON-SITE DOCUMENTS

.1 Maintain at job site at all times, one copy (written or digital) each of the following:

.1 Complete set of Contract drawings.

.2 Specifications.

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

1.8. SCHEDULES

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

1.9. CONSTRUCTION PROGRESS MEETINGS

.1 Prior to the commencement of the Work, the Contractor together with the Consultant shall mutually agree to a sequence for holding regular "on site meetings".

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

1.10. SUBMITTALS

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

.4 Submit requests for interpretation of Contract Documents, and obtain instructions through Consultant.
.5 Process substitutions through Consultant.
.6 Process change orders through Consultant.
.7 Deliver closeout submittals for review and preliminary inspections, for transmittal to Consultant.

1.11. RECORD (AS-BUILT) DOCUMENTS AND SAMPLES

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

1.12. CLOSEOUT PROCEDURES

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

END OF SECTION

01 32 00 – Construction Progress Documentation

1.0 GENERAL

1.1. RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

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

1.2. SCHEDULES

.1 Within seven 7 days following the award of the Contract, submit a detailed cash flow chart broken down on a monthly basis, in a manner acceptable to the Consultant. Cash flow chart shall indicate anticipated Contractor's monthly progress billings from commencement of work until completion.

.2 Update cash flow chart whenever changes occur to scheduling and in manner and at times satisfactory to Consultant.

.3 Submit schedule of values at least fourteen (14) days before the first application

.4 Submit schedules as follows:

.1 Submittal Schedule for Shop Drawings and Product Data.

.2 Submittal Schedule for Samples.

.3 Submittal Schedule for timeliness of Owner-furnished Products.

.4 Product Delivery Schedule.

.5 Cash Allowance Schedule for acquiring Products and Installation.

.6 Shutdown or closure activity.

1.3. CONSTRUCTION PROGRESS SCHEDULING

.1 Submit initial schedule to the Consultant and the Board in duplicate within seven (7) days after following the award.

.2 Schedule Format.

.1 Prepare schedule in form of a horizontal bar chart.

.2 Split horizontally for projected and actual performance.

.3 Provide horizontal time scale identifying each Working Day of each week.

.3 Schedule Submission.

.1 Consultant will review schedule and return reviewed copies within five (5) days after receipt.

.2 Submit schedules in electronic format, forward to the Consultant and Owner as a pdf. file.

.3 Resubmit finalized schedule within five (5) days after return of review copy.
.4 Submit revised progress schedule with each application for payment.
.5 Distribute copies of revised schedule to:
.1 Job site office.
.2 Subcontractors.
.3 Other concerned parties.
.6 Instruct Consultant to report to Contractor within ten (10) days, any problems anticipated by timetable shown in schedule.

.4 Submit revised schedules with Application for Payment, identifying changes since previous version.
.5 Select either of the following paragraphs to identify the type and format of schedule required.
.6 Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
.7 Indicate estimated percentage of completion for each item of Work at each submission.
.8 Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by Allowances.
.9 Include dates for commencement and completion of each major element of construction:
.1 Site clearing.
.2 Site utilities.
.3 Foundation Work.
.4 Structural framing.
.5 Subcontractor Work.
.6 Equipment Installations.
.7 Finishes.
.10 Indicate projected percentage of completion of each item as of first day of month.
.11 Indicate progress of each activity to date of submission schedule.
.12 Indicate changes occurring since previous submission of schedule:
.1 Major changes in scope.
.2 Activities modified since previous submission.
.3 Revised projections of progress and completion.
.4 Other identifiable changes.
.13 Provide a written report to define:

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

1.4. PROGRESS PHOTOGRAPHS

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

1.5. SHOP DRAWING SUBMITTAL SCHEDULE

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

END OF SECTION

01 33 00 – Submittal Procedures

1.0 GENERAL

1.1 RELATED SECTIONS

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

1.2 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.

1.3 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.

1.4 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.

1.5 MOCK-UP

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

1.6 ` 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)

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

01 35 23 – Health And Safety

1.0 GENERAL

1.1. RELATED SECTIONS

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

1.2. REFERENCES

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

1.3. SAFETY PLAN

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

1.4. TEMPORARY WORK

.1 Temporary work requiring engineering proficiency for the design, erection, operation maintenance and removal shall be designed and bear the stamp of the registered professional Engineer or Architect. Detail drawings will be submitted to the Consultant for review prior to commencing any work.

.2 Before a temporary structure is used, the person responsible for design, or their representative, shall inspect the structure and certify it has been constructed according to their design.

1.5. RESPONSIBILITY

.1 The "Prime Contractor" according to applicable local jurisdiction, is responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to the extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

.3 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, and follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Health and Safety Act having jurisdiction. Advise the Board and the Consultant verbally and in writing.

.4 The Contractor shall make their own arrangements for emergency treatment of accidents. Any accidents shall be reported immediately to the Board contact.

.5 The Contractor agrees to hold the Board harmless of any and all liability of every nature and description, which may be suffered through bodily injuries, involving deaths of any persons, by reasons of negligence of the Contractor, his agents, employees, or his subcontractors.

1.6. SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00.

.2 Submit site-specific Health and Safety Plan: Within ten (10) days after the date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Results of site specific safety hazard assessment.

.2 Results of safety and health risk or hazard analysis for site tasks and operation

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

1.7. SAFETY ACTIVITIES

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

1.8. HEALTH AND SAFETY COORDINATOR

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

1.9. POSTING OF DOCUMENTS

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

1.10. CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Consultant or by the Board.

.2 Provide Consultant and/or Board with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Consultant and or the Board may stop Work if non-compliance of health and safety regulations is not corrected.

1.11. PROJECT/SITE CONDITIONS

.1 Work at site will involve contact with:

.1 Refer to Section 01 35 43 Hazardous Materials

1.12. HAZARDOUS WORK

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

1.13. WORK STOPPAGE

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

1.14. LOCKOUT PROCEDURES

.1 All Work to be done on electrical systems or machinery, where the unexpected switching on of the system or machinery could result in personal injury to a student, staff, employee, or the Contractor’s employee, must be done in accordance with the Contractor’s standard lockout procedure.

.2 The Contractor shall provide his/her own locks for the above procedure.

.3 The lock shall include contact information for the person(s) locking out such devices.

1.15. OVERHEAD LIFTING

.1 Under no circumstances will a crane or lifting device be used over an occupied space.

.2 When working adjacent to occupied spaces, ensure a clearance of one (empty) classroom, or a minimum of 10m between any occupied space and the furthest possible reach of the crane.

1.16. WARNING SIGNS AND NOTICES

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

1.17. FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by the governing codes, regulations and bylaws.

.2 Burning rubbish and construction waste materials is not permitted on site.

.3 Maintain placed or installed Fire Protection to protect the portions of the Work during construction.

1.18. SCENT-FREE ENVIRONMENT

.1 The Board requires that, where advised, a building may be deemed scent-free and as such, the wearing of scented products is prohibited.

.2 Any methods or materials that are found to create negative responses in staff or students shall cease and be removed under advisement of the Consultant and or the Board, until alternate methods can be determined.

END OF SECTION

01 35 43 – Hazardous Materials

1.0 GENERAL

1.1. RELATED SECTIONS

.1 Section 01 35 23 – Health and Safety Requirements.

.2 Section 01 41 00 – Regulatory Requirements.

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

1.2. REFERENCES

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

1.3. ASBESTOS and OTHER REGULATED SUBSTANCES

.1 An Asbestos Audit, as prepared by MTE Consultants Inc. for this facility, is attached under Appendix 013543 A. A duplicate set is also available in the Facilities Services Departments located in the Education Centre. Unless specifically covered by a Cash Allowance or Contingency Allowance that states otherwise, include in this Contract the required removal of all asbestos containing materials (ACM) to complete the work. No claims for extra costs will be accepted for areas known to contain ACM that are within the scope of this Work.

.2 Comply with applicable legislation regarding asbestos. Should the Contractor encounter asbestos not noted in the referenced Asbestos Audit that would be disturbed during the course of the Work, they should stop the work in that immediate area and report the same to the Consultant and Board contact.

.3 In addition, Lead, Mercury, Silica, and Isocyanates are anticipated to be present in existing facilities. New construction, renovations, or alterations require compliance by the Contractor with the applicable legislation.

1.4. PROTOCOL FOR ABATEMENT WORK

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

.2 Asbestos Abatement Contractors must maintain appropriate insurance coverage and WISB certification.

.3 Contractors retained for asbestos abatement work shall use personnel certified by the Ontario College of Trades and must provide the Consultant and Board with proof of asbestos certification (AAS and AAW) for all supervisors / all staff involved.

.4 School Access

.1 During school hours all asbestos contractors are to report to the school office upon arrival. After school hours, ensure card-in / card-out procedures are followed and building security is maintained.

.5 Communication

.1 Establish communication contact list with email and phone numbers that shall include:

.1 Principal / Vice Principal
.2 Area Facility Manager
.3 Head Custodian
.4 Environmental Officer
.5 Manager of Mechanical, Electrical and Environmental Services
.6 Manager of Health Safety & Security
.7 Contractor staff
.8 Consultant

.2 Contact the School Principal / Vice to set up a firm date for the abatement (removal / repair). Schedule to allow at least 72 hours notice ahead of the work.

.3 Confirm the date by notifying via email the following:

.1 Principal / Vice-principal,
.2 Area Facility Manager, and
.3 Environmental Officer.
.4 Consultant

.4 Indicate the date, the start time, the anticipated completion time for the work and the work areas in the school.

.5 Identify personnel managing the project and provide current cell numbers for emergency contacts.

.6 For emergency work, as requested by Area Supervisors, Facility Managers or Environmental Officer, no notification to the school is required.

.7 Additionally, for Type 3 work also contact:

.1 Manager of Health, Safety & Security, and
.2 Notify the MOL (also for Type 2) where required by regulation.
.3 Consultant

.8 Discussions with other groups, school staff, media and others is discouraged and shall be directed to the Board Communication Officer where warranted.

.6 Asbestos Operations

.1 Emergency work shall be carried out the same day (evening/night) or under exceptional conditions the following day / evening / night. Contractors shall exercise discretion when working in the school to minimize anxiety of staff/school community. Where warranted, contact Area Supervisor, Facility Manager or Environmental Officer to obtain further direction.

.2 For non-emergency work, contractor is to assess the work on site and provide a cost estimate to the Environmental Officer, (daniela_budure@wrdsb.on.ca) and Consultant. Some work will require discussion with the Facility Manager or Environmental Officer to assess if additional work should be done as to completely remove all ACM material form the area or similar.

.3 Where the MTE report shows ACM requiring repair, remove and re-insulate where required.

.4 Before beginning any Type 1, Type 2 or Type 3 Operations, the work area must be secured, doors closed, warning signs added to all entrances, caution tape used in open areas and signs used to restrict access to the work area so as to keep persons not involved in the work from entering in the work area.

.5 Provide “Construction” warning signs on solid barriers between the Work and public areas. Install a sufficient number of “asbestos abatement” warning signs behind the barriers, posted to warn of the hazard, and that access to the work area is restricted to persons wearing protective clothing and equipment.

.6 The contactor is responsible to disable the mechanical ventilation serving the work area and positively prevent operation using Lock-out / Tag-out devices for each air handling unit /fan. Exercise caution during heating season to ensure areas of the building are maintained above freezing and ensure equipment is turned back on after abatement / air clearance completed.

.7 Contractor’s employees shall put on / take off PPE within work area marked by construction signs. No employee shall leave the work area wearing PPE.

.8 All dust and waste is to be cleaned up and removed at frequent / regular intervals as the work proceeds and immediately upon completion. No waste bags or similar are to be left behind.

1.5. SUBMITTALS

.1 Once the abatement is completed, forward a Letter of Completion to the Environmental Officer, (daniela_budure@wrdsb.on.ca). This letter shall be received no later than 72 hours after completion and shall include any sample results.

.2 For those projects requiring Air Clearance, ensure this info is sent without delay but in all cases no later than 24 hours after sampling. All Type 3 work must take into account that the initial samples may not pass and the contactor must allow one additional day to re-clean and re-sample before school is to resume operations. For those projects not under the direct supervision of a Environmental Consultant, the contactor is to expedite the air clearance sampling with the lab of their choice and carry these costs.

.3 Forward Air Clearance results to:

.1 Principal / Vice-principal,

.2 Facility Manager,

.3 Environmental Officer,

.4 Manager of Mechanical, Electrical and Environmental Services, and

.5 Manager of Health, Safety & Security.

.6 Consultant

1.6. ACKNOWLEDGEMENT

.1 The protocols for asbestos work must be read and understood by Asbestos Contractor.

.2 Submit a signed copy of the most current copy of *PROTOCOL FOR ABATEMENT WORK (ASBESTOS ABATEMENT CONTRACTORS)* to the General Contractor, the Consultant, and the Board’s Environmental Officer.

END OF SECTION

Appendix 01 35 43A Asbestos Audit Report

June 5, 2018
MTE File No.: C34532-914

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

Re: 2018 Asbestos Audit Update – King Edward Public School
709 King Street West, Kitchener, Ontario

1.0 INTRODUCTION

MTE Consultants Inc. (MTE) was authorized by the Waterloo Region District School Board (WRDSB) to conduct the 2018 Asbestos Audit Update for the subject building.

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

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

2.0 SCOPE OF WORK

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

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

3.0 METHODOLOGY AND ASSESSMENT CRITERIA

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

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

3.1 Condition of ACM

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

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

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

4.0 FINDINGS

An inspection of the building was conducted by MTE on May 29, 2018. The two-storey school building and was constructed in 1905 with additions in 1946 and 1962.

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**, and Laboratory Certificates of Analysis for any sampling conducted as part of the 2018 inspection are also provided, as applicable.

4.1 Analytical Results

During this inspection, a total of 6 building material samples that are suspect ACM were collected with a total of 4 analyses being performed. The threshold of equal to or greater than 0.5% asbestos by dry weight and is classified as ACM according to O. Reg. 278/05. Samples collected were submitted for analysis to Paracel Laboratories Ltd. (Paracel), in Mississauga, Ontario. Paracel is certified under the National Voluntary Laboratory Accreditation Program to perform asbestos analysis of bulk samples by PLM. Laboratory analysis was conducted in accordance with the United States Environmental Protection Agency, Test Method EPA/600-R-93/116: Method for the Determination of Asbestos in Bulk Building Materials, June, 1993 by Polarized Light Microscopy as prescribed by O. Reg. 278/05.

Reported laboratory detections of asbestos ranged between 1% to 10% Chrysotile and are therefore confirmed as ACM.

4.2 Removed ACM

A summary of ACM that has been removed since the previous audit/inspection is provided in the abatement letters provided in in **Appendix D.**

4.3 Discovery of Additional ACM

ACM or suspect ACM that was not previously identified includes the following:

Non-Friable:

- 1962 Addition – Mastic Associated with Vinyl Floor Tile; and
- 1946 Addition – Mastic Associated with Vinyl Floor Tile.

4.4 Damaged ACM

A summary of all ACM that has been identified as requiring annual monitoring or Type 1 Operations in accordance with O. Reg. 278/05 is provided in **Table 1** of **Appendix C**. Type 1 abatement Operations will be conducted internally by trained and qualified WRDSB staff.

A summary of all ACM that has been identified as requiring Type 2, Type 2 Glove Bag or Type 3 Operations in accordance with O. Reg. 278/05 is provided in **Table 2** of **Appendix C**. Abatement work will be conducted by certified asbestos contractors trained and qualified to conduct the type of work required.

5.0 RECOMMENDATIONS

5.1 Remedial

Damaged ACM was identified and requires annual monitoring. At the time of the audit, all other ACM at the building was noted to be in good condition.

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

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

5.2 Long Term Management

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

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

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

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

6.0 LIMITATIONS

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

This report was completed for the sole use of MTE and the Client. It was completed in accordance with the approved Scope of Work referred to in Section 2.0. As such, this report may not deal with all issues potentially applicable to the site and may omit issues that are or may be of interest to the reader. MTE makes no representation that the present report has dealt with all-important environmental features, except as provided in the Scope of Work. All findings and conclusions presented in this report are based on site conditions, as they existed during the time period of the investigation. This report is not intended to be exhaustive in scope or to imply a risk-free facility.

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

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

All of which is respectfully submitted,

MTE CONSULTANTS INC.

Steven Nieboer, M.ES., C.E.T.
Project Manager, Indoor Environments
snieboer@mte85.com

Aisling Dennett, B.A., C.E.T., CRSP, LEED AP
Manager, Indoor Environments
adennett@mte85.com

SJN:amc
Attach.
M:\34532\914 - 2018 AAU\King Edward\Report\34532-914 - King Edward PS Asbestos Audit Report - June 2018.doc

APPENDIX A

ASBESTOS MANAGEMENT DATABASE

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

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										
	Throughout	Not Inspected	Not Inspected	Roofing Materials	NF	Suspect ACM	VC	-	-	-
	Throughout	Structure	Concrete	Concrete	-	Non ACM	-	-	-	-
	Throughout	Façade	Brick Veneer	Brick and Mortar	-	Non ACM	-	-	-	-
	Original Building	Structure	Deck	Plaster	-	Non ACM	-	-	-	-
	Original Building	Windows	Exterior Pane	Beige Sealant	-	Non ACM	SL	S07	18-Oct-16	ND
	Original Building	Windows	Interior Frames	Hard Beige Sealant	NF	ACM	SL	S14	18-Oct-16	0.92% Chrysotile
	Original Building	Windows	Interior Pane	Hard Grey Sealant	NF	ACM	SL	S13	18-Oct-16	0.59% Chrysotile
	Original Building	Doors	Interior/Exterior Frames	Silicon Sealant	-	Non ACM	-	-	-	ND
	Original Building	Mastic	Mastic	Floor Tile Mastic	-	Non ACM	SL	34532-700-S05A-KEPS	7-May-13	ND
	1946 Addition	Structure	Deck	Plaster	-	Non ACM	-	-	-	-
	1946 Addition	Structure	Wood	Wood	-	Non ACM	-	-	-	-
	1946 Addition	Windows	Interior Frames	Grey Sealant	NF	ACM	SL	S15	18-Oct-16	2% Chrysotile
	1946 Addition	Windows	Exterior Frames	Grey Sealant	NF	ACM	SL	S14	18-Oct-16	1.46% Chrysotile
	1946 Addition	Mastic	Mastic	Floor Tile Mastic	NF	ACM	SL	S02	29-May-18	1% Chrysotile
	1962 Addition	Structure	Deck	Steel	-	Non ACM	-	-	-	-
	1962 Addition	Exterior Entrance	Overhang	Transite	NF	ACM	VC	-	-	-
	1962 Addition	Windows	Interior Frames	Grey Sealant	NF	ACM	SL	S11	18-Oct-16	0.9% Chrysotile
	1962 Addition	Windows	Exterior Frames	Black Sealant	-	Non ACM	SL	S09	18-Oct-16	ND
	1962 Addition	Windows	Interior Pane	Black Sealant	NF	ACM	SL	S10	18-Oct-16	8.4% Chrysotile
	1962 Addition	Doors	Interior Frames	Brown/Grey Sealant	NF	ACM	SL	S12	18-Oct-16	4.18% Chrysotile
	1962 Addition	Doors	Exterior Frames	Hard Grey Sealant	NF	ACM	SL	S08	18-Oct-16	2.23% Chrysotile
	1962 Addition	Mastic	Mastic	Floor Tile Mastic	NF	ACM	SL	S01	29-May-18	10% Chrysotile
	Roof Section R-D	Roof	Flashing	Black Sealant	NF	ACM	SL	S01	18-Oct-16	0.5% Chrysotile
	Roof Section R-D	Roof	Flashing	Coverboard	NF	ACM	SL	S02	18-Oct-16	5.67% Chrysotile

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

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
	Roof Section R-D	Windows	Exterior Frame	Light Grey Sealant	-	Non ACM	SL	S03	18-Oct-16	ND
	Roof Section R-D	Windows	Exterior Pane	Black Sealant	-	Non ACM	SL	S04	18-Oct-16	ND
	Roof Section R-D	Roof	Roofing Membrane	4-Ply	NF	ACM	SL	S05	18-Oct-16	0.97% Chrysotile
	Roof Section R-D	Roof	Roofing Membrane	Paper Layer and Mastic	-	Non ACM	SL	S06	18-Oct-16	ND
Basement										
19	Computer Lab	Floor	Vinyl Floor Tile 12"x 12"	Mottled Floor Tile	-	Non ACM	SL	S03abc	4-Dec-09	ND
19	Computer Lab	Wall	Concrete	-	-	Non ACM	-	-	-	-
19	Computer Lab	Wall	Brick	-	-	Non ACM	-	-	-	-
19	Computer Lab	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
19	Computer Lab	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
19	Computer Lab	Above Ceiling	Plaster	-	-	Non ACM	SL	S01ab	4-Dec-09	ND
19	Computer Lab	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
27	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Mottled Floor Tile	-	Non ACM	HM	S03	4-Dec-09	ND
27	Classroom	Wall	Brick	-	-	Non ACM	-	-	-	-
27	Classroom	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	SL	S05abc	4-Dec-09	1.8% Amosite
27	Classroom	Ceiling	Ceiling Tile 1' x 1'	Cellulose	-	Non ACM	-	-	-	-
27	Classroom	Ceiling	Ceiling Tile Mastic	Brown Mastic	NF	ACM	HM	S11	4-Dec-09	0.75% Chrysotile
27	Classroom	Above Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
27	Classroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
27	Classroom	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
30	Storage North	Floor	Concrete	-	-	Non ACM	-	-	-	-
30	Storage North	Floor	Vinyl Sheet Flooring	Orange (Post 2010)	-	Non ACM	-	-	-	-
30	Storage North	Wall	Concrete	-	-	Non ACM	-	-	-	-
30	Storage North	Wall	Brick	-	-	Non ACM	-	-	-	-
30	Storage North	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	SL	S05abc	4-Dec-09	1.8% Amosite

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

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
30	Storage North	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
30	Storage North	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
30	Storage North	Above Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
30	Storage North	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
30	Storage North	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
31	Custodial Room	Floor	Concrete	-	-	Non ACM	-	-	-	-
31	Custodial Room	Wall	Brick	-	-	Non ACM	-	-	-	-
31	Custodial Room	Deck	Concrete	-	-	Non ACM	-	-	-	-
31	Custodial Room	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
31	Custodial Room	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
32	Washroom	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
32	Washroom	Wall	Brick	-	-	Non ACM	-	-	-	-
32	Washroom	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
32	Washroom	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
32	Washroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
32	Washroom	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
33	Washroom	Floor	Vinyl Floor Tile 12"x 12"	Mottled Floor Tile	-	Non ACM	HM	S03	4-Dec-09	ND
33	Washroom	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
33	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
33	Washroom	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
33	Washroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
34	Gym Storage	Floor	Vinyl Floor Tile 12"x 12"	Mottled Floor Tile	-	Non ACM	HM	S03	4-Dec-09	ND
34	Gym Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
34	Gym Storage	Deck	Concrete	-	-	Non ACM	-	-	-	-
34	Gym Storage	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
35	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Mottled Floor Tile	-	Non ACM	HM	S03	4-Dec-09	ND
35	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

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
35	Classroom	Wall	Brick	-	-	Non ACM	-	-	-	-
35	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
35	Classroom	Above Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
35	Classroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
35	Classroom	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
36	Kitchen	Floor	Vinyl Floor Tile 12"x 12"	White with Purple Fleck	-	Non ACM	SL	S06abc	4-Dec-09	ND
36	Kitchen	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
36	Kitchen	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
36	Kitchen	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
37	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Mottled Floor Tile	-	Non ACM	HM	S03	4-Dec-09	ND
37	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
37	Classroom	Wall	Brick	-	-	Non ACM	-	-	-	-
37	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
37	Classroom	Above Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
37	Classroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
37	Classroom	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
38	Washroom	Floor	Vinyl Floor Tile 12"x 12"	White with Purple Fleck	-	Non ACM	HM	S06	4-Dec-09	ND
38	Washroom	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
38	Washroom	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
38	Washroom	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
38	Washroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
39	Washroom	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
39	Washroom	Wall	Brick	-	-	Non ACM	-	-	-	-
39	Washroom	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
39	Washroom	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
39	Washroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
39	Washroom	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

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
40	Storage	Floor	Concrete	-	-	Non ACM	-	-	-	-
40	Storage	Wall	Brick	-	-	Non ACM	-	-	-	-
40	Storage	Deck	Concrete	-	-	Non ACM	-	-	-	-
40	Storage	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
40	Storage	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
41	Storage South	Floor	Concrete	-	-	Non ACM	-	-	-	-
41	Storage South	Floor	Vinyl Sheet Flooring	Orange (Post 2010)	-	Non ACM	-	-	-	-
41	Storage South	Wall	Concrete	-	-	Non ACM	-	-	-	-
41	Storage South	Wall	Brick	-	-	Non ACM	-	-	-	-
41	Storage South	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	SL	S05abc	4-Dec-09	1.8% Amosite
41	Storage South	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
41	Storage South	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
42	Electrical Room	Floor	Concrete	-	-	Non ACM	-	-	-	-
42	Electrical Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
42	Electrical Room	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND
42	Electrical Room	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
42	Electrical Room	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
42	Electrical Room	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
43	Custodial Office	Floor	Carpet	-	-	Non ACM	-	-	-	-
43	Custodial Office	Floor	Vinyl Floor Tile 12"x 12"	Mottled Floor Tile	-	Non ACM	HM	S03	4-Dec-09	ND
43	Custodial Office	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
43	Custodial Office	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
43	Custodial Office	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
43	Custodial Office	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
44	Kiln Room	Floor	Concrete	-	-	Non ACM	-	-	-	-
44	Kiln Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
44	Kiln Room	Deck	Concrete	-	-	Non ACM	-	-	-	-

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

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
45	Boiler Room	Floor	Concrete	-	-	Non ACM	-	-	-	-
45	Boiler Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
45	Boiler Room	Deck	Concrete	-	-	Non ACM	-	-	-	-
45	Boiler Room	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
45	Boiler Room	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
46	Storage	Floor	Concrete	-	-	Non ACM	-	-	-	-
46	Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
46	Storage	Deck	Concrete	-	-	Non ACM	-	-	-	-
46	Storage	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
801	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
801	Corridor	Floor	Concrete	-	-	Non ACM	-	-	-	-
801	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
801	Corridor	Wall	Brick	-	-	Non ACM	-	-	-	-
801	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
801	Corridor	Above Ceiling	Plaster	-	-	Non ACM	SL	S01cd	4-Dec-09	ND
801	Corridor	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
801	Corridor	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
802	Entrance	Floor	Concrete	-	-	Non ACM	-	-	-	-
802	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
802	Entrance	Wall	Concrete	-	-	Non ACM	-	-	-	-
802	Corridor	Wall	Brick	-	-	Non ACM	-	-	-	-
802	Entrance	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
802	Entrance	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
802	Entrance	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
802	Corridor	Above Ceiling	Plaster	-	-	Non ACM	SL	S01e	4-Dec-09	ND
901	Stairwell	Floor	Wood	-	-	Non ACM	-	-	-	-
901	Stairwell	Floor	Stair Tread	Rubber	-	Non ACM	-	-	-	-

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
901	Stairwell	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
901	Stairwell	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
901	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
902	Stairwell	Floor	Wood	-	-	Non ACM	-	-	-	-
902	Stairwell	Floor	Stair Tread	Rubber	-	Non ACM	-	-	-	-
902	Stairwell	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
902	Stairwell	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
902	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
903	Stairwell	Floor	Concrete	-	-	Non ACM	-	-	-	-
903	Stairwell	Wall	Concrete	-	-	Non ACM	-	-	-	-
903	Stairwell	Deck	Concrete	-	-	Non ACM	-	-	-	-
904	Stairwell	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
904	Stairwell	Wall	Concrete	-	-	Non ACM	-	-	-	-
904	Stairwell	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
904	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
Level 1										
1	Classroom	Floor	Wood	-	-	Non ACM	-	-	-	-
1	Classroom	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
1	Classroom	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
2	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Mottled Floor Tile	-	Non ACM	HM	S03	4-Dec-09	ND
2	Classroom	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
2	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
3	Library	Floor	Carpet	-	-	Non ACM	-	-	-	-
3	Library	Floor	Vinyl Floor Tile 12"x 12"	Light Tan	-	Non ACM	SL	S12abc	4-Dec-09	ND
3	Library	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
3	Library	Wall	Wood	-	-	Non ACM	-	-	-	-
3	Library	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
3	Library	Ceiling	Ceiling Tile 1' x 1'	Cellulose	-	Non ACM	-	-	-	-
3	Library	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
3	Library	Ceiling	Ceiling Tile Mastic	Brown Mastic	NF	ACM	SL	S11abc	4-Dec-09	0.75% Chrysotile
10	Classroom	Floor	Vinyl Sheet Flooring	Wood (Post 2013)	-	Non ACM	-	-	-	-
10	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
10	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND
10	Classroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
10	Classroom	Ceiling	Ceiling Tile 2' x 4'	Textured Pinhole (Post 2013)	-	Non ACM	-	-	-	-
10	Classroom	Deck	Concrete	-	-	Non ACM	-	-	-	-
10	Classroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
10A	Washroom	Floor	Vinyl Sheet Flooring	Wood (Post 2013)	-	Non ACM	-	-	-	-
10A	Washroom	Wall	Drywall	Drywall Joint Compound (Post 2013)	-	Non ACM	-	-	-	-
10A	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
10A	Washroom	Ceiling	Ceiling Tile 2' x 4'	Textured Pinhole (Post 2013)	-	Non ACM	-	-	-	-
10A	Washroom	Deck	Concrete	-	-	Non ACM	-	-	-	-
10A	Washroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
11	Classroom	Floor	Vinyl Sheet Flooring	Wood (Post 2013)	-	Non ACM	-	-	-	-
11	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
11	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND
11	Classroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
11	Classroom	Ceiling	Ceiling Tile 2' x 4'	Textured Pinhole (Post 2013)	-	Non ACM	-	-	-	-
11	Classroom	Deck	Concrete	-	-	Non ACM	-	-	-	-
11	Classroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
11A	Washroom	Floor	Vinyl Sheet Flooring	Wood (Post 2013)	-	Non ACM	-	-	-	-
11A	Washroom	Wall	Drywall	Drywall Joint Compound (Post 2013)	-	Non ACM	-	-	-	-

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

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
11A	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
11A	Washroom	Ceiling	Ceiling Tile 2' x 4'	Textured Pinhole (Post 2013)	-	Non ACM	-	-	-	-
11A	Washroom	Deck	Concrete	-	-	Non ACM	-	-	-	-
11A	Washroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
12	Classroom	Floor	Vinyl Sheet Flooring	Wood (Post 2013)	-	Non ACM	-	-	-	-
12	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
12	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND
12	Classroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
12	Classroom	Ceiling	Ceiling Tile 2' x 4'	Textured Pinhole (Post 2013)	-	Non ACM	-	-	-	-
12	Classroom	Deck	Concrete	-	-	Non ACM	-	-	-	-
12	Classroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
12A	Washroom	Floor	Vinyl Sheet Flooring	Wood (Post 2013)	-	Non ACM	-	-	-	-
12A	Washroom	Wall	Drywall	Drywall Joint Compound (Post 2013)	-	Non ACM	-	-	-	-
12A	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
12A	Washroom	Ceiling	Ceiling Tile 2' x 4'	Textured Pinhole (Post 2013)	-	Non ACM	-	-	-	-
12A	Washroom	Deck	Concrete	-	-	Non ACM	-	-	-	-
12A	Washroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
12B	Classroom	Floor	Vinyl Sheet Flooring	Wood (Post 2013)	-	Non ACM	-	-	-	-
12B	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
12B	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND
12B	Classroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
12B	Classroom	Ceiling	Ceiling Tile 2' x 4'	Textured Pinhole (Post 2013)	-	Non ACM	-	-	-	-
12B	Classroom	Deck	Concrete	-	-	Non ACM	-	-	-	-
12B	Classroom	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
50	Audio/Visual Room	Floor	Carpet	-	-	Non ACM	-	-	-	-
50	Audio/Visual Room	Floor	Vinyl Floor Tile 12"x 12"	Light Tan	-	Non ACM	HM	S12	4-Dec-09	ND
50	Audio/Visual Room	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

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
50	Audio/Visual Room	Wall	Wood	-	-	Non ACM	-	-	-	-
50	Audio/Visual Room	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
50	Audio/Visual Room	Ceiling	Ceiling Tile 1' x 1'	Cellulose	-	Non ACM	-	-	-	-
50	Audio/Visual Room	Ceiling	Ceiling Tile Mastic	Brown Mastic	NF	ACM	HM	S11	4-Dec-09	0.75% Chrysotile
50	Audio/Visual Room	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
51	Office	Floor	Carpet	-	-	Non ACM	-	-	-	-
51	Office	Floor	Vinyl Floor Tile 12"x 12"	Light Tan	-	Non ACM	HM	S12	4-Dec-09	ND
51	Office	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
51	Office	Wall	Wood	-	-	Non ACM	-	-	-	-
51	Office	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
51	Office	Ceiling	Ceiling Tile 1' x 1'	Cellulose	-	Non ACM	-	-	-	-
51	Office	Ceiling	Ceiling Tile Mastic	Brown Mastic	NF	ACM	HM	S11	4-Dec-09	0.75% Chrysotile
51	Office	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
52	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Mottled Floor Tile	-	Non ACM	HM	S03	4-Dec-09	ND
52	Classroom	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
52	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
54	Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
54	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
54	Washroom	Ceiling	Ceiling Tile 2' x 4'	Textured Pinhole (Post 2013)	-	Non ACM	-	-	-	-
55	Classroom	Floor	Vinyl Floor Tile 12"x 12"	White with Black Fleck	-	Non ACM	SL	S10abc	4-Dec-09	ND
55	Classroom	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
55	Classroom	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
56	Staff Workroom	Floor	Vinyl Floor Tile 12"x 12"	White with Black Fleck	-	Non ACM	SL	S10abc	4-Dec-09	ND
56	Staff Workroom	Mastic	Vinyl Floor Tile 12"x 12"	Black Mastic	-	Non ACM	SL	S2abc	18-Oct-16	1% Chrysotile
56	Staff Workroom	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
56	Staff Workroom	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
57	Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

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
57	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
57	Washroom	Ceiling	Ceiling Tile 2' x 4'	Textured Pinhole (Post 2013)	-	Non ACM	-	-	-	-
58	Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
58	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
58	Washroom	Ceiling	Ceiling Tile 2' x 4'	Textured Pinhole (Post 2013)	-	Non ACM	-	-	-	-
59	Custodial Room	Floor	Vinyl Floor Tile 12"x 12"	Mottled Floor Tile	-	Non ACM	HM	S03	4-Dec-09	ND
59	Custodial Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
59	Custodial Room	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
59	Custodial Room	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
60	Office	Floor	Vinyl Floor Tile 12"x 12"	Grey Dense Fleck (Post 2013)	-	Non ACM	-	-	-	-
60	Office	Floor	Carpet	-	-	Non ACM	-	-	-	-
60	Office	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND
60	Office	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
60	Office	Ducting	Duct Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
60	Office	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
61	Office	Floor	Carpet	-	-	Non ACM	-	-	-	-
61	Office	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND
61	Office	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
61	Office	Ducting	Duct Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
61	Office	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
62	General Purpose Room	Floor	Vinyl Sheet Flooring	Wood (Post 2013)	-	Non ACM	-	-	-	-
62	General Purpose Room	Wall	Plaster	-	-	Non ACM	-	-	-	-
62	General Purpose Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
62	General Purpose Room	Deck	Metal Pan	-	-	Non ACM	-	-	-	-
62	General Purpose Room	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
62	General Purpose Room	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
63	Stage	Floor	Vinyl Floor Tile 9"x 9"	Beige with Brown Streak	NF	ACM	SL	S07abc	4-Dec-09	2.2% Chrysotile

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

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
63	Stage	Floor	Floor Tile Mastic	Black	NF	ACM	SL	S02ABC	7-May-13	1.6% Chrysotile
63	Stage	Floor	Floor Tile Mastic	Black	NF	ACM	SL	S01ABC	18-Oct-16	10% Chrysotile
63	Stage	Floor	Vinyl Floor Tile 9"x 9"	Blue with White Streak	NF	ACM	SL	S08abc	4-Dec-09	0.75% Chrysotile
63	Stage	Floor	Wood	-	-	Non ACM	-	-	-	-
63	Stage	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
63	Stage	Wall	Concrete	-	-	Non ACM	-	-	-	-
63	Stage	Deck	Concrete	-	-	Non ACM	-	-	-	-
63	Stage	Wall	Concrete	-	-	Non ACM	-	-	-	-
63	Stage	Deck	Concrete	-	-	Non ACM	-	-	-	-
63	Stage	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
63	Stage	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
64	Office	Floor	Carpet	-	-	Non ACM	-	-	-	-
64	Office	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND
64	Office	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
64	Office	Ducting	Duct Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
64	Office	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
65	Washroom	Floor	Vinyl Floor Tile 12"x 12"	Grey Dense Fleck (Post 2013)	-	Non ACM	-	-	-	-
65	Washroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND
65	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
77	Work Room	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
77	Work Room	Deck	Concrete	-	-	Non ACM	-	-	-	-
77	Work Room	Ceiling	Ceiling Tile 2' x 4'	Textured Pinhole (Post 2013)	-	Non ACM	-	-	-	-
77	Work Room	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
77	Work Room	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
77	Work Room	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
810	Corridor	Floor	Wood	-	-	Non ACM	-	-	-	-
810	Corridor	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
810	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
810	Corridor	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
811	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
811	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
811	Corridor	Ceiling	Ceiling Tile 2' x 4'	Textured Pinhole (Post 2013)	-	Non ACM	-	-	-	-
811	Corridor	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
811	Corridor	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
811	Corridor	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
901	Stairwell	Floor	Wood	-	-	Non ACM	-	-	-	-
901	Stairwell	Floor	Stair Tread	Rubber	-	Non ACM	-	-	-	-
901	Stairwell	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
901	Stairwell	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
901	Stairwell	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
902	Stairwell	Floor	Wood	-	-	Non ACM	-	-	-	-
902	Stairwell	Floor	Stair Tread	Rubber	-	Non ACM	-	-	-	-
902	Stairwell	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
902	Stairwell	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
902	Stairwell	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
902	Stairwell	Ceiling	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
903	Stage	Floor	Vinyl Floor Tile 9"x 9"	Beige with Brown Streak	NF	ACM	SL	S07abc	4-Dec-09	2.2% Chrysotile
903	Stage	Floor	Floor Tile Mastic	Black	NF	ACM	SL	S02ABC	7-May-13	1.6% Chrysotile
903	Stage	Floor	Vinyl Floor Tile 9"x 9"	Blue with White Streak	NF	ACM	SL	S08abc	4-Dec-09	0.75% Chrysotile
903	Stage	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
903	Stage	Wall	Concrete	-	-	Non ACM	-	-	-	-
903	Stage	Deck	Concrete	-	-	Non ACM	-	-	-	-
904	Stairwell	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
904	Stairwell	Wall	Concrete	-	-	Non ACM	-	-	-	-
904	Stairwell	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
905	Stairwell	Floor	Wood	-	-	Non ACM	-	-	-	-

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

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
905	Stairwell	Floor	Stair Tread	Rubber	-	Non ACM	-	-	-	-
905	Stairwell	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
905	Stairwell	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
905	Stairwell	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
906	Vestibule	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
906	Vestibule	Wall	Concrete	-	-	Non ACM	-	-	-	-
906	Vestibule	Ceiling	Ceiling Tile 2' x 4'	Textured Pinhole (Post 2013)	-	Non ACM	-	-	-	-
906	Vestibule	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
906	Vestibule	Piping	Pipe Insulation	Horsehair	-	Non ACM	-	-	-	-
Level 2										
5	Staff Lounge	Floor	Vinyl Floor Tile 12"x 12"	Mottled Floor Tile	-	Non ACM	HM	S03	4-Dec-09	ND
5	Staff Lounge	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
5	Staff Lounge	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
5	Staff Lounge	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
5	Staff Lounge	Ceiling	Ceiling Tile 1' x 1'	Pinhole (Cellulose)	-	Non ACM	-	-	-	-
5	Staff Lounge	Ceiling	Ceiling Tile Mastic	Brown Mastic	NF	ACM	HM	S11	4-Dec-09	0.75% Chrysotile
6	Classroom	Floor	Vinyl Floor Tile 9"x 9"	Black & Brown Marble	-	Non ACM	HM	S13	4-Dec-09	ND
6	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck (Post 2013)	-	Non ACM	-	-	-	-
6	Classroom	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
6	Classroom	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole (Post 2013)	-	Non ACM	-	-	-	-
6	Classroom	Ceiling	Ceiling Tile 1' x 1'	Pinhole (Cellulose)	-	Non ACM	-	-	-	-
6	Classroom	Ceiling	Ceiling Tile Mastic	Brown Mastic	NF	ACM	HM	S11	4-Dec-09	0.75% Chrysotile
7	Classroom	Floor	Vinyl Floor Tile 9"x 9"	Black & Brown Marble	-	Non ACM	HM	S13	4-Dec-09	ND
7	Classroom	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
7	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

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
7	Classroom	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole (Post 2013)	-	Non ACM	-	-	-	-
7	Classroom	Ceiling	Ceiling Tile Mastic	Brown Mastic	NF	ACM	HM	S11	4-Dec-09	0.75% Chrysotile
8	Classroom	Floor	Vinyl Floor Tile 9"x 9"	Black & Brown Marble	-	Non ACM	SL	S13abc	4-Dec-09	ND
8	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck (Post 2013)	-	Non ACM	-	-	-	-
8	Classroom	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
8	Classroom	Ceiling	Ceiling Tile 1' x 1'	Pinhole (Cellulose)	-	Non ACM	-	-	-	-
8	Classroom	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
8	Classroom	Ceiling	Ceiling Tile Mastic	Brown Mastic	NF	ACM	HM	S11	4-Dec-09	0.75% Chrysotile
13	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige with White & Grey Fleck	-	Non ACM	HM	S09	4-Dec-09	ND
13	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
13	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND
13	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
14	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige with White & Grey Fleck	-	Non ACM	HM	S09	4-Dec-09	ND
14	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
14	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND
14	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
15	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige with White & Grey Fleck	-	Non ACM	HM	S09	4-Dec-09	ND
15	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
15	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND
15	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
16	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige with White & Grey Fleck	-	Non ACM	HM	S09	4-Dec-09	ND
16	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
16	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND
16	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
17	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige with White & Grey Fleck	-	Non ACM	HM	S09	4-Dec-09	ND
17	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
17	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

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
17	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
18	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige with White & Grey Fleck	-	Non ACM	HM	S09	4-Dec-09	ND
18	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
18	Classroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND
18	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-
70	Guidance Room	Floor	Vinyl Floor Tile 12"x 12"	Mottled Floor Tile	-	Non ACM	HM	S03	4-Dec-09	ND
70	Guidance Room	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
70	Guidance Room	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
70	Guidance Room	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
71	Custodial Room	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
71	Custodial Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
71	Custodial Room	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
72	Fan Room	Floor	Concrete	-	-	Non ACM	-	-	-	-
72	Fan Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
72	Fan Room	Deck	Concrete	-	-	Non ACM	-	-	-	-
72	Fan Room	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	S01ABC	7-May-13	ND
72	Fan Room	Ducting	Flex Joint	-	NF	ACM	VC	-	-	-
74	Washroom	Floor	Vinyl Floor Tile 12"x 12"	Mottled Floor Tile	-	Non ACM	HM	S03	4-Dec-09	ND
74	Washroom	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
74	Washroom	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
75	Washroom	Floor	Vinyl Floor Tile 9"x 9"	Beige Dense Fleck	-	Non ACM	-	-	-	-
75	Washroom	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
75	Washroom	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
820	Corridor	Floor	Vinyl Floor Tile 9"x 9"	Black & Brown Marble	-	Non ACM	HM	S13	4-Dec-09	ND
820	Corridor	Wall	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
820	Corridor	Ceiling	Ceiling Tile 1' x 1'	Pinhole (Cellulose)	-	Non ACM	-	-	-	-
820	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 1994)	-	Non ACM	-	-	-	-

School Name	Legend:	Notes:
King Edward 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

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
820	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
820	Corridor	Ceiling	Ceiling Tile Mastic	Brown Mastic	NF	ACM	HM	S11	4-Dec-09	0.75% Chrysotile
820	Fan Room	Floor	Wood	-	-	Non ACM	-	-	-	-
820	Fan Room	Wall	Brick	-	-	Non ACM	-	-	-	-
820	Fan Room	Deck	Concrete	-	-	Non ACM	-	-	-	-
820	Fan Room	Ducting	Flex Joint	-	NF	ACM	VC	-	-	-
821	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
821	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
821	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
821	Corridor	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
821	Corridor	Ducting	Duct Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
901	Stairwell	Floor	Vinyl Floor Tile 12"x 12"	Beige	-	Non ACM	SL	S05ABC	7-May-13	ND
901	Stairwell	Wall	Drywall	-	-	Non ACM	SL	S01C	7-May-13	ND
901	Stairwell	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
901	Stairwell	Ceiling	Plaster	-	-	Non ACM	HM	S01	4-Dec-09	ND
901	Stairwell	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
902	Stairwell	Floor	Vinyl Floor Tile 12"x 12"	Beige	-	Non ACM	HM	S05ABC	7-May-13	ND
902	Stairwell	Wall	Plaster	-	-	Non ACM	HM	S01	-	-
902	Stairwell	Ceiling	Plaster	-	-	Non ACM	HM	S01	-	-
902	Stairwell	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
902	Stairwell	Piping	Pipe Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-
902	Stairwell	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Boiler Room, Elbow Cement	Apr-90	50-75% Chrysotile
904	Stairwell	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
904	Stairwell	Wall	Concrete	-	-	Non ACM	-	-	-	-
904	Stairwell	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
904	Stairwell	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
904	Stairwell	Ducting	Duct Insulation	Fibreglass insulation	-	Non ACM	-	-	-	-

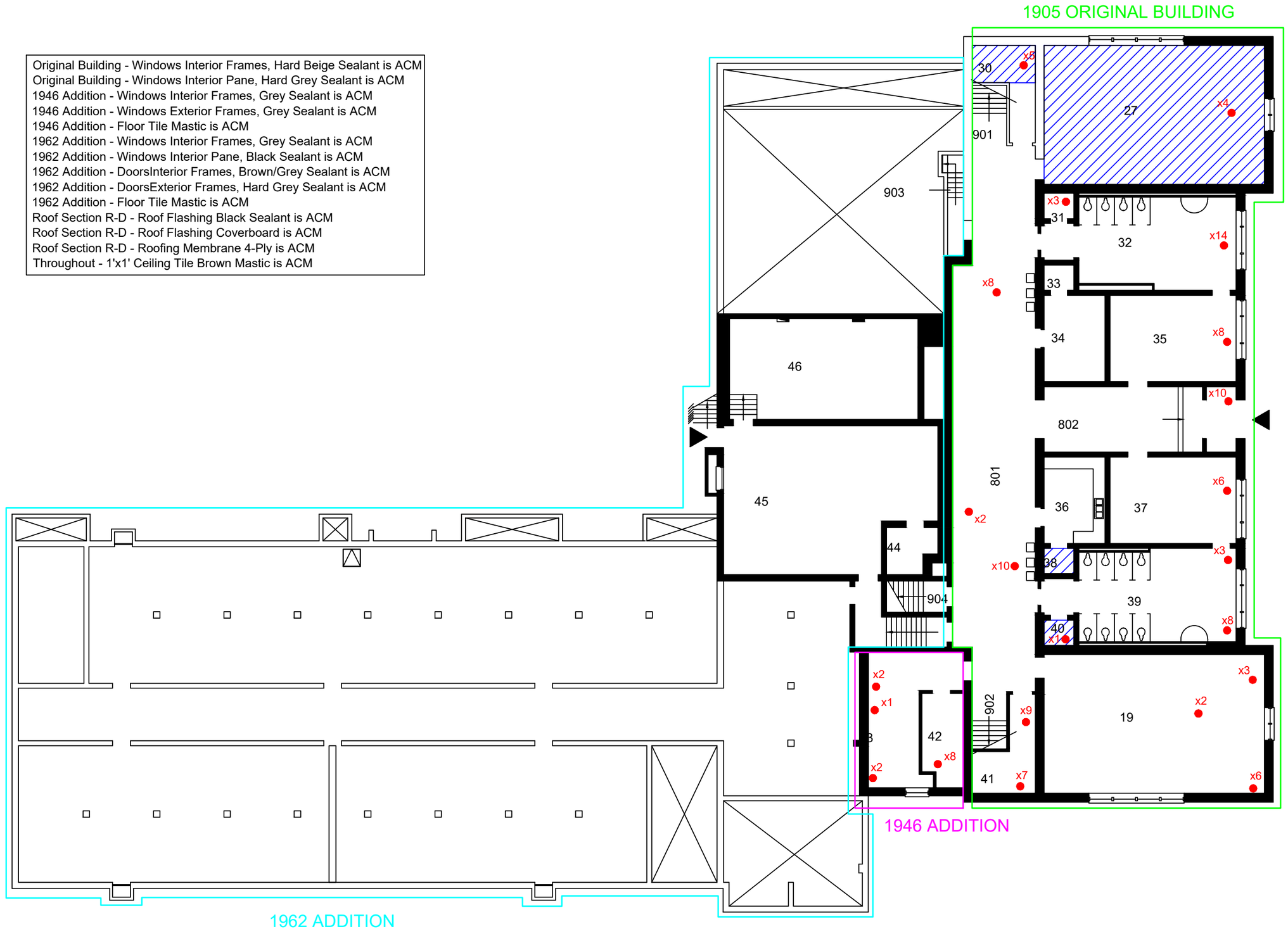
School Name	Legend:	Notes:
King Edward Public School	**HM -** Homogenous Material - homogeneous with previously sampled material **SL** - Sample Location - Material Sampled **VC** - Visually Confirmed - Material not sampled, deemed ACM **NF** - Non-Friable **F**- Friable	**All quantities provided on 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/renovationand confirms the finishes as non-ACM.**
Original: 1905		
Addition(s): 1946, 1962		

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
905	Stairwell	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
905	Stairwell	Wall	Concrete	-	-	Non ACM	-	-	-	-
905	Stairwell	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite
906	Stairwell	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
906	Stairwell	Wall	Concrete	-	-	Non ACM	-	-	-	-
906	Stairwell	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	NF	ACM	HM	S05	4-Dec-09	1.8% Amosite

APPENDIX B

FIGURES

Original Building - Windows Interior Frames, Hard Beige Sealant is ACM
Original Building - Windows Interior Pane, Hard Grey Sealant is ACM
1946 Addition - Windows Interior Frames, Grey Sealant is ACM
1946 Addition - Windows Exterior Frames, Grey Sealant is ACM
1946 Addition - Floor Tile Mastic is ACM
1962 Addition - Windows Interior Frames, Grey Sealant is ACM
1962 Addition - Windows Interior Pane, Black Sealant is ACM
1962 Addition - DoorsInterior Frames, Brown/Grey Sealant is ACM
1962 Addition - DoorsExterior Frames, Hard Grey Sealant is ACM
1962 Addition - Floor Tile Mastic is ACM
Roof Section R-D - Roof Flashing Black Sealant is ACM
Roof Section R-D - Roof Flashing Coverboard is ACM
Roof Section R-D - Roofing Membrane 4-Ply is ACM
Throughout - 1'x1' Ceiling Tile Brown Mastic is ACM



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 1986 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
Engineers | Scientists | Surveyors
Ph. (519) 743-6500 www.mte85.com

CLIENT
WATERLOO REGION DISTRICT SCHOOL BOARD

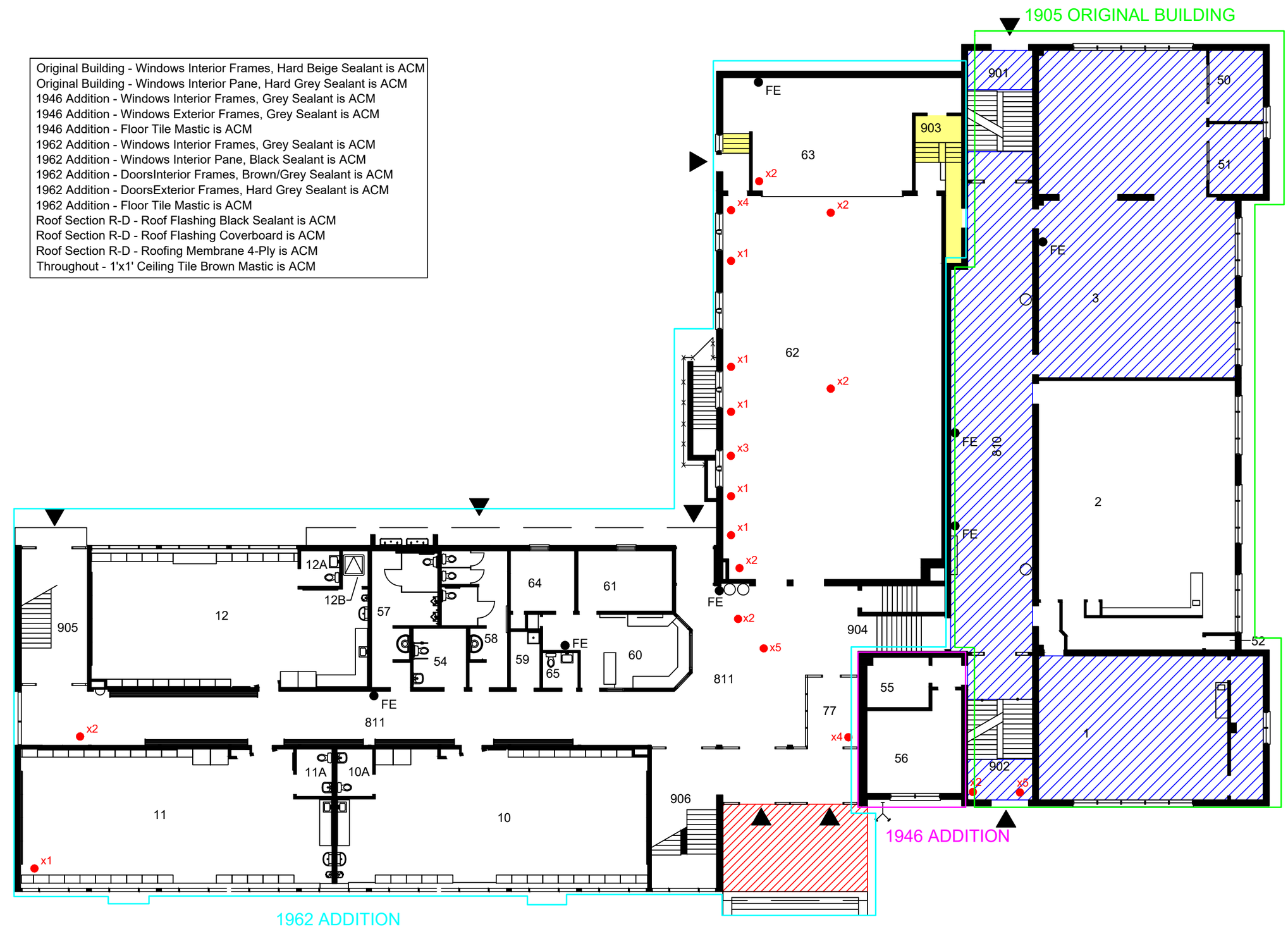
PROJECT
2018 ASBESTOS AUDIT UPDATE

DRAWING
KING EDWARD PUBLIC SCHOOL

BASEMENT

Project Manager	A. Dennett	Date	June 2018
Design By	WRDSB	Project No.	34532-914
Drawn By	S. Nieboer	Drawing No.	1.0
Scale	N.T.S.		

Original Building - Windows Interior Frames, Hard Beige Sealant is ACM
Original Building - Windows Interior Pane, Hard Grey Sealant is ACM
1946 Addition - Windows Interior Frames, Grey Sealant is ACM
1946 Addition - Windows Exterior Frames, Grey Sealant is ACM
1946 Addition - Floor Tile Mastic is ACM
1962 Addition - Windows Interior Frames, Grey Sealant is ACM
1962 Addition - Windows Interior Pane, Black Sealant is ACM
1962 Addition - DoorsInterior Frames, Brown/Grey Sealant is ACM
1962 Addition - DoorsExterior Frames, Hard Grey Sealant is ACM
1962 Addition - Floor Tile Mastic is ACM
Roof Section R-D - Roof Flashing Black Sealant is ACM
Roof Section R-D - Roof Flashing Coverboard is ACM
Roof Section R-D - Roofing Membrane 4-Ply is ACM
Throughout - 1'x1' Ceiling Tile Brown Mastic is ACM



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 1986 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
Engineers | Scientists | Surveyors
Ph. (519) 743-6500 www.mte85.com

CLIENT
WATERLOO REGION DISTRICT SCHOOL BOARD

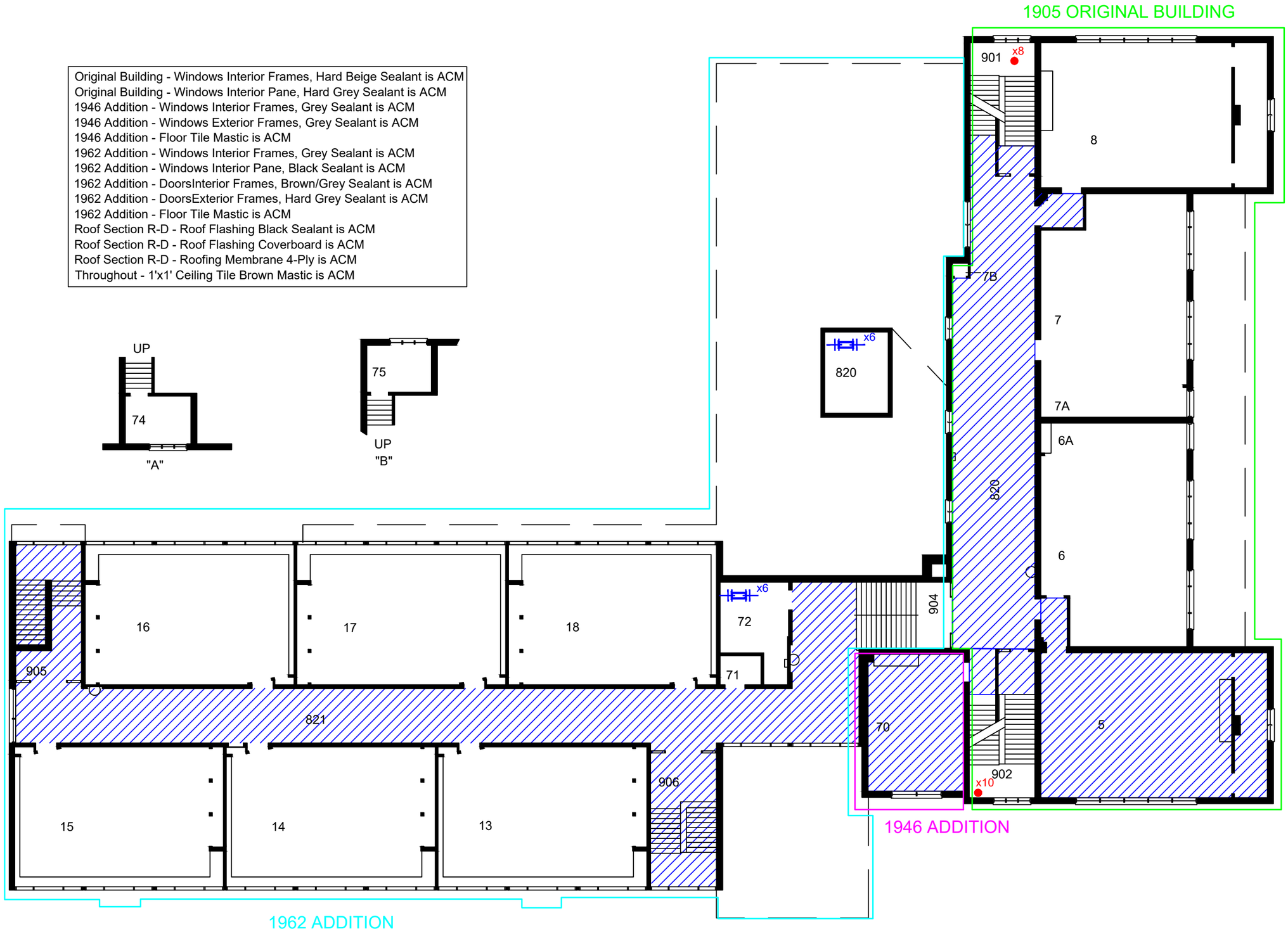
PROJECT
2018 ASBESTOS AUDIT UPDATE

DRAWING
KING EDWARD PUBLIC SCHOOL

MAIN FLOOR

Project Manager: A. Dennett	Date: June 2018
Design By: WRDSB	Project No.: 34532-914
Drawn By: S. Nieboer	Drawing No.: 2.0
Scale: N.T.S.	

Original Building - Windows Interior Frames, Hard Beige Sealant is ACM
Original Building - Windows Interior Pane, Hard Grey Sealant is ACM
1946 Addition - Windows Interior Frames, Grey Sealant is ACM
1946 Addition - Windows Exterior Frames, Grey Sealant is ACM
1946 Addition - Floor Tile Mastic is ACM
1962 Addition - Windows Interior Frames, Grey Sealant is ACM
1962 Addition - Windows Interior Pane, Black Sealant is ACM
1962 Addition - DoorsInterior Frames, Brown/Grey Sealant is ACM
1962 Addition - DoorsExterior Frames, Hard Grey Sealant is ACM
1962 Addition - Floor Tile Mastic is ACM
Roof Section R-D - Roof Flashing Black Sealant is ACM
Roof Section R-D - Roof Flashing Coverboard is ACM
Roof Section R-D - Roofing Membrane 4-Ply is ACM
Throughout - 1'x1' Ceiling Tile Brown Mastic is ACM



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 1986 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
Engineers | Scientists | Surveyors
Ph. (519) 743-6500 www.mte85.com

CLIENT
WATERLOO REGION DISTRICT SCHOOL BOARD

PROJECT
2018 ASBESTOS AUDIT UPDATE

DRAWING
KING EDWARD PUBLIC SCHOOL

SECOND FLOOR

Project Manager: A. Dennett	Date: June 2018
Design By: WRDSB	Project No.: 34532-914
Drawn By: S. Nieboer	Drawing No.: 3.0
Scale: N.T.S.	

APPENDIX C

TABLES

TABLE 1 - INTERNAL ABATEMENT MANAGEMENT							
King Edward Public School							
Material	**WRDSB Fixed Reference Number**	**MTE Functional Space Number**	**Material Description**	**Approximate Quantity**	**Photograph - Context**	**Photograph - Detail**	**Required Action**
Asbestos Non-Friable	905	1030	2'x4' Ceiling Tile - Long Fissure Random Pinhole	<1m²			Monitor Annually
	905	1030	2'x4' Ceiling Tile - Long Fissure Random Pinhole	<1m²	-		Monitor Annually
	906	2008	2'x4' Ceiling Tile - Long Fissure Random Pinhole	<1m²			Monitor Annually
	902	1008	2'x4' Ceiling Tile - Long Fissure Random Pinhole	<1m²	-		Monitor Annually

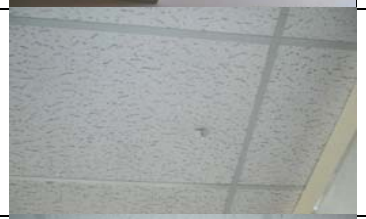
TABLE 1 - INTERNAL ABATEMENT MANAGEMENT							
King Edward Public School							
Material	**WRDSB Fixed Reference Number**	**MTE Functional Space Number**	**Material Description**	**Approximate Quantity**	**Photograph - Context**	**Photograph - Detail**	**Required Action**
Asbestos Non-Friable	901	1016	2'x4' Ceiling Tile - Long Fissure Random Pinhole	<1m²	-		Monitor Annually
	3	1012	2'x4' Ceiling Tile - Long Fissure Random Pinhole	<1m²	-		Monitor Annually
	3	1012	2'x4' Ceiling Tile - Long Fissure Random Pinhole	<1m²	-		Monitor Annually
	901	2020	2'x4' Ceiling Tile - Long Fissure Random Pinhole	<1m²	-		Monitor Annually

TABLE 1 - INTERNAL ABATEMENT MANAGEMENT

King Edward Public School

Material	WRDSB Fixed Reference Number	MTE Functional Space Number	Material Description	Approximate Quantity	Photograph - Context	Photograph - Detail	Required Action
Asbestos Non-Friable	810	2015	2'x4' Ceiling Tile - Long Fissure Random Pinhole	<1m²	-		Monitor Annually
	811	2011	2'x4' Ceiling Tile - Long Fissure Random Pinhole	<1m²	-		Monitor Annually
	811	2007	2'x4' Ceiling Tile - Long Fissure Random Pinhole	<1m²	-		Monitor Annually
	811	2007	2'x4' Ceiling Tile - Long Fissure Random Pinhole	<1m²	-		Monitor Annually
Asbestos Non-Friable	27	0014	2'x4' Ceiling Tile - Long Fissure Random Pinhole	<1m²	-		Monitor Annually

Notes:
1) A copy of this report should be provided to all prospective contractors prior to tender or quotation, in accordance with Section 30 of the Occupational Health and Safety Act.
2) Recommended actions are the minimum required actions, as prescribed by the appropriate Acts, regulations, guidelines, standards, codes and general best practice measures. The Contractor may choose to alter the approach and combine or break out sections of work. This is acceptable provided that the appropriate Acts, regulations, guidelines, standards and codes are followed and afford protection for the health and safety of workers, occupants and the public that is at least equal to the protection that would be provided by complying with the minimum requirements.
3) All waste generated is subject to characterization and disposal in accordance with Ontario Regulation 347.

TABLE 2 - EXTERNAL ABATEMENT MANAGEMENT

King Edward Public School

Material	WRDSB Fixed Reference Number	Material Description	Approximate Quantity	Photograph - Context	Photograph - Detail	Required Action
None Identified During Inspection						

1) A copy of this report should be provided to all prospective contractors prior to tender or quotation, in accordance with Section 30 of the Occupational Health and Safety Act.
2) Recommended actions are the minimum required actions, as prescribed by the appropriate Acts, regulations, guidelines, standards, codes and general best practice measures. The Contractor may choose to alter the approach and combine or break out sections of work. This is acceptable provided that the appropriate Acts, regulations, guidelines, standards and codes are followed and afford protection for the health and safety of workers, occupants and the public that is at least equal to the protection that would be provided by complying with the minimum requirements.
3) All waste generated is subject to characterization and disposal in accordance with Ontario Regulation 347.

TABLE 2: BULK ASBESTOS SAMPLING SUMMARY					
Sample #	**Location**	**Material Description**	**Asbestos Content (%)**	**Fibre Type**	**Is Material ACM**
2009 Asbestos Audit Update					
KEPS-S01A	0001	Plaster	ND	-	No
KEPS-S01B	0001		ND	-	No
KEPS-S01C	0015		ND	-	No
KEPS-S01D	0015		ND	-	No
KEPS-S01E	0008		ND	-	No
KEPS-S01F	-		ND	-	No
KEPS-S01G	-		ND	-	No
KEPS-S02A	0001	2' x 4' Ceiling Tile - Short Fissure Random Pinhole	ND	-	No
KEPS-S02B			ND	-	No
KEPS-S02C			ND	-	No
KEPS-S03A	0017	12" x 12" Floor Tile - Mottled	ND	-	No
KEPS-S03B			ND	-	No
KEPS-S03C			ND	-	No
KEPS-S04A	0007	2' x 4' Ceiling Tile - Short Fissure Random Pinhole	ND	-	No
KEPS-S04B			ND	-	No
KEPS-S04C			ND	-	No
KEPS-S05A	**0014**	**2' x 4' Ceiling Tile - Long Fissure Random Pinhole**	**1.8**	**Amosite**	**Yes**
KEPS-S05B			**NA**	**-**	**No**
KEPS-S05C			**NA**	**-**	**No**
KEPS-S06A	0005	12" x 12" Floor Tile - White with Purple Fleck	ND	-	No
KEPS-S06B			ND	-	No
KEPS-S06C			ND	-	No
KEPS-S07A	**1015**	**9" x 9" Floor Tile - Beige with Brown**	**2.2**	**Chrysotile**	**Yes**
KEPS-S07B			**NA**	**-**	**No**
KEPS-S07C			**NA**	**-**	**No**
KEPS-S08A	**1015**	**9" x 9" Floor Tile - Blue with White**	**0.75**	**Chrysotile**	**Yes**
KEPS-S08B			**NA**	**-**	**No**
KEPS-S08C			**NA**	**-**	**No**
KEPS-S09A	1000	12" x 12" Floor Tile - Beige with White and Grey Fleck	ND	-	No
KEPS-S09B			ND	-	No
KEPS-S09C			ND	-	No
KEPS-S10A	1007	12" x 12" Floor Tile - White with Black Fleck	ND	-	No
KEPS-S10B	1007		ND	-	No
KEPS-S10C	1006		ND	-	No
KEPS-S11A	**Throughout**	**Ceiling Tile Mastic**	**0.75**	**Chrysotile**	**Yes**
KEPS-S11B			**NA**	**-**	**No**
KEPS-S11C			**NA**	**-**	**No**
KEPS-S12A	1012	12" x 12" Floor Tile - Under Carpet	ND	-	No
KEPS-S12B	1013		ND	-	No
KEPS-S12C	1014		ND	-	No
KEPS-S13A	2021	9" x 9" Floor Tile - Marble	ND	-	No
KEPS-S13B			ND	-	No
KEPS-S13C			ND	-	No
2013 Asbestos Audit Update					
34532-700-S01A-KEPS	0015 (storage)	Drywall Joint Compound	ND	-	No
34532-700-S01B-KEPS	1028		ND	-	No
34532-700-S01C-KEPS	2020		ND	-	No
34532-700-S02A-KEPS	**1015**	**9" x 9" Black Floor Tile Mastic - Beige with Brown**	**1.6**	**Chrysotile**	**Yes**
34532-700-S02B-KEPS			**NA**	**-**	**No**
34532-700-S02C-KEPS			**NA**	**-**	**No**
34532-700-S03A-KEPS	1015	9" x 9" Brown Floor Tile Mastic - Blue with White	ND	-	No
34532-700-S03B-KEPS			ND	-	No
34532-700-S03C-KEPS			ND	-	No

TABLE 2: BULK ASBESTOS SAMPLING SUMMARY					
Sample #	**Location**	**Material Description**	**Asbestos Content (%)**	**Fibre Type**	**Is Material ACM**
34532-700-S04A-KEPS	**2014**	**9" x 9" Floor Tile - Yellow**	**Layer 1 (tile): 2.7**	**Chrysotile**	**Yes**
			Layer 2 (mastic): ND		**Yes**
34532-700-S04B-KEPS			**Layer 1 (tile):NA**	**-**	**No**
			Layer 2 (mastic): ND		**No**
34532-700-S04C-KEPS			**Layer 1 (tile):NA**	**-**	**No**
			Layer 2 (mastic): ND		**No**
34532-700-S05A-KEPS	2020	12" x 12" Floor Tile - Beige	Layer 1 (tile): ND	-	No
			Layer 2 (mastic): ND		No
34532-700-S05B-KEPS			Layer 1 (tile): ND	-	No
			Layer 2 (mastic): ND		No
34532-700-S05C-KEPS			Layer 1 (tile): ND	-	No
			Layer 2 (mastic): ND		No
2016 Limited Designated Substance Audit					
S01A	**Roof R-D**	**Black Sealant on Flashing**	**0.50%**	**Chrysotile**	**Yes**
S01B			**NA**	**-**	**Yes**
S01C			**NA**	**-**	**Yes**
S02A	**Roof R-D**	**Black Flashing Coverboard**	**5.67%**	**Chrysotile**	**Yes**
S02B			**NA**	**-**	**Yes**
S02C			**NA**	**-**	**Yes**
S03A	Roof R-D	Light Grey Sealant on Window (Exterior Panel)	ND	-	No
S03B			ND	-	No
S03C			ND	-	No
S04A	Roof R-D	Black Sealant on Window (Interior Panel)	ND	-	No
S04B			ND	-	No
S04C			ND	-	No
S05A	Roof R-D	Dark Grey Sealant on Window (Interior Panel)	ND	-	No
S05B			ND	-	No
S05C			ND	-	No
S06A	**Roof R-D**	**Roofing Membrane (4-Ply)**	**<MDL**	**Chrysotile**	**Yes**
		Paper Layer with Mastic	ND	-	No
S06B	**Roof R-D**	**Roofing Membrane (4-Ply)**	**<MDL**	**Chrysotile**	**Yes**
		Paper Layer with Mastic	ND	-	No
S06C	**Roof R-D**	**Roofing Membrane (4-Ply)**	**0.97%**	**Chrysotile**	**Yes**
		Paper Layer with Mastic	ND	-	No
S07A	1011 (Exterior Window)	Beige Sealant on Window (Exterior Panel)	ND	-	No
S07B			ND	-	No
S07C			ND	-	No
S08A	**1004 (Exterior Door)**	**Hard Grey Sealant on Door**	**2.23%**	**Chrysotile**	**Yes**
S08B			**NA**	**-**	**Yes**
S08C			**NA**	**-**	**Yes**
S09A	1002 (Exterior Window)	Black Sealant on Window (Interior Panel)	ND	-	No
S09B			ND	-	No
S09C			ND	-	No
S10A	**1020 (Interior Window)**	**Black Sealant on Window (Interior Panel)**	**8.40%**	**Chrysotile**	**Yes**
S10B			**NA**	**-**	**Yes**
S10C			**NA**	**-**	**Yes**
S11A	**1020 (Interior Window)**	**Grey Sealant on Window (Exterior Panel)**	**0.90%**	**Chrysotile**	**Yes**
S11B			**NA**	**-**	**Yes**
S11C			**NA**	**-**	**Yes**
S12A	**1030 (Interior Door)**	**Brown/Grey Sealant on Door**	**4.18%**	**Chrysotile**	**Yes**
S12B			**NA**	**-**	**Yes**
S12C			**NA**	**-**	**Yes**
S13A	**1011 (Interior Window)**	**Hard Grey Sealant on Window (Interior Panel)**	**0.59%**	**Chrysotile**	**Yes**
S13B			**NA**	**-**	**Yes**
S13C			**NA**	**-**	**Yes**

Table 3 - Sample Summary Table

TABLE 2: BULK ASBESTOS SAMPLING SUMMARY					
Sample #	**Location**	**Material Description**	**Asbestos Content (%)**	**Fibre Type**	**Is Material ACM**
S14A	**2015 (Interior Window)**	**Hard Beige Sealant on Window**	**0.92%**	**Chrysotile**	**Yes**
S14B			**NA**	**-**	**Yes**
S14C			**NA**	**-**	**Yes**
S15A	**2012**	**Interior Window Sealant (1946)**	**2%**	**Chrysotile**	**Yes**
S15B			**NA**	**-**	**Yes**
S15C			**NA**	**-**	**Yes**
S16A	**2012**	**Exterior Window Sealant (1946)**	**1.46%**	**Chrysotile**	**Yes**
S16B			**NA**	**-**	**Yes**
S16C			**NA**	**-**	**Yes**
S17A	1000	Plaster (1962)	ND	-	No
S17B	1000	Plaster (1962)	ND	-	No
S17C	1001	Plaster (1962)	ND	-	No
S17D	1001	Plaster (1962)	ND	-	No
S17E	1001	Plaster (1962)	ND	-	No
S18A	2012	Plaster (1946)	ND	-	No
S18B	2012	Plaster (1946)	ND	-	No
S18C	2012	Plaster (1946)	ND	-	No
2018 Asbestos Audit Update					
S01A	**1015**	**Mastic Associated with Vinyl Floor Tile (1962)**	**10**	**Chrysotile**	**Yes**
S01B			**NA**	**-**	**Yes**
S01C			**NA**	**-**	**Yes**
S02A	**1006**	**Mastic Associated with Vinyl Floor Tile (1946)**	**ND**	**-**	**Yes**
S02B			**ND**	**-**	**Yes**
S02C			**1**	**Chrysotile**	**Yes**

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

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

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

15 - 6800 Kitimat Rd
Mississauga, ON, L5N 5M1
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

MTE Consultants Inc. (Kitchener)

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

Client PO:
Project: 34532-914-King Edward
Custody:

Report Date: 12-Jun-2018
Order Date: 7-Jun-2018

Order #: 1823462

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

Paracel ID	Client ID
1823462-01	S01A
1823462-02	S01B
1823462-03	S01C
1823462-04	S02A
1823462-05	S02B
1823462-06	S02C

Approved By:

Emma Diaz
Senior Analyst

PARACEL LABORATORIES LTD.

Order #: 1823462

Certificate of Analysis

Client: MTE Consultants Inc. (Kitchener)

Client PO:

Report Date: 12-Jun-2018

Order Date: 7-Jun-2018

Project Description: 34532-914-King Edward

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

Paracel I.D.	*Sample Date*	*Layers Analyzed*	*Colour*	*Description*	*Asbestos Detected:*	*Material Identification*	*% Content*
1823462-01	29-May-18	sample homogenized	Black	Mastic	**Yes**	Client ID: S01A	
						Chrysotile	10
						Cellulose	5
						Non-Fibers	85
1823462-02	29-May-18					Client ID: S01B	
						not analyzed	
1823462-03	29-May-18					Client ID: S01C	
						not analyzed	
1823462-04	29-May-18	sample homogenized	Black	Mastic	No	Client ID: S02A	
						Non-Fibers	100
1823462-05	29-May-18	sample homogenized	Black	Mastic	No	Client ID: S02B	
						Non-Fibers	100
1823462-06	29-May-18	sample homogenized	Black	Mastic	**Yes**	Client ID: S02C	
						Chrysotile	1
						Non-Fibers	99

**** 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	8-Jun-18

** 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.*

Work Order Revisions / Comments

None

PARACEL LABORATORIES LTD

Paracel ID: 1823462

uga Location
t Road, Unit # 15
ı, ON L5N 5M1

Chain of Custody
(Lab Use Only)

Page 1 of 1

Client Name: MTE Consultants Inc.	Project Reference: 34532-914 - King Edward	TAT:
Contact Name: Steven Nieboer	Quote #: 18-009 MTE Standing Offer	[ ] Regular [ ] 3 Day
Address: 520 Bingemans Centre Drive, Kitchener	PO #: N/A	[ ] 2 Day [ ] 1 Day
	Email Address: snieboer@mte85.com	[ ] Same Day
Telephone:519-743-6500		Date Required:

1823462

ASBESTOS ANALYSIS

Matrix: [ ] Air [X] Other **Regulatory Guideline:** O. Reg. 278/05

Required Analyses: [ ]PCM [X]PLM [ ]PLM 400PC [ ]PLM 1000PC [ ]Chatfield [ ]TEM

	Sample ID	Location	Matrix Description	Sampling Date	Air Volume (L)	Positive Stop? (Y / N)	Is the Sample Layered? (Y / N)	If layered, Describe Layer(s) to be Analyzed Separately* or Homogenize all **
1	S01ABC	1015	Mastic (1962)	29-May		Y	N	
2	S02ABC	1003	Mastic (1946)	29-May		Y	N	
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

* Each layer is charged as a separate analysis ** Homogenize = Sample is combined to a uniform mixture

Comments:

Method of Delivery: Purolator

Relinquished By (Sign):	Received at Depot:	Received at Lab:	Verified By:
Relinquished By (Print)& Date/Time: Steven Nieboer, June 6, 2018	Date/Time:	Date/Time: June 7-18 9:00	Date/Time: June 7-18 09:08

King Edward

APPENDIX D

ABATEMENT LETTERS

REITZEL BROS. ASBESTOS REMOVAL LTD.

P.O Box 190 Woolwich St. South
Breslau, Ontario
N0B 1M0

PHONE: (519) 648-2237
Toll Free: (800) 463-9702
Fax: (519) 648-3374

Date: July 29, 2013

Attention: Daniela Budure (Environmental Officer)

RE: Confirmation of Completed Asbestos Removal for the Waterloo Regional District School Board Table 2 Asbestos Audit

- Work requested by Merle Straus
- WO # 13008902

Location: King Edward Public School

Area: MTE Room #"s 0003, 2014, 0017

Work Description:

MTE Room Number	Room Description	Asbestos-Containing Material & Quantity	Quantity	Activity Required
0003	Girls' washroom	Insulation on Pipe Fitting	1	Removal Type 2 Operation Glove bag
2014	Staff room vestibule entrance area only	Floor tile	1	Removal Type 1 Operation
0017	Boiler room	Insulation on Pipe Fitting	1	Removal Type 2 Operation

(All work performed in accordance with Ontario Regulation 278/05)

Start Date: June 4, 2013 (after regular hours)

Completion Date: June 4, 2013 (after regular hours)

Disposal of Asbestos Waste: Reitzel Bros. Ltd. Location

Regards'

Jackie Cox

Confirmation of Completion

Date:	**January 5 2014**
Attention:	**WRDSB**
Regardining :	**Asbstos abatement**
Location:	**King Edward PS** **709 King St West Kitchener** **MTE Room 0003, 0017, & 2013**
Discription of Work:	**Completion of Table 1 from 2014 Asbestos inspection report prepared by MTE Consultants Inc., dated August 7 2014**
Completion Date:	**Jan 2 2015 With (2) AAW certified staff (1) AAS job**
Disposal of Asbestos containg Waste:	**PuroClean Property Restoration via RCT bins** **licence number 3337YYS8P**

Please feel free to contact us if you have any questions.

Hank Miller
Puroclean Property Restoration
hmiller@puroclean.com
519-569-9101

107 Whitney Pl,
Kitchener, ON, Canada.
N2G 2X8

Phone: (519) 498-0077
Fax: (519) 568 8426
E-mail: frank@asbestosmouldexperts.com

April 27th, 2015

Attention: Environmental Officer - WRDSB

Re: Confirmation of Completed Asbestos Removal for the Waterloo Region District School Board

Location: King Edward Public School – 709 King Street West Kitchener

Area: Room MTE#0015, 0017, 0018, 0019, 1000

Work Description:
Completion of MTE Asbestos Inspection report Table 02, file #34532-904 from March 17 2015.

NOTE: One extra fitting removed requested by Eric Edward at Room MTE#0017.

All work done in accordance with Ont. Reg. 278/05

Completion Date: April 17th with 01 AAS and 1 AAW certified staff.

Disposal of Asbestos Waste: Erb St. Dumping & Disposal Unit Waterloo ON

License # 7549-9EZL TL

Regards,

Frank Parronchi,
Owner/President
519 498-0077

Appendix 01 35 34B– Lead Report

PROJECT-SPECIFIC
DESIGNATED SUBSTANCES &
HAZARDOUS MATERIALS ASSESSMENT

King Edward Public School
709 King Street West
Kitchener, Ontario

Prepared for:

Mr. Jeff Cull,
Environmental Officer | Facilities Services

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

Prepared by:
Safetech Environmental Limited

Per: Shannon Deline, B.A.,
Senior OH&S Technician

Reviewer: Jeremy J. Gore, C.E.T., EP
Regional Manager - SWO

Safetech Project Number 2-3210083

100 Hanson Avenue, Unit 2
Kitchener, ON
N2C 2E2

TEL 519.954.2732 1.877.GO.TO.SEL
FAX 519.772.1968
www.safetechenv.com

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

EXECUTIVE SUMMARY

Safetech Environmental Limited (Safetech) was retained by Mr. Jeff Cull of Waterloo Region District School Board to conduct a project-specific designated substances and hazardous materials (DSHM) assessment for King Edward Public School located at 709 King Street West in Kitchener, Ontario. The building will herein be referred to as the "Site".

The objective of our assessment was to determine the presence, location, condition, and approximate quantities of designated substances and other hazardous materials within the proposed project areas of the subject site that have the potential to be disturbed as part of future renovation activities, which include the installation of a new elevator system, so that appropriate control measures can be implemented to protect workers and occupants.

It should be noted that our assessment was limited to locations within the building that are expected to be impacted by the potential renovation project, as stipulated by Mr. Jeff Cull. The extent of our assessment is identified on the Figures attached in Appendix B. There is a possibility of unknown materials and finishes present in areas not visually assessed, including pipe chases, above solid ceilings, within elevator shafts, etc. Additional materials and finishes may be present in these areas and should be assessed prior to their disturbance.

The following designated substances and other hazardous building materials were confirmed, deemed and/or suspected present within the project work areas. Please refer to the Results (Section 3) and Conclusions and Recommendations (Section 4) of our report for complete details and additional information.

Asbestos

Asbestos was confirmed present in the following materials:

- Mechanical pipe fitting insulation (parging cement) present within the basement Custodial Office. Additional asbestos-containing parged cement fittings are suspected present in concealed locations throughout the project work areas (i.e. within wall cavities, at radiators, above solid ceilings);
- 9" x 9" green vinyl floor tiles and black vinyl floor tiles present beneath carpet flooring within the first floor Special Education Room;
- 9" x 9" brown vinyl floor tiles present beneath carpet flooring within the second floor Book Room;
- Black mastic associated non-asbestos vinyl floor tiles located within the basement Custodial Office, the first floor Special Education Room and ESL Room, and the second floor Book Room;

- Exterior Transite panels present at the front entrance overhang; and,
- Roofing membrane.

Lead

Grey paint identified on the concrete floor (beneath carpet) within the basement Custodial Office was found to contain between 1000 and 5000 µg/g of lead and is considered 'lead-containing'.

Lead is also deemed present in small quantities as solder in pipe fittings and electrical equipment and as lead packing at sanitary drain pipe bell and spigot connection gaskets identified within the basement.

Mercury

Deemed present in florescent lamps located within the first floor ESL Room and the second floor Book Room.

Silica

Deemed present in all drywall finishes, plaster finishes, ceramic tiles and grout, ceiling tiles, caulking, brick and associated mortar, all concrete materials and finishes and roofing materials.

This assessment satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statues of Ontario 1990, as amended.

Should you have any questions regarding the information contained in the report, please contact our office at 519.954.2732.

Safetech Environmental Limited

Shannon Deline, B.A.
Senior OH&S Technician
sdeline@safetechenv.com

Jeremy J. Gore, C.E.T., EP
Regional Manager – SWO
jgore@safetechenv.com

December 10, 2021

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

Attention: **Mr. Jeff Cull,**
Environmental Officer | *Facility Services*
jeff_cull@wrdsb.ca

RE: Project-Specific Designated Substances & Hazardous Materials Assessment
King Edward Public School Located at
709 King Street West, Kitchener, Ontario, (Site)

1.0 INTRODUCTION

1.1 Background and Objectives

Safetech Environmental Limited (Safetech) was retained by Mr. Jeff Cull of Waterloo Region District School Board to conduct a project-specific designated substances and hazardous materials (DSHM) assessment for King Edward Public School located at 709 King Street West in Kitchener, Ontario (the Site). The objective of our assessment was to determine the presence, location, condition, and approximate quantities of designated substances and other hazardous building materials within the Site that have the potential to be disturbed during future renovation activities (including the installation of a new elevator) so that appropriate control measures can be implemented to protect workers and occupants.

This assessment satisfies the requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statues of Ontario 1990, as amended. Section 30(1) requires an assessment to determine if there are any designated substances present at a project site prior to construction or demolition activity. Sections 30(2), (3) and (4) require the constructor for a project to provide the findings in this report as part of the tendering information for any tendered project or to prospective contractors (and subcontractors) of a project before entering into a binding contract.

This report documents findings of our on-site inspection that was conducted on November 16, 2021, and provides conclusions and recommendations based on our findings and knowledge of the Site.

1.2 Scope of Work

Our scope of work included the following activities:

- A visual assessment of the site to identify the presence, location, condition, and approximate quantities of designated substances and other hazardous materials pertaining to the areas impacted by the potential renovation project;

- Collection, analysis, and interpretation of representative bulk samples of suspect asbestos-containing building materials for the determination of asbestos content and material classification;

- Collection, analysis, and interpretation of representative paint chip samples for the determination of lead content; and,

- Preparation of a report to document findings and provide recommendations regarding control measures and/or special handling procedures for designated substances or specific hazardous materials that may be removed or disturbed as part of potential renovation activities.

This assessment only identified designated substances and hazardous materials that were deemed to be part of the building or somehow otherwise incorporated into the building structure and its finishes. Assessing occupant items such as stored products, furnishings, items, and materials used or produced as part of a manufacturing process or treatment procedure, etc. was beyond the scope of this assessment. In addition, our assessment did not include an investigation for underground materials or equipment (vessels, drums, underground storage tanks, pipes, cables, etc.). Furthermore, this assessment was limited to the areas investigated, and more specifically, to those materials that may be disturbed as part of the potential renovation work, as described in Section 1.3.

1.3 Description of Area Assessed

The areas investigated included all locations expected to be impacted by potential renovation work. This includes the basement Custodial Office, the first floor entrance vestibule, the first floor Special Education Room and ESL Room and the second floor Book Room. The building was constructed in 1905, with additions constructed in 1946 and 1962. The areas investigated were all within the 1946 building addition. Typical interior building finishes include plaster finishes, vinyl floor tiles, carpet flooring, lay-in acoustic ceiling tiles and ceramic.

1.4 Past Environmental Reports

Data from past environmental surveys was referenced in terms of understanding previous assessment results and obtaining a general understanding of the overall asbestos-containing material conditions. Where possible, Safetech relied upon results indicated in past surveys and only collected confirmatory samples as necessary.

The following environmental report was provided:

- *'2018 Asbestos Audit Update – King Edward Public School, 709 King Street West, Kitchener, Ontario'* completed by MTE Consultants, dated June 5, 2018.

Based on our review of the previous asbestos reassessment report, the following asbestos-containing materials were identified within the project area:

- Parged cement pipe fittings present on mechanical elbows within the basement Custodial Office;
- Black mastic associated with vinyl floor tiles throughout the 1946 building addition;
- 2'x4' long fissure random pinhole pattern ceiling tiles identified within the second floor Book Room;
- Exterior Transite overhang located at the front entrance; and,
- Roofing membrane.

2.0 METHODOLOGY

The presence of hazardous materials was assessed by visual inspection. For the purpose of this assessment and this document, hazardous materials include designated substances as well as other chemical, biological, and environmental hazards as defined below:

- **Designated Substances (as prescribed by Ontario Regulation 490/09):**
  - Acrylonitrile, Arsenic, Asbestos, Benzene, Coke Oven Emissions, Ethylene Oxide, Isocyanates, Lead, Mercury, Silica, and Vinyl Chloride.

- **Other Hazardous Materials:**
  - ***Chemical Hazards*** – Urea Formaldehyde Foam Insulation (UFFI) and other obvious potential chemical hazards
  - ***Biological Hazards*** – Mould Contamination
  - ***Environmental Hazards*** – Polychlorinated Biphenyls (PCBs) and Ozone Depleting & Global Warming Substances

For background information regarding the above hazardous materials, please refer to Appendix E.

Destructive testing was not conducted as part of this assessment. Concealed locations such as above solid plaster or drywall ceilings, within plaster or drywall wall cavities, enclosed mechanical/pipe shafts and bulkheads, etc. were not investigated. Similarly, motors, blowers, electrical panels, etc., were not de-energized or disassembled to examine concealed conditions.

Building materials that are not detailed within this assessment due to inaccessibility at the time of our site visit and/or uncovered during renovation/demolition activities should be assessed by a qualified person prior to their disturbance.

Bulk sampling followed by laboratory analysis was also conducted to confirm the presence/absence of selected hazardous materials. Bulk sampling was limited to asbestos in building materials and lead in paint. All other hazardous materials were identified by visual inspection only. Where possible, observations regarding the location, quantity and condition of the hazardous materials identified were made in order to determine the potential for exposure and provide appropriate recommendations for remedial action, if necessary. Specific methodology for each individual hazardous material assessed is further detailed below.

2.1 Designated Substances

2.1.1 Asbestos

A visual inspection for the presence of both friable and non-friable asbestos-containing material (ACM) was performed within the assessment area. The condition of ACM was rated as Good, Fair, or Poor based on our assessment criteria provided in Appendix A.

Limited intrusive assessment for asbestos-containing materials was conducted as part of this survey. The possible presence of ACM in enclosed locations was assessed on a case-by-case basis where our visual inspection indicated this possibility. Materials that may be present in the surveyed area(s) that were not tested intrusively should be considered asbestos-containing until proven otherwise. This includes materials such as fire door cores, high voltage wiring, inaccessible mechanical packing and gaskets, and underground services or piping which are completely concealed. These materials are recommended to be sampled prior to renovation work which may disturb them, or simply treated as an asbestos-containing material and proactively abated prior to disturbance.

Bulk samples of building materials suspected to contain asbestos were retrieved by Safetech only for materials that were deemed to have a potential to be disturbed as part of the potential renovation project. Bulk samples were retrieved in accordance with Section 3 and Table 1 of Ontario Regulation 278/05, *"Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations"*. The number of samples collected for each material was based on the type and quantity of the material present within the area(s) investigated. Each individual sample was placed in a labeled sealable bag for transportation to an independent laboratory (EMC Scientific Inc.).

EMC Scientific Inc. is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos fibre analysis.

Analysis for asbestos content was performed by the independent laboratory in accordance with the U.S. Environmental Protection Agency (EPA) Test Method EPA/600/R-93-116:Method for the Determination of Asbestos in Bulk Building Materials. June 1993. This method identifies the asbestos fibre content of building materials using polarized light microscopy (PLM) analytical techniques, with confirmation of presence and type of asbestos made by dispersion staining optical microscopy. This analytical method meets the requirements set forth in Section 3 of O.Reg. 278/05.

In accordance with O. Reg. 278/05, an asbestos-containing material is defined as material that contains 0.5 per cent or more asbestos by dry weight. The laboratory was instructed to conduct “stop-positive” analysis for five (5) of the eight (8) sample sets collected. If a sample was found to be asbestos-containing, no further analysis was conducted for samples taken from the same homogeneous material. The Laboratory Certificate of Analysis is included in Appendix C.

Locations where ACM have been identified are detailed in this report. Recommendations pertaining to ACM were made based on the friability, accessibility, and condition of the material in conjunction with the potential for renovation work to disturb the ACM.

2.1.2 Lead

An assessment for lead in paint was conducted by retrieving paint chip samples from representative surfaces within the areas assessed that were deemed to have a potential to be disturbed as part of the potential renovation activities as well as future demolition/renovation activities. The condition of the painted surface from which the sample was taken was also visually assessed for signs of deterioration such as cracking, chipping, flaking, bubbling, and deterioration due to friction. The condition of this surface was assessed as good, fair or poor based on the degree and extent of deterioration. The paint chip sample was retrieved by scraping the paint down to the base material substrate to ensure collection of all layers of paint. Care was taken to avoid collection of the underlying substrate to reduce analytical substrate matrix interference.

Upon completion of our assessment, the paint chip sample was submitted to an independent laboratory (Caduceon Environmental Laboratories) for the determination of lead content. This laboratory participates in and is accredited by the EPA (U.S. Environmental Protection Agency) for analysis of lead in paint chips through the American Industrial Hygiene Association (AIHA) Environmental Lead Laboratory Accreditation Program (ELLAP). Analysis was conducted by the laboratory following the EPA Method 6010. Result of analysis was reported by the laboratory in micrograms per gram (µg/g). The Laboratory Certificate of Analysis is included in Appendix C.

The presence of lead in other materials, such as lead sheeting, pigmented mortar, lead piping, lead solder, etc. were noted where observed but were not sampled to verify lead content. Lead can be present in these materials to varying degrees, depending on their age of application (refer to Appendix E for additional details) and should be considered lead-containing until proven otherwise.

2.1.3 Mercury

The type, quantity, and location of mercury-containing equipment and devices within the area(s) assessed were determined by visual inspection based on appearance, age and knowledge of historical uses. Sampling for mercury-containing building materials and dismantling of suspect mercury-containing equipment was not performed. Where possible, attempts were made to verify the presence/absence of mercury by gathering additional information such as equipment model number, serial number, etc.

2.1.4 Silica

The presence of crystalline silica in building materials was determined through visual inspection of building materials only, based on knowledge of the historic use of silica-containing materials in certain building materials. Sampling to verify the presence/absence of silica in building materials was not performed.

2.1.5 Other Designated Substances

Other designated substances (i.e. acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride) are typically not expected to be encountered in building materials as significant constituents or in a form that would represent an exposure concern. These substances were not included in our assessment unless specific information regarding their use (e.g. in a manufacturing process) was provided to us. Please refer to Appendix E for information regarding where these designated substances are typically found or used. No sampling for these designated substances was performed.

2.2 Other Hazardous Materials

2.2.1 Chemical Hazards

<u>Urea Formaldehyde Foam Insulation (UFFI)</u>

A visual inspection to evaluate the possible presence of Urea Formaldehyde Foam Insulation (UFFI) was conducted within the area(s) assessed. Our visual inspection was limited to looking for evidence of possible UFFI installation (i.e. repaired nozzle holes in walls) and overspray at wall/ceiling joints, etc. No material sampling was conducted as part of our assessment.

2.2.2 Biological Hazards

Mould Contamination

A visual inspection to determine the possibility of indoor mould growth was conducted within the area assessed. Our assessment was limited to looking for evidence of mould growth and water damage (staining, material deterioration, efflorescence, etc.) on the surface of building materials, which may be an indicator of hidden mould growth. No moisture content readings of building materials were taken to determine their current condition. Additionally, destructive testing to confirm the presence/absence of hidden mould growth and material sampling to verify the presence/absence of mould on suspect surfaces was beyond the scope of this assessment.

2.2.3 Environmental Hazards

Polychlorinated Biphenyls (PCBs)

The presence of PCB-containing electrical equipment within the area(s) assessed was identified through visual inspection and knowledge of the timeline of historical use.

For stand-alone transformers and capacitors, information from the manufacturer nameplate (such as the date of manufacture, dielectric fluid trade name or "Type Number", etc.) was gathered, where possible, to further evaluate if the equipment may contain PCBs. This information was then compared to the information provided in the Environment Canada document entitled "*Handbook on PCB's in Electrical Equipment*" (Third Edition, April 1988) to aid in identification. Transformers and capacitors confirmed to be manufactured after 1979 were assumed to not contain PCBs. If appropriate information could not be obtained it was assumed that the transformer or capacitor contained PCBs.

Light fixture ballasts were not removed to obtain manufacturer information that may be on the back of the ballast due to an electrical shock hazard. If visual confirmation of ballast type could not be made it was assumed that light fixtures in these areas were installed prior to 1980 and therefore deemed PCB-containing. At the time of light fixture removal, ballast information should be compared to the information provided in the Environment Canada document entitled *"Identification of Lamp Ballasts Containing PCBs" (Report EPS 2/CC/2 (revised) August 1991)* to aid in identification.

No sampling of materials or fluids within equipment was conducted to verify the presence/absence of PCBs. Inspection and testing of other materials for PCB content, including (but not limited to) caulking, asphalt, oil-based paint, plastics, switches, oil residue, electric cables and hydraulic fluids was beyond the scope of our assessment.

Ozone Depleting and Global Warming Substances

The presence of fixed equipment likely to contain ozone-depleting substances (ODS) and/or global-warming substances (GWS) was identified through visual inspection and knowledge of the timeline of historical use. This included equipment such as chillers, air-conditioners and fixed dry-chemical fire extinguishers, where chemicals such as hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs) or halons may be present. Where possible, information regarding the type and quantity of refrigerant present was obtained from the manufacturer nameplate. Our visual assessment was limited to fixed equipment within the area(s) assessed and did not include portable equipment such as stand-alone refrigerators, freezers, water coolers, air-conditioners and fire extinguishers, etc.

3.0 RESULTS

Results of our visual assessment and bulk sample analytical findings are summarized in the sections below. Photographs of conditions observed are referenced in the appropriate section where applicable (as **P#**) and are included in Appendix D.

3.1 Designated Substances

3.1.1 Asbestos

Results of bulk sample analysis for the determination of asbestos content are summarized in Table 1. Materials have been classified as “ACM” or “Non-ACM” based on analytical results. Please refer to the Limitations section of this report (Section 5.0) for additional details. The Laboratory Certificate of Analysis is included in Appendix C. Bulk sample locations are identified on Figures AS-01 to AS-03 included in Appendix B.

TABLE 1
Bulk Sample Analytical Results for Determination of Asbestos Content
709 King Street West, Kitchener, Ontario
Sample Collection Date: November 16, 2021

Sample No.	Material Description	Sample Location	Asbestos Content	Material Classification
S01a	Smooth Plaster 2 Phases: a) White plaster b) Grey plaster	Basement – Custodial Office (MTE Location ID 43)	None Detected	Non-ACM
S01b		First Floor – ESL Room (MTE Location ID 56)		
S01c		Second Floor – Book Room (MTE Location ID 70)		
S02a	**9" x 9" Vinyl Floor Tiles – Green** **4 Phases:** **a) Brown mastic** **b) Black floor tile** **c) Brown mastic** **d) Green floor tile**	**First Floor – Special Education Room (MTE Location ID 55)**	a) None Detected	**ACM (Floor Tile Only – 2 Layers)**
			b) 2% Chrysotile	
			c) None Detected	
			d) 3% Chrysotile	
S02b			a) None Detected	
			b) Not Analyzed	
			c) None Detected	
			d) Not Analyzed	
S02c			a) None Detected	
			b) Not Analyzed	
			c) None Detected	
			d) Not Analyzed	
S03a	**9"x 9" Vinyl Floor Tiles – Brown** **2 Phases:** **a) Brown floor tile** **b) Black mastic**	**Second Floor – Book Room (MTE Location 70)**	**a) 3% Chrysotile**	**ACM (Floor Tile Only)**
			b) <0.5% Chrysotile	
S03b			a) Not Analyzed	
			b) <0.5% Chrysotile	
S03c			a) Not Analyzed	
			b) <0.5% Chrysotile	

Table Note: As per O. Reg. 278/05, ACM contains ≥0.5% asbestos by dry weight. Less than this amount is considered a "trace" quantity and is therefore not classified as an asbestos-containing material.

Materials assessed for asbestos content are summarized in Table 2 based on the type/use of the material. The condition and friability of materials confirmed or suspected to be asbestos-containing (based on our visual assessment and results of bulk sample analysis) is provided. Condition (Cond.) ratings are provided as Good (G), Fair (F) or Poor (P) based on our Assessment Criteria provided in Appendix A. Estimates of quantity have only been provided for confirmed or suspected asbestos-containing materials that were deemed to have a potential to be disturbed as part of the upcoming demolition work. Any quantities provided should be considered rough estimates only and should not be relied upon for bidding purposes. It is the responsibility of the Contractor to obtain actual quantities.

TABLE 2
Results of Assessment for Asbestos-Containing Materials
709 King Street West, Kitchener, Ontario
Date of Assessment: November 16, 2021

Sprayed and Loose Fill Insulating Materials	Location/Description	Cond.	Est. Quantity	Friability
Sprayed Fireproofing	Spray applied fireproofing was identified above lay-in acoustic ceiling tiles within the front entrance vestibule. This area was confirmed on site by the WRDSB representative to have been renovated within the last three (3) years and is not suspected to contain asbestos. Additionally based on surveyor's knowledge, the material was visually confirmed to be non-asbestos.	N/A	N/A	N/A
Sprayed Insulation	None identified in the area assessed.	N/A	N/A	N/A
Loose Fill / Vermiculite Insulation	No vermiculite or other loose fill insulation was identified within the assessed area, nor is it suspected to be present.	N/A	N/A	N/A
Thermal System Insulation	**Location/Description**	**Cond.**	**Est. Quantity**	**Friability**
Mechanical Pipe Insulation – Straights & Fittings (elbows, valves, tees, hangars, etc.)	Parging cement was identified on mechanical pipe fittings (elbows) within the basement Custodial Office. The material was previously sampled and determined to contain **50-75% Chrysotile** asbestos (refer to MTE Sample ID 'Boiler Room Elbow Cement' in the report referenced in Section 1.4 and Photograph **P1**).	**Good**	**9**	**Friable**
	Additional asbestos-containing parged cement fittings are suspected to be present within inaccessible concealed locations (i.e. enclosed wall cavities, at radiators and inaccessible ceiling spaces).	**N/D**	**N/D**	**N/D**
	All other mechanical piping throughout the assessed area was either un-insulated or insulated with non-asbestos fibreglass insulation.	N/A	N/A	N/A

Thermal System Insulation	Location/Description	Cond.	Est. Quantity	Friability
HVAC Duct Insulation	Ducting identified within the areas assessed was observed to be uninsulated.	N/A	N/A	N/A
Breeching / Exhaust Insulation	None identified in the area assessed.	N/A	N/A	N/A
Tank Insulation	None identified in the area assessed.	N/A	N/A	N/A
Boiler Insulation	None identified in the area assessed.	N/A	N/A	N/A
Duct Vibration Dampeners	None identified in the area assessed.	N/A	N/A	N/A
Other Mechanical Equipment Insulation	None identified in the area assessed.	N/A	N/A	N/A
Architectural Finishes & Finishing Materials	**Location/Description**	**Cond.**	**Est. Quantity**	**Friability**
Sprayed Texture / Stucco Finishes	None identified in the area assessed.	N/A	N/A	N/A
Plaster Finishes	Smooth plaster wall and ceiling finishes were identified throughout the areas assessed. The material was previously sampled and determined to be non-asbestos (refer to MTE Sample ID S01, 4-Dec-09 in the report referenced in Section 1.4). Safetech collected additional verification samples of the plaster finishes identified within the project specific work areas. The material was confirmed to be non-asbestos (refer to sample set S01 in Table 1).	N/A	N/A	N/A
Drywall Joint Compound	A limited quantity of drywall with associated joint compound was identified within the front entrance vestibule. This area was confirmed on site by the WRDSB representative to have been renovated within the last three (3) years and is not suspected to contain asbestos. Additionally, drywall joint compound has been previously sampled throughout the building and determined to be non-asbestos (refer to MTE Sample ID S01, 7-May-13 in the report referenced in Section 1.4).	N/A	N/A	N/A

Ceiling Tiles	Location/Description	Cond.	Est. Quantity	Friability
Lay-in Acoustic Ceiling Tiles	2' x 4' ceiling tiles with a pinhole pattern were identified within the first floor front entrance vestibule. The ceiling tiles were noted to contain manufacturer's stamps on the back that indicated that the tile was manufactured after 2010, when asbestos was no longer in use for this material.	N/A	N/A	N/A
	Asbestos-containing 2' x 4' long fissure random pinhole pattern ceiling tiles were identified within the second floor Book Room in the past environmental report. At the time of our assessment, 2' x 4' pinhole patterned ceiling tiles were identified. The ceiling tiles were noted to contain manufacturer's stamps on the back that indicated that the tile was manufactured after 2010, when asbestos was no longer in use for this material. Therefore, no asbestos-containing ceiling tiles are present within the project specific work areas.	N/A	N/A	N/A
Fixed-in-Place Ceiling Tiles	None identified in the area assessed.	N/A	N/A	N/A
Transite Ceiling Panels	None identified in the area assessed.	N/A	N/A	N/A
Flooring	**Location/Description**	**Cond.**	**Est. Quantity**	**Friability**
Vinyl Floor Tiles	12" x 12" dark brown mottled vinyl floor tiles were identified within the basement Custodial Office and the second floor Book Room. The material was previously sampled and determined to be non-asbestos (refer to MTE Sample ID S03, 4-Dec-09 in the report referenced in Section 1.4).	N/A	N/A	N/A
	12" x 12" white with black fleck patterned vinyl floor tiles were identified within the first floor ESL Room. The material was previously sampled and determined to be non-asbestos (refer to MTE Sample ID S10, 4-Dec-09 in the report referenced in Section 1.4).	N/A	N/A	N/A
	9" x 9" green vinyl floor tiles and a second layer of black vinyl floor tiles were identified beneath carpet flooring within the first floor Special Education room. The material was sampled and determined to contain 2-3% Chrysotile asbestos (refer to sample set S02 in Table 1 and Photograph **P2**). The associated brown mastic was also sampled and determined to be non-asbestos.	**Good**	**~50 ft²**	**Non-Friable**
	9" x 9" brown vinyl floor tiles were identified beneath carpet flooring within the second floor Book Room. The material was sampled and determined to contain 3% Chrysotile asbestos (refer to sample set S03 in Table 1 and Photograph **P3**). The associated black mastic was also sampled and determined to be non-asbestos.	**Good**	**~50 ft²**	**Non-Friable**

Floor Mastic	Black mastic present throughout the 1946 building addition (i.e. the basement Custodial Office, the first floor ESL Room, the first floor Special Education Room and the second floor Book Room) was previously sampled and determined to contain 1% Chrysotile asbestos (refer to MTE Sample ID S02, 29-May-18 and MTE Sample ID S2, 18-Oct-16 in the report referenced in Section 1.4). Mastic sampled by Safetech and determined to be non-asbestos cannot be adequately visually distinguished from the asbestos-containing mastic. Therefore, due to historical sample results, all mastic associated with vinyl floor tiles throughout the project-specific work areas shall be treated as asbestos-containing.	**Good**	**~ 150-200 ft²**	**Non-Friable**
Vinyl Sheet Flooring	None identified in the area assessed.	N/A	N/A	N/A
Asbestos Cement Products	**Location/Description**	**Cond.**	**Est. Quantity**	**Friability**
Piping	None identified in the area assessed.	N/A	N/A	N/A
Roofing, Siding, Wallboard	Asbestos cement (Transite) panels were identified at the exterior overhang of the front entrance. The material is deemed to be asbestos-containing based on visual assessment and the surveyor's knowledge of the material (refer to Photograph **P4**).	**Good**	**~200 ft²**	**Non-Friable**
Other Cement Products	None identified in the area assessed.	N/A	N/A	N/A
Misc. Materials	**Location/Description**	**Cond.**	**Est. Quantity**	**Friability**
Caulking	Brown window caulking was identified around the exterior window frames of the building. The caulking was sampled and determined to not contain asbestos (refer to sample set **S07** in Table 1).	N/A	N/A	N/A
Roofing Materials	The roof was not accessed at the time of our assessment; however, the roof membrane has been previously sampled. As per the past environmental report, Roof Section R-D was determined to contain 0.97% Chrysotile asbestos (refer to MTE Sample ID S05, 18-Oct-16 in the report referenced in Section 1.4). As we cannot confirm which roof section this applies to based on the figures provided, the portion of the roof expected to be impacted by potential renovation work shall be treated as asbestos-containing.	**Good**	**N/D**	**Non-Friable**
Discovered Materials	Any materials uncovered that are not identified in this report and are suspected of containing asbestos must be sampled prior to proceeding with any work.	**N/D**	**N/D**	**N/D**

Notes: N/A=Not Applicable; N/D=Not Determined

3.1.2 Lead

Laboratory analytical results for paints and surface coatings tested to determine lead content are summarized below in Table 3. The Laboratory Certificates of Analysis are included in Appendix C. Sample locations are identified on Figures AS-01 to AS-03 included in Appendix B.

TABLE 3
Results of Paint Condition and Lead Content Assessment
709 King Street West, Kitchener, Ontario
Sample Collection Date: November 16, 2021

Sample No.	Location	Surface	Paint Colour	Condition	Lead Conc. (µg/g)	EACC Classification
LP01	Custodial Office (MTE Location ID 43)	Concrete	Beige	Good	<5	*"de minimis"* level of lead
LP02	Custodial Office (MTE Location ID 43)	Plaster	White	Good	948	*"de minimis"* level of lead
LP03	**Custodial Office (MTE Location ID 43)**	**Concrete**	**Grey**	**Good**	**2,260**	**Lead-Containing**
LP04	Book Room (MTE Location ID 70)	Plaster	Beige	Poor	403	*"de minimis"* level of lead
LP05	Book Room (MTE Location ID 70)	Plaster	Green	Poor	723	*"de minimis"* level of lead

Grey paint on the concrete floor (beneath carpet flooring, Photograph **P5**) identified within the basement Custodial Office was found to contain between 1000 and 5000 µg/g of lead (above 0.1% lead by weight but less than 0.5% lead by weight) and is considered 'lead-containing' in accordance with the October 2014 Environmental Abatement Council of Canada (EACC) publication *Lead Guideline for Construction, Renovation, Maintenance or Repair.* Materials coated with lead-containing paint require special procedures when performing work that may disturb them or their coatings.

All other paint samples collected for lead content analysis were found to have concentrations below 1000 µg/g or 1000 ppm (0.1% Lead by Weight) which are considered to have a '*de minimis'* level of lead in paint (virtually safe) in accordance with the October 2014 Environmental Abatement Council of Canada (EACC) publication *Lead Guideline for Construction, Renovation, Maintenance or Repair* and require no extra precautions provided they and the surfaces they're adhered to are not aggressively disturbed (e.g. sand blasted, heat torched, etc.).

Suspect lead-containing materials within the project work areas included the following:

- Lead solder used in pipe fittings and electrical equipment; and,
- Lead packing at sanitary drain pipe bell and spigot connection gaskets (**P6**).

3.1.3 Mercury

Mercury is presumed present in vapour form within fluorescent light tubes present within the first floor ESL Room and the second floor Book Room. All identified thermostats were electronic and do not contain mercury.

No other equipment suspected of containing mercury was identified.

3.1.4 Silica

A number of building materials were identified within the surveyed areas that are suspected to contain crystalline silica. This includes the following materials:

- Plaster finishes;
- Lay-in acoustic ceiling tiles;
- Drywall and associated joint compounds;
- Caulking;
- Brick and associated mortar;
- Ceramic tiles and grout;
- Concrete; and,
- Roofing materials.

3.1.5 Other Designated Substances

Acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride were not included in our assessment as these substances are not expected to be a significant component of building materials or present in a form that would represent an exposure concern. Additionally, no specific information regarding their use was provided to us.

3.2 Other Hazardous Materials

3.2.1 Chemical Hazards

No visible evidence of UFFI installation (i.e. injection openings) or overspray of foam insulation at wall/ceiling joints was identified. In addition, UFFI insulation within interior wall cavities is not suspected. No other hazardous materials were identified nor are they suspected present.

3.2.2 Biological Hazards

Mould Contamination

No signs of mould contamination or water damage were identified in the areas assessed at the time of our assessment.

Polychlorinated Biphenyls (PCBs)

Fluorescent light fixtures were identified within first floor ESL Room and the second floor Book Room. Lamp types that are ballast dependent were noted to be four-foot, three-lamp fixture types containing T8 lamps. Ballasts associated with these light fixtures are not suspected to contain PCBs due to the date of manufacture. However, as a matter of due diligence, ballasts should be inspected at the time of replacement.

All other lighting within the project work areas have been converted to LED bulbs. LED lighting is a relatively new style of lighting and ballasts associated with LED light fixtures are not expected to have associated PCB light ballasts.

Ozone Depleting and Global Warming Substances

No ozone depleting or global warming substances were identified in the areas assessed at the time of our assessment.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Designated Substances

4.1.1 Asbestos

Results of our assessment identified the following asbestos-containing materials:

- Mechanical pipe fitting insulation (parging cement) present within the basement Custodial Office. Additional asbestos-containing parged cement fittings are suspected present in concealed locations throughout the project work areas (i.e. within wall cavities, at radiators, above solid ceilings);
- 9” x 9” green vinyl floor tiles and black vinyl floor tiles present beneath carpet flooring within the first floor Special Education Room;
- 9” x 9” brown vinyl floor tiles present beneath carpet flooring within the second floor Book Room;
- Black mastic associated non-asbestos vinyl floor tiles located within the basement Custodial Office, the first floor Special Education Room and ESL Room, and the second floor Book Room;
- Exterior Transite panels present at the front entrance overhang; and,
- Roofing membrane.

Any materials uncovered that are not identified in this report and are suspected of containing asbestos. All suspect materials shall be assumed to be asbestos-containing until proven otherwise by bulk sample analysis (i.e. prior to disturbance as part of any potential renovation work). Alternatively, treat all suspect materials as asbestos-containing and remove/dispose of them prior to disturbance.

As per O. Reg. 278/05, removal or disturbance of <1 square metre of friable ACM, such as asbestos-containing parged cement fittings, is classified as a Type 2 operation provided the removal is performed using non-powered hand tools only. Removal of >1 square metre of friable ACM shall be conducted as a Type 3 operation.

Non-friable asbestos-containing materials in GOOD condition, such as exterior Transite panels, vinyl floor tiles, vinyl floor tile mastic and roof membrane, may remain in place until activities which could result in disturbance of this material occur. In the event the non-friable asbestos-containing materials are removed, Type1 operations apply (provided that the material is wetted down and removed using non-powered hand held tools) as outlined in O. Reg. 278/05. The use of power tools on non-friable asbestos-containing materials will classify the work as a Type 3 Operation unless the equipment is connected to a HEPA filtered dust collection device. Given that floor tile mastic is difficult to remove, it is recommended to be removed by using grinders equipped with an individual HEPA filtered dust collection assembly following Type 2 asbestos procedures.

The removal or disturbance of ACM must follow the measures and procedures indicated in Ontario Regulation 278/05. This work should be conducted by workers who have received proper training by a “competent person” in the hazards of asbestos exposure, personal hygiene and work practices, and the use and care of respirators and protective clothing. Any worker/supervisor who works in a Type 3 operation must successfully complete the Asbestos Abatement Worker or Supervisor Training Program approved by the Ministry of Training, Colleges and Universities.

It is recommended that all work involving the removal or disturbance of ACM be subject to inspection and testing to document conformance with O. Reg. 278/05 requirements. The degree of inspection and testing is dependent on site-specific conditions such as the type, duration, size and location of the work. In most circumstances Type 3 operations require a visual inspection and clearance air testing to be conducted by a competent worker on completion of the work. The inspection should be conducted to ensure that the enclosure and the work area inside the enclosure are free from visible dust, debris or residue that may contain asbestos. Clearance air testing for Type 3 operations requires a minimum number of air samples to be taken (depending on the size of the work area) following specific sampling and analytical procedures and all samples taken must meet the clearance criteria set out in O. Reg. 278/05.

4.1.2 Lead

Grey paint on the concrete floor (beneath carpet flooring) identified within the basement Custodial Office was found to contain between 1000 and 5000 µg/g of lead (above 0.1% lead by weight but less than 0.5% lead by weight) and is considered ‘lead-containing’ in accordance with the October 2014 Environmental Abatement Council of Canada (EACC) publication *Lead Guideline for Construction, Renovation, Maintenance or Repair.*

Materials coated with lead-containing paint require special procedures when performing work that may disturb them or their coatings. Inform all workers of the presence of paint finishes which contain lead. For any renovation / demolition work which can be done without removing or stripping the paint, a basic dust suppression and worker protection plan is sufficient.

Results of paint chip analysis indicated that all other paints sampled contain a ‘*de minimis*’ level of lead. Provided these materials are disturbed in a non-aggressive manner and the work is performed using normal dust control procedures, then worker protection from the inhalation of lead is not required. General health and safety precautions must still be implemented, such as prohibiting eating, drinking, smoking, and chewing in the work area, implementing dust suppression techniques and providing washing facilities for workers to wash hands and face.

Lead may also be present as a minor component as solder in pipe fittings and as lead packing at sanitary drain pipe bell and spigot connection gaskets. Removal or disturbance of this material, if applicable, should be performed using non-powered hand tools and no hot work should be performed on pipes containing solder.

If practicable, all bulk lead waste materials should be separated from other wastes and sent to a recycling facility. If not practicable, lead-containing waste should be handled and disposed of according to R.R.O. 1990 Regulation 347 (Reg. 347), “General – Waste Management”, made under the Environmental Protection Act. Under this regulation (and depending on the quantity of waste generated) the waste may be subject to analysis following the Toxicity Characteristic Leaching Procedure (TCLP) to determine if it is a “leachate toxic waste” based on the leachate quality criteria provided in Schedule 4 of the regulation. Such wastes must meet specific treatment requirements (Schedule 5) or undergo alternative treatment for hazardous debris (Schedule 8) prior to land disposal.

4.1.3 Mercury

Fluorescent light fixtures containing mercury vapour are present within the assessed area. These materials must be handled with care and kept intact to avoid potential exposure to mercury. In accordance with R.R.O 1990 Regulation 347, waste mercury produced in amounts less than 5 kilograms (kg) are exempt from hazardous waste registration, treatment and disposal requirements and can be disposed of in landfill as regular waste. Larger quantities of waste mercury must be treated and disposed of in accordance with the requirements of R.R.O 1990 Regulation 347.

4.1.4 Silica

Suspect silica-containing materials were identified throughout the assessed areas. In their current state, building materials containing silica do not represent a risk to building occupants or construction workers. Risks associated with exposure to silica arise during demolition activities that cause silica dust to be created (particularly grinding, drilling or cutting operations and during major demolition), resulting in a crystalline silica inhalation hazard.

If any materials suspected to contain silica are to be removed or otherwise disturbed as a result of renovation or demolition activities it is recommended that procedures be put in place to control the generation of dust (such as routine water misting) and thus reduce the potential for worker exposure. Workers that have the potential to be exposed to airborne silica should also wear appropriate protective clothing and respiratory protection.

Any work involving the disturbance of silica-containing materials should follow the procedures outlined in the MOL *"Silica on Construction Projects"* guideline (April 2011). The appropriate engineering controls, work practices, hygiene practices, personal protective measures, and training necessary to conduct the work in a safe manner are provided in this guideline. The general measures and procedures (or Type of operation) necessary depends on the type of work to be conducted.

4.1.5 Other Designated Substances

No other designated substances are expected to be a component of building materials within the surveyed area in a form that would represent an exposure concern. Therefore, no protective measures or procedures specific to acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride are considered necessary.

4.2 Other Hazardous Materials

4.2.1 Chemical Hazards

As no UFFI was identified or is suspected to be present within the surveyed area no further action is required. However, although intrusive testing was conducted, there is a remote possibility that UFFI could be hidden within locations such as exterior wall cavities that were not investigated. If suspect foam insulation is identified during demolition activities work should be stopped and the area should be re-assessed to evaluate conditions and determine appropriate control measures and worker protection, if necessary.

4.2.2 Biological Hazards

Mould Contamination

No mould growth or water damage was identified during our assessment and therefore, no actions regarding mould contamination are required at this time.

4.2.3 Environmental Hazards

Polychlorinated Biphenyls (PCBs)

The federal government has set strict regulations for the handling, storage, and disposal of PCBs. The *PCB Regulations* (SOR/2008-273) came into effect on September 5th, 2008 and consolidates and replaces the *Chlorobiphenyls Regulations* (SOR/91-152) and the *Storage of PCB Material Regulations* (SOR/92-507). The purpose of the PCB Regulations is to improve the protection of Canada's environment and the health of Canadians by minimizing the risks posed by the use, storage, and release of PCBs by accelerating the elimination of these substances.

As of December 31, 2009, all current PCB storage sites are to have been eliminated and there should no longer be any electrical capacitors, electrical transformers, electromagnets, heat transfer equipment, or any other equipment in service that contains PCBs at a concentration greater than 500 mg/kg (500 ppm). As of this time, all of this equipment should have been removed from service and sent for destruction. Furthermore, the PCB Regulations restricts the use of equipment containing PCBs (other than light ballasts or pole-top electrical transformers) at concentrations exceeding 50 mg/kg (50 ppm) in sensitive areas (such as drinking water treatment plants, schools, hospitals and senior citizen care facilities) by the same date. All other locations have until December 31, 2025 to decommission equipment containing 50 ppm to 500 ppm PCBs.

Only T8 fluorescent lamps were identified within the assessed area. It is therefore unlikely that fluorescent lamp ballasts within the area would contain PCBs as T8 lamps do not function properly with PCB-containing light ballasts. It is, however, possible that light fixtures with PCB-containing ballasts within the assessed area have been retrofitted to function with T8 lamps. It is the responsibility of the contactor to inspect each light ballast to determine whether or not PCBs are present by referring to the Environment Canada document entitled *"Identification of Lamp Ballasts Containing PCBs" (Report EPS 2/CC/2 (revised) August 1991)* to aid in identification. If PCB-containing light ballasts are identified they should be removed and separated from other waste and disposed of at an approved waste facility.

Ozone Depleting and Global Warming Substances

Ontario Regulation 463/10, "Ozone Depleting Substances and Other Halocarbons" (O. Reg. 463/10, made under the Environmental Protection Act) controls the use, discharge, sale, transfer, transport, storage, and disposal of ozone depleting substances and halocarbons in Ontario. This regulation enhances the control and management of ODS and other halocarbons to prevent or minimize emissions, which serves a dual environmental benefit of lowering emissions of substances that deplete the ozone layer and contribute to global warming.

No ozone depleting and global warming substances were identified in the areas assessed. Therefore, no actions are required regarding the handling of these substances.

5.0 LIMITATIONS

The information and recommendations detailed in this report were carried out by trained professional and technical staff in accordance with generally accepted environmental and industrial hygiene work practices and procedures. Recommendations provided in this report have been generated in accordance with accepted industry guidelines and practices. These guidelines and practices are considered acceptable as of the date of this report.

In preparation of this report, Safetech Environmental Limited (Safetech) relied on information supplied by others, including without limitation, information pertaining to the history and operation of the site, and testing services provided by independent laboratories. Except as expressly set out in this report, Safetech has not made any independent verification of information provided by independent entities.

The collection of samples at the locations noted was consistent with the scope of work agreed-upon with the person or entity to whom this report is addressed and the information obtained concerning prior site investigations. As conditions between samples may vary, the potential remains for the presence of unknown additional contaminants for which there were no known indicators.

The analytical method used for determination of asbestos content meets the requirements of O.Reg. 278/05. However, small asbestos fibres may be missed by PLM due to resolution limitations of the optical microscope. Interfering binder/matrix and/or low asbestos content may also hinder positive identification by PLM. These conditions are common for vermiculite attic insulation (VAI) and non-friable organically bound (NOB) materials such as vinyl floor tiles, roofing materials, mastics and caulking and can lead to “false negative” results. If PLM analytical results for these types of materials indicate no asbestos detected they have been reported as “Presumed Non-ACM”. Due to limitations of the analytical method, we cannot confirm that low quantities of asbestos are not present in these samples using solely PLM analysis. Additional analytical procedures should be considered for such materials to rule out false negative results.

Conclusions are based on site conditions at the time of inspection and can only be extrapolated to an undefined limited area around inspected locations. The extent of the limited area depends on building construction and conditions. Building materials that are not detailed within this survey due to inaccessibility during the time of survey and/or are uncovered during demolition activities should be properly assessed by a qualified person prior to their disturbance. Safetech cannot warrant against undiscovered environmental liabilities. If any information becomes available that differs from the findings in this report, we request that we be notified immediately to reassess the conclusions provided herein.

No other person or entity is entitled to use or rely upon this report without the express written consent of Safetech Environmental Limited and the person or entity to who it is addressed. Any use that a third party makes of this report, or any reliance based on conclusions and recommendations made, are the responsibility of such third parties. Safetech accepts no responsibility for damages suffered by third parties as a result of actions based on this report.

Appendix A

Condition Assessment Criteria for Asbestos-Containing Materials

The condition of asbestos-containing materials identified within the surveyed area(s) was assessed as Good (G), Fair (F) or Poor (P). The assessment criteria used to determine condition is dependent on material characteristics, such as friability. The following Table summarizes the criteria used by Safetech to evaluate the condition of ACM.

Condition Assessment Criteria for Asbestos-Containing Materials

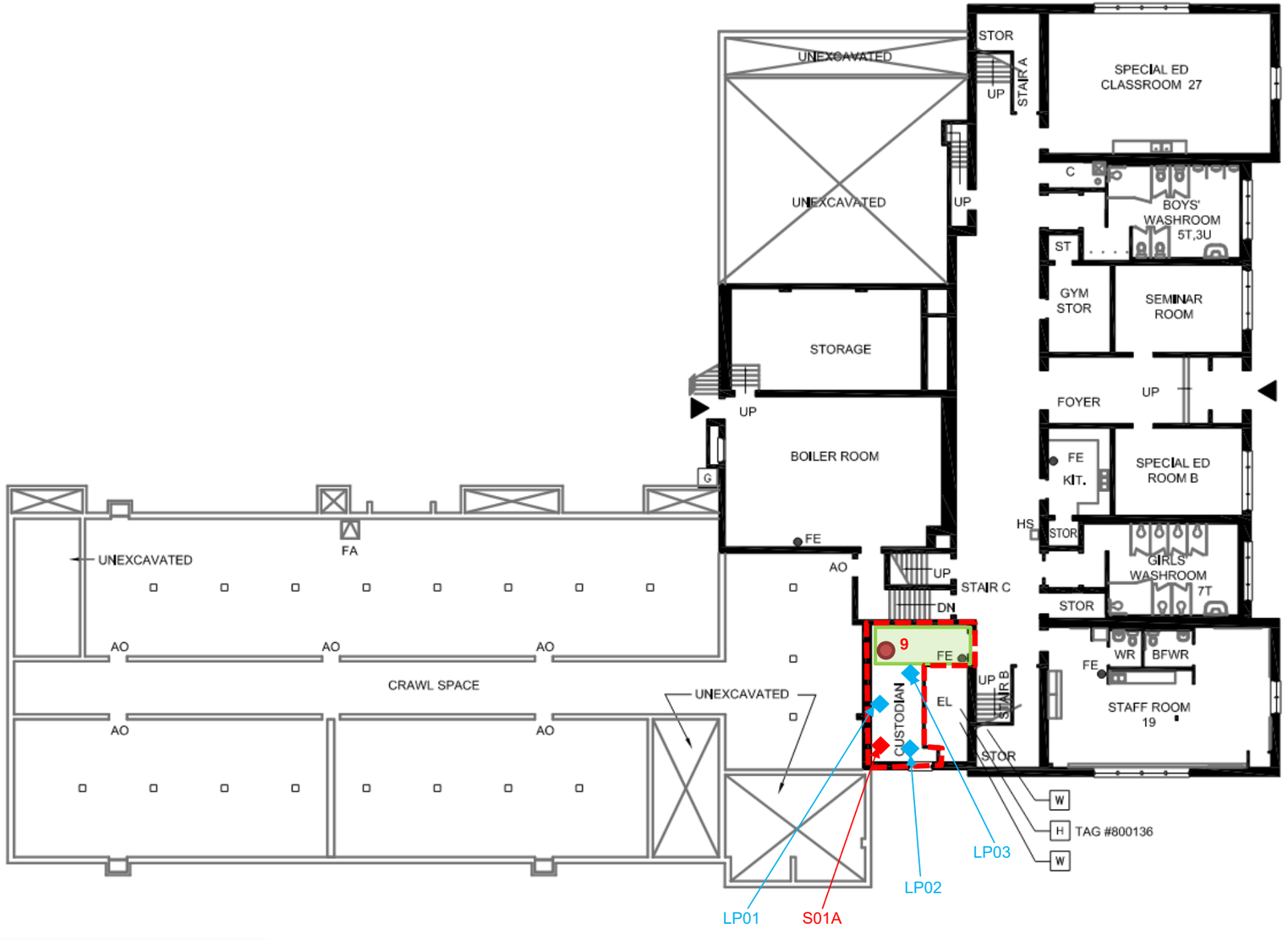
Sprayed Fireproofing, Sprayed Insulation and Sprayed Texture Finishes	
Good	• Surface shows no significant signs of damage, deterioration, or delamination (i.e. <1%). • Unencapsulated or unpainted fireproofing or texture finishes, where no delamination or damage is observed. • Encapsulated fireproofing or texture finishes where encapsulation applied after damage or fallout.
Fair	• Not utilized as part of condition assessment for these materials.
Poor	• Greater than 1% damage, delamination, or deterioration to surface.
In areas where damage exists in isolated locations, both Good and Poor may be applicable.	
Mechanical Insulation (boilers, breeching, ductwork, piping, tanks, equipment, etc.)	
Good	• Insulation completely covered in jacketing and exhibits no evidence of damage or deterioration. • Jacketing may have minor damage (i.e. scuffs or stains), but is not penetrated.
Fair	• Minor penetrating damage to jacketed insulation (cuts, tears, nicks, deterioration or delamination). • Undamaged insulation that had never been jacketed. • Insulation is exposed but not showing surface disintegration. • Extent of missing insulation ranges from minor to none. • Damage that can be repaired.
Poor	• Original insulation jacket is missing, damaged, deteriorated, or delaminated. • Insulation is exposed and significant areas have been dislodged. • Damage that cannot be easily repaired.
Non-Friable and Potentially Friable Materials (includes materials such as plaster finishes, drywall compound, ceiling tiles, asbestos cement products, vinyl asbestos tile and asbestos paper backed vinyl sheet flooring, etc., which have the potential to become friable when handled)	
Good	• No significant damage. • Material may be cracked or broken but is stable and not likely to become friable upon casual contact. • No friable debris present
Fair	• Not utilized as part of condition assessment for these materials.
Poor	• Material is severely damaged. • Debris is present or binder has disintegrated to the point where the material has become friable.
Asbestos-Containing Debris (noted separately from the presumed source material)	
Poor	• Debris is always considered to be in Poor condition.

Appendix B

Figures AS -01, AS-02 and AS-03
Sample Locations, Extent of Assessment Area and Location of Major ACM and other DSHM

NOTES:

1. Refer to report entitled “Project-Specific Designated Substances and Hazardous Materials Assessment, King Edward Public School located at 709 King Street West, Kitchener, Ontario” for complete details regarding designated substances and hazardous materials identified, deemed and suspected within the assessed areas.
2. All known, deemed, or suspected asbestos-containing materials may not be depicted on the figures. Refer to the report for a complete list of identified and suspected asbestos-containing materials.
3. Figure to be referenced with the report.
4. Figure is not to scale.
5. Figure is colour dependent; photocopies may alter interpretations of the figure.
6. Locations and quantities of asbestos-containing materials are approximate.
7. Asbestos-containing parged cement fittings are present within the basement Custodial Office. Additional asbestos-containing parged cement fittings are suspected in inaccessible locations throughout the assessed areas (i.e. within wall cavities, at radiators and above solid ceilings).
8. Asbestos-containing black mastic associated with vinyl floor tiles is present throughout the areas assessed.
9. The section of the roof that is expected to be impacted by potential renovation work is asbestos-containing.



SAMPLE LOCATION AND SURVEY LEGEND:

◆	S01A	Asbestos Bulk Sample and Sample Identification Number
◆	LP01	Lead Bulk Sample and Sample Identification Number
▭		Extent of Assessment Area

ASBESTOS –CONTAINING MATERIALS AND OTHER HAZARDOUS MATERIALS LEGEND:

- Vinyl Floor Tile and Mastic
- Black Floor Mastic
- Ceiling Tiles
- Ceiling Texture Coat
- Asbestos Cement (Transite) Panels
- 2 Parged Pipe Fitting Insulation and Quantity
- Pipe Insulation (Horizontal)
- Pipe insulation (Vertical)
- Duct or Mechanical Equipment Insulation
- Flexible Duct Coupling
- Asbestos Cement (Transite) Pipe (Horizontal)
- Asbestos Cement (Transite) Pipe (Vertical)
- 2 Mercury-Containing Thermostat Switch and Quantity

BASEMENT

PROJECT: **Waterloo Region District School Board** Pre-Renovation Project-Specific Designated Substance and Hazardous Materials Assessment	**DRAWING NAME:** **Designated Substances and Hazardous Materials Sample and Asbestos-Containing Material Locations for 709 King Street West, Kitchener, Ontario**
Safetech Project Number: 2-3210082	SURVEY DATE: November 16, 2021
	DRAWING BY: SD
Building Address: 709 King Street West, Kitchener, Ontario	DRAWING #: AS-01
	APPROVED BY: JJG

Prepared for:

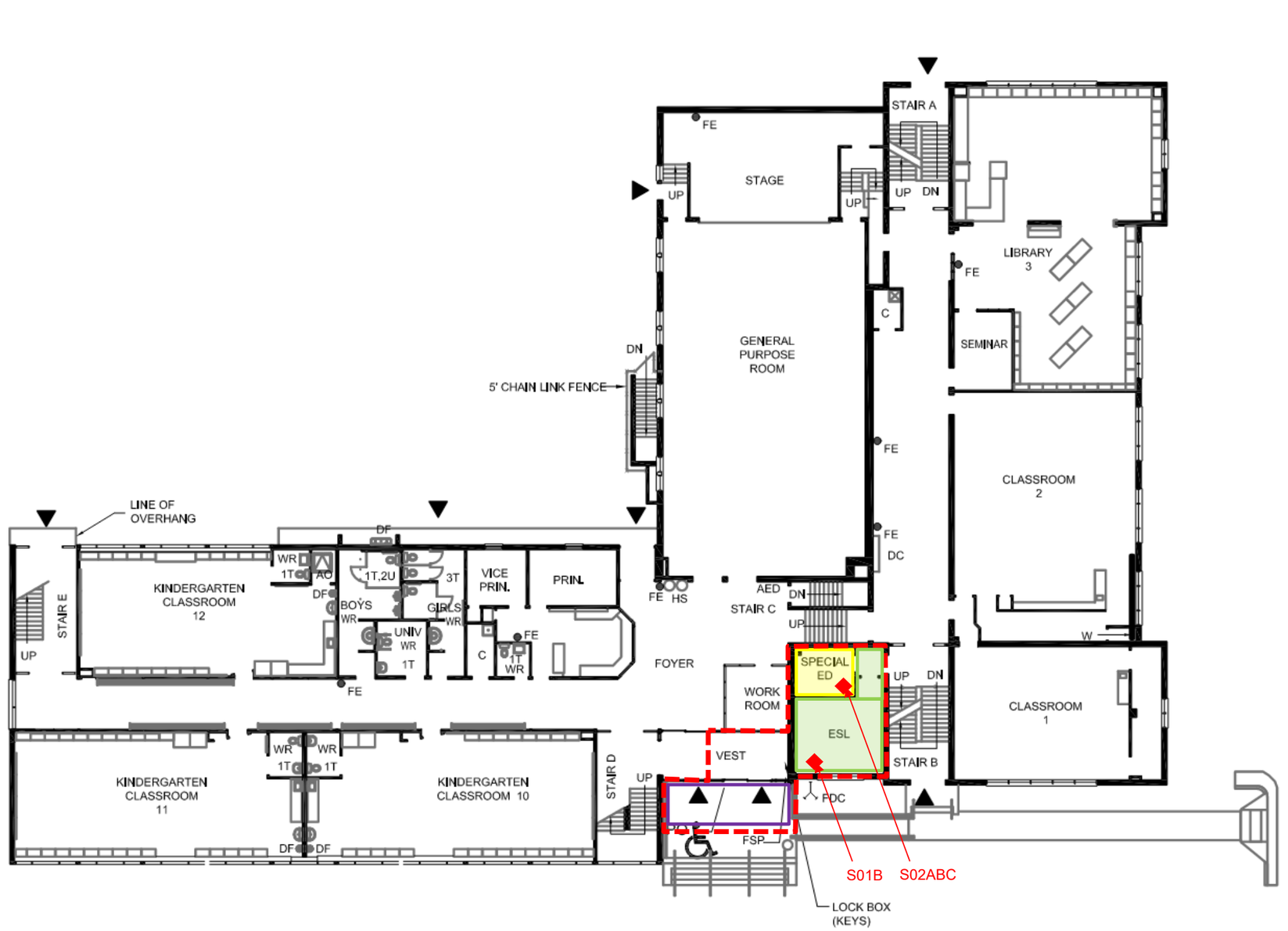
Waterloo Region District School Board
51 Ardelt Avenue
Kitchener, Ontario
N2C 2R5

Prepared by:

Safetech Environmental Limited
100 Hanson Avenue, Unit 2, Kitchener, ON
N2C 2E2

NOTES:

1. Refer to report entitled “Project-Specific Designated Substances and Hazardous Materials Assessment, King Edward Public School located at 709 King Street West, Kitchener, Ontario” for complete details regarding designated substances and hazardous materials identified, deemed and suspected within the assessed areas.
2. All known, deemed, or suspected asbestos-containing materials may not be depicted on the figures. Refer to the report for a complete list of identified and suspected asbestos-containing materials.
3. Figure to be referenced with the report.
4. Figure is not to scale.
5. Figure is colour dependent; photocopies may alter interpretations of the figure.
6. Locations and quantities of asbestos-containing materials are approximate.
7. Asbestos-containing parged cement fittings are present within the basement Custodial Office. Additional asbestos-containing parged cement fittings are suspected in inaccessible locations throughout the assessed areas (i.e. within wall cavities, at radiators and above solid ceilings).
8. Asbestos-containing black mastic associated with vinyl floor tiles is present throughout the areas assessed.
9. The section of the roof that is expected to be impacted by potential renovation work is asbestos-containing.



SAMPLE LOCATION AND SURVEY LEGEND:

◆	S01A	Asbestos Bulk Sample and Sample Identification Number
◆	LP01	Lead Bulk Sample and Sample Identification Number
▭		Extent of Assessment Area

ASBESTOS –CONTAINING MATERIALS AND OTHER HAZARDOUS MATERIALS LEGEND:

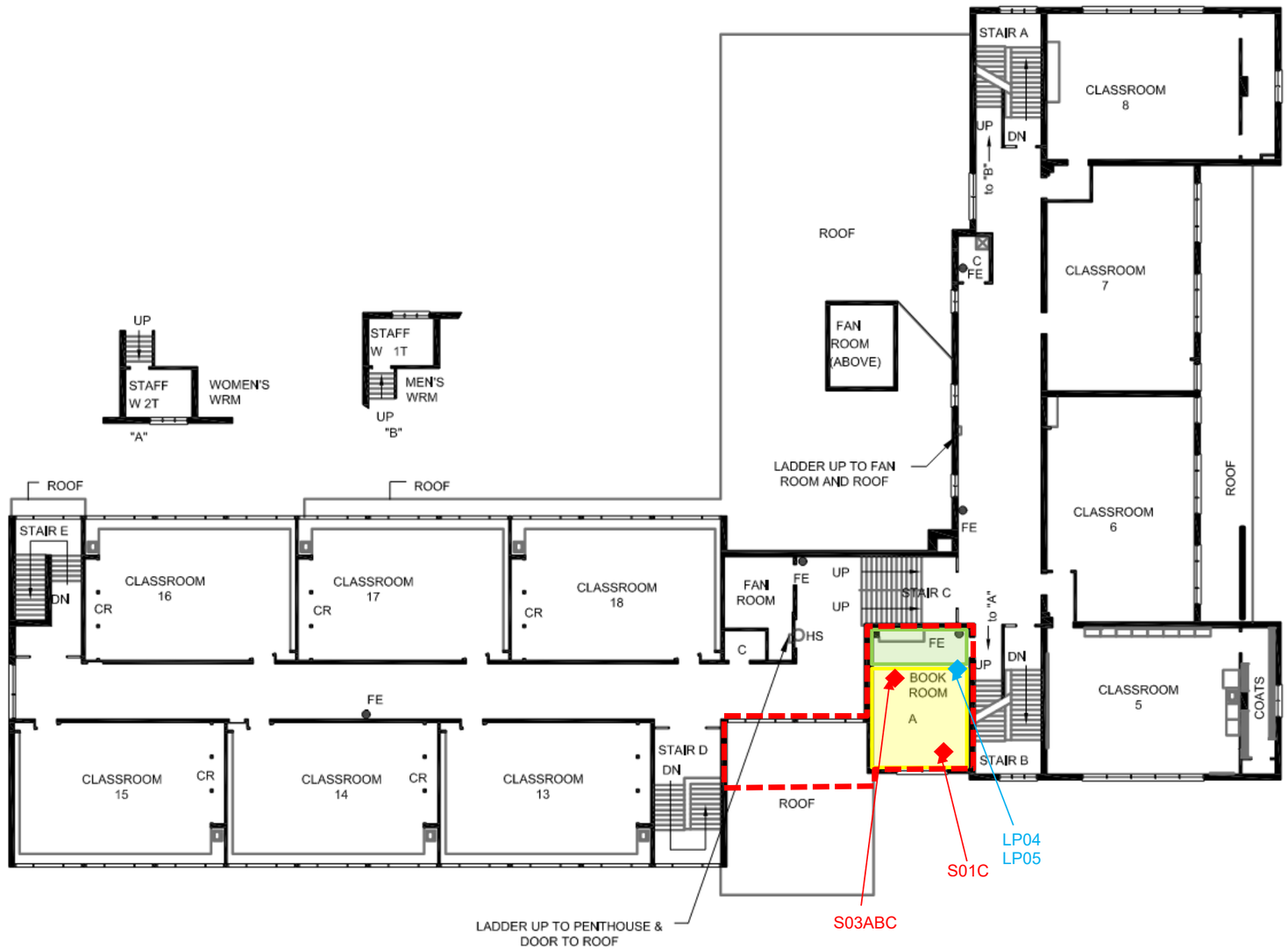
- Vinyl Floor Tile and Mastic
- Black Floor Mastic
- Ceiling Tiles
- Ceiling Texture Coat
- Asbestos Cement (Transite) Panels
- 2 Parged Pipe Fitting Insulation and Quantity
- Pipe Insulation (Horizontal)
- Pipe insulation (Vertical)
- Duct or Mechanical Equipment Insulation
- Flexible Duct Coupling
- Asbestos Cement (Transite) Pipe (Horizontal)
- Asbestos Cement (Transite) Pipe (Vertical)
- 2 Mercury-Containing Thermostat Switch and Quantity

FIRST FLOOR

PROJECT: **Waterloo Region District School Board** Pre-Renovation Project-Specific Designated Substance and Hazardous Materials Assessment		**DRAWING NAME:** **Designated Substances and Hazardous Materials Sample and Asbestos-Containing Material Locations for 709 King Street West, Kitchener, Ontario**		**Prepared for:**	**Prepared by:**
Safetech Project Number:	2-3210082	SURVEY DATE:	November 16, 2021	**Waterloo Region District School Board** 51 Ardelt Avenue Kitchener, Ontario N2C 2R5	**Safetech Environmental Limited** 100 Hanson Avenue, Unit 2, Kitchener, ON N2C 2E2
		DRAWING BY:	SD		
Building Address:	709 King Street West, Kitchener, Ontario	DRAWING #:	AS-02		
		APPROVED BY:	JJG		

NOTES:

1. Refer to report entitled “Project-Specific Designated Substances and Hazardous Materials Assessment, King Edward Public School located at 709 King Street West, Kitchener, Ontario” for complete details regarding designated substances and hazardous materials identified, deemed and suspected within the assessed areas.
2. All known, deemed, or suspected asbestos-containing materials may not be depicted on the figures. Refer to the report for a complete list of identified and suspected asbestos-containing materials.
3. Figure to be referenced with the report.
4. Figure is not to scale.
5. Figure is colour dependent; photocopies may alter interpretations of the figure.
6. Locations and quantities of asbestos-containing materials are approximate.
7. Asbestos-containing parged cement fittings are present within the basement Custodial Office. Additional asbestos-containing parged cement fittings are suspected in inaccessible locations throughout the assessed areas (i.e. within wall cavities, at radiators and above solid ceilings).
8. Asbestos-containing black mastic associated with vinyl floor tiles is present throughout the areas assessed.
9. The section of the roof that is expected to be impacted by potential renovation work is asbestos-containing.



SECOND FLOOR

SAMPLE LOCATION AND SURVEY LEGEND:

◆	S01A	Asbestos Bulk Sample and Sample Identification Number
◆	LP01	Lead Bulk Sample and Sample Identification Number
		Extent of Assessment Area

ASBESTOS –CONTAINING MATERIALS AND OTHER HAZARDOUS MATERIALS LEGEND:

- Vinyl Floor Tile and Mastic
- Black Floor Mastic
- Ceiling Tiles
- Ceiling Texture Coat
- Asbestos Cement (Transite) Panels
- 2 Parged Pipe Fitting Insulation and Quantity
- Pipe Insulation (Horizontal)
- Pipe insulation (Vertical)
- Duct or Mechanical Equipment Insulation
- Flexible Duct Coupling
- Asbestos Cement (Transite) Pipe (Horizontal)
- Asbestos Cement (Transite) Pipe (Vertical)
- 2 Mercury-Containing Thermostat Switch and Quantity

PROJECT:
Waterloo Region District School Board
Pre-Renovation
Project-Specific Designated Substance and Hazardous Materials Assessment

Safetech Project Number:	2-3210082
Building Address:	709 King Street West, Kitchener, Ontario

DRAWING NAME:
Designated Substances and Hazardous Materials Sample and Asbestos-Containing Material Locations for 709 King Street West, Kitchener, Ontario

SURVEY DATE:	November 16, 2021
DRAWING BY:	SD
DRAWING #:	AS-03
APPROVED BY:	JJG

Prepared for:

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

Prepared by:

Safetech Environmental Limited
100 Hanson Avenue, Unit 2, Kitchener, ON
N2C 2E2

Appendix C

Laboratory Certificate of Analysis – Asbestos and Lead

emcscientific
INCORPORATED

Laboratory Analysis Report

To:

Shannon Deline
Safetech Environmental Ltd.
100 Hanson Avenue, Unit 2
Kitchener, Ontario
N2C 2E2

EMC LAB REPORT NUMBER: A74513
Job/Project Name: King Edward
Analysis Method: Polarized Light Microscopy – EPA 600
Date Received: Nov 18/21 **Date Analyzed:** Nov 25/21
Analyst: Dina Yousif
Reviewed By: Malgorzata Sybydlo, *Laboratory Manager*

No. of Phases Analyzed: 18
Job No: 2-3210082
Number of Samples: 9
Date Reported: Nov 25/21

Client's Sample ID	Lab Sample No.	Description/Location	Sample Appearance	SAMPLE COMPONENTS (%)			
				Asbestos Fibres		Non-asbestos Fibres	Non-fibrous Material
S01A	A74513-1[5]	Plaster	2 Phases:				
			a) White, plaster	**ND**			100
			b) Light grey, plaster	**ND**			100
S01B	A74513-2	Plaster	2 Phases:				
			a) White, plaster	**ND**			100
			b) Grey, plaster	**ND**			100
S01C	A74513-3	Plaster	2 Phases:				
			a) White, plaster	**ND**			100
			b) Grey, plaster	**ND**			100
S02A	A74513-4	9x9 VFT- green	4 Phases:				
			a) Brown, mastic	**ND**			100
			b) Black, vinyl floor tile	**Chrysotile**	**2**		98
			c) Brown, mastic	**ND**			100
			d) Green, vinyl floor tile	**Chrysotile**	**3**		97
S02B	A74513-5	9x9 VFT- green	4 Phases:				
			a) Brown, mastic	**ND**			100
			b) NA	**NA**			
			c) Brown, mastic	**ND**			100
			d) NA	**NA**			

emcscientific
INCORPORATED

Laboratory Analysis Report

EMC LAB REPORT NUMBER: A74513
Client's Job/Project Name/No.: 2-3210082
Analyst: Dina Yousif

Client's Sample ID	Lab Sample No.	Description/Location	Sample Appearance	SAMPLE COMPONENTS (%)			
				Asbestos Fibres		Non-asbestos Fibres	Non-fibrous Material
S02C	A74513-6	9x9 VFT- green	4 Phases: a) Brown, mastic b) NA c) Brown, mastic d) NA	 **ND** **NA** **ND** **NA**			 100 100
S03A	A74513-7[5]	9x9 VFT- brown	2 Phases: a) Brown, vinyl floor tile b) Black, mastic	 **Chrysotile** **Chrysotile**	 **3** **<0.5**		 97 100
S03B	A74513-8[5]	9x9 VFT- brown	2 Phases: a) NA b) Black, mastic	 **NA** **Chrysotile**	 **<0.5**		 100
S03C	A74513-9[5]	9x9 VFT- brown	2 Phases: a) NA b) Black, mastic	 **NA** **Chrysotile**	 **<0.5**		 100

Note:
1. Bulk samples are analyzed using Polarized Light Microscopy (PLM) and dispersion staining techniques. The analytical procedures are in accordance with EPA 600/R-93/116 method.
2. The results are only related to the samples analyzed. **ND** = None Detected (no asbestos fibres were observed), **NA** = Not Analyzed (analysis stopped due to a previous positive result)
3. This report may not be reproduced, except in full without the written approval of EMC Scientific Inc. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. Government.
4. The Ontario Regulatory Threshold for asbestos is 0.5%. The limit of quantification (LOQ) is 0.5%.
5. Phase b) is small in size.

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-38116

Report To:

EMC Scientific Inc.
5800 Ambler Dr. #100,
Mississauga ON L4W 4J4 Canada
Attention: Alister Haddad

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 19-Nov-21
DATE REPORTED: 25-Nov-21
SAMPLE MATRIX: Paint Chips

JOB/PROJECT NO.: King Edward
P.O. NUMBER: 2-3210082
WATERWORKS NO.

	Parameter		Lead				
	Units		µg/g				
	R.L.		5				
	Reference Method		EPA 6010				
	Date Analyzed/Site		25-Nov-21/O				
Client I.D.	**Sample I.D.**	**Date Collected**					
LP01 Beige on Concreste	B21-38116-1	16-Nov-21	< 5				
LP02 White on Plaster	B21-38116-2	16-Nov-21	948				
LP03 Grey on Concrete	B21-38116-3	16-Nov-21	2260				
LP04 Beige on Plaster	B21-38116-4	16-Nov-21	403				
LP05 Green on Plaster	B21-38116-5	16-Nov-21	723				

Tahir Yapici Ph.D
Lab Supervisor

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Appendix D
Site Photographs

P1 – Basement Custodial Office

Asbestos-containing parged cement fittings are present on the 2” pipe line within the Custodial Office. Additional asbestos-containing mechanical pipe fittings are suspected throughout the assessed areas in concealed locations.

P2 – First Floor Special Education Room

Photograph of asbestos-containing 9” x 9” green vinyl floor tiles and black vinyl floor tiles present beneath carpet flooring within the first floor Special Education Room.

P3 – Second Floor Book Room

Photograph of 9” x 9” brown vinyl floor tiles present beneath carpet flooring within the second floor Book Room.

P4 – Exterior

Asbestos cement (Transite) panels are present at the exterior overhang located at the front entrance.

P5 – Basement Custodial Office

Grey paint on the concrete floor of the custodial office was determined to be lead-containing.

P6 – Basement Custodial Office

Lead packing was identified at sanitary drain pipe bell and spigot connection gaskets within the basement.

Appendix E

Background Information on Designated Substances and Other Hazardous Materials

DESIGNATED SUBSTANCES

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

Section 14 of O. Reg. 490/09 exempts an employer and the workers of an employer who engage in construction from the requirements of the regulation. However, designated substances are still required to be identified prior to the beginning of a demolition or renovation project to ensure that construction workers (and potentially building occupants) are adequately protected from the hazards posed by the presence of these materials if the planned work may cause them to be disturbed. Accordingly, under Section 30 of the OHSA building owners are required to perform an assessment to determine whether any designated substances are present at the project site before the beginning of the project. The owner is also required to prepare a list of designated substances that are present at the site and provide this list to prospective constructors before entering into a binding contract with the constructor. This way, contractors and construction workers are made aware of designated substances present within the work area so that appropriate measures can be taken during the work to limit exposure to these substances.

Designated Substances and Hazardous Materials Assessments are conducted to conform to the requirements of Section 30 of the OHSA. The assessments are performed to identify designated substances (and other hazardous materials) within the work area that may present a hazard to workers if disturbed. These substances are commonly a component of building materials or equipment found in buildings. Additional information regarding the eleven designated substances including their properties, uses and health effects are provided below.

Acrylonitrile

Acrylonitrile (ACN) is a clear, colourless or pale yellow liquid with a pungent onion- or garlic-like, irritating odour. It is highly flammable and as such is a severe fire and explosion hazard.

Acrylonitrile is used mainly as a monomer or comonomer in the production of acrylic fibres, plastics, resins and nitrile rubbers. Historically, a mixture of acrylonitrile and carbon tetrachloride was used as a pesticide; however, all pesticide uses have stopped. Based on its use as a chemical intermediate, exposure to acrylonitrile is primarily occupational, via inhalation during its manufacture and use. Therefore, this designated substance is not expected to be encountered in buildings where it is not either produced or used in a manufacturing process.

Acute (short-term) exposure of workers to acrylonitrile has been observed to cause mucous membrane irritation, headaches, dizziness, and nausea. More significant exposures may lead to symptoms such as limb weakness, labored and irregular breathing, impaired judgment, cyanosis, collapse, and convulsions. Exposure of the skin to high concentrations of acrylonitrile in the air may irritate the skin and cause it to turn red while direct skin contact with acrylonitrile may cause the skin to blister and peel. The International Agency for Research on Cancer (IARC) concluded that there is inadequate evidence in humans for the carcinogenicity of acrylonitrile, but has classified it as possibly carcinogenic to humans (Group 2B).

Arsenic

Arsenic is a naturally occurring mineral, widely distributed in the earth's crust. Elemental arsenic (sometimes referred to as metallic arsenic) is a silver-gray or white brittle metal. However, arsenic is usually found in the environment combined with other elements such as oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic has no odour and is almost tasteless.

Arsenic and its compounds have a variety of commercial uses. Inorganic arsenic compounds are mainly used as a wood preservative. Copper chromated arsenic (CCA) is used to make "pressure-treated" lumber. CCA-treated wood is no longer used for residential applications but may still be used in industrial applications. Arsenic is also used in metallurgy for hardening copper, lead and certain metal alloys, in pigment production, in the manufacture of certain types of glass, and in semiconductors and light-emitting diodes. Inorganic arsenic compounds are no longer used as pesticides in agriculture; however, organic arsenic compounds, namely cacodylic acid, disodium methylarsenate (DSMA), and monosodium methylarsenate (MSMA), are used, as yet, as pesticides – principally on cotton.

Today, workplace exposure to arsenic may still occur in some occupations that use arsenic, such as copper or lead smelting, wood treating, or pesticide application. Exposure to arsenic within buildings other than where it is used as part of the manufacturing process is unlikely and therefore arsenic is not expected to be encountered as part of a routine hazardous building materials assessment.

Human exposure to arsenic can cause both short and long term health effects. Short-term or acute effects can occur within hours or days of exposure. If you breathe high levels of inorganic arsenic, then you are likely to experience a sore throat and irritated lungs. Longer exposure at lower concentrations can lead to skin effects (such as darkened patches of skin and areas of thickened skin), and also to circulatory and peripheral nervous disorders. An important concern is the ability of inhaled inorganic arsenic to increase the risk of cancer. Long term exposure to arsenic has been linked to cancer of the bladder, lungs, skin, kidneys, nasal passages, liver and prostate. The IARC classifies arsenic and arsenic compounds as "carcinogenic to humans" (Group 1).

Asbestos

Asbestos is the name given to a number of naturally occurring fibrous minerals found in the environment. Ontario Regulation 490/09 (Designated Substances) defines asbestos as any one of the following fibrous silicates: actinolite; amosite; anthophyllite; chrysotile; crocidolite; and tremolite. Asbestos fibres have several desirable characteristics such as high textile strength, the ability to be spun and woven, and resistance to heat and most chemicals. These characteristics have resulted in the historical use of asbestos in a wide variety of building materials and other manufactured goods. Examples of products where asbestos has been used include roofing shingles, ceiling and floor tiles, insulation, sprayed fireproofing, gaskets, and friction products such as automotive brakes and clutches.

The peak years for asbestos use were in the 1960s and early 1970s. Therefore, asbestos is commonly found in building materials of this era. The use of asbestos in building materials and other products has decreased significantly since this time. Friable asbestos-containing materials (material that when dry can be crumbled, pulverized or powdered by hand pressure), such as sprayed fireproofing and sprayed insulation, ceased use circa 1973. Mechanical thermal system insulation ceased use circa 1981 while sprayed acoustic texture coat finishes ceased use circa 1982. Non-friable asbestos-containing materials were generally manufactured for a longer period of time (with the exception of plaster finishes which ceased use circa 1960’s). Asbestos-containing drywall joint compound ceased use circa 1980. Vinyl floor tiles, vinyl sheet flooring and acoustic ceiling tile ceased use 1982. Other non-friable materials continued to be produced into the 1990’s, including roofing materials (ceased use circa 1991) and floor adhesives (ceased use circa 1992). Today, asbestos is a controlled substance, and is banned for use in most products sold in Canada under the Hazardous Products Act (with the exception of certain roof shingles, clutch facings and brake linings).

Potentially harmful exposure to asbestos occurs through inhalation of air containing asbestos fibres. The greatest risk for workplace exposure to airborne asbestos is in occupations that produce and use asbestos, such as in mining and milling operations or in the manufacture of products containing asbestos. Exposure to airborne asbestos fibres may also occur to construction workers, trades people, maintenance workers and other building occupants in buildings constructed with asbestos-containing materials; especially during building renovations or repairs or if the materials are in poor condition or are otherwise disturbed.

Health risks associated with asbestos exposure are dependent on several factors such as the type and airborne concentration of asbestos, and period of exposure. In general, the greater the exposure to asbestos, the greater the chance of developing harmful health effects. Typically, chronic, daily exposure to elevated airborne concentrations of asbestos over a period of years is required for health effects to eventually manifest themselves. Health effects associated with exposure to asbestos can result in asbestosis (a scarring of the lungs which makes breathing difficult), mesothelioma (a rare cancer of the lining of the chest or abdominal cavity) and lung cancer. The link between exposure to asbestos and other types of cancers and health effects is less clear.

Benzene

Benzene is a clear, colourless liquid with a characteristic, sweet or aromatic hydrocarbon odour. It is a liquid at room temperature but evaporates into the air very quickly, making it a highly flammable vapour as well as an extremely flammable liquid.

Benzene is formed from both natural processes and human activities. Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke. It is produced from petroleum and coal sources and is used mainly in the manufacture of other chemicals which are used to make plastics, resins, and nylon and synthetic fibres. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides.

Exposure to pure benzene within buildings other than where it is produced or used as part of a manufacturing process is unlikely. Therefore benzene is not expected to be encountered as part of a routine hazardous building materials assessment.

Exposure to benzene primarily occurs through inhalation of airborne vapours. Short-term (acute) health effects associated with overexposure to benzene vapours can result in symptoms such as headache, nausea, dizziness, drowsiness and confusion, with unconsciousness or even death at very high levels. Long-term (chronic) exposure to Benzene may cause blood and bone marrow effects which can lead to anemia and leukemia (cancer of the blood-forming organs) as well as cause damage to the immune system, increasing the chance for infection. The IARC classifies benzene as "carcinogenic to humans" (Group 1).

Coke Oven Emissions

Coke Oven Emissions refers to the benzene soluble fraction of total particulate matter emitted during the destructive distillation or carbonization of coal for the production of coke (pure carbon). These emissions are a mixture of coal tar, coal tar pitch, volatiles (including benzene, toluene and xylene), creosote, polycyclic aromatic hydrocarbons (PAHs – including benzo(a)pyrene, benzanthracene, chrysene and phenanthrene), and metals (including cadmium, arsenic, beryllium and chromium). Condensed coke oven emissions are a brownish, thick liquid or semisolid with a naphthalene-like odour, while uncondensed coke oven emissions are vapours that escape when the ovens are changed and emptied and are a component of fugitive emissions.

The coke produced is used as a component in the manufacturing of iron and steel. Coke is also used to synthesize calcium carbide and to manufacture graphite and electrodes. Additional chemicals recovered from the coke oven emissions (such as benzene, toluene, naphthalene, sulfur, and ammonium sulfate) are used as raw materials for plastics, solvents, dyes, drugs, waterproofing, paints, pipe coating, roads, roofing, insulation, and as pesticides and sealants.

Coke oven emissions would only be present within facilities producing or using coke as part of the manufacturing process and thus occupational exposure is limited to those workers in the aluminum, steel, graphite, electrical, and construction industries. Therefore, coke oven emissions are not a contaminant of concern during a routine hazardous building materials assessment.

Chronic (long-term) exposure to coke oven emissions can result in chronic bronchitis (particularly those who smoke) and additional health effects such as conjunctivitis, severe dermatitis, and lesions of the respiratory system and digestive system. However, the greatest concern regarding chronic exposure to coke oven emissions is the increased risk of cancer. The IARC classifies coke production as "carcinogenic to humans" (Group 1). The site at which excess cancer rates have been identified most commonly among workers in coke production is the lung. Excess risk for kidney cancer has also been associated with work in coke plants. Additional studies have also reported excess risks for other types of cancers such as cancer of the large intestine and pancreas.

Ethylene Oxide

Ethylene oxide is colourless gas with a somewhat sweet odour. It is extremely flammable and also dangerously reactive. Ethylene oxide exists as a compressed gas that has been produced since the early 1900s. It is used primarily as a chemical intermediate in the production of ethylene glycol, glycol ethers, non-ionic surfactants and other industrial chemicals. Much smaller amounts are used as a non-explosive mixture with nitrogen or carbon dioxide for sterilizing medical instruments and supplies in hospitals and industrially for the fumigation of spices.

Most people are not likely to be exposed to ethylene oxide because it is not commonly found in the environment. Exposure to ethylene oxide is generally limited to those facilities where it is made or used. Therefore, ethylene oxide is not a contaminant of concern during a routine hazardous building materials assessment, although the presence of it should be determined in buildings such as hospitals if construction activities are to occur in or adjacent to areas where it is used or stored.

Exposure to ethylene oxide can result in irritation to the skin or eyes; however, the greatest risk for health effects is through inhalation. This can result in irritation to the nose, throat and respiratory tract, with damage to the central nervous system at higher concentrations. Exposure to high concentrations may cause headache, nausea, dizziness, drowsiness, and incoordination. Exposure to ethylene oxide is also a cancer hazard and possible reproductive hazard. In epidemiological studies of exposure to ethylene oxide, the most frequently reported association has been with lymphatic and haematopoietic cancer. The IARC has concluded that there is limited evidence for the carcinogenicity of ethylene oxide in humans and sufficient evidence for carcinogenicity in experimental animals, classifying ethylene oxide as “carcinogenic to humans” (Group 1).

Isocyanates

Isocyanates are a family of highly reactive, low molecular weight, manufactured chemicals containing one or more isocyanate groups (-NCO). An isocyanate that has two isocyanate groups is known as a diisocyanate, which are the most common type of isocyanates used for manufacturing other products. The most commonly used diisocyanates include methylene diphenyl diisocyanate (MDI), toluene diisocyanate (TDI), and hexamethylene diisocyanate (HDI).

When isocyanates are combined with other compounds that contain free hydroxyl functional groups (i.e. –OH) they react and begin to form polyurethane polymers. These polyurethanes find significant application in the manufacture of rigid and flexible foams. Flexible foam is primarily used for cushioning, while rigid foam is used mainly for insulation. Polyurethanes are also used in the production of adhesives, elastomers, and coatings and are increasingly used in the automobile industry, autobody repair, and building insulation materials.

This diversity of applications means that exposures to isocyanates can occur in a broad range of production facilities from small workshops to automated production lines. Jobs that may involve exposure to isocyanates include painting, foam-blowing, and the manufacture of many polyurethane products. Exposure to isocyanates within buildings where it is not produced or used as part of manufacturing is unlikely, as products such as rigid foam insulation that may be used in buildings has already undergone the curing process. Completely cured products are fully reacted and therefore are considered to be inert and non-toxic. However, some products such as spray foams, coatings, sealants and adhesives may be sold and used in an uncured form. An example would be an adhesive, which is sold to be initially applied in an uncured form and as it cures (hardens), bonds two pieces of wood together. Such products can provide potential exposure to building occupants and construction workers during the application and use of these products. However, for the purposes of a routine hazardous building materials assessment, products that may have contained isocyanate as part of the manufacturing process (e.g. rigid foam) or during the application/installation process (e.g. spray foam, adhesives and sealants) are assumed to be fully cured and would no longer contain free isocyanate.

Direct skin contact with isocyanates can cause marked skin irritation, resulting in reddening, swelling and blistering. However the greatest route of exposure to isocyanates is through inhalation of fine vapours or droplets. Airborne exposure to isocyanates can result in irritation to the mucous membranes of the eyes and respiratory tracts. This results in symptoms such as excessive tear secretion, dry throat, dry cough, chest pains and difficulty in breathing. Isocyanates are also a major cause of work-related asthma worldwide. Increased exposure to isocyanates can lead to sensitization. Once sensitized, individuals are subject to severe asthma attacks (which in some cases has been reported to result in death) if they are re-exposed.

Lead

Lead is a naturally occurring metal found in small amounts in the earth's crust. It is usually found in ore with zinc, silver and (most abundantly) copper, and is extracted together with these metals. Metallic lead is bluish-white in colour but soon tarnishes to a dull grey when exposed to air. When melted into liquid form it has a shiny chrome-silver appearance.

Lead is soft, dense, highly malleable and resistant to corrosion, with poor electrical conductivity as compared to most other metals. Such properties have resulted in lead being used in many applications, including products and materials commonly found in buildings. It is present as a component of lead-acid batteries, ammunition, PVC plastics, and older brass and chrome-plated brass faucets. As a building component, lead has been used in water distribution piping, as an alloy in solder, in electrical conduits, roofs and roofing details, and as an additive to paints, ceramic glazes and mortars as pigments

or for anti-corrosion properties. Lead has also used as sheeting inside buildings for shielding X-rays and for sound attenuation.

Exposure to lead can occur for workers in workplaces that produce the above materials but also to construction workers, building maintenance personnel and the general population due to the widespread historical use of lead in building materials and consumer products. Most exposure to lead occurs through ingestion or inhalation, with the health effects being the same. Overexposure to lead can result in damage to nervous connections and can cause blood and brain disorders, severe damage to the kidneys and ultimately death. Infants and young children are especially vulnerable to the health effects of lead, as overexposure has been proven to result in the permanent reduction in cognitive capacity. In pregnant women, high levels of exposure to lead may cause miscarriage. The IARC has concluded that lead and inorganic lead compounds are “possibly carcinogenic to humans” (Group 2B).

The known serious health effects associated with lead exposure has brought about widespread reduction in its use. The use of lead in building materials and consumer products has decreased substantially since the 1970s to where lead is no longer being used in building materials and consumer products or is present at significantly lower concentrations. For example, unleaded gasoline was introduced in Canada in 1975, after which leaded gasoline was phased out and banned in 1990. Lead-based solder has been banned since the1980s and most solder used today is either lead-free or has very low lead concentrations. Up until the 1960s, lead was added to paints in significant quantities. Since that time, the concentration of lead in paint has decreased. The federal government began reducing the amount of lead allowed in interior paint in 1976 (to 0.5% by weight). By 1991, paint manufacturers in Canada and the U.S. voluntarily stopped adding lead to paint, reducing lead concentrations to background levels. In 2005 the *Surface Coating Materials Regulations* came into effect to limit the concentration of lead in paint (to 0.06% by weight) for both interior and exterior paints sold to consumers. This was since amended in 2011 to further reduce the allowable lead limit (to 0.009% by weight) and extended to include all consumer paints and coatings.

Mercury

Mercury is a naturally occurring element found in the earth's crust, with natural deposits generally found as a vermilion red ore called cinnabar. Mercury can exist as metallic mercury, organic mercury or inorganic mercury. Metallic or elemental mercury has unique properties as compared to other metals. It is the only pure metal that is a liquid at room temperature, having a silvery-white, shiny appearance. Mercury is the densest liquid known, which produces a colourless, odourless vapour at room temperature.

The unique properties of mercury have resulted in it being used in a wide variety of applications. Properties such as its coefficient of expansion and ability to conduct electricity has resulted in mercury being used in thermometers, barometers and other

measuring devices (blood pressure gauges, vacuum gauges, manometers, etc.), thermostats and a variety of other electrical switches (temperature sensitive, tilt switches, float switches, etc.). Mercury is also used in antifouling paints, dry cell or button batteries, and numerous lighting products, including fluorescent lamps and a variety of High Intensity Discharge (HID) lamps such as mercury vapour, metal halide and high pressure sodium lamps. HID lamps are used for street lights, floodlights and industrial lighting applications. Because of the wide variety of uses mercury can be found as a component of machinery, equipment and lighting within buildings; although many of its uses have been phased out over the years.

The health effects of mercury exposure depend on its chemical form (elemental, inorganic or organic), the route of exposure (inhalation, ingestion or skin contact), and the level of exposure. Vapours from liquid elemental mercury and methyl mercury are more easily absorbed than inorganic mercury salts and can, therefore, cause more harm. Exposure to mercury occurs mainly from breathing contaminated air or ingesting contaminated water and food. Mercury is a neurotoxin, which means it can adversely affect the central nervous system. Upon exposure, mercury tends to accumulate quickly in the brain where it tightly binds with the tissue and is released at a very slow rate. The nervous system effects of mercury toxicity are sometimes referred to as "Mad Hatter's Disease" since mercurous nitrate was used in making felt hats. High levels of exposure to mercury can also lead to harmful effects on the digestive and respiratory systems, and the kidneys. Many mercury compounds may also be teratogenic or capable of causing birth defects.

Mercury compounds can also be toxic at low levels in the environment. The characteristics of mercury that make it an environmental problem are its toxicity and persistence in the environment, and its ability to accumulate and bioconcentrate as methyl mercury in fish and fish-eating predators such as large fish or loons. Therefore, proper disposal of mercury-containing materials is essential. The improper disposal of mercury-containing products such as fluorescent light bulb tubes, high intensity discharge lamps, mercury vapour lamps, mercury thermometers and thermostats can lead to the release of mercury from municipal landfills. Used fluorescent and HID lamps may be classified as hazardous waste due to their mercury content and should be recycled if possible rather than being disposed of in landfill.

Silica

Silica (silicon dioxide) is the name of a group of minerals that contain silicon and oxygen in a chemical combination and have the general formula SiO_2. It is one of the most common minerals in the earth's crust. Silica can be present as crystalline silica (free silica) or amorphous silica (combined silica), and exists in many forms. The three most common crystalline forms of silica encountered in the workplace environment are quartz, tridymite, and cristobalite. Quartz is by far the most common crystalline silica found in nature, being abundant in most rock types, notably granites, sandstones, quartzites and in sands and soils. Cristobalite and tridymite are found in volcanic rocks. Amorphous silica is found in

nature as biogenic silica and as silica glass of volcanic origin. One form of biogenic silica, diatomaceous earth, originates from the skeletons of diatoms deposited on sea floors. From a health perspective it is the crystalline silica forms that raise the biggest concerns.

Silica is present in numerous building materials and products, including concrete, brick, stone, terrazzo, refractory brick, etc. Low concentrations of silica are also possible in plaster, drywall, acoustical ceiling tiles, drywall joint compound, mortars and adhesives. Because of the wide usage of quartz-containing materials, workers may be exposed to crystalline silica in a large variety of industries and occupations. Occupational exposure to silica dust occurs in cement and brick manufacturing, asphalt pavement manufacturing, china and ceramic manufacturing, and the tool and die, steel and foundry industries. Exposure to silica also occurs during many different construction and maintenance activities. The most severe exposures to crystalline silica result from abrasive blasting activities using silica sand. Other activities that may produce crystalline silica dust include jack hammering, rock/well drilling, concrete mixing, concrete drilling, tuck pointing, and brick and concrete block cutting and sawing. Additionally, crystalline silica exposures occur in the maintenance, repair and replacement of refractory brick furnace linings.

Adverse health effects associated with silica exposure result from inhalation of the respirable fraction of crystalline silica, which can arise from many of the activities outlined above. The main health effects associated with silica exposure are lung cancer and silicosis. The IARC has concluded that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is “carcinogenic to Humans” (Group 1). Silicosis is caused by scarring of the lung tissue from breathing in silica dust. This scarring is permanent and causes a reduction in the lungs’ ability to take in oxygen, making it difficult to breathe and in severe cases can be disabling, or even fatal. Since silicosis affects lung function, it also makes one more susceptible to lung infections like tuberculosis.

Vinyl Chloride

Vinyl chloride is a manufactured substance that does not occur naturally. It is used as a chemical intermediate and not an end product. Vinyl chloride exists in liquid form if kept under high pressure or at low temperatures. At room temperature, it is a colourless gas. It burns easily and is not stable at high temperatures.

Most of the vinyl chloride produced is used to make a polymer called polyvinyl chloride (PVC). PVC is used to make a variety of plastic products including pipes, wire and cable coatings, vinyl flooring, vinyl wallpaper and window frames. It is also used to make furniture, upholstery and packaging materials. One of the concerns regarding PVC is that upon burning it will emit toxic fumes. Contaminants emitted when PVC is burned include hydrochloric acid, carbon monoxide, and carbon dioxide, along with lesser amounts of dioxin and furan.

Vinyl chloride is reported to be slightly irritating to the eyes and respiratory tract in humans. Central nervous system effects (including dizziness, drowsiness, fatigue, headache, visual and/or hearing disturbances, memory loss, and sleep disturbances) as well as peripheral nervous system symptoms (peripheral neuropathy, tingling, numbness, weakness, and pain in fingers) have been reported in workers exposed to vinyl chloride. Short-term (acute) exposure to extremely high levels of vinyl chloride has also reportedly caused loss of consciousness, lung and kidney irritation, and inhibition of blood clotting in humans. The most significant health effect associated with exposure to vinyl chloride is that it is a known human carcinogen that causes a rare cancer of the liver. It has been classified by the IARC as “carcinogenic to humans” (Group 1). Brain cancer, lung cancer, and some cancers of the blood also may be connected with breathing vinyl chloride over long periods.

OTHER HAZARDOUS MATERIALS

CHEMICAL HAZARDS

Urea Formaldehyde Foam Insulation

Urea-formaldehyde foam insulation (UFFI) was developed in as an improved means of insulating difficult-to-reach cavities. It was typically made at the construction site from a mixture of urea-formaldehyde resin, a foaming agent and compressed air. When the mixture is injected into the wall, urea and formaldehyde unite and "cure" into an insulating foam plastic. Its appearance is like ordinary shaving cream. Dry, it can be a white or tan colour, and fluffy like styrofoam. Over time UFFI shrinks significantly and may begin to degrade due to its crumbly texture.

UFFI was installed primarily in wall cavities during the 1970's as an energy conservation measure. The insulation was used most extensively from 1975 to 1978, during the period of the Canadian Home Insulation Program (CHIP), when financial incentives were offered by the government to upgrade home insulation levels. In addition to detached homes, it can be found in common areas and walls of semi-detached homes, apartment buildings and condominiums. UFFI was also used to a lesser degree in some commercial and industrial buildings.

UFFI installation has been banned in Canada under the Hazardous Products Act (HPA) since December, 1980 due to concerns regarding the health effects of exposure to formaldehyde. Formaldehyde is a colourless, pungent-smelling gas. Health effects include eye, nose, and throat irritation; wheezing and coughing; fatigue; skin rash; nausea; headache; dizziness; and severe allergic reactions.

Sometimes, a slight excess of formaldehyde was often added to ensure complete "curing" with the urea to produce the urea-formaldehyde foam. The excess formaldehyde was given off after installation during the initial curing process, which typically took a few days to a week to complete. UFFI was sometimes improperly installed or used in locations where it should not have been, resulting in continued off-gassing of formaldehyde past the initial curing stage. Since UFFI was last installed in 1980, it should have little effect on indoor formaldehyde levels today. However, if UFFI comes in contact with water or moisture, it could begin to break down. Due to the age of the insulation UFFI may also begin to degrade and crumble into a fine powder. Under these conditions UFFI may release more formaldehyde and consideration should be given to removing the material using properly trained remediation personnel.

BIOLOGICAL HAZARDS

Mould

Mould is part of the fungi kingdom, which also includes mushrooms and yeasts. They are a naturally occurring and essential part of our environment since they break down dead organic material in the outdoor environment (such as leaves, wood and other plant debris), which they use as a food source.

Mould reproduces by means of tiny spores that are so small they can’t be seen by the naked eye. Because of their small size mould spores easily become airborne and can travel long distances, entering indoor environments through ventilation systems, open windows or doors, or tracked in on footwear. Therefore, mould spores are a commonly detected in indoor air and as a component of settled dust.

Under normal conditions, the presence of indoor mould is not an issue. However, if conditions exist that allow it to grow and multiply indoors it can become a potential hazard. Several factors will affect what moulds will grow within a building and how fast they will grow. This includes parameters such as temperature, airflow, and the pH (i.e. acidity/alkalinity) of the food substrate. However, the most important parameter affecting mould growth is water availability, as all moulds need some amount of moisture for them to be able to grow. Buildings that have had a history of water damage are at greater risk of indoor mould growth.

Indoor mould growth may present a risk to the building structure itself through decomposition of building materials. Health risks to building occupants may also occur as

a result of indoor mould growth. Construction or renovation work which disturbs mould-contaminated materials increases this risk of exposure to building occupants and the construction workers themselves. Health effects associated with exposure to mould most commonly results in allergic type reactions such as runny nose, cough, congestion, eye irritation and aggravation of asthma, headache and fatigue. Exposure to very high concentrations of airborne mould spores (such as those that may be observed during disturbance of mould-contaminated building materials) can result in more serious health effects such as Organic Dust Toxic Syndrome (ODTS) or Hypersensitivity Pneumonitis (HP), where flu-like symptoms (fever, chills, cough, fatigue, shortness of breath, body aches, etc.) are exhibited. The chronic form of HP may occur from long-term exposure to lower levels of mould and results in a continued worsening in shortness of breath or cough. A variety of species of mould have also been documented to cause serious invasive infections, which are generally limited to individuals whose immune systems are already somehow compromised.

ENVIRONMENTAL HAZARDS

Polychlorinated Biphenyls

Polychlorinated biphenyls (PCBs) are a class of man-made organic chemicals known as chlorinated hydrocarbons. They vary in consistency from thin, light-coloured liquids to yellow or black waxy solids. They were manufactured in the United States from 1929 until their manufacture was banned in 1979. Although PCBs were not manufactured in Canada, they were imported from the U.S. over the years. Canada banned the import, manufacture and sale of PCBs in 1977.

PCBs are non-flammable, chemically stable over a wide range of temperature and physical conditions, not soluble in water, unaffected by acids, base or corrosive chemicals, and have a high dielectric or electrical insulating capacity. Due to these unique properties PCBs were used in hundreds of industrial and commercial applications, most commonly in electrical transformers and capacitors, including those capacitors found in light ballasts. They were also used as coolants, fire retardants and as insulation and in a number of other commercial applications including carbonless copy paper, dust suppressors for roads, hydraulic fluids, caulking compounds, plasticizers and lubricating oils and heat-transfer applications.

Although PCBs were found to be extremely useful in many industrial and commercial applications some of their chemical properties also made them an environmental and health hazard. PCBs are nearly indestructible and therefore persist if released into the natural environment. Their high fat and low water solubility result in a build-up (bioaccumulation) of PCBs in the fatty tissue of animals and humans if ingested/inhaled. Because PCBs persist in the fatty tissue of animals their concentration will tend to increase the higher up the food chain.

Most of what is known about the human health effects of PCBs is based on exposures due to accidental releases or job-related activities. These exposures are much higher than the levels normally found in the environment. The adverse health effects include a severe form of acne (chloracne), swelling of the upper eyelids, discolouring of the nails and skin, numbness in the arms and/or legs, weakness, muscle spasms, chronic bronchitis, and problems related to the nervous system. The International Agency for Research on Cancer (IARC) classifies PCBs as “probably carcinogenic to humans” (Group 2A) based on limited evidence that long-term, high-level occupational exposure can lead to increased incidence of liver and kidney cancers. The long-term impact of low-level exposures to PCBs that is common in the general population is unclear. The current state of knowledge suggests that low-level exposures to PCBs are unlikely to cause adverse health effects. However, people eating large amounts of certain sports fish, wild game and marine mammals are at increased risk for higher exposures and possible adverse health effects.

Ozone Depleting and Global Warming Substances

There are several different types of chemicals that are being or have been used as refrigerants in commercial, home and vehicle air conditioners and refrigerators or as fire extinguishing agents in portable and fixed fire extinguishing equipment. This includes groups of chemical compounds known as chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) and halons. Some of these chemicals have also been used as foam blowing agents, as cleaning solvents for electrical components, as aerosol spray propellants, and in hospital sterilization procedures. Fixed halon fire extinguishing systems have historically been used in areas such as data centers, IT rooms, museums, libraries, surgical suites, and other locations where use of water-based suppressants could irreparably damage electronics or vital archival collections. There is a large number of halon fire extinguishing systems still in service in Canada.

The concern regarding past and present use of many of the chemicals used as refrigerants or fire extinguishing agents is that they are ozone-depleting substances (ODS). When released into the environment these chemicals break down in the stratosphere and release chlorine or bromine, which destroy the stratospheric ozone layer. The ozone layer screens the earth from some of the sun's harmful ultraviolet rays (UVB). As the ozone layer is depleted, higher UVB levels reach the earth, resulting in increased exposure to UVB. Increased exposure to UVB can cause skin cancer and plays a major role in malignant melanoma development. It can also increase the likelihood of cataracts and may also suppress proper functioning of the body's immune system and the skin's natural defenses.

CFCs, HCFCs and halons are also known to be greenhouse gases and contribute to global warming due to the build-up of these heat-trapping gases in the atmosphere. Hydrofluorocarbons (HFCs) are a common replacement chemical for CFC and HCFC

refrigerants; and although they do not have any ozone depleting potential they are a potent greenhouse gas.

Due to the ozone-depleting potential and/or global warming potential of CFCs, HCFCs, HFCs and halons it is important to control their use and emission into the environment. The manufacture and use of CFCs has stopped while transitional refrigerants (HCFCs) are scheduled to be phased out of production. No phase-out dates are currently planned for any HFCs. In Ontario, Regulation 463/10, “Ozone Depleting Substances and Other Halocarbons” (made under the Environmental Protection Act) enhances the control and management of substances that deplete the ozone layer and contribute to global warming. This regulation has requirements to prevent or minimize ozone-depleting substances and other halocarbons emissions, which serves a dual environmental benefit of lowering emissions that destroy the ozone layer and contribute to climate change.

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

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

ARCHITECTURAL

A0.0 – COVER
A0.1 – WALL, FLOOR, ROOF SCHEDULES
A0.2 – LIFE SAFETY PLAN 1906 LEVEL 1 & DURING CONSTRUCTION
A0.3 – LIFE SAFETY PLAN 1962 LEVEL 1 & 1906 LEVEL 2
A0.4 – LIFE SAFETY PLAN 1962 LEVEL 2 & 1906 LEVEL 3
A1 - EXISTING SITE PLAN
A1.0 – SITE PLAN – DEMO.
A1.1 – SITE PLAN – SCOPE OF WORK
A1.2 – TEMPORARY SITE PLAN – DURING CONSTRUCTION
A2.1 – 1906 LEVEL 1 FLOOR PLAN
A2.2 – 1962 LEVEL 1 & 1906 LEVEL 2 FLOOR PLAN
A2.3 – 1906 LEVEL 3 PLOOR PLAN (A)
A2.4 – ROOF PLAN
A3.1 – ELEVATIONS
A4.01 – BUILDING SECTIONS
A4.02 – BUILDING SECTIONS
A4.10 – WALL SECTION & DETIALS
A4.11 – WALL SECTION & DETAILS
A4.12 - WALL SECTION & DETAILS
A4.13 - WALL SECTION & DETAILS
A4.14 - WALL SECTION & DETAILS
A4.15 - WALL SECTION & DETAILS
A4.16 – PLAN SECTION DETAILS
A4.17 – STANDARD DETAILS
A5.1 – STAIR AND RAMP PLAN DETAILS
A5.2 – STAIR AND RAMP SECTION DETAILS
A6.1 – 1962 LEVEL 1 & 1906 LEVEL 1 RCP
A7.1 – BARRIER FREE WASHROOM DETAILS
A8.1 – DOOR AND CURTAIN WALL SCHEDULE
A8.2 – DOOR AND SCREEN DETAILS
D2.0 – LEVEL 1 1905 DEMOLITION PLAN
D2.1 – DEMOLITION PLANS
D2.2 – DEMOLITION PLANS
D4.0 – DEMOLITION SECTION
D4.1 – DEMOLITION SECTION
D6.1 – DEMOLITION REFLECTED CEILING PLAN

MECHANICAL

M1.1 - LEGEND, SCHEDULES, AND KEY PLANS
M1.2 - PARTIAL DEMOLITION AND RENOVATION PLANS
M1.3 - PARTIAL RENOVATION PLANS
M1.4 - PARTIAL RENOVATION PLAN
M1.5 - PARTIAL RENOVATION PLANS
M1.6 - PARTIAL ROOF PLANS AND DETAILS
M1.7 - DETAILS
M1.8 - KEY PLAN, PART DEMO AND RENO PLANS (CASH ALLOWANCE)

ELECTRICAL

E1.1 - LEGEND, SCHEDULES, AND KEY PLANS
E1.2 - DETAILS AND SCHEDULES
E2.1 - DEMOLITION PLANS
E3.1 - RENOVATION PLANS
E3.2 - RENOVATIONS PLANS
E3.3 - RENOVATIONS PLANS
E4.1 - DISTRIBUTION RISER DIAGRAM AND PANEL SCHEDULES
E5.1 - FIRE ALARM RISER AND PASSIVE GRAPHIC

STRUCTURAL

S1.1 – STRUCTURAL NOTES
S1.2 – STRUCTURAL NOTES, SCHEDULES, AND DETAILS
S1.3 – STANDARD DETAILS
S2.0 – FOUNDATION AND LEVEL 1 FLOOR FRAMING PLANS
S2.1 – LEVEL 2 & 3 FLOOR FRAMING PLANS
S2.2 – ROOF FRAMING PLANS
S3.1 – STRUCTURAL DETAILS
S3.2 – STRUCTURAL DETAILS

END OF SECTION

PART 1 GENERAL

1.1 REPORTS

1. Attached 2018 Asbestos Audit Update – King Edward Public School dated June 5, 2018 as prepared by MTE for Waterloo Region District School Board.

2. The information given in this report was obtained for the use of the Owner in the execution of the design. It is presented in good faith to assist the Contractors and their sub-trades.

3. It is incumbent upon the Contractors to make whatever additional materials investigation they feel may be required for the proper execution of the Contract at no additional cost to the Owner.

1.2 SCOPE OF WORK

1. The work of asbestos abatement is part of the Base Contract. Refer to reports referenced herein for scope and procedures.

2. The extent of abatement is limited to only those parts of the building in which the Work of this Contract (renovation) is being done. Coordinate between the drawings and the reports references herein to determine the exact scope.

3. Any areas discovered during construction requiring abatement which are not indicated within the attached report(s) will be completed as part of a cash allowance.

4. The methods and procedures for the Work of this section shall as per the enclosed report(s) and as required by National, Provincial and Local regulations.

1.3 SITE CONDITIONS

1. Examine the conditions on the site, present site conditions.

1.4 AWARENESS OF HAZARDOUS MATERIALS

1. Each Contractor shall be constantly aware of the possible discovery of additional unknown hazardous materials. Should the Contractor encounter any hazardous material or suspected hazardous material, the Contractor shall immediately stop work in the area affected and report the condition to the Architect.

2. If the Contractor encounters any additional unknown hazardous material

or suspected hazardous material, the Contractor agrees to immediately initiate the required procedures of the Canadian Environmental Protection Act, 1999, and/or federal or provincial agencies having jurisdiction to protect any and all persons exposed to the affected areas or areas affected thereby.

3. Upon written notification by the Contractor to the Architect, the Contractor will engage an industrial hygienist to sample and test the suspected hazardous material.

    5. Should the test prove negative, and proper clearance obtained from the industrial hygienist, the work will then proceed.

    6. Should the test prove positive, the work will be put on hold and the Contractor will conduct corrective measures and/or disposal program in accordance with applicable laws and regulations.

4. The work in affected areas shall not be resumed until the Contractor has separately arranged for the hazardous material to be removed or rendered harmless, and the hazardous material is removed or rendered harmless in accordance with all applicable laws and regulations and has been certified safe by appropriate authorities.

5. Each Contractor and/or Subcontractor shall be responsible to inform all of its employees on the site of the provisions in these paragraphs. Instruct each employee of the jobsite procedures in reporting any and all suspected materials.

6. Absolutely no material will be allowed on site that does not have a manufacturer's label stating contents.

PART 2 PRODUCTS - Not Used

PART 3 <u>EXECUTION</u> - Refer to reports referenced herein

END OF SECTION

PART 1 GENERAL

1. DESCRIPTION

1. Unless specified otherwise, the following instructions shall apply to all sections of the work.

2. Conform to the latest Ontario Building Code, CEC CSA C22, CAN3-B44 and CSA W59.1 - latest amendments, where applicable, to the Canadian Code for Construction Safety, as currently amended, and to the Construction Safety Act, Ont. as currently amended, and to all other applicable codes and Building By-Laws hereinafter referred to as Codes; and to the requirements of the authorities having jurisdiction, including public utilities, referred to in the Contract Documents as the authorities.

3. Conform to regulations of Municipality having jurisdiction regarding clean up of tracking on streets and protection of sidewalks and curbs, and all other applicable laws, By-laws and Regulations.

4. Read General Work - Section 01015, for instructions and requirements regarding General Work and Services, Miscellaneous Work and Services and Temporary Work and Services. Trades requiring own offices, sheds, etc. shall provide, maintain, relocate and remove same in a manner satisfactory to Contractor.

5. Establish rates of wages, hours and conditions of work, in accordance with Provincial Codes and as generally recognized and accepted in locality. Wherever possible, give preference to use of local labour, building mechanics, suppliers and subcontractors.

6. Install and arrange ducts, piping, tubing, conduit, equipment and fixtures in such a way as to conserve head room and space as much as possible, to provide minimum interference and to be neat, orderly and tidy. Unless otherwise noted, run pipes, ducts, tubing and conduit vertical, horizontal and square with building grid. Conceal pipes, ducts, tubing and conduit above ceilings, behind furrings, in walls, except in mechanical rooms, equipment rooms and unfinished spaces, unless indicated or specified otherwise.

7. In all cases where a device or part of the equipment is herein referred to in the singular number, it is intended that such reference shall apply to as many such devices as are required to complete the installation.

8. Definitions

    1. Wherever the word 'Contractor' is used, it shall refer to either the General Contractor or the Trade Contractor, whomever is performing the Work being described. Wherever the Work has not be allowed for by the Trade Contractor, such Work shall be deemed as the General Contractor's

responsibility and as such, included in the base Contract Value.

2. Wherever the words 'approved', 'satisfactory', 'directed', 'permitted', 'inspected', 'instructed', 'required', 'submit', 'ordered', or similar words or phrases are used in the Contract Documents, it shall be understood, unless the context provides otherwise, that the words 'by (to) the Architect' follow.

3. The words 'by others' when used in the Specifications or on the Drawings shall not mean by someone other than the Trade Contractor. The only means by which something shown or specified shall be indicated as not being in the Contract is by the use of the initials 'NIC' or the words 'not in (the) Contract', 'by Client', or by another Contractor.
4. Exposed: means when visible by the occupants at completion of the work, unless scheduled or specified otherwise.

5. The use of scope, related work, or similar articles in the specifications shall not relieve the contractor from their responsibility to assign the various parts of the work to the appropriate subcontractors and forces and shall not impose upon the Architect or Client the duty to arbitrate disputes between the Contractor and the Subcontractor, nor shall it relieve the subcontractors from their responsibility for carefully examining all the Drawings and Specifications and coordinating their work with each other and the Contractor.

2. CO-OPERATION

1. Co-operate and co-ordinate with other trades as required, for satisfactory and expeditious completion of work. Take field dimensions relative to work. Fabricate and erect work to suit field dimensions and field conditions. Provide forms, templates, anchors, sleeves, inserts and accessories required to be fixed to, or inserted in work, and set in place or instruct related trades as to their location. Pay cost of extra work caused by and make up time lost, as a result of failure to provide in adequate time, the necessary co-operative information of items to be fixed to, or built in.

2. Allow for four (4) site tours by the Owner to be scheduled throughout construction. Provide safety helmets and vests for twelve (12) persons. It is the General Contractor's responsibility to lead the tour to ensure safe passage through the work area.

3. MATERIALS

1. Reject material damaged in transit. Store packaged materials in original undamaged containers with manufacturer's labels and seals intact. Handle and store materials in accordance with manufacturers' and suppliers' recommendations. Prevent damage. Remove from site and replace damaged materials.

2. Conform to the Products, tables and standards in Section 01016 for the following:

    1. Metals

    2. Gauges & Equivalent Thickness

    3. Glass

    4. Concrete, Masonry, Paving

    5. Finish for Aluminum, Baked on Coatings

    6. Pencil Hardness Test

    7. Finish for Aluminum, Hard Anodizing

4. EXAMINATION

1. The Contractor affirms that before tendering, they did examine the site and ascertain the extent and nature of all conditions affecting the performance of the work including the existing conditions; and including the location of all concealed or buried services which may have to be protected, removed or relocated. No extras will be allowed for anything which would have been revealed in the course of such an examination.

2. The Contractor affirms that before tendering they did examine the Specifications, Drawings, and other tender documents thoroughly. It shall be assumed that the Contractor thoroughly understands these documents, including those particular items about which questions have been asked and written instructions given.

3. Examine work upon which your work depends. Application of your work or any part of it shall be deemed acceptance of work upon which your work, or that part of it which has been applied, depends.

4. Drawings are in part, diagrammatic and incomplete, and are intended to convey scope of work and indicate general and approximate location, arrangement and size of fixtures, equipment, ducts, piping, conduit and outlets. Obtain more accurate information about locations, arrangement and sizes, from study and coordination of construction drawings, including architectural, structural, mechanical and electrical and become familiar with conditions and spaces affecting these matters before proceeding with work.

5. Where job conditions require reasonable changes in indicated location and arrangements, make changes at no extra cost to Client. Install and arrange ducts, piping, conduit, equipment and fixtures in such a way as to conserve head

room and space as much as possible.

5. SCAFFOLDING

1. The Contractor shall provide at their own expense all manner of materials, labour, scaffolding, ladders, hand tools, and appliances necessary for the due execution and proper completion of work described herein, unless otherwise specified in tender specifications.

2. Erect scaffolding independent of walls. Use scaffolding so as to interfere as little as possible with other trades. When not in use, move scaffolding as necessary to permit installation of other work. Construct and maintain scaffolding in rigid, secure and safe manner. Remove scaffolding promptly when no longer required. Scaffolding must comply to Occupational Health and Safety Act.

6. FLOOR SURFACES

1. Adequately protect existing and new floors and finishes from damage. Take special measures when moving heavy loads or equipment on them.

2. Keep floors free of oils, grease, or other material likely to damage them, discolour them, or affect bond of applied finishes.

7. PROTECTION AND MAKING GOOD

1. Protect existing property, adjacent public and private property and work of other sections from damage while doing work.

2. Damaged work and property shall be made good (includes replacing, fixing, re-finishing) wherever possible by those performing work originally, but at expense of those causing damage.

3. Attach and fasten fixtures and fittings in place in safe, sturdy, secure manner so that they cannot work loose or fall or shift out of position during occupancy of building as a result of vibration or other causes in normal use of building.

4. If, during work, any buildings, curbs, walks, roads or landscaping are damaged, repair or replace them to the satisfaction of Architect and the local jurisdiction.

5. Protect glass and other finishes against heat, slag and weld spatter, by erecting sturdy plywood or other heavy shield.

6. If tape or strippable coatings are used to protect finished metal surfaces, do not allow them to become baked on or to thermoset.

8. IMPACT DRIVEN FASTENINGS

1. Do not use impact driven (explosive, hammer, etc., but not twist driven) fastening devices without written approval. Properly size holes in concrete and drill cleanly to avoid oversizing for expansion anchors. When drilling upward, use jig to hold drill steady and plumb.

9. ALTERATIONS AND MAKING GOOD

1. Wherever it becomes necessary to cut or interfere in any manner with existing services and apparatus, do so at such times as approved by the Architect. Give minimum advance notice of one week and provide sufficient information of such requirements.

2. Take into account existing installations to ensure best arrangement of pipes, conduit, ducts and mechanical, electrical and other equipment in available space. For critical locations, prepare interference and installation drawings showing work of various sections as well as existing installations, for approval, before commencing work.

3. Comply with Section 01045 Cutting and Patching for additional information

10. STANDARDS

1. Where initials of an organization are used, followed by number or combination of numerals and letters, this designates a standard produced by the organization. Conform to issue of standard so designated, as amended and revised to date of contract. When designation does not indicate particular edition of standard edition current at date of Contract shall apply.

2. Wherever a standard confers upon a person, a body politic or a body corporate the right to approve, to select, to exercise authority or to interpret the standard, and refers to that person, body politic or body corporate as the Authority having jurisdiction, the Authority, the Engineer, the Department, the Purchaser, the Contracting Officer (e.g. U.S. Fed. Spec.) or by some other such designation, the Architect shall have the right to exercise the powers of any such person, body politic, or body corporate.

3. Where standards and manufacturer's instructions conflict with the Contract Documents, the Contract Documents shall govern.

11. FINISHED DIMENSIONS AND ELEVATIONS

1. See Article on Setting Out, in Section 01015. Give particular attention to finished dimensions and elevations of the work. Make finished work fit indicated spaces accurately. Make finished work flush, plumb, true to lines and levels and accurate in all respects

12. NON-PAYMENT

1. All those doing work or supplying materials shall notify the Architect in writing if the Contractor fails to make payment when due. Failing such notice, the Architect will assume that payments have been duly made.

13. CLEANING AND CONTRACT CLOSE-OUT

1. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

2. Store volatile wastes in covered metal containers and remove from premises daily.

3. Prevent accumulation of wastes which create hazardous conditions.

4. Provide adequate ventilation during use of volatile or noxious substances.

5. Use only cleaning materials recommended by manufacturer on surface to be cleaned, and as recommended by cleaning material manufacturer.

6. Refer also to Section 01710 Cleaning and Dust Control.

7. Final Inspection and Closeout

    1. Submit proposed closeout procedures and schedule of inspection to Architect for approval before final inspections commence.

    2. Arrange for, conduct and document final inspections, closeout and take-over at completion of work of this specification in accordance with procedures described in OAA/OGCA TAKE-OVER PROCEDURES, OAA/OCGA Document No. 100, December 2007.

    3. Substantial completion cannot be applied for until the building is approved for occupancy by the local Building Authority, maintenance manuals and as-builts have been submitted, operating instructions to the Client have been completed and percentage of completion as per the Construction Lien Act has been obtained.

    4. Comply with Section 01700 – Contract Close-Out.

14. TRADEMARKS AND LABELS

1. Trademarks and labels shall not be visible in the finished work except for labels of ULC and other similar authorities and except where necessary to identify mechanical and electrical equipment, for maintenance and replacement and except where specified otherwise.

2. Except as provided in the foregoing paragraph, locate trademarks and labels on concealed or inconspicuous surfaces or remove by grinding if necessary or paint out where surface painted, if located conspicuously.

15. BURIED SERVICES

1. The Contractor shall be responsible for all required locates and keeping records of all buried services indicated in the locates and wherever discovered on site. The subcontractors concerned shall provide the Contractor with all necessary dimensions required to accurately locate those services.

16. EXISTING SERVICES

1. Where work involves breaking into or connecting existing services, carry out work at times directed by governing authorities, with minimum of disturbance to the operation of the facility, pedestrian and vehicular traffic.

2. Before commencing work, establish location and extent of service lines in area of work and notify Architect of findings.

3. Where unknown services are encountered, immediately advise Architect and confirm findings in writing.

4. Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.

5. Remove abandoned service lines to distance of six feet from foundations. Cap or otherwise seal lines at cut-off points, in manner approved by authorities having jurisdiction over service.

6. Record locations of maintained, re-routed and abandoned service lines. The sub-contractors concerned shall provide the General Contractor with all necessary dimensions required to accurately locate those services.

7. The appropriate Sub-contractor shall assume full responsibility for the locations and protection of all under and above ground utilities, such as water, sewer and gas mains and building connections, hydro and telephone poles, wires and conduits, etc. when excavating or digging below grade whether they are shown on the plans or not.

8. Where the location of any of these utilities has been shown on the plans, such

information is not guaranteed. It is the appropriate Sub-contractor's responsibility to verify locations, invert elevations, etc., immediately after moving on the site. If for any reason the information obtained necessitates changes in procedures or design, advise the Architect at once. If this verification of existing conditions is not done at the outset and any problems arise, the responsibility for same will be entirely the Contractor's.

9. Contractor to provide temporary support of existing service lines and pipes where work requires excavation below existing lines for construction of new footings, foundations, etc.

17. EMBEDDED CONDUIT, PIPE AND SLEEVES

1. Concrete Slabs

    1. All pipes and conduits shall be depressed to pass under concrete slabs on grade.

    2. Sleeves, conduits and pipes which pass through suspended slabs, beams or walls, shall be in approved locations which do not impair the strength of the construction. Space them all not less than three diameters o.c.

18. SAFETY

1. The General Contractor will be responsible for submitting their safety program used in the ongoing operation of their company and any safety recommendations specifically relating to the tendered project.

2. Safety measures or procedures taken by the General Contractor i.e. site safety meetings, site construction fences, etc., will not relieve the Contractor of their responsibilities for the safety of persons and property, and for compliance with the federal, provincial and local statutes, rules, regulations and orders applicable to the conduct of the work.

3. Submit copies of all Safety Meeting Minutes to Architect and Client.

4. Comply with Section 01545.

21. OMISSIONS AND DISCREPANCIES

1. Notify Architect at once of discrepancies found in, or omissions from the drawings, specifications or other documents or if in doubt as to their meaning; Architect will send a written instruction to all Bidders. If a discrepancy exists, the Architect will issue an addendum to all Bidders to clarify or correct such discrepancies.

2. Neither Client nor Architect will be responsible for any verbal instructions.

3. Should any discrepancies or omissions go unreported to the Architect during tendering period, the proper interpretation shall be at the discretion of the Architect.

22. SITE

1. The work to be done at 325 Louisa Street, Kitchener, ON.

23. EXAMINATION

1. The site shall be accepted by the Contractor in their present condition. The Contractor will be held to have visited the site and to have carefully examined all conditions affecting the site, the work to be done there on, including the location of all services which may have to be protected, removed or relocated. The Contractor shall accept sole responsibility for any error or neglect on their part in this respect. Submission of Tender shall be deemed confirmation that tenderer has inspected site and is thoroughly conversant with existing conditions. No claims for extra payment will be considered for extra work, expense or difficulties encountered due to conditions on site which were visible upon or reasonably inferable from an examination of the said site prior to the closing of tenders.

2. Examine the specifications, drawings and soils report thoroughly. Report to Architect all ambiguities, discrepancies, omissions, errors, departures from Building By Laws, or from good practice, discovered during examination as early in the tender period as possible to allow clarification by addenda to be issued to all bidders. No claims for extra payment will be considered for work, expense or difficulties which are reasonably inferable from an examination of the documents prior to the closing of tenders.

3. The drawings and specifications complement each other, and neither is to be considered alone. Hence, any item omitted in one, but mentioned or implied in the other, must be provided.

4. All changes to the contract documents which result in an extra or a credit to the contract amount are not to be executed until written instructions have been received and the extra or credit agreed to in writing by all parties to the contract.

5. The Contractor shall execute variations, alterations and substitutions which do not affect the contract amount as instructed by the Owner or its representatives.

24. PROCEDURES AND SUPPLY OF CRITICAL MATERIALS

1. Submission of a tender shall constitute the Tenderer's agreement that they will commence work immediately upon award of the Contract, and that they will execute the same without interruption until completion, including the furnishing of

all necessary supplies and equipment for winter operations. Contractor shall assure themselves before submitting a tender that they are in a position to furnish adequate supplies of all materials, critical or otherwise, at such times necessary to ensure immediate commencement of the work and continuous operation without delays on the project. The Contractor shall include in their tender amount, sufficient sums for the purchase of critical materials from any source available. After award of the contract, the Client will not grant increases to the tender amount to obtain critical materials at premium prices, nor will delays or interruption of the work be tolerated.

25. LAWS, CODES AND REGULATIONS

1. The tenderer is assumed to have made themselves familiar with and abide by the Federal National Authorities, Provincial, Municipal and local laws, rules and regulations which in any manner affect those engaged or employed in the work, or in any way affect the work, and no plea of misunderstanding will be considered on account of ignorance thereof. If the Bidder shall discover any provisions in the drawings, specifications or contract which are contrary to or inconsistent with any law, rule of regulation, Contractor shall at once report it to the architect in writing.

26. SITE ACCESS

1. Contractor to remove all debris from site daily.

2. Location of all trailers, storage units, and construction fences by contractor shall be reviewed and approved by the Client and Architect at a preliminary site meeting prior to contractor moving on to site.

3. Parking for construction workers shall be on site as directed by the General Contractor, only when parking spaces are available.

4. Site access for construction to be confirmed at first site meeting.

27. CONSTRUCTION SAFETY

1. Safety measures or procedures taken by the Contractor, i.e. site safety meetings, protective street hoarding, site construction fences, etc. will not relieve the contractor of their responsibilities for the safety of persons and property, and for compliance with the federal, provincial and local statues, rules, regulations and orders applicable to the conduct of the work.

2. This Contractor shall be liable for any costs, fines, penalties, etc. levelled against the Client or Consultant due to violation of the Construction Safety Act by this Contractor or any Subcontractors on this project.

3. This Contractor will be responsible for submitting to the Client their safety program

used in ongoing operation of their company and any safety recommendations specifically relating to the tendered project.

28. PROJECT SCHEDULE

1. The successful bidder will be required within one (1) week after award of a Letter of Intent to forward to the Architect, a schedule indicating construction sequences, manpower and equipment required in order to complete the work. This schedule is to be posted on site at all times. Schedule is to be updated on a weekly basis.

2. When the Architect deems that the Contractor's work has fallen behind schedule, the contractor will provide the necessary manpower and work the necessary overtime to bring the work back on schedule at no cost to the Client.

3. Contractor shall commence shop drawings immediately once acceptance of tender has been given by the Client. A complete shop drawing and sample submission schedule is to be provided within seven days of tender award. This will be reviewed by Architect.

4. Commence construction on the Project as soon as Building Permit is obtained.

5. Refer also to Section 01310 Construction Schedules.

29. PROTECTION AND MAKING GOOD

1. Protect existing property, adjacent public and private property and work of other sections from damage while doing work.

2. Damaged work and property shall be made good wherever possible by those performing work originally, but at expense of those causing damage. The General Contractor is solely responsible for all subtrades and any damage.

3. Attach and fasten fixtures and fittings in place in safe, sturdy secure manner so that they cannot work loose or fall or shift out of position during occupancy of building as a result of vibration or other causes in normal use of building.

4. If, during performance of the work, any buildings, curbs, walks, roads or landscaping are damaged, repair or replace them to the satisfaction of Architect and the local jurisdiction at no additional cost to the Client.

30. MATERIALS AND EQUIPMENT

1. All materials and equipment supplied for the work shall be new, of the best quality, and in accordance with the latest applicable specifications of the Canadian Standards Association.

2. The particular method, material, procedure or equipment specified in this tender shall be used as a standard.

3. M.S.P.S. (Material Safety Data Sheets) for all materials being used on this project are to be kept on site and made available for use by all concerned.

4. Controlled substances: the use of any controlled substance of any kind must be reviewed by Client and written acceptance of its use obtained.

5. When proposing an alternative method, material, procedure or equipment to that specified in the tender specifications. All alternatives shall be equal or superior to the standard specified in these tender documents and all unit prices along with overall product quantity cost is to be submitted. Alternates may not necessarily be accepted by the Architect.

   Where particular products are specified and approved alternate manufacturers are listed or proposed by the Contractor, it is the responsibility of the contractor to ensure that any products carried in their tender from one of the approved manufacturer's meets or exceeds the original specified product.

   Upon the alternate product shop drawing submission to the architect for review, all product data sheets (for specified and alternates) comparing the two products are to be submitted. Should the Architect then deem the proposed alternate not to be acceptable the Contractor shall provide the specified product at no additional cost to the Contract.

6. The Contractor who at any time, whether during the tender period or during construction, furnishes an alternative method, material, procedure or equipment in place of the standard item specified shall furnish complete documented data which proves the quality and equality of the proposed alternative. Note that the Contractor who furnishes an alternative method, material, procedure or equipment in place of the standard item specified is responsible that the alternative will work with the Architectural layout, equipment will fit in the provided space and any revisions to any affected Work that will be required will be at no additional cost to the Contract.

7. In all cases where alternative methods, materials, procedures or equipment are offered in response to this tender, the Owner shall make the final ruling on their acceptability.

8. During and upon completion of the work, the Contractor shall remove from the premises all surplus materials, equipment and debris.

31. GENERAL NOTES

1. The contractor will be required to keep and maintain a set of as-built drawings for each project. These drawings will be used for no other purpose than recording

the exact location of buried or covered services and all changes to the contract documents. The as-built drawings will be submitted to the Architect along with guarantees, maintenance data, extra supplies, etc. at the substantial performance of the contract.

2. The contractor will turn over to the Architect at the completion of the contract all **project close out documents, as-built drawings, material, etc.** These documents, material, etc. including occupancy permit, will be accepted only with a transmittal and at no other time than when submitting a written request for substantial performance of the contract. For purposes of determining a value of this work it will be considered as **$5,000.**

3. The contractor is not to act on verbal instruction from the Client, Consultants, or Architect on work they consider to be extra to their contract scope. Extra work can only be authorized by the Architect and in a written form only. The written form must also include that this work is an extra to the contract scope, and the method by which extra costs will be tabulated.

4. Ensure the building is maintained weather tight, safe and secure. Furnish all temporary protection as may be required.

5. Remove and dispose of all resultant debris.

6. Work shall be done in accordance with best standard practice, unless special methods or performance standards are specified or given in writing by the Client. Only skilled mechanics shall be used where such are required to produce a first-class job. Where required by code or other by-laws and regulations, trades people shall be licensed in their trades.

7. Use, install and handle manufactured materials in accordance with manufacturer's instructions.

8. Conform to the latest Ontario Building Code, CEC CSA C22, (latest Edition as currently amended) CAN3-B44, and CSA W59.1, where applicable, to the Canadian Code for Construction Safety, as currently amended, and to the Construction Safety Act, Ont. as currently amended, and to all other applicable codes and Building By-Laws hereinafter referred to as Codes; and to the requirements of the authorities having jurisdiction, including public utilities, referred to in the Contract Documents as the authorities.

9. Conform to regulations of Municipality having jurisdiction regarding clean-up of tracking on streets and protection of sidewalks and curbs, and all other applicable laws, By-laws and Regulations.

10. Any work not acceptable to the Architect or Client or local authorities shall be removed and replaced when and as directed by them. The cost of re-executing such work shall be borne by the Contractor.

11. All mechanical maintenance pads and penetrations to be by Division 15, and all electrical maintenance pads and penetrations to be by Division 16.

12. The contractor shall provide internet service on the jobsite and make access available to the Owner and Consultant and shall maintain this service until the date of substantial performance of the contract.

13. The contractor shall maintain access to the buildings and portable buildings on site and shall restrict access to construction areas.

14. The contractor shall provide temporary drainage as required at construction access points to prevent the build-up of dirt and mud and the migration of this onto municipal streets. Periodic cleaning of municipal streets is to be provided when required and whenever specifically requested by the municipality.

PART 2 PRODUCTS - Not Used

PART 3 EXAMINATION - Not Used

END OF SECTION

PART 1 GENERAL

1. EXAMINATION

    1. Throughout the project, examine the work of all trades and promptly notify the Consultant if any conditions do not or will not comply with the drawings and specifications.

2. SETTING OUT

    1. Lay out work from control bench marks and indicated verified reference points. The General Contractor shall have a qualified land surveyor, registered to practice in Province of Ontario and approved by Consultant, verify accuracy of layout and certify that building foundations and finish grade levels and locations are in accordance with the contract documents. File certification with Building Department and Consultant immediately after foundations are completed. Payment for the Land Surveyor will be carried out by the General Contractor not under the Cash Allowance.

    2. The Land Surveyor shall provide four lines and one benchmark for the General Contractor to layout their work to. The General Contractor will provide these layout lines and benchmarks for work on all other areas once they begin work on the site.

    3. Protect and preserve bench marks and reference points. Inform Consultant immediately if bench marks or reference points are disturbed or damaged by any work and pay for their repair and/or replacement.

    4. Locate and fix grid lines and locations of walls, partitions, shafts and all parts of the construction as work proceeds.

    5. Verify grades, lines, levels and dimensions indicated, particularly with road and sidewalk elevation, and report any errors or inconsistencies to the Consultant before commencing work. Confirm job dimensions at once to allow prompt checking of shop and other drawings.

    6. As work progresses, provide and maintain bench marks at each floor, giving exact elevation of finished floor.

3. PROTECTION

    1. Conform to Ontario Building Code, latest amendments, and The Construction Health and Safety Act, all as currently amended.

    2. Provide spare safety helmets for and enforce their use by Owner, Consultant, their representatives and any authorized visitors to site.

    3. Protect excavation, trenches, and buildings from damage by rain, water, ground water, backing up of drains or sewers and other water, frost and all other weather conditions. Do not allow footings or slabs to be placed on frozen ground. Do not

permit excavations to reach full depth indicated when freezing temperature may be expected unless footings or slabs can be placed immediately after excavation has been completed. Protect excavations from frost by placing of suitable approved insulating material to adequate depth, if placing of concrete is delayed and after placing of concrete until backfilling occurs or freezing conditions terminate. Provide necessary pumps (including spare pumps) and temporary drainage for keeping project free of water throughout construction period. Pump water to public sewers or ditches by approved means. Refer to soils report for details. Control grading around excavations to prevent surface water from draining into excavation and from damaging adjoining property.

4. Protect building from movement and damage, especially during filling and compaction and until elements are securely anchored and cannot be damaged or moved by filling or compaction. Obtain approval of authorities having jurisdiction for such work and make changes as required by them.

5. Provide temporary construction fence to enclose construction area, and pavement protection as required for protection of public, and of public and private property and as required by law and by authorities having jurisdiction. Erect sturdy railings around shafts, stair wells and the like to protect workers and public from injury. Equip foregoing protection with warning lights and signs. Alter, remove and relocate or replace hoardings, barriers, and entrances therein as required by authorities having jurisdiction and by the work. Hazards requiring such protection shall be eliminated as soon as possible and protection devices removed. Maintain fences, gates until construction is complete. Keep free from unauthorized signs.

6. Provide wood hoarding protection as indicated on drawings and in conformance with the local authority having jurisdiction along all streets where new construction is within 6 metres of the street sidewalk.

7. Provide and maintain in working order, adequate, temporary Canadian Underwriters labelled, chemical solution (soda acid) Class A.1, fire extinguishers and locate in prominent positions to approval of authorities having jurisdiction.

8. Utilities and Services - Before starting the work contact the Public Utilities for location of underground services.

4. AS BUILT DRAWINGS

1. Maintain as work progresses, accurate records of changes to the Drawings and concealed services. Accurate locations, depth, size, and type of underground utilities shall be included in these as built drawings. The General Contractor will be supplied with digital drawings in AutoCad®, 2012 or later and PDF format of the floor plans for making these recordings. As built drawings will be reviewed at each site meeting and must be properly maintained to receive Consultant's approval before the monthly certificate draw will be approved.

2. Keep a daily record showing progress of the work and all factors affecting the work, i.e., weather, strikes, accidents, shipping delay, etc.

3. The General Contractor shall also provide as built drawings in AutoCad 2012 (or later) by a professional drafting service.

4. Completed as built drawings and instruction and warranty manuals shall be submitted prior to requesting substantial completion.

5. STORAGE AREA

1. Storage Area: General Contractor to provide storage area at site for products and tools. Include construction and operating hardware, with security locks, as required. Separate storage for painter's materials and tools from other storage areas. Locate storage area where directed by Owner's Representative and provide security.

6. WASHROOM CONVENIENCES

1. General Contractor to provide washroom facilities as per the Construction Health and Safety Act for use of subcontractors and employees. Facilities shall be provided with a screen and contents shall be removed regularly during construction. Maintain it without offense to neighbourhood and adjacent public and private areas. At completion of building, washroom facilities and contents shall be removed, and the ground carefully levelled and cleared. Employees on work must avail themselves of this convenience. It shall be to the satisfaction of local Health Authority.

2. Use of permanent toilets is forbidden.

7. TEMPORARY DRAINS

1. Excavations and building site shall be kept free from water at all times by means of trenches to sewers or pits from which it shall be pumped away and disposed from the site.

8. TEMPORARY WATER SERVICE

1. The General Contractor shall provide and pay for all temporary water and connections for water used for construction operations. Water for compaction and watering of seed or sod shall be trucked to the site and paid by for the General Contractor.

9. TEMPORARY ELECTRICAL SERVICE

1. The General Contractor shall provide and pay all temporary light and power necessary to the operations under this contract, including all connections necessary to supply to the Trade Contractors on site.

10. TEMPORARY HEATING

1. Provide temporary heat, heating equipment, and shelter, to keep that work which requires protection from cold, adequately warm and sheltered from elements and to allow it to be done safely and well, maintaining minimum temperature of 16 degrees Celsius (60 degrees F.) when finishing is being done and when building is closed in, until completion of work. Provide heating for materials affected by cold, both in storage and during construction. Construction requiring heat shall be suitably enclosed.

2. Do not use salamanders. Use temporary heaters of forced warm air type, operated in well-ventilated location and vented to exterior, or radiant panel type. If used in areas of completed building, provide protection on floors and adjacent surfaces to prevent damage to floors and adjacent surfaces, particularly when re-fuelling.

3. Provide temporary heat for interior spaces to maintain a minimum temperature of 16 degrees Celsius (60 degrees F.) throughout the building at all times once the building is enclosed.

11. TEMPORARY USE OF PERMANENT HEATING SYSTEM

1. Permanent heating and ventilation system may be used for temporary heating and ventilation only if the Consultant gives their approval to do so in writing, and when piping is complete, all units are connected, all pumps and valves are installed and operating properly, all strainers are installed and permanent or temporary filters are installed, and entire system has been tested and is safe operating condition, and when no further shut-down of system will be necessary for future conditions.

2. Do not use air distribution system until permanent or temporary filters are in place. Filter air distribution system to prevent dirt and dust from entering units via return air. Keep unused ducts sealed to prevent entry of air. Replace or clean filters frequently during construction to minimize entry of dirt. Clean (if cleanable) or replace filters before turning over system to Owner.

3. Put system in charge of fully trained and experienced operator at all times. If required, operators shall be selected jointly by Owner and Contractor with a view to permanent employment by Owner upon completion. Operators shall qualify as set out in Operating Engineers Act, if applicable.

4. Clean, maintain and repair heating and ventilation system as require throughout its use during construction. Notify manufacturer and Consultant immediately before turning over new heating equipment to Owner so that heating items may be checked for possible damage during temporary heating period. Make good damage to heating and air distribution equipment. Replace all worn parts and turn over system to Owner in clean, new condition, operating with circulating water properly treated chemically.

5. Permission might be given by the Consultant in writing only upon 100% operation completeness of the systems. Neither the Owner nor the Consultant are under any obligation to grant permission to use permanent heating system during construction period.

12. SITE ACCESS FOR CONSTRUCTION ACTIVITIES

1. The Contractor shall construct and maintain in good condition, such temporary service roads, culverts that may be necessary to provide safe, convenient and adequate access for materials, and other supplies at all times while the General Contractor is working on site, all to the approval of the Consultant. NOTE: The Contractor shall protect existing roads, sidewalks, curbs and provide mud mats to the satisfaction of the Local Authorities and replace any that become damaged due to any operations under this contract.

13. DELIVERY AND STORAGE OF MATERIALS

1. Arrange for early deliveries necessary for execution of work without delay and have materials on job well in advance of the time it is needed.

2. Deliver, store and handle materials to exclude foreign material and prevent damage, soiling or breakage.

3. Materials to be stored on site, which need to be protected from weather shall be so protected.

4. Packaged materials shall be delivered in packages with manufacturer's seals and all labels intact.

14. BUILDING AND PREMISES

1. Owner reserves right to take over any completed portion prior to specified completion date, provided it does not affect completion of remaining work.

2. If Owner is forced to occupy building or parts thereof prior to completion, but after date of Substantial Performance, Contractor shall not be entitled to indemnity for interference with the performance of the work.

15. OWNERSHIP OF MATERIALS

1. All work or material delivered on the site or premises to form part of the works shall be considered the property of the Owner and shall not be removed without the consent of the Consultant, but the Contractor shall have the right to and shall remove the surplus materials after he has completed the work. If so directed by the Consultant, such surplus materials shall be removed at any time prior to the completion of the work.

2. All materials which are to be removed from the existing site and are not called for to be re-used or specifically called for in the specifications to be turned over to the Owner, shall become the property of the General Contractor and shall be removed from the site.

16. DETAILS AND MEASUREMENTS

1. Ensure that necessary job dimensions are taken, and trades are coordinated for the proper execution of the work. Assume complete responsibility for the accuracy and completeness of such dimensions, and for co-ordination.

2. Verify that work, as it proceeds, is executed in accordance with dimensions and positions indicated which maintain levels and clearances to adjacent work, as set out by requirements of the drawings, and ensure that work installed in error is rectified before construction continues.

3. Check and verify dimensions referring to work and interfacing of services. Dimensions, when pertaining to work of other trades, shall be verified with trade concerned.

4. Do not scale directly from the drawings. If there is ambiguity or lack of information, immediately inform the Consultant and await his instructions before proceeding. Be fully responsible for rectifying, altering or redoing any work resulting from disregarding this clause.

5. All details and measurements of any work which is to fit or to conform with work installed shall be taken at the site.

6. Should revised drawings be issued after work has commenced, Contractor shall immediately return to Consultant previous drawings which refer to said work. The Contractor will be held responsible for work being carried out in accordance with said revised drawings.

17. WORKMANSHIP

1. Work shall be done in accordance with best standard practice. Only skilled mechanics shall be used where such are required to produce a first class job.

2. Use, install and handle manufactured materials, equipment and appliances in strict accordance with manufacturer's directions and instructions, unless specified otherwise.

18. FROST PROTECTION

1. Provide proper frost protection, including heating for materials to ensure scheduling of work without delay.

2. Similar protection shall be given to work done.

3. Work or materials damaged by frost shall be replaced by Contractor.

4. Snow and ice shall not be allowed to remain on any part of structure, except finished roofs, and shall be removed by Contractor.

19. PROJECT MEETINGS

1. Arrange regular meetings every week and notify the representatives of the Owner, Consultant, Engineer and each subcontractor concerned with the current progress.

2. Contact all subcontractors concerned at least 24 hours in advance and request their presence at job meeting.

3. Review approved progress schedule for rapid and efficient completion of work according to Contract requirements, with suppliers of materials and sub-contractors.

4. Post and forward copies of progress schedule for advice of interested parties.

5. Record the minutes of each meeting and send copies to all attending and interested parties not later than two days after the meeting. In addition, send copies to the Consultant, Consultants and Owner. Contractor to provide updated change order register and shop drawing register attached to each record of minutes to indicate exactly what has been issued and the status of approvals and/or distribution.

6. Keep Consultant informed of progress, delays and of potential delays during all stages of work to avoid delays.

20. BROKEN GLASS

1. Replace all broken, damaged or scratched glass and mirrors. Glass which has been broken, scratched or damaged in installation shall be replaced by installer.

21. TREE PROTECTION

1. Protect tops, trunks and roots of existing trees on project site that are to remain. Box, fence or otherwise protect trunks of existing trees which may be subject to construction damage before any work is started. Do not permit heavy equipment or stockpiles within branch spread. When approved, remove interfering branches without injury to trunks and cover scars with tree paint.

2. Wherever excavating is required within branch spread of trees that are to remain, do not cut tree roots, but tunnel or trench under or around roots by careful hand digging and without injury to roots.

22. CHECK FLOOR DRAINS

1. Just before acceptance of building by Owner, check floor drains and see that they are clean, clear and functioning properly.

23. FIRE PROTECTION AND ACCESS TO EQUIPMENT AND EXITS

1. Take necessary precautions to eliminate fire hazards and to prevent damage to work, equipment and other property both public and private having to do with the work. Inspect work of this contract at least once a week for this purpose.

2. Provide and maintain in working order suitable Underwriters' labelled fire extinguishers and locate in prominent positions, to approval of authorities.

3. When welding, brazing and performing any operation with an open flame, a portable fire extinguisher shall be kept within 10 feet (3000 mm) of the operator at all times.

4. Store and locate materials and equipment packed in cardboard cartons, wood crates and other combustible containers in orderly and accessible manner. Place approved types of firefighting equipment in vicinity of materials or equipment packed in this type of crate or carton until permanent fire protection and equipment are available.

5. Store all rags and waste containing oil, grease or other flammable materials in an approved metal container and remove from the site at the end of each working day.

6. Only fire resistant tarpaulins are permitted on site.

7. Locate temporary buildings and storage areas in relation to their hazards and probability of damage to existing buildings under construction. Unless constructed of non-combustible materials, wherever possible locate them at least 33 feet (10 m) away from buildings. If constructed of combustible materials separate these structures into small, detached units.

8. Provide and maintain free access at all times from the street to fire hydrants and to outside connections for standpipes or other fire extinguishing equipment whether permanent or temporary. Do not place material or construction equipment within 10 feet (3 m) of hydrants or connection, nor between them and centre line of the street.

   Maintain free access at all times to control valves and hose on fire lines within building and to all portable extinguishers.

9. Install fire doors and put into operating condition at the earliest possible time.

10. Comply with requirements of 01545 Safety Requirements.

24. SAFETY

1. Take all precautions necessary to protect and safeguard workers from dangerous conditions including fumes; lead paints, etc.; asbestos; and silica hazardous to health.

2. Comply with requirements of 01545 Safety Requirements.

25. EXISTING/ADJACENT BUILDING

1. Particular attention shall be paid to prevention of fire and elimination of fire hazards which would endanger new work or existing property.

2. No existing footings, foundations, pipe lines, electrical conduit and wiring shall be undermined or otherwise damaged or endangered by digging, butting of any other operation in the performance of the work of this Contract. Any existing work so affected shall be immediately repaired and made good to the Consultant's satisfaction at the Contractor's expense.

3. Active services to the adjacent buildings shall be protected.

4. In case of damage to active services, notify Consultant, Utilities and Authorities immediately and make all required repairs under direction of appropriate utility. Carry out repairs during off hours if required.

26. NOTES TO GENERAL CONTRACTOR

1. Ensure that the building is maintained weathertight and secure. The General Contractor shall furnish all temporary protection, enclosures, tarpaulins, etc., as may be required to weatherproof openings in the work.

2. Demolish and clean up all existing trees, scrub and debris and any other items found on the site not indicated to remain.

3. The General Contractor shall carry out all removal and disposal of all resultant debris.

4. In case of damage to active services, notify Consultant, Utilities and authorities immediately and make all required repairs under direction of appropriate utility. Carry out repairs during off hours if required. In absence of specific requirements or direction, plug or cap unused or abandoned utility lines at least 3 feet (1000 mm) outside of new building walls, or as required by utilities, codes and authorities.

5. The location of construction shacks and trailers to be approved by the Consultant and Owner.

6. Take all precautions necessary to protect and safeguard workers from dangerous

conditions including fumes, lead and silica products that may be present during the construction that are hazardous to health.

7. Restore disturbed areas to original condition unless shown otherwise on drawings or stated in specifications.

27. CONSTRUCTION PARKING

1. Parking will be permitted on site provided it does not disrupt the performance of Work.

28. PROTECTION FOR OFF-SITE & PUBLIC PROPERTY

1. Protect surrounding private and public property from damage during performance of work.

2. Be responsible for damage incurred.

29. SIGN AND ADVERTISEMENTS

1. Erect no other signs, except those signs which are necessary to give direction or for safety, or warning signs, without the Consultant's permission. Where other signs are required or wanted, obtain Consultant's approval.

30. PROTECTION OF BUILDING FINISHES & EQUIPMENT

1. Provide protection for finished and partially finished building finishes and equipment during performance of work.

2. Provide necessary screens, covers, hoardings as required.

3. Be responsible for damage incurred due to lack of or improper protection. Replace or repair finishes or equipment so damaged.

31. SECURITY

1. Extent of security services shall be at the discretion of the Contractor. Note that the fit, finish and new appearance of the finished building will not be comprised. Materials, products, finishes, etc. damaged due to vandalism are to be restored and/or replaced to an as-new condition.

PART 2 PRODUCTS - Not Used

PART 3 EXAMINATION - Not Used

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

1. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard, warranties on products; special warranties; and comparable products.

2. Related Requirements:

    1. Section 01500 – Substitutions (for requests for substitutions).

1.3 DEFINITIONS

1. **Products**: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

2. **Named Products**: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.

3. **New Products**: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

4. **Comparable Product:** Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

5. **Basis-of-Design Product Specification**: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other

designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

6. **Subject to Compliance with Requirements:** Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. Submit a comparable product request, if applicable.

1.4 REFERENCE STANDARDS

1. The Standards listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

2. Aluminum Association (AA)

    1. AA ADM (2010) Aluminum Design Manual

    2. AA ASM-35 (2000) Specifications for Aluminum Sheet Metal Work in Building Construction Manual Series Section 5

    3. AA DAF-45 (2003; Reaffirmed 2009) Designation System for Aluminum Finishes

    4. AA PK-1 (2009) Pink Sheets: Designations and Chemical Composition Limits for Aluminum Alloys in the Form of Castings & Ingot

3. American National Standards Institute (ANSI)

    1. ANSI H35.1/H35.1M – Standard Specification for Aluminum-Alloy 6061-T6

4. American Standard for Testing and Materials (ASTM)

    1. ASTM A653/A653M-18: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

    2. ASTM B221M-14: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire Profiles and Tubes

    3. ASTM B308/B308M-10: Standard Specification for Aluminum-Alloy

6061-T6 Standard Structural Profiles.

4. ASTM B361-16: Standard Specification for Factory-Made Wrought Aluminum and Aluminum-Alloy Welding Fittings.

5. Canadian Standards Association

1. SA Standard CAN3-S157-M83: Strength Design in Aluminum.

2. CSA Standard S190-1969: Design of Light Gauge Aluminum Products.

3. CSA Standard S244-1969 "Welded Aluminum Design and Workmanship".

1.5 ACTION SUBMITTALS

1. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a comparable product request. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

1. Form of Architect's Approval of Submittal: As specified in Section 01300 – Submittals.

2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

3. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01300 submittals. Show compliance with requirements.

1.6 QUALITY ASSURANCE

1. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected

products were also options.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

1. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

2. Delivery and Handling:

    1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

    2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

    3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

    4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

3. Storage:

    1. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

    2. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

    3. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

    4. Protect stored products from damage and liquids from freezing.

    5. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.8 PRODUCT WARRANTIES

1. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract

Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

2. **Manufacturer's Warranty**: Written warranty furnished by individual manufacturer for a product and specifically endorsed by manufacturer to Owner.

3. **Special Warranty**: Written warranty required by the Contract Documents to provide specific rights for Owner.
4. **Special Warranties**: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. See other Sections for specific content requirements and requirements for submitting special warranties.

3. Submittal Time: Comply with requirements in Section 0700 – Contract Closeout.

PART 2 PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

1. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.

4. Where products are accompanied by the term "as selected," Architect will make selection.

5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

6. Or Equal: For products specified by name and accompanied by

the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

7. Submit additional documentation required by Architect through Construction Manager in order to establish equivalency of proposed products. Evaluation of "or equal" product status is by the Architect; whose determination is final.

2. Product Selection Procedures:

1. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

1. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: …"

2. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

1. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: …"

3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

1. For approval of products by unnamed manufacturers, comply with requirements in Section 01500 - Substitutions for convenience.

2.2 COMPARABLE PRODUCTS

1. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following

conditions are satisfied.

2. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

    1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.

    2. Evidence that proposed product provides specified warranty.

    3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

    4. Samples, if requested.

3. Submittal Requirements: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

2.3 METAL

1. Where a product is named in the Specifications by one of the following names or by any name followed by the number of one of the following articles, the product shall conform to the standard named in the corresponding article, except as specified or indicated otherwise.

2. Aluminum (A1)

    1. Bar, rod, wire, extruded shapes; architectural: CSA HA. Series (AA/AnS1 6063) (Alcan 50S) condition T5.

    2. Bar, rod, wire, extruded shapes; Structural: CSA HA Series (AA/ANS1 6061) (Alcan 65S) Condition T6.

    3. Plate, sheet, coil; utility: CSA HA Series Alloy MC10, (AA/ANS1 3003) (Alcan D3S); condition H14 (sheet, coil), F (plate).

    4. Plate, sheet, coil; anodizing: CSA HA Series Alloy 990C, (AA/ANS1 1100) (Alcan D2S); condition H14.

    5. Specially anodized aluminum (hard anodized): (AA-M21 or

M12C22A42) conform to Finishes, Aluminum, Hard Anodized (FA.HA) attached to Section 01016.

6. Painted aluminum: conform to Finishes, Aluminum, Baked on Coatings FABC attached to Section 01016.

7. Anodized Aluminum: AA-M21 or M12C22A31.

8. Aluminum for elevated floor plates: (Bruce EDP) US Fed. Spec.QQ-A-591c, Ty A380 (mil-HDBK-H1C code 20087).

9. Aluminum sand casting: (signs, etc.) AA 443.0.

3. Sheet Gauges

1. Gauges and equivalent thicknesses of sheet, plate, coil and strip shall conform to the table of gauges and equivalent thicknesses (GET) attached to Section 01016. See 1.3.4 and 1.3.6 special application of gauges to structural sheet.

4. Galvanized Sheet Steel

1. ASTM A525 and 526, commercial quality sheets, plain commercial galvanized, stretcher levelled, or temper rolled to stretcher levelled standard of flatness if specified.

2. Same as 1.3.1 except wipe coated instead of plain commercial galvanized.

3. Same as 1.3.1 except mill phosphatized instead of plain commercial.

4. ASTM A446 structural quality, Grades A or B, max. permissible working stress: Grade A, 20,000 psi; Grade B, 22,400 psi. plain commercial galvanized. Gauges shall apply to core sheet and shall be msg. Coating thickness shall be added to core thickness to determine thickness of coated sheet (see 1.2 .1).

5. Same as 1.3.4 except wiped coated instead of plain commercial, with a coating not less than .050 oz. per sq. ft. (see 1.1.4).

6. Same as 1.3.4 except wiped coated instead of plain commercial galvanized (see 1.2.1).

7. Preparation for painting, in ship, ASTM D2092-68.

5. Copper Metals

1. Nickel Silver (white bronze): Anaconda American Brass Alloy 796

(leaded nickel silver) (has higher zinc content than any of the nickel silvers in ASTM B122-71a):

Copper	45%
Zinc	42%
Nickel	10%
Lead	1%
Manganese	2%

2. Sheet copper and strip copper for roofing, flashing and building construction: ASTM B370, cold rolled temper, 16 oz. or as specified otherwise.

3. Monel: (nickel 63-70%, approx. 5% other metals, remainder copper) plate, sheet, strip, hot rolled, annealed and pickled, AST B127; (Inco Monel 400).

4. All applicable copper metals: ASTM B248.

5. Architectural Bronze (Red Brass), ASTM B36, No. 3 (85% CU + 15% NI).

6. Stainless Steel

1. Plate, sheet and strip; CSA G110.6-1968, Type 302 or 304 as specified, or as specified otherwise; finish: No. 4 unless specified otherwise.

2. Structural shapes and bars, CSA G110, 4-1968, Type 302, 304 or 316 as specified; No. 4 finish unless specified otherwise.

7. Sheet Steel

1. Sheets, cold-rolled carbon steel, commercial quality, ASTM A366 stretcher levelled or temper rolled to stretcher levelled standard of flatness if specified.

2. Porcelain enamelling steel, ASTM A424, Commercial Quality, Type 1 or 2.

1. Same as 1.6.1 except special quality for electro deposited coatings.

2. Same as 1.3.4. except un-galvanized.

3. Hot-rolled, carbon steel sheets and strip, structural quality

ASTM A570-70, 5 grades (stair treads, risers, etc.).

4. Hot-rolled carbon steel sheet and strip, commercial quality ASTM A569-66T.

8. Prepainted:

1. CSSB1 Technical Bulletin No. 5, as currently amended (modified silicone alkyd, 2000).

2. CSSB1 Technical Bulletin No. 5, as currently amended, except humidity resistance 5000 hours; salt spray resistance 400 hours; resistance to accelerated weathering 2500 hours (fluoropolymer, 10,000).

3. CSSB1 Technical Bulletin No. 5, as currently amended, except humidity resistance 3000 hours (silicone alkyd, 5000).

9. Sheet Steel (Cold Rolled)/Structural Steel (Hot Rolled)

1. When steel thickness is indicated by gauge or by decimal fractions of inches, it is sheet steel (1.6) or galvanized sheet steel (1.3) or stainless steel (1.5). When steel thickness is indicated by common fractions of inches, it is structural steel (1.8). However, some sheet steels are structural quality, (i.e., having guaranteed strength).

10. Structural Steel

1. CAN/CSA G40.21-M87, 38W or 44.

11. Soldering Materials

1. Solder: Solder for Div. 15 to conform to Div. 15 specifications. Under no circumstances shall any lead containing solder be used on any potable water piping systems throughout the project.

2. Flux: on stainless steel:

1. Muriatic acid killed by the addition of zinc until all effervescence stops and no excess of zinc remains; improved by the addition of a small amount of ammonium chloride, plus 10% acetic acid; or

2. muriatic acid: ferric chloride: nitric acid 90:50:3, by weight; or

3. Approved commercial flux designed especially for use with stainless steel, such as EutecSol 682, or approved equal.

3. Flux: on copper and galvanized steel:

    1. killed muriatic acid as specified in 1.9 b.1; or

    2. suitable rosin type.

12. Galvanizing

    1. All steel except (1.3), CSA G164 Hot Dip Galvanizing of irregular Shaped Articles. Must be done after all welding complete. No welding of galvanized products allowed.

13. Welding Materials

    1. CSA W59, CSA W 55.2; for stainless steel, ASTM A371; for aluminum, ASTM B285.

    2. Metal Filler

14. Epoxy: Hysol 6C epoxy adhesive kit (or 4297 in bulk) manufactured by Hysol (Canada) Limited or approved equal.

15. Plating (Electrodeposited Coatings)

    1. Cadmium (on steel): ASTM A165, Type NS (13 mu), OS (7.6 mu), TS (3.8 mu).

    2. *Chrome (on steel):* ASTM B.456, Fe Ni20b Cr r unless specified otherwise, bright unless dull specified.

    3. Chrome (on copper and copper-base alloys): ASTM B456, Type FC unless KC or QC specified; bright unless dull specified. (In this case FC is thick and QC is thin.)

    4. Weight of zinc coating and thickness to be added to base metal to determine thickness of coated material.

(Source: ASTM A-446, Tables 2 and 4)

Coating Class oz. Per sq. ft.	Triple-Spot Test, Minimum Check Limited oz. per sq. ft.	Thickness in
2.75	2.35	0.0041
2.5	2.1	0.0037

2.25	1.85	0.0033
2	1.65	0.003
1.75	1.4	0.0026
1.5	1.15	0.0022
1.25 commercial	0.9	0.0019
Wipe Coated (Colourbond or Satin coat in Canada only)	0.25	0.0005

NOTE: Light Commercial not available in Canada.

16. Paint (See 1.6.7)

    1. Shop primer on steel: CAN/CGSB 1-GP-40d.

    2. Bituminous paint: CAN/CGSB 1-GP-108c.

    3. Baked enamel on steel: primer, CA/CGSB 1-GP-81e, Type 2; finish CANCGSB 1-GP-88e, baking alkyd enamel.

    4. Baked enamel on aluminum: FA.BTAE, attached to Section 01016.

PART 3 EXECUTION - Not Used

END OF SECTION

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

1. Requirements and limitations for cutting and patching the Work.

1.2 RELATED SECTIONS

1. General Requirements - Section 01010
2. General Work - Section 01015
3. Individual Sections - Cutting and patching incidental work of the section. Advance notification to other sections required.

1.3 SUBMITTALS

1. 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 elements.
    3. Efficiency, maintenance, or safety of any operational element.
    4. Visual qualities of sight-exposed elements.
    5. Work of the Owner or separate contractor.
2. Include in request:
    1. Identification of Project.
    2. Location and description of affected work.
    3. Statement on 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 the Owner or separate contractor.
    7. Written permission of affected separate contractor.
    8. Date and time work will be executed.

1.4 GENERAL

1. Execute cutting, fitting, and patching including excavation and fill, to complete the Work.
2. Fit the several parts together, to integrate with other work.

3. Uncover work to install ill-timed work.

4. Remove and replace defective and non-conforming work.

5. Remove samples of installed work for testing if requested by Consultant.

6. Provide openings in non-structural elements of Work for penetrations of mechanical and electrical work.

1.5 INSPECTION

1. Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

2. After uncovering, inspect conditions affecting performance of work.

3. Beginning of cutting or patching means acceptance of existing conditions.

1.6 PREPARATION

1. Provide supports to assure structural integrity of surroundings; devices and methods to protect other portions of project from damage.

2. Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.

1.7 PERFORMANCE

1. Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.

2. Use material to match existing.

3. For a change in material submit request for substitution under provisions of Section 01500 – Substitutions.

4. Employ qualified trade contractor to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight exposed surfaces.

5. Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed without prior approval.

6. Restore work with new products in accordance with requirements of Contract Documents.

7. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

8. Refinish surfaces to match adjacent finishes: For continuous surfaces refinish to nearest intersection.

END OF SECTION

PART1- GENERAL

1.1 SUMMARY

1. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

2. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

    1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

    2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.

1.2 SUBMITTAL PROCEDURE

1. Provide submittals electronically in Portable Document Format (PDF).

2. Submissions must be clear, to scale, complete, specific and correctly transmitted.

3. Submittals are to be numbered in the sequence which they are submitted. Submittal numbering to be as follows 001, 002, 003 etc.

4. Processing: To avoid the need to delay installation as a result of the time required to process submittals such as samples and shop drawings , allow enough time for submittal review, including time for resubmittals.

    1. Allow Consultant five (5) working days to respond to Request for Information (RFI).

    2. Allow ten (10) days for initial review of shop drawings and samples. Allow additional time if the Consultant must delay processing to permit coordination with subsequent submittals.

    3. The Consultant will return to the Contractor indicating that, the items been:

        1. Reviewed (no re-submittal required).

        2. Reviewed as indicated (no submittal required).

        3. Revise and resubmit (re-submittal required).

    4. Review by the Consultant is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that the Consultant approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Subcontractor, and such review shall not relieve the Subcontractor of his responsibility for

errors / omissions in the shop drawings or of his Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to the processes or techniques of construction and installation and for co-ordination of all sub-trades.

5. The Contractor will advise all Trades, Subcontractors and suppliers of the limits of the Consultant's responsibility with respect to Shop Drawings and other submittals.

6. If an intermediate submittal is necessary, process the same as the initial submittal.

7. No extension of contract time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

1.3 SHOP DRAWINGS

1. Submit shop drawings as per indicated procedure and as required in various sections of these specifications and on the drawings.

2. Review submittals prior to submission. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated by the General Contractor and identified as to specific project will be returned without being examined and considered rejected.

3. Notify, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

    1. Verify field measurements and affected adjacent Work are coordinated.

    2. Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.

    3. Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant's review.

    4. Keep one reviewed copy of each submission on site.

    5. Submit Shop Drawings as specified in the following Sections:

SHOP DRAWINGS	
Section	**Title**
03200	Concrete Reinforcement
03300	Concrete Mix Design
07270	Firestopping and Smoke Seals
09500	Acoustical Treatment (ACT)
09650	Resilient Flooring

09900	Paint Draw Downs
10165	Washroom Partitions
10800	Washroom Accessories
	Mechanical
	Electrical

1.4 SAMPLES

1. Submit samples as listed in List of Samples below.

2. Samples of materials, both manufactured and otherwise, proposed for the use on the work shall be submitted to the Architect for approval as required by the Contract Document and/or reasonably required by the Architect. The work shall be in accordance with approved samples. All samples shall be supplied and delivered to the Architect free of charge. The approval of samples shall not be construed as an acceptance of work subsequently carried out.

3. Samples shall be labelled indicating date of submission, name of project, names of contractor and manufacturer, and complete identification of locations at which materials are to be installed.

SAMPLES	
Section	**Title**
09500	ACT (to match ex. As close as possible)
09650	Resilient Flooring
09900	Paint Draw Downs
10165	Washroom Partition (colour)

1.5 EXTENDED WARRANTIES

1. In addition to the warranty requirements of GC 12.3 of CCDC Document 2, 2008, and as revised in the Supplementary General Conditions, the Contractor shall note that the following extended warranty periods are required by the Contract Documents for the individual items under respective Sections.

2. Note: This table is meant to be used as a guide. Extended warranties are dictated by individual sections.

EXTENDED WARRANTIES	
Section	Title
Mechanical	Refer to Mechanical
Electrical	Refer to Electrical

1.6 MAINTENANCE MANUALS

MAINTENANCE MANUALS	
Section	**Title**
07270	Firestopping and Smoke Seals
09500	Acoustical Treatment (ACT)
09650	Resilient Flooring
09900	Paint Draw Downs
10165	Washroom Partitions
10800	Washroom Accessories
	Mechanical
	Electrical

1.7 EXTRA MATERIAL

1. Submit extra material as specified in the following Sections:

EXTRA MATERIAL	
Section	**Title**
09500	ACT – 5% of total area
09650	Resilient Flooring - 5% of total of each colours
09900	Painting - See Section
	Mechanical
	Electrical

CERTIFICATE OF PAYMENT APPLICATION FORM

Contractor: _____ Application No. _____

Work: _____ Date: _____

Period Covered: _____

Description	Contract Amount	% To Date	Value Performed to Date	Value Previously Performed	Value Current Period	Balance to Complete
This Section to show breakdown of Contract such details as:						
General Conditions	$	$	$		$	$
Excavation						
Concrete Footings						
Concrete Walls, Cash Allowances, Hardware, etc.						
SUB-TOTAL						
Change Orders No. 1 No. 2 No. 3						
TOTAL CONTRACT						

NOTE: HST TO BE INCLUDED IN EACH OF THE FOLLOWING VALUES:

SUMMARY (HST to be included in all items)

Value of Work Completed to date $ _____

Less Holdback of 10% $ _____

Holdback Released $ _____
Current Holdback (Net Retained) $ _____
Sub-Total $ _____

Less Previous Certificates $ _____

Amount of this Claim $ _____

Total of H.S.T. included above ($ _____)

GENERAL CONTRACTOR'S H.S.T. NO. _____

PART 1 GENERAL

1.1 DESCRIPTION

1. See Individual Specifications Sections for full listing of inspections and approvals.

2. Architect's approvals required:

3. Architect's and Consultant's approval before interfering with existing services and apparatus. One week notice to be given. Section 01010.

4. Architect's approval of work schedule (Progress Schedule) - 01310.

5. Architect's and Consultant's approval of substitutions - 01500.

6. Consultant's approval of footing bearing soil compaction - 02200.

7. Consultant's approval of compaction - 02200.

2. Notify Architect:

1. Notify Architect for Deficiency Inspection upon agreed Substantial Performance.

2. Notify Architect for One-Year Holdback Inspection.

3. Notify Client for Two Year Inspection of Extended Warranties

4. Notify Client for Three Year Inspection of Extended Warranties

5. Notify Client for Five Year Inspection for Extended Warranties

6. Notify Client for Ten Year Inspection for Extended Warranties.

3. Submit samples for approval.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

PART 1 GENERAL

1.1 CONSTRUCTION SIGNAGE AND ADVERTISEMENTS

1. Erect no other signs, except those signs which are necessary to give direction or for safety, or warning signs, without the Architect's permission. Where other signs are required or wanted, obtain Architect's approval.

PART 2 – PRODUCTS Not Used

PART 3 – EXECUTION Not Used

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

1. Before commencing any work, the Construction Manager, along with their trade contractors, are to prepare working / interference drawings, to ensure that all components are to be properly accommodated within the spaces provided, ensuring all clearances required by jurisdictional authorities and for proper maintenance are indicated and maintained.

2. Schedule meetings on site with all associated trades to review all interference areas until all issues have been coordinated and required interference drawings issued.

3. Prepare drawings to indicate coordination and method of installation of a mechanical system with sprinkler, electrical, structural and other systems where their relationship is critical. Ensure all details of equipment, apparatus and connections are coordinated.

4. The Construction Manager shall provide interference drawings prepared by their Mechanical, Sprinkler and Electrical subtrades. Drawings are to be red-line markups scanned to PDF Format and shall indicate any perceived interference between mechanical, sprinkler, structural, and electrical work and the work of all other Divisions along with proposed solution to such interference.

5. Failure to coordinate with all other trades could result in reworking of installed equipment, piping or ducting at the discretion of the Consultant. Any reworking to accommodate the installation of other trades is to be performed at no extra cost.

6. All interference drawings shall be submitted and approved prior to the second Certificate of Payment being released.

1.2 COOPERATION AND COORDINATION

1. Cooperate and coordinate with other trades as required, for satisfactory and expeditious completion of work. Take field dimensions relative to work. Fabricate and erect work to suit field dimensions and field conditions. Provide forms, templates, anchors, sleeves, inserts and accessories required to be fixed to, or inserted in work, and set in place or instruct related trades as to their location. Pay cost of extra work caused by and make up time lost, as a result of failure to provide inadequate time, the necessary cooperative information of items to be fixed to, or built in.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

1. This section details General Contractor's responsibilities in preparation, submission and maintenance of construction schedules with form and requirements for periodic revisions. The Sub-Contractors shall provide the General Contractor with their schedule of work and co-ordinate the work with General Contractor and the Work Progress of other trades on site.

1.2 REQUIREMENTS INCLUDE

1. Schedule, form, content.

    1. Stages/Phased Construction.

    2. Schedule Revisions.

    3. Weekly schedule updating.

1.3 SCHEDULES REQUIRED

1. Submit the following schedules:

    1. Construction Progress Schedule.

    2. Weekly Schedule and Manpower Loading.

    3. Submittal Schedule for Shop Drawings and Product Data and Shades.

    4. Product Delivery Schedule. Include required decision dates for finishes and colours.

    5. Sub-schedule showing submittals, review times, procurement schedules, and delivery dates.

    6. Sub-schedules to define critical portions of overall schedule.

1.4 FORMS OF SCHEDULES

1. Prepare schedules in form of horizontal bar chart (GANTT, or C.P.M. network). Provide separate horizontal bar column for each trade or operation, or separate activity for each operation that can be completed independently of other operations or trades. Provide as follows:

    1. Order: Chronological order of beginning of each item of work.

        1. Identification: Identify each column by distinct graphic delineation.

2. Horizontal Time Scale: Identify first work day of each week.

3. Scale and Spacing: To allow space for updating.

4. Minimum Sheet Size: 11" x 17" for electronic submission.

1.5 SUBMITTALS SCHEDULE

1. Include schedule for submitting shop drawings, product data, and samples. Co-ordinate with section 01300 requirements. Incorporate into Preliminary Progress Schedule and Weekly Schedule updates.

2. Indicate dates for submitting, review time, resubmission time, float time, and last date for meeting fabrication schedule.

3. Include dates when SUBMITTALS and delivery will be required for the Owner-furnished products if applicable.

4. Include dates when reviewed submittals will be required from the Consultant.

1.6 PRODUCT DELIVERY SCHEDULE

1. Include dates for delivery of products specified in Section 01020 - Allowances, if applicable.

2. Include dates for products furnished by Owner, if applicable.

3. Submit a schedule of required equipment order dates and delivery dates for products and/or assemblies which involve insignificant production time or fabrication time and/or will significantly affect the project schedule if not available when needed.

1.7 CONSTRUCTION PROGRESS SCHEDULE

1. Submit a preliminary construction schedule and phasing plan within ten working days of notification of bid acceptance, for approval.

2. Incorporate approved preliminary schedule in construction schedule specified in GC 3.5 of The General Conditions of The Stipulated Price Contract.

3. Submit a bar-chart progress schedule a minimum of seven (7) days before first progress application for payment. Prepare schedule in sufficient detail to indicate timing of major activities during phased progress of the Work and which will ensure completion of the Work on or before schedule.

4. On schedule indicate a time bar for each major construction activity to be performed at the site, properly sequenced and co-ordinate with other activities of work. Itemize activities in sufficient detail that no one bar exceeds two months in duration (separate long running trades such as Masonry into Logical Sub-

Sections). Allow sufficient space below planned time bar for another time bar to record actual progress.

5. Show dates for commencement and completion of all activities. Estimate duration period and float (contingency) time for each activity.

6. Show projected percentage of completion for each activity as of the date of submission of monthly progress payment applications and/or to the date of submission of schedule when requested.

7. Indicate actual progress of each activity to date of submission of schedule. Indicate current status of all activities to date of submissions of schedule by showing where behind, on or ahead of planned schedule.

8. Show changes occurring since previous submission of schedules:

    1. Major changes to scope

    2. Activities modified since previous submission

    3. Revised projections of progress and completion

    4. Other identifiable changes.

    5. Confirm commencement, duration and completion dates of all activities with subcontractors, subtrades and suppliers.

    6. Deliver to Architect, at the end of each calendar month with progress application a project status report derived from evaluation of Schedule.

    7. Include in this report updated schedule together with such supporting narrative and such graphical presentations necessary to clearly outline the progress of Work, areas of current and anticipated problems, effect of changes on schedules of major trade subcontractors and proposed corrective action.

    8. Be aware that the nature and day-to-day functioning of the Owner will have precedence over any phasing and arranged schedule, and stoppage of the work with good reason, and changes to the schedule may be made by the Owner on an as needed basis without prior notice and at no extra cost to the contract. The Contractor shall take this into account and shall co-ordinate and co-operate with the Owner and reschedule the work to accommodate the Owner's requirements.

    9. Lengthy shutdowns and disruptions of services will not be tolerated, and strict attention shall be paid to minimizing any disruption.

    10. Schedule required work in occupied areas in co-ordination with the Owner and such schedule be approved by the Owner prior to start of the

work. Provide two weeks minimum notice when work in existing area is required

1.8 STAGED/PHASE CONSTRUCTION

1. Prepare and submit sub-schedules for each separate stage of Work when pertinent to the project.

2. Provide sub-schedules to define critical portions of prime concern to master schedule.

3. Describe start and stop, float time and affected other work.

1.9 WEEKLY SCHEDULE UPDATE AND MANPOWER LOADING

1. Use the Construction Progress Schedule as a basis for reporting on a weekly basis the complete status of construction progress, scheduled activities and manpower loading on the project.

2. There will be an Owner/Architect/Consultant/General Contractor/Trade Contractor meeting every second week to review the project status. Provide a detailed 2-week work schedule (based upon the Construction Progress Schedule) outlining work activities and manpower requirements planned for that period.

3. Identify current and anticipated problems and delays with respect to the past work period the effects of said problems on the overall schedule and proposed corrective measures.

4. Submit to Architect two days prior to site meetings (every second week) the following:

    1. Updated Construction Progress Schedule.

    2. Outline of anticipated work activities for the forthcoming period.

    3. Outline of required and/or anticipated manpower levels (by trade) for the forthcoming period.

    4. Problems or delays experienced and/or anticipated.

    5. Proposed corrective measures to react to problems or delays.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

1. Division One - General Requirements is a part of this Section and shall apply as if repeated here.

1.2 APPOINTMENT AND PAYMENT OF INSPECTION COMPANIES

1. Inspection and Testing Companies for various trades will be appointed by the Consultant where specifically stated or required.

2. The cost of inspection and testing will be paid out of an allowance provided under Section 01020, except where tests or inspections reveal work not in accordance with the Contract, the Construction Manager shall bear the cost of such tests and additional tests as the Consultant requires to verify the acceptability of corrected work.

1.3 RESPONSIBILITIES

1. The Consultant will supply drawings and specifications as required for the use of the respective inspection and testing authorities and advise the Construction Manager of the Company appointed for the respective work.

2. The Construction Manager shall advise the Consultant and the respective Inspection and Testing authority not less than five (5) working days prior to the commencement of any work to be inspected or tested and ensure that proper facilities and co-operation is provided and that no work is carried out without the required inspection and testing.

3. Proper storage shall be provided for storing concrete specimens at the job site at the required temperature and free from vibration or injury.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

PART 1 GENERAL

1.1 ACCEPTABLE PRODUCTS

1. No alternate manufacturers or products or substitutions will be accepted during the tender (bid) period.

2. Should alternates or substitutions be proposed upon award of this Contract the requirements of this Section shall apply.

3. First item named or specified by catalogue number meets specifications in all respects regarding performance, quality of material and workmanship, and is acceptable to the Architect.

4. Items, other than first named, meeting specifications regarding quality of materials and workmanship only, are acceptable to the Architect, if they also meet performance, match the first named product in colour and texture, etc. and/or capacities specified and can be accommodated within the space allotted.

5. Where the contractor proposes the use of equivalent products other than that first named, on which design is based, the contractor shall be responsible for all details of installation including product size, arrangement, fit, colour, etc. and maintenance of all required clearances. Contractor shall prepare and submit revised layouts to indicate arrangement of all affected piping, ductwork, conduit, lighting, equipment, etc. Failure by Contractor to provide such drawings may be considered indication that additional costs associated with equivalent products such as revisions to surrounding architectural finishes, structural components, or the need for larger motor starters, larger power feeders, space revisions to associated product equipment, controls, etc. shall be included in Bid price.

1.2 APPROVAL REQUIRED

1. The Contract is based on the materials, equipment, and methods described in the Contract Documents.

2. The Architect will consider proposals for substitution of materials, equipment, and methods only upon award of Contract and when such proposals are accompanied by full and complete technical data and all other information required by the Architect to evaluate the proposed substitution.

6. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this work by the Architect, in writing.

1.3 "OR EQUAL"

1. Where the phrase "or equal", "approved equal", or "equal as approved by the Architect" occurs in the Contract Documents, do not assume that materials, equipment, or methods will be approved by the Architect.

2. The decision of the Architect shall be final.

1.4 AVAILABILITY OF SPECIFIED ITEMS

1. Verify prior to bidding that all specified items will be available in time for installation during orderly and timely progress of the work.

2. In the event specified items will not be so available, notify the Architect prior to receipt of bids.

3. Costs of delays because of non-availability of specified items, when such delays could have been avoided by the Contractor, shall not be borne by the Owner.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

1. Safety measures
2. Fire protection
3. Overloading precautions
4. Falsework
5. Scaffolding

1.2 CONSTRUCTION SAFETY MEASURES

1. Observe and enforce construction safety measures required by National Building Code (Part 8) and Ontario Building Code (latest edition as currently amended), Provincial Government, Workplace Safety & Insurance Board and municipal statues and authorities.
    1. In particular, the Ontario Construction Safety Act, the regulations of the Ontario Department of Labour and Ontario Hydro Safety Requirements shall be strictly enforced.
    2. In the event of conflict between any provisions of above authorities the most stringent provisions will apply.

1.3 MATERIAL SAFETY DATA SHEETS

1. Submit Material Safety Data Sheets (MSDS) for any product to be used, installed or applied inside of the building if said product may emit toxic fumes and/or noxious odours.
2. Submit Material Safety Data Sheets for any product which is known to or suspected of creating a health hazard or discomfort when used in confined spaces, including but not limited to the following:
    1. Adhesives
    2. Solvents
    3. Sealants (Caulking, etc.)
    4. Other products which may give off air borne particles after installation
        1. Any other product as direct by Architect/Consultants.
    5. The required Material Safety Data Sheets to be submitted prior to ordering

material or product for use as a part of the Work

3. The Owner may withhold payment for work of a subtrade or section until MSD Sheets for products supplied by that subtrade or section have been submitted, reviewed by Consultant and found to be acceptable.

4. Refer to Section 01700 - Project Close-Out for requirements regarding Certificates of Compliance.

1.4 MATERIALS SPECIFICALLY EXCLUDED

1. Asbestos and/or asbestos - containing products are not permitted. Submit Material Safety Data Sheets for any product suspected of containing asbestos if so requested by Consultant. Examples of some materials requiring close scrutiny and/or confirmation include:

2. Transite drainage pipe - whether buried or above grade - not permitted.

    1. Insulation and/or jacketting for pipes, ducts, motors, pumps, etc. - not permitted if any asbestos is present.

3. Solder for all piping is to be lead-free. "Lead Free" shall mean solder which contains less than 0.030% of lead when dissolved in fluoroboric and nitric acids and tested by inductively coupled argon plasma atomic emission spectroscopy. Steelbond 281 and Silverbrite are acceptable solder products.

4. The mechanical contractor shall provide an affidavit signed by the principal of the company, on company letterhead, that all of the solder used on the project was either one of the two acceptable products or that the solder used (identified by brand name) meets or exceeds the testing criteria.

5. The Owner shall undertake random testing of the soldered joints. Should testing provide that the solder used was not as specified, the Owner shall take legal action against the contractor as appropriate.

6. All paint and finish coatings are to be lead and mercury-free. Submit Material Safety Data Sheets confirming that these products are free of all lead and/or mercury compounds.

1.5 FIRE SAFETY REQUIREMENTS

1. Comply with requirements of the local municipal fire department with respect to continuous fire safety on the job site.

2. Comply with fire safety requirements of other construction related authorities (Workplace Safety & Insurance Board, Ministry of Labour, construction trade unions, etc.). If more than one authority issues similar requirements, the more stringent shall govern.

3. The appropriate clauses of the Ontario Building Code relating to fire protection shall be strictly followed.

4. Provide and maintain free access to temporary or permanent fire hydrants and other fire protection equipment during performance of work required by insurance companies having jurisdiction and governing codes, regulations and by-laws.

1.6 OVERLOADING

1. Ensure no part of Work is subjected to a load which will endanger its safety or cause permanent deformation.

1.7 FALSEWORK

1. Design and construct falsework in accordance with latest issue of CSA S269.1-.

1.8 SCAFFOLDING

1. Design and construct scaffolding in accordance with latest issue of CSA-S269.2.

1.9 LIST OF MINIMUM SAFETY

1. Include all provisions for construction safety such as fences, hoarding along streets, storage provisions facilities, sanitation facilities, fire protection, electrical supply, temporary heat, ventilation, construction equipment with its supports and guards, stairs, platforms, ladders, scaffolds, guardrails, walkway lighting and morality lighting, work around asbestos lead, silica and fumes, all as required by the Construction Safety Act and Regulation, latest edition of the Province of Ontario, as well as all other applicable regulations of Jurisdictional Authorities.

1.10 OWNER SAFETY REQUIREMENTS

1. The Contractor will take all necessary steps to protect personnel (workers, visitors, general public, etc.) and property from any harm during the course of the contract.

2. All work procedures will be in accordance with Client legislated standards.

3. All equipment shall be in safe operating condition and appropriate to the task.

4. The Contractor shall ensure that only competent personnel are permitted work on site. The owner will throughout the term of the contract also remove from the site any persons not observing or complying with safety requirements.

5. The Contractor shall provide competent personnel to implement their safety programs and ensure that the owner's standards and those of the Ontario Health and Safety Act are being complied with.

6. Plant Services or the consultant will monitor every week to ensure that safety

requirements are met and that safety records are properly kept and maintained. Continued disregard for safety standards can cause the contract to be cancelled and the Contractor or subcontractors removed from site.

7. The Contractor will report to the owner, architect and jurisdictional authorities any accident or incident involving Contractor, owner or public personnel and/or property arising from the contractor's execution of the work.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

PART 1 GENERAL

1.1 FIRES

1. Open fires and burning of rubbish are not permitted on the site.

1.2 DISPOSAL OF WASTES

1. Do not bury rubbish and waste materials on site.

2. Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

3. All removal of waste products and debris resulting from the work must be audited and source-separated to comply with the most current version O.Reg 102 103 Industrial, Commercial and Institutional Source Separation Programs under the Environmental Protection Act and the 3 R's Regulation.

1.3 DRAINAGE

1. Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

2. Do not pump water containing suspended materials into waterways, sewer or drainage systems.

3. Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.4 SITE CLEARING AND PLANT PROTECTION

1. Refer to Division 2.

1.5 POLLUTION CONTROL

1. Provide and maintain temporary erosion and pollution control features including mud mats and siltation fences as per the Bruce County- Town of Mildmay and Ontario provincial standard details and requirements installed under this contract or previously installed.

2. Control emissions from equipment and plant to local authorities' emission requirements.

3. Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.

4. Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.6 NOISE CONTROL

1. Adhere to local noise bylaws.

2. Equip vehicles and equipment with efficient noise attenuation devices (mufflers) to minimize noise levels in vicinity of Site

3. Where necessary place noise attenuation devices (barriers) around stationery pumps and compressors.

1.7 WASTE MANAGEMENT CONTROL

1. Prepare Waste Audit and Waste Reduction Plans in accordance with O.Reg. 102/94 made under the environmental Protection Act for Waste Audits and Waste Reduction Work Plans. Ensure these plans are prepared prior to construction or demolition work proceeds on Site.

2. Prepare and implement a Source Separation Program in accordance with Ont. Reg. 103/94 made under the environmental Protection Act for Industrial Commercial source Separation Programs. Ensure program is implemented prior to construction or demolition work proceeds on Site.

3. Post plans on Site where most workers will see them and allow any worker to view plans who makes such a request.

4. The following set of definitions are intended to augment terms provided within this Article:

1.8 3 R: REDUCE (REDUCTION), REUSE, RECYCLE

1. REDUCE (REDUCTION) - Reduction involves actions to minimize quantity of waste at source and consequently, assumes highest priority in hierarchy of 3R activities.

2. REUSE - Direct reuse of products which otherwise would become waste, provides another means of diverting quantity of waste destined for landfill.

3. RECYCLE - Recycling involves collection of materials for use as feedstock in manufacturing of new products. Recycling can be most effectively accomplished if recyclable materials have been source separated at point of generation.

4. SOURCE SEPARATION - Purposeful segregation of materials from designated solid waste stream into specific material types at point of generation to facilitate recycling.

5. SOURCE SEPARATED MATERIALS - Specific types of materials that have been purposefully segregated from municipal waste into specific material types at point of generation.

6. CONSTRUCTION BUSINESS - Business enterprise employing more than 50 persons out

of 1 office involved in building, renovation and repair of immobile structures, including soil excavation and landscaping.

7. DEMOLITION BUSINESS - Business enterprise employing more than 50 persons out of 1 office involved in dismantling any immobile structure, facility or dwelling.

8. Apply waste management activities of reduction, reuse and recycling of waste materials during construction and/or renovation of this Contract.

9. Construction/Demolition Businesses shall be required to source separate in accordance with Ont. Reg. 103/94, for purposes of recycling, following materials:

    1. corrugated cardboard

    2. wood waste (i.e. non-treated dimensional lumber, manufactured wood) non-painted gypsum board

    3. ferrous metals

    4. Brick and Portland cement concrete

10. Submit agreement as requested to include source separation of above identified materials and other waste diversion activities during construction phase.

11. Requirements: During construction phase, Contractor shall be required to comply with following program requirements:

    1. Identify sorting, storage and disposal requirements anticipated during construction to maximize waste diversion.

    2. Establish reduction, reuse and on-site source separation activities during construction.

12. Identify haulers and recycling companies that have entered into agreement with or have expressed willingness to enter into such agreement with Contractor.

13. Identify person responsible for source separation program.

14. Establish effective education and information program for on-site employees, including training sessions, use of signs, and designated waste diversion program.

15. Establish cooperative agreements with Sub-Contractors/trades to abide by waste diversion program.

16. Contractor shall be willing to allow monthly on-site visits by Architect to review waste management/recycling program.

17. Immediately upon notification of award of Contract, and before starting work on Site, submit fully completed "Sub-Contractor Participation Form" appended to this

Section to the Architect.

18. Contractors shall provide evidence that they can and shall implement required waste diversion program. Provision of evidence includes, but is not limited to following:

    1. Written agreements with Sub-Contractors that they will participate in waste diversion program.

    2. Letters from reuse/recycling markets that they are in position to accept designed materials.

    3. Action plan prepared by Contractor for meeting objectives of waste diversion program; and

    4. Contract Sum shall include costs for implementing waste diversion program.

1.9 HAZARDOUS MATERIALS

1. See Section 00840 Hazardous Materials.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SUBCONTRACTOR PARTICIPATION FORM

For source separation program to be effective, it is important for Subcontractors/trades to work cooperatively with your company. To ensure this cooperative arrangement will be carried out, you may wish to ask Subcontractors/trades companies to sign this agreement.

I hereby agree to participate in the source separation program to the best of my abilities.

1. Company Name _____

   Address _____

   _____

   Signature _____

2. Company Name _____

   Address _____

   _____

   Signature _____

3. Company Name _____

   Address _____

   _____

   Signature _____

4. Company Name _____

   Address _____

   _____

   Signature _____

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

1. Systems demonstration
2. Document submission
3. Project commissioning
4. Inspection and takeover procedures

1.2 SYSTEM DEMONSTRATION

1. Prior to final inspection, demonstrate operation of each system to the Owner and Consultant.

1.3 DOCUMENTS

1. Collect reviewed submittals in Section 01010 and 01300 and assemble documents executed by Subcontractors, suppliers, and manufacturers. Submit as per requirements in Section 01010 - General Requirements.
    1. Provide bonds fully executed and notarized.
    2. Submit a final statement of accounting giving total adjusted Contract Sum, previous payments, and monies remaining due.
    3. Architect will issue a final change order reflecting approved adjustments to Contract Sum not previously made.

1.4 PROJECT COMMISSIONING

1. Expedite and complete deficiencies and defects identified by the Consultant.
2. Review record "as-built" drawings for completeness and then have “as-built” AutoCad 2010 or later drawings completed by a professional drafting service and provide “as-builts” on computer disks.
3. Review Cash and Contingency Allowances in relation to Contract Price, change orders, hold-backs and other Contract Price adjustments.
4. Submit required documentation such as statutory declarations, Workplace Safety & Insurance Board Certificates, certificates of approval or acceptance from regulating bodies.
5. Attend "end-of-work" testing and break-in or start-up demonstrations.

6. Review inspection and testing reports to verify conformance to the intent of the documents and that changes, repairs or replacements have been completed.
7. Meet with structural consultant and inspection and testing consultant to co-ordinate completion, testing approvals.

1.5 INSPECTION/TAKEOVER PROCEDURES

1. The requirements of OAA/OGCA Document No. 100 "Take-Over Procedures" also govern applicable take-over procedures for this Contract.

2. Prior to application for certificate of Substantial Performance, carefully inspect the Work and ensure it is complete, that major and minor construction deficiencies are complete and/or corrected and the building is clean and in condition for occupancy. Notify the Architect, in writing, of satisfactory completion of the Work and request an inspection.

3. During the Architect/Consultant inspections, lists of deficiencies and defects will be tabulated. Correct same.

4. When the Architect/Consultants consider deficiencies and defects have been corrected and it appears requirements of the Contract have been performed, make application for certificate of Substantial Performance. Refer to General Conditions Article GC 14 for specifics to application.

5. All utility meters to be read and transferred into the Owner's name.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

1. Environmental Protection – Section 01560

1.2 DUST AND CLEANING REQUIREMENTS

1. Standards: Maintain project in accordance with the latest edition of The Occupational Health and Safety Act.

2. Hazards and Dust Control:

.1 Provide adequate ventilation during use of volatile or noxious substances.

.2 Prevent spread of dust beyond the construction site by wetting, or by other means suitable for conditions, as it accumulates.

.3 Provide Tack Mats at entrances to prevent dust and dirt from being traced through the project as required. Dispose of mats and replace on regular basis with new mat.

3. Floors:

.1 Keep troweled concrete floors free from oils, grease or other materials likely to damage them, discolour them or affect bond of applied finishes. Once building is enclosed, keep floors as dry as possible after curing.

.2 To prevent soiling or damage to finish flooring where pedestrian traffic occurs after the flooring has been installed, install and maintain reinforced kraft paper temporary protection, secured in place and with joints sealed by reinforced pressure sensitive tape.

.3 Install plywood panels of minimum ¼" thickness over completed finish flooring materials on which further construction work is performed or delivery of products is made, or both. Seal joints between panels with reinforced pressure sensitive tape.

1.3 MATERIALS

1. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

2. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 DURING CONSTRUCTION

1. Execute cleaning to ensure that building, grounds, and public properties are maintained free from accumulations of waste materials and rubbish. Keep site clear of snow, mud and pooling of water due to severe rain. Ensure that work is not stopped because of failure to provide access to site.

2. Wet down dry materials and rubbish to prevent blowing dust.

3. At reasonable intervals during progress of Work, clean site and public properties and dispose of waste materials, debris and rubbish.

4. Unless otherwise specified, salvaged material resulting from construction, and surplus materials and construction debris shall become property of Contractor, who shall dispose of it away from site.

5. Vacuum clean interior building areas when ready to receive finish paining and continue vacuum cleaning on an as-needed basis until building is ready for Substantial Performance or occupancy.

6. Obtain from each Subcontractor, instructions which designate proper methods and materials to be used in final cleaning and submit such instructions to the Consultant. Include Instructions in Manufacturer's Data Book specified in Section 01300.

7. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

8. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

3.2 FINAL CLEANING

1. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all surfaces exposed to view; leave project clean and ready for occupancy.

2. Employ experienced workers, or professional cleaners, for final cleaning.

3. In preparation for Substantial Performance or occupancy, conduct final inspection of interior and exterior surfaces exposed to view, and of concealed spaces.

4. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from all sight-exposed interior and exterior finished surfaces; polish resilient and ceramic surfaces so designated to shine finish. Vacuum carpet.

5. Clean and polish glass and mirrors.

6. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.

7. Broom-clean paved surfaces; rake clean other surfaces of grounds.

8. Clean filters, exposed ductwork, and structure.

9. Clean bulbs and lamps and replace those burned out.

10. Clean diffusers and grilles.

11. Clean sinks, faucets, and water closets and controls.

12. Remove snow and ice from access to building.

13. Maintain cleaning until project, or portion thereof, is occupied by Owner.

3.3 REMOVAL OF TEMPORARY FACILITIES

1. Completely remove temporary facilities from site, making good any damage when no longer required.

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

1. The printed forms outlined below shall form the basis of communication between the Architect and the General Contractor. Copies of forms unrelated to the issuance of monies, shall be kept on the site; neatly filed and readily accessible to the parties concerned.

2. TRANSMITTAL RECORD

    1. A record of material issued by the Architect or General Contractor.

3. GENERAL REVIEW REPORT

    1. A progress report completed by the Architect or Consultant on a regular basis.

4. PROPOSED CHANGE

    1. A description of contemplated changes to the Contract.

5. CASH ALLOWANCE CHANGE ORDER

    1. Assignment of money for work executed under the Cash Allowance Section.

6. CHANGE ORDER

    1. Assignment of money for work executed beyond the financial limits of the Contract.

7. CHANGE DIRECTIVE

    1. A description of a change in the work when the Owner requires the Contractor to proceed with a change in the work prior to the Owner and the Contractor agreeing upon the adjustment in Contract Price and Contract Time.

8. CERTIFICATE FOR PAYMENT

    1. For release of contract money based on monthly progress draws.

9. SUPPLEMENTAL INSTRUCTIONS

    1. A description and/or clarification for the purpose of recording a clarification or interpretation of the contract documents or giving directions on problems resulting from field conditions.

END OF SECTION

PART 1 GENERAL

1.1 NEWFORMA SOFTWARE SYSTEM

1. This project will be administered through the Architect using the NEWFORMA software system.

2. The Contractor is required to use this internet-based software for ALL project communications, RFIs, quotations, project schedule, shop drawing log, change log, RFI log, etc., including all administrative forms as outlined in Section 01800 and construction schedules as outlined in Section 01310. All shop drawings, interference drawings and as-built drawings shall be submitted electronically through the Newforma Info Exchange in PDF format and shall be numbered in the order which they are submitted. Numbering shall be in the following format; 001, 002, 003, etc. Submittals will not be deemed as received unless delivered through Newforma Info Exchange.

3. Utilization of this system does not require the purchase or download of the Newforma software. The Architect will send an email notification which will automatically provide online access to the Newforma Info Exchange specific to this project.

1.2 NEWFORMA INSTRUCTIONS

1. You will receive an email instructing you how to get into the system (click on link). The system is self-explanatory as to the "use" for Submittals (Shop Drawings) and RFIs. Refer to attached screen shots.

2. When issuing Submittals and RFIs, the following people are to always be COPIED (not addressed to):

   Linda Butler **lbutler@plusvg.com**

3. Shop Drawings are to be issued as "Submittals". There is a place on the Submittal section to put in the Contractor's "expected response date" – please ensure that is filled in. Submittals are to be numbered in the sequence which they are submitted. Numbering to be as follows; 001, 002, 003, etc. (NOTE: as per the contract, the Architect has 10 working days to respond).

4. RFIs: There is a place on the RFI section to put in the Contractor's "expected response date" – please ensure that is filled in. RFI's are to be numbered in the sequence which they are submitted. Numbering to be as follows; 001, 002, 003, etc. (NOTE: as per the contract, the Architect has 5 working days to respond)

5. RFCs: (all Contractor quotations to be submitted as an RFC) RFC's are to be numbered in the sequence which they are submitted. Numbering to be as follows; 001, 002, 003, etc.

6. Submittals and RFI's requiring consultant review other than the Architect shall be sent via Newforma directly to the respective consultant. The +VG Project Manager as well as the persons noted above shall be copied on all submittals and RFI's.

7. All shop drawings, interference drawings and as-built drawings shall be submitted electronically through the Newforma Info Exchange in PDF format. Submittals will not be deemed as received unless delivered through Newforma Info Exchange.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary conditions as well as Divisions 01 and 1 Specification Sections apply to this section.

1.2 SUMMARY

1. This section requires the selective removal and subsequent disposal of the following:

    1. Carry out demolition in accordance with requirements of CSA S350-M. Demolish and remove materials from Site.

    2. Work includes but is not limited to demolition and/or removal of portions of existing building ,doors, windows, flooring, roofing, ceiling, plumbing fixtures, concrete, fixed furnishings, railings, mechanical equipment/components, and/or electrical work.

    3. Conduct all demolition and removal work as indicated on drawings and as required to accommodate new construction.

    4. Removal and protection of existing fixtures, materials, equipment and/or items indicated to remain, reuse return to Client and/or salvage.

    5. Contractor to remove existing millwork, sinks, appliances, ductwork, plumbing and electrical as noted on the drawings.

    6. Locate, identify, stub off, and disconnect utility services that are not indicated to remain.

    7. Materials and debris shall not be stacked in building but removed entirely from all circulation spaces at the end of each day.

    8. At end of each day's work leave work in safe and clean condition.

1.3 REMOVAL OF WORK SPECIFIED ELSEWHERE

1. Cutting non-structural concrete floors and masonry wall for piping, ducts and conduits is included with the work of the respective fire suppression, plumbing, HVAC and electrical specifications sections in Divisions 20 to 26.

1.4 RELATED WORK SPECIFIED ELSEWHERE

1. Remodelling construction work and patching are included within the respective sections and drawings, including removal of materials for reuse and incorporation

into remodelling or new construction.

2. Relocation of pipes, conduits, ducts and other mechanical and electrical work is specified in their corresponding divisions.

1.5 SUBMITTALS

1. Submit the following in accordance with Conditions of the contract and Division 01 specifications sections.

    1. Schedule indicating proposed sequence of operations for selective demolition work to Owner's Representative for review prior to start of work. Include coordination for shutoff, capping and continuation of utility services as required, together with details for dust and noise control protection.

    2. Photographs of existing conditions of structure surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal operations.

    3. File submittals with Owner's Representative prior to start of work.

1.6 STANDARD REFERENCES

1. CSA S350 M80 (R2003) Code of Practice for Safety in Demolition of Structures.

1.7 JOB CONDITIONS

1. Some work may be required to be completed after hours and on weekends.

2. Partial demolition and removal:

    1. Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progressed. Transport salvaged items from site as they are removed.

    2. Storage or sale of removed items on site will not be permitted.

1.8 PROTECTION

1. Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to selective demolition work.

2. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structure or element to be demolished to adjacent facilities or work to remain.

3. Protect from damage existing finish work that is to remain in place and become

exposed during demolition operations.

4. Protect floors with suitable coverings when necessary.

5. Protect all existing adjacent work (wainscoting, plaster walls, bases and trim, etc) against damages which might occur from falling debris, scrapes or other causes due to work of this Section.

6. Construct temporary insulated dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks.

7. Ensure that all dust and debris is removed before finishing work commences.

8. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building. .

9. Remove protections at completion of work.

1.9 DAMAGES

1. Inform Owner's Representative immediately of any damage caused to adjacent facilities during demolition activities.

2. Promptly repair damages caused to adjacent facilities by demolition work once Owner's Representative gives the order proceed.

1.10 TRAFFIC

1. Conduct selective demolition operations and debris removals to ensure minimum interference with roads, streets, walks and other adjacent occupied or used facilities.

    1. Do not close or otherwise obstruct streets or walks without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

1.11 QUALITY ASSURANCE

1. Regulatory Requirements: Conform to the latest Occupational Health and Safety Act, as currently amended.

2. Most recent Occupational Health and Safety Act, as currently amended,

3. Conform to OBC, as applicable.

4. Conform to Fire Code, Regulation under Fire Marshals Act, especially Part 8.

5. Flame Cutting: Only if permitted by authorities having jurisdiction.

    1. Do not use torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of ducts and pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.

6. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operation.

    1. Do not interrupt utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities as acceptable to governing bodies.

    2. Maintain fire protection services during selective demolition operations.

    3. Provide bypass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shutdown service is necessary during changeover.

7. Environmental Controls: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with regulations pertaining to environmental protection.

8. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding and pollution.

9. Remove hazardous materials in accordance with applicable laws and regulations.

1.12 DISPOSAL OF WASTER MATERIALS

1. Selling or burning of materials on Site is not permitted.

2. Provide bin for garbage on sidewalk in a location acceptable to the Owner.

3. Conform to requirements of municipality's Works Department regarding disposal of waste materials.

4. Materials prohibited from municipality waste management facilities shall be removed from Site and disposed of at recycling companies specializing in recyclable materials

PART 2 PRODUCTS Not Used

PART 3 EXECUTION

3.1 PREPARATION

1. Provide interior and exterior shoring, bracing or support to prevent movement, settlement, or collapse of are to be demolished and adjacent facilities to remain.

2. Cease operations and notify Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

3. Cover and protect furniture, equipment and fixtures to remain from soilage or damage when demolition work is performed in areas where such items have not been removed.

4. Provide and weatherproof closures for exterior opening resulting from demolition work.

3.2 DEMOLITION

1. Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on drawings in accordance with demolition schedule and governing regulations.

2. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.

3. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors or framing.

4. Provide services for effective air and water pollution controls as required.

5. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions.

6. If unanticipated mechanical, electrical or structural elements are encountered and conflict with intended function or design, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written accurate detail. Pending receipt of directive from Owner's Representative, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.

3.3 SALVAGED MATERIALS / EQUIPMENT

1. Salvaged items: Where indicated on drawing as "Salvage" or "Deliver to

Owner", carefully remove indicated item (s), clean, store and turn over to Owner and obtain receipt.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

1. Remove from building site debris, rubbish and other materials resulting from demolition operations. Transport and legally dispose off site.

2. If hazardous materials are encountered during demolition, comply with applicable regulations, laws and ordinances concerning removal, handling and protection against exposure or environmental pollution.

3. Burning of removed materials is not permitted on project site.

3.5 CLEANUP AND REPAIR

1. Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove partitions and leave interior areas clean.

2. Repair/replace areas, components and/or items that were intended to remain but got damaged during demolition work
to the full satisfaction of the Owner.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

1.1 Section One, General Requirements, is a part of this section and shall apply as if repeated here.

1.2 SCOPE

1. Provide topsoil at all areas receiving new seeding for repair of existing grassed areas disturbed by the work of this Contract.

1.3 TESTING

1. Inspection and testing of topsoil is required and will be carried out as follows:

    1. **Stockpiled Topsoil**: BASIC AGTEST TOPSOIL REPORT

    2. **Imported Topsoil**: BASIC AGTEST TOPSOIL REPORT WITH ATRIZINE

    ** Both soil tests must include soil modification and fertility recommendations.*

2. Testing to be paid out of the cash allowance.

3. An additional soil test may be required after the soil has been amended at the direction of the Landscape Architect.

4. Submit the soil testing report to the Consultant for approval before commencing work.

5. Conform to recommendations from soil testing agency with respect to improvement of tested topsoil.

6. Adjust fertilizer requirements and rates as well as addition of other additives, to conform to soil testing recommendation, at no extra cost to the contract.

PART 2 PRODUCTS

2.1 MATERIALS

.1 All topsoil, supplied by the Contractor shall meet the following requirements:

pH	5.5-7.5
Total Salts (mmhos/cm)	<1.5

Organic Matter%	4-15
Phosphorus (ppm)	10-60
Potassium (ppm)	80-250
Magnesium (ppm)	100-300
Calcium (ppm)	1000-4000
Sodium (ppm)	<200
Chloride (ppm)	<100
Sodium Absorption Ratio	<15
Sand Fraction %	20-75
Silt Fraction %	5-50
Clay Fraction %	5-30
Texture	Loam/Sandy
Atrazine (ppm)	<0.05

PART 3 EXECUTION

3.1 TOPSOIL SPREADING AND FINE GRADING

1. Spread topsoil to the following depths:

    1. 150 mm for all areas to be seeded and sodded.

    2. Depth indicated is compacted depth.

    3. Spread topsoil on prepared sub-grade of the work site.

    4. Fine grade topsoil to produce a smooth even surface free from debris, sod, stones larger than 20 mm diameter and roots.

    5. Compact (85% Standard Proctor Density).

    6. Meet and match all existing turf areas, curbs, manholes and catch basin frames in a smooth uniform line to the satisfaction of the Consultant.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

1. Section 01010 - General Requirements

2. Section 02920 - Topsoil Placement and Grading

1.2, TRANSPORTATION

1. Protect sod from drying out during transportation by covering with tarpaulin.

2. Lay sod immediately after arrival on job site, but no later than within 36 hours of lifting.

3. Do not lay broken and dried-out sod but remove from site immediately.

1.3 SCHEDULING

1. Schedule sod laying to coincide with topsoil operations.

PART 2 PRODUCTS

2.1 MATERIALS

1. **Nursery Sod**: Certified No. 1 Cultivated Turf Grass Sod, grown in accordance with the metric "Guide Specification for Nursery Stock", Section 17, 1984 edition, published by Canadian Nursery Trades Association. Sod for Sport Field areas to be supplied in large rolls.

2. **Wood Pegs**: 17 x 17 x 200mm.

3. **Water**: Potable and free of materials which may be detrimental to growth.

4. **Fertilizer**: Complete synthetic, slow-release fertilizers of approved manufacture. They shall contain not less than 60% urea-formaldehyde and the following percentages by weight:

Nitrogen	Phosphoric Acid,	Potash
10	10	10
0	20	10
5	20	20

1. Superphosphate must contain a minimum of 20% P_2H_5 and have same approved prior to sodding.

2. All fertilizer shall be clearly marked with the name of manufacturer, contents, weight and materials.

3. Fertilizer shall be stored in a weatherproof storage place and in such a manner that it will stay dry and its effectiveness will not be impaired.

5. **Topsoil:** A fertile, friable, natural loam (A horizon layer), capable of sustaining vigorous plant growth, free of subsoil contamination, roots and stones over 50mm diameter, reasonably free of weeds (as determined by the Contract Administrator), and falling within the following guidelines:

Soil Texture Range: (OMAFRA)soil texture triangle)	**loam to sandy loam**	**clay loam**
pH range:	5.5 to 7.9	5.5 to 7.9
Total Salts (mmhos/cm)	less than 1.5	less than 1.5
Organic Matter (%)	4% to 15%	4% to 15%
N - Nitrogen (ppm)	See below	See below
P - Phosphorus (ppm)	10 – 60	10 – 60
K - Potassium (ppm)	80 – 250	80 – 500
Mg - Magnesium (ppm)	100 – 300	100 – 600
Ca - Calcium (ppm)	1000 – 4000	1000 – 7000
Na - Sodium (ppm)	less than 200	less than 200
Cl - Chloride (ppm)	less than 100	less than 100
Sodium Absorption Rate	less than 15	less than 15

6. **Nitrogen**: Provide the required amount of nitrogen as identified in the soil test report at no additional cost to the Contract.

7. Arrange and pay for testing to be carried out by:
Agri-Food Laboratories, www.agtest.com
1-503 Imperial Rd. N., Guelph, ON, N1H 6T9,
1.800.265.7175 | 519.837.1600

8. A&L Canada Laboratories Inc., alcanadalabs@alcanada.com
136 Jetstream Rd, London, ON N5V 3P5
T 519.457.2575 | F 519.457.2664

9. or an equally reputable independent testing company approved by the Contract Administrator.

10. Conduct a Basic Topsoil Test from each proposed source which includes: Soil Texture (% Sand, % Silt, % Clay), Total Salts, Organic Matter, pH, Bph, available Nitrogen, Phosphorus, Potassium, Magnesium, Calcium, CEC, Chloride, Sodium, and SAR. If topsoil source is a former farm field, also conduct a test for Atrazene. Obtain recommendations for amendments and the quantities and type of fertilizers needed to eliminate the deficiencies made evident by the testing. Amend as directed at no additional cost to the Contract.

11. Submit the results of soil testing and fertilizer recommendations to the Contract Administrator for approval before commencing with the work. Provide topsoil results at least 4 weeks prior to installation

PART 3 EXECUTION

3.1 LAYING OF SOD

1. Have finish grade approved by Contract Administrator prior to sodding.

2. Where liming is required, apply ground limestone and work well into topsoil before applying fertilizer.

3. Be prepared to supply all necessary fertilizers to correct any deficiencies indicated by the soil analysis. The Contract shall be deemed to include the cost of soil amendments based on the following minimum rates:

10-10-10	@	11.0	kg/100 sm, or
0-20-10	@	6.5	kg/100 sm, or
5-20-20	@	6.5	kg/100 sm, or
Superphosphate	@	13.5	kg/100 sm

4. The specified fertilizer shall be applied to and well worked into topsoil by discing, raking or harrowing. Fertilizer shall be applied within 48 hours before laying sod.

5. Lay sod immediately after arrival on site, but not later than within 36 hours of lifting.

6. Do not install sod over frozen soil or at freezing temperatures, or during excessively wet conditions.

7. Install sod close-knit so that no open joints are visible, and no pieces are overlapping.

8. Lay sod smooth and flush with adjoining grass areas, paving surfaces and top of curbs.

9. In swales and ditches, sod is to be installed perpendicular to direction of water flow.

10. Water sod immediately after laying to obtain moisture penetration into top 100mm of topsoil.

11. After sod has dried sufficiently to prevent damage, roll area with roller to provide close contact between sod and soil and to remove irregularities.

3.2 LAYING OF PEGGED SOD

1. Lay sod section perpendicular to slopes steeper than 3:1 and secure with wooden pegs. Place 3 pegs per m^2, 100mm below top edge to prevent shifting of sod and

drive pegs flush with top of sod level.

2. In drainage swales, install 6 pegs around entire edge of each square meter of sod.

3.3 PROTECTION

1. Install snow fence-type barriers in all areas which are subject to trespassing and undue traffic.

2. Maintain barriers and remove immediately after final inspection and acceptance.

3.4 MAINTENANCE

1. Water sodded areas in sufficient quantities and at frequency required to maintain soil under sod continuously moist to depth of 75 to 100mm.

2. Cut grass to 40mm when it reaches height of 50mm. Remove clippings which will smother grassed areas.

3. Fertilize sodded areas one month after sodding with 2:1:1 ratio fertilizer. Spread evenly at rate of 0.75 kg of nitrogen/100 square meters and water in well.

3.5 PRELIMINARY ACCEPTANCE

1. Substantial Completion will be granted provided that:

    1. All sod is well established and in vigorous growing condition.

    2. Sod is free of bare and dead spots and is without weeds.

    3. No surface soil is visible when grass has been cut to 40mm height.

    4. Sodded area has been cut a minimum of two (2) times.

3.6 FINAL ACCEPTANCE

1. Final acceptance will be provided two years after Substantial Completion provided that all sodded areas are well "knitted-in" and in a condition equal to that at Substantial Completion with allowance for normal wear and tear.

3.7 GUARANTEE

1. Guarantee all sodded areas for two years after Substantial Completion.

2. During the guarantee period replace all sod that is bare, dead, diseased, or has failed to establish.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

.1 Provide all labour, materials, equipment, access cooperation and services to allow the testing of concrete and concrete reinforcement.

.2 The scope of the required quality assurance testing described in this section is to inform Contractor of the type and scope of testing on this project and provide for appropriate allowances.

1.2 QUALITY VERIFICATION

.1 Reference Standards, Codes and Acts

.1 The latest edition of the following Reference Standards, Codes, and Acts shall govern Work of this Section. Standards referenced within the Standards noted below are to apply even if they are not included in the list.

.1 National Building Code of Canada 2010 (NBCC)

.2 Ontario Building Code, 2012 (OBC)

.3 Canadian Standards Association (CSA)

.1 CAN/CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction, Methods of Test and Standard Practices for Concrete.

.2 CSA A23.3-04, Design of Concrete Structures.

.3 CSA S413-07, Parking Structures.

.4 Ontario Provincial Standard Specification (OPSS)

.1 OPPS 1442, Material Specification for Epoxy Coated Reinforcing Steel Bars for Concrete.

.2 Ontario Provincial Standard Specification (OPSS) 1443 Material Specification for Organic Coatings for Reinforcing Steel Bars for Concrete.

.5 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

PART 2 - PRODUCTS

2.1 RESPONSIBILITY OF THE CONTRACTOR

.1 Contractor shall cooperate fully with the terms of the Project Agreement.

.2 Contractor shall give the independent inspection and testing agency at least 24 hours prior notice of a concrete placement.

.3 It is the responsibility of Contractor to provide a finished product that meets the specification. Additional testing will be required for initial tests that indicated the concrete failed to meet the specification requirements.

.4 Contractor shall be responsible for costs associated with additional testing resulting from rejected work, or proposed alternatives, and shall be responsible for the costs of remedial work.

PART 3 - EXECUTION

3.1 GENERAL

.1 All concrete strength tests shall be numbered consecutively and the cylinders marked as follows:

- .1 7-day test: Marked “A”
- .2 28-day test: Two (2) cylinders marked “B” and “C”
- .3 56-day test: When required, two cylinders marked “D” and “E”

.2 All test reports shall record:

- .1 Name of project;
- .2 Date and time of sampling;
- .3 Name of supplier;
- .4 Delivery truck number;
- .5 Batch time and discharge time;
- .6 Identification of sampling and testing technicians;
- .7 Exact location in the structure of the concrete sampled;
- .8 Design strength of concrete sampled;
- .9 Admixtures, cement type, and maximum aggregate size;
- .10 Air and concrete temperature;
- .11 Slump and air content.

.3 All field cured cylinders shall be marked “F”

.4 Slump tests shall be performed prior to the addition of superplasticizers.

.5 Tests for slump and air content shall be taken with each strength test and as required.

.6 Chloride ion tests shall be performed on the first set of compressive test cylinders taken from the first parking slab pour, to show that the chloride ion content of these mixes satisfies the limits set out in CAN/CSA A23.1.

3.2 REGULAR TESTING – CONCRETE

.1 To conform to the Standards, except each test shall consists of three (3) test cylinders:

.1 One (1) for 7-day strength

.2 Two (2) for 28-day strength

.2 Testing for concrete with SCM's to reduce the cement content (greater than 30% cement reduction as defined in SECTION 03 30 00) to conform to the Standards, except each test shall consist of 4 cylinders:

.1 One (1) for 7-day strength

.2 One (1) for 28-day strength

.3 Two (2) for 56-day strength

.3 Regular testing applies to all elements not listed in 3.03 FULL TIME TESTING - CONCRETE

3.3 FULL TIME TESTING – CONCRETE

.1 Full time testing shall apply to:

.1 Concrete above 40 MPa design strength

.2 Parking slab concrete in suspended slabs

.2 Shall conform to the Standards and Regular testing except:

.1 The independent inspection and testing agency shall have personnel on the job site at all times when the concrete requiring full time testing is being placed.

.2 Test the slump and air content from every truck and reject any concrete not within the specification.

3.4 FIELD CURED CYLINDERS

.1 Field cured cylinders shall be stored on the floor right below the slab they represent and be protected against wind unless the floor below is heated, in which case they shall be stored on top of the representative slab but covered with a plywood box. The cylinders are to be undisturbed at this location until picked up by the independent testing and inspection agency.

3.5 TESTING OF CONCRETE REINFORCEMENT

.1 The independent inspection and testing agency shall, at the start of the project, perform at least one (1) tensile test and bend test for each bar size used. Such testing shall comply with the applicable CSA Standard.

.2 The independent inspection and testing agency will select the bars to be tested from the reinforcing supplied to the construction site, not from the suppliers' yard.

.3 Mill certificates of the chemical analysis in accordance with CAN/CSA G30.18R and G30.18W shall be prepared when requested.

.4 For epoxy coated reinforcing steel, the independent inspection and testing agency will visit the epoxy coating fabrication site, as required, to satisfy themselves that the fabrications and quality control process is in accordance with ASTM A775M.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

.1 Provide all labour, methods, equipment and accessories to supply, install, erect and remove as appropriate, formwork, accessories and temporary shoring or reshoring necessary to construct the concrete structure shown on drawings, specified herein, and as required for the complete and proper execution of Work of this Section, including, but not limited to, the following:

- .1 shoring, falsework, and reshoring;
- .2 plywood, glass fibre reinforced or metal forms;
- .3 Forms;
- .6 vertical drainage pans;
- .7 round column fibre forms;
- .8 form ties, chamfers, joint tape;
- .9 lintel and shelf angle anchors;
- .10 Expansion joints;
- .12 expansion joint filler

1.2 QUALITY VERIFICATION

.1 Reference Standards, Codes and Acts.

- .1 The latest edition of the following Reference Standards, Codes, and Acts shall govern Work of this Section. Where there are differences between the specifications and drawings and the codes, standards, or acts, the most stringent shall govern. Standards referenced within the Standards noted below are to apply even if they are not included in the list.
  - .1 National Building Code of Canada, 2010 (NBC).
  - .2 Ontario Building Code, 2012 (OBC).
  - .3 American Society for Testing and Materials International (ASTM).
    - .1 ASTM D1751-04(2008), Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
    - .2 ASTM D1752-04a(2008), Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
  - .4 Canadian General Standards Board (CGSB).
    - .1 CGSB Standard 41-GP-35M, Polyvinyl Chloride Waterstop.
  - .5 Canadian Standards Association (CSA)

.1 CAN/CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction, Methods of Test and Standard Practices for Concrete;

.2 CSA-A23.4.09, Precast Concrete - Materials & Construction;

.3 CSA S413-07 (R2000), Parking Structures;

.4 CSA-O86-01, Engineering Design in Wood;

.5 CSA O151-09, Canadian Softwood Plywood;

.6 CSA O153-M1980(R2008), Poplar Plywood;

.7 CSA O325-07 (R2012), Construction Sheathing;

.8 CSA-O437 Series-93(R2006), CSA Standards for OSB and Waferboard;

.9 CSA S269.1-1975(R2003), Falsework for Construction Purposes;

.10 CSA-S269.2-M87(R2003), Access Scaffolding for Construction Purposes;

.11 CSA-S269.3-M92 (R2008), Concrete Formwork.

.2 Qualifications:

.1 Design of formwork, shoring, falsework and reshoring for suspended concrete structural members shall be by a Professional Engineer experienced in the design of concrete formwork, falsework, shoring and reshoring and licensed in the Province of Ontario. Design Engineer for formwork, falsework, shoring, and reshoring, must be insured against professional liability in accordance with Contract Documents.

.3 Quality Verification:

.1 As per SECTION 03 05 00.

.2 Maintain a copy of both CAN/CSA-A23.1/A23.2 and ACI 117 on site and be familiar with the provisions related to tolerances for concrete work.

.3 Ensure that the Professional Engineer responsible for design of formwork, falsework, shoring, and reshoring conducts field review.

.4 Provide competent supervisor experienced in concrete formwork, shoring, and reshoring construction to direct work of this Section.

.5 Before each concrete placement, inspect formwork and accessories for conformance with shop drawings and the requirements of the design as necessary.

.6 Schedule Work to allow sufficient time and provide free access for the Independent Inspection and Testing Agent to conduct periodic field review prior to concrete placement.

.7 Notwithstanding any requirement of Reference Standards, field review of Work of this Section shall be periodic based on a rational sampling program.

1.3 DESIGN

.1 Formwork and Reshoring

.1 Design formwork and reshoring to safely support vertical and lateral loads until they can be supported by the structure. Design formwork for loads and lateral pressures recommended in CSA S269.3 and other applicable design standards.

.2 Design and provide shoring and bracing to excavations and underpinning to safely withstand any lateral pressures to which they may be subjected.

.3 Design shores for these slabs and walls to safely support the total vertical and lateral loads until the walls and slabs are complete and have reached 70% of their specified strength. Design the shores so that they can be unloaded gradually.

1.4 ARCHITECTURAL CONCRETE

.1 Quality of Finish:

.1 The quality of finish shall be such that, when the forms are stripped, it meets the standards set out below without further finishing work other than clean up.

.2 Dense, even concrete, free of defects such as nails, ties, temporary inserts, honeycombing, inconsistencies in plane, severe cold joint lines, and loss of fines. Defects shall necessitate replacement. Patching is not permitted and if used shall constitute a defect. Repairs, i.e. removal of sections of a member, may be carried out if approved by the Contractor's Design Team, but the repair shall match the colour and texture of the surrounding concrete.

.3 Concrete members of generally uniform colour.

.4 Concrete members with sharp, accurate definition at corners, arises, and reglets generally free of chipped or spalled areas and within dimensional tolerances set out in CSA A23.1 and CSA A23.2. Members shall be visually straight.

.5 Plane surfaces without protuberances, indentations, ridges, or bulges.

.6 Under no circumstances shall repair to any architectural concrete be undertaken without the written consent of the Contractor's Design Team. Concrete members which are repaired without consent shall be classified as defective Work and the may require removal and replacement.

.2 Samples and Assistance

.1 General

Supply samples of all materials and the following, the cost of which shall be paid for by this trade.

.1 Show method and schedule of construction, materials, arrangement of joints, ties, shores, liners, and locations of temporary embedded parts.

.2 Sample Panels/Areas - Architectural Concrete Forms

.1 Well in advance of constructing architectural concrete, to prove out the materials and procedures proposed; construct a sample section of each type of architectural concrete utilizing portions of the concrete structure not exposed to view in the finished building.

.2 If the sample panels do not meet the minimum standards specified it may be necessary to construct additional samples, again utilizing portions of the structure to be concealed. The quality of the approved samples along with the criteria specified shall be the minimum standards for architectural concrete.

1.5 SUBMITTALS

.1 Shop Drawings:

.1 Submit Shop Drawings for formwork & reshoring. Comply with CAN/CSA-S269.3. The structural drawings shall not be reproduced, in whole or in part, for use as shop drawings.

.2 As-Built Drawings

.1 Mark on a complete set of final reproducible drawings any changes, additions or deletions that occur during construction as a result of the Contractor's work, change orders, or for any other reason.

1.6 DELIVERY, STORAGE AND HANDLING

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

.2 Handle, transport, store, and install formwork to prevent damage to surfaces affecting appearance of concrete exposed to view.

.3 Protect fibre column forms against damage from weather or impact.

.4 Handle, transport, store, and install construction joint waterstops and expansion joint waterstops to prevent damage or deterioration.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Place materials defined as hazardous or toxic in designated containers.

.2 Divert wood materials from landfill to a recycling, reuse or composting facility as approved by Consultant.

.3 Divert plastic materials from landfill to a recycling or reuse facility as approved by Consultant.

.4 Divert unused form release material from landfill to an official hazardous material collections site as approved by Consultant.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Forms

.1 Formwork lumber: plywood and wood formwork materials shall conform to O86.1 and CSA - O325.0.

.2 Sheathings for exposed surfaces: New, Douglas Fir Plywood not less than 19 mm (¾") thick, concrete form grade, sanded one side, conforming to CSA-O325.0.

.3 Sliding Bearings: as manufactured and supplied by Sorbtex (R.J Scearce Assoc., Burlington), or by Goodco, or an approved alternative consisting of a bottom plate of Teflon bonded to an elastomer backing and a top plate of stainless steel bonded to a steel backing.

.4 Neoprene Bearing Pads: Molded or cut from a sheet of high-grade, neoprene synthetic rubber compound and conforming to current issue of AASHTO specification.

.3 Expansion and Isolation Joint Filler

.1 Bituminous Type:

.1 Premoulded, resilient, non-extruding, asphalt impregnated fibre, to ASTM D1751.

.2 Non-Bituminous Type:

.1 Premoulded, resilient, non-extruding, to ASTM D1752, and compatible with polysulphide urethane, polyepoxide urethane, or neoprene sealants, as applicable.

.4 Dovetail anchor slots:

.1 Minimum 0.6 mm thick galvanized steel with insulation filled slots.

.5 Form Spacers:

.1 (Stay-in-place form spacers exposed to weather, earth, or moisture may not be made of wood, and must be corrosion and decay resistant.)

.6 Architectural Concrete Form Materials:

.1 Reglet material at junction of circular columns and capitals: Neoprene, unicellular foam. Cement in place. Neoprene shall be sufficiently stiff so that it does not deform during concreting.

.2 Plywood sheathing for smooth concrete and concrete to be sandblasted: Evans 107 Plywood at least 17 mm (11/16") thick, or approved alternative.

.3 Board Lining: Undressed, rough, circular sawn, eastern spruce boards with abutting edges smooth sawn. All board lining must be the same species of lumber, and shall confirm to the following thicknesses and widths:

.1 Thicknesses: The boards of each width shall be equally divided among the thicknesses of 12 mm (½"), 17 mm (11/16") and 28 mm (1-1/8").

.4 Form Ties: Williams Shebolt, or approved alternative, threaded internal disconnecting type adjustable in length. Ties shall be designed to act as spreaders and be of such a type that when the external portion of the tie is removed, no metal is left closer than 40 mm (1½") to the surface. Maximum diameter of external portion of tie shall be 12.5 mm (½"). Form Ties: Removable ties fitted with plastic cones leaving holes not larger than 37 mm (1 7/16") in concrete surface.

.5 At all vertical outside corners of forms for walls, balustrades, piers and the like, use continuous threaded coil and corner ties with associated corner brackets and coil wing nuts.

PART 3 – EXECUTION

3.1 PREPARATION

.1 Coordinate for requirements of other Sections which affect Work of this Section.

.2 Coordinate with other Sections, in writing or by schedules, requirements for services, materials, and built-in items stipulated in by other Sections which affect Work of this Section.

.3 Review with the Design Team proposed location and details of construction joints in walls, columns, beams and slabs prior to commencing formwork construction.

.4 Verify lines, levels, centres, dimensions, details, and location of openings and built-in items before proceeding with formwork.

.5 Provide site drainage to prevent washout of soil supporting mud sills and shores.

3.2 TOLERANCES

.1 Construct concrete formwork in accordance with reviewed Shop Drawings, requirements of Contract Documents and Referenced Standards to produce finished concrete conforming to shape, dimensions, locations and levels within tolerances specified in CAN/CSA-A23.1/A23.2 and ACI 117.

.2 Perform forming operations and place hardware so that finished concrete shall be within the tolerances set out in CSA A23.1 [and as listed below:].

.3 Variations in building lines which result in extension of the building over lot lines or restriction lines shall not be permitted.

.4 These tolerances are acceptable with regard to structural requirements. Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.

.5 In addition to tolerances specified in CAN/CSA-A23.1/A23.2 and ACI 117 erect concrete formwork such that:

.1 The offset between adjacent pieces of formwork facing material shall not exceed:

CLASS OF SURFACE	
Class A - For surfaces to be waterproofed or surfaces prominently exposed to public view where appearance is of special importance	3 mm [1/8"]
Class B - Coarse textured concrete formed surfaces intended to receive plaster, stucco, or wainscoting	6 mm [1/4"]
Class C - General standard for permanently exposed surfaces where other finishes are not specified	12 mm [1/2"]
Class D - Minimum quality surface where roughness is not objectionable, usually applied where surfaces shall be concealed.	25 mm [1"]

3.4 FORMWORK

.1 General

.1 Erect, support, brace, and maintain formwork to safely support vertical and lateral loads until they can be supported by the structure.

.2 All falsework erection shall be supervised by the Professional Engineer responsible for its design.

.3 All forms shall be inspected by the contractor, prior to the concrete pour to ensure that they have been erected in conformance with the formwork shop drawings.

.2 Construction

.1 If required, camber formwork such that hardened concrete, prior to stripping of forms, is cambered as shown. Maintain beam depth and slab thickness from cambered surface.

.2 Mark building, grid, or other lines on forms to permit the accurate positioning of reinforcing steel.

.3 Construct templates and supports to rigidly fix reinforcing dowels in the forms prior to concreting.

.4 Provide suitable markers to indicate the location and configuration of continuing concrete members so that dowels can be positioned accurately in relation to their position in the continuing members.

.5 Set anchor bolts, templates, steel connection units, hardware, or other inserts into the forms and secure them rigidly so that they do not become displaced during concreting. Set and secure these items to the tolerances specified and required in the appropriate Sections.

.6 Build top forms on sloping concrete where required to prevent flow of the concrete out of the forms. Provide vents to top forms to permit air or bleed water to escape from the forms.

.7 Where concrete is poured against structural steel beams causing unbalanced horizontal pressures, provide sufficient horizontal support to resist such pressures and to prevent deflection of the steel beams.

.8 In the case of sloping slabs, employ suitable forming procedures compatible with the concrete placing and compaction techniques to ensure that completed concrete has the specified design characteristics, and in particular, to prevent movement of plastic concrete resulting in cracking, loss of bond, etc., and to achieve a surface equivalent to a fine wood float finish suitable to receive a membrane.

.9 Do not use petroleum or paraffin based form oils on forms in contact with concrete to be coated with Silicone Rubber Roofing System.

.3 Sleeves, Chases and Formed Openings

.1 Form sleeves, chases and openings except where such items are specified to be formed or sleeved by the appropriate trade.

.2 All openings, sleeves, chases may not be necessarily shown on the structural drawings nor are their sizes or locations shown. Refer to architectural, mechanical, and electrical drawings and specifications for openings and sleeving requirements not shown, located, and dimensioned on the structural drawings.

.4 Exposed Concrete Forms

.1 Make joints of forms sufficiently tight to prevent leakage of concrete fines at corners of exposed beams, walls, and columns or at the corners of exposed edges of slabs, and other concrete exposed to view in the finished building.

.2 Provide 25 mm (1") chamfer strips at all exposed edges of concrete and 18 mm (¾") v-joints at control joints.

.3 Form panels for exposed concrete may be reused [3] times, providing the tie holes are reused and panels are not damaged in a way that shall cause visual defects.

3.5 ARCHITECTURAL CONCRETE

.1 Construction Simulator

.1 Well in advance of the start of the work, construct construction simulator as agreed with the Design Team.

.2 Notify the Design Team sufficiently in advance of the work so that they can inspect the forms prior to concreting.

.3 Use techniques of forming, form materials, reinforcement, and spacers, stripping as shall be employed on finished work. The simulator shall have as a minimum the standard of quality specified. If the simulator or parts thereof do not meet this standard, construct additional member of parts thereof at no cost to the Owner until the quality is acceptable to the Design Team. The quality of the accepted construction simulator along with the criteria set out below shall be the minimum acceptable standard for the architectural concrete.

.4 In addition to constructing the simulator, employ forming techniques which shall be used for architectural concrete as necessary on members which are not to be architecturally exposed in order to perfect technique.

.5 At the conclusion of the work, remove and dispose of the construction simulator, if it has not been incorporated into the work.

.2 Formwork

.1 Construct forms for architectural concrete so that they are grout tight at corners, panel joints, construction joints, arises, and recesses and so that concrete surfaces that are shown to be plane are plane and correctly aligned without indentations or protuberances other than those shown.

.2 Use straight lumber making an accurate tight fit.

.3 Seal, tape or caulk form panel joints.

.4 Solidly back all joints between sheathing panels and tightly secure panels thereto.

.5 Employ corner ties at all external corners.

.6 Construct side forms for balustrades, sills, upstand beams and the like to the exact height of the member. Align the top edges of the forms to the correct elevation or

slope so that the tops of the members can receive a fine wood float finish to a straight line.

.7 In walls and the like, provide suitable spaced clean out doors at the bottom of the forms. Place the doors, if possible, in the side of the member which is not exposed. Where this cannot be arranged accurately, construct clean out doors and install so as to leave no indentations or protuberances and to prevent concrete leakage.

.3 Form Ties

.1 Align ties on a particular member both vertically and horizontally.

.2 Ties shall not be placed horizontally closer than 300 mm (12") to a corner, or at an edge of an opening, or to a vertical reglet nor vertically closer than 150 mm (6") to an edge of an opening or to a horizontal reglet. The tie pattern shall be symmetrical and to the Architect's approval.

.3 Install ties at right angles to the form in tight fitting holes to prevent concrete leakage. Where re use of forms is permitted, arrange so that tie holes are also re used. All form ties, particularly at corners and construction joints, shall be fully tightened so as to eliminate leakage of concrete fines.

.4 Walls, Columns and Deep Beams:

.1 Studs shall be carefully plumbed and not spaced over 400 mm (16") on centre. Reduce spacing to 300 mm (12") where the grain of the outer plies is parallel to the studs. Walers shall consist of two members and the joints in the top and bottom members shall be staggered at least the spacing of the form ties. Walers shall not be spaced more than 600 mm (24") on centre and ties not more than 700 mm (28") on centres when used with double 50 mm x 100 mm (2" x 4") walers.

.2 For forms 6 m (20') or more in height, double 50 mm x 150 mm (2" x 6") vertical walers spaced not more than 3 m (10') on centres and extended the full height of the forms shall be bolted to every other set of horizontal walers to maintain the forms in straight and true alignment.

.3 Forms for duct openings, sills and the like shall be removable to permit access for concrete placing and vibration.

.4 Braces or shores through exposed faces of walls shall not be permitted.

.5 Smooth Concrete

.1 Form surfaces generally with full sized plywood sheets. Panel arrangements shall be as shown or to the Design Team's approval.

.2 Provide 20 mm (¾") half round reglets at all butt joints between form panels, construction joints and control joints where shown. Seal form panel joints with caulking prior to installing reglets.

.3 Provide 20 mm (¾") chamfers at all external vertical and horizontal corners on the interior and exterior of the building.

.4 Provide 20 mm (¾") V-joint reglets at all butt joints between form panels, construction joints and control joints. Seal form panel joints with caulking prior to installing reglets.

.6 Smooth Concrete soffits

.1 Form slab and stair soffits generally with full-sized plywood sheets with joint layout shown or approved by the Design Team.

.2 Coordinate with other trades and provide protection to slab forms as required to prevent damage or staining during the work of other trades.

.7 Construction Joints in Walls

.1 Horizontal joints shall be permitted at locations approved by the Design Team. Build forms to finish flush with the top of construction joints to permit trowelling the surface to accurate alignment. Install and securely fix reglets as shown.

.2 Vertical construction joints shall only be permitted at locations approved by the Design Team Construct the bulkhead in a manner which shall prevent leakage of concrete fines.

.3 When erecting forms for the continuing concrete, use a system where the forms, including reglets from the pour below remain in place, undisturbed for the pour above.

.12 Construction Joints in Other Members

.1 Construction joints shall be permitted only at the locations shown, or where not shown, only at locations approved by the Design Team Provide reglets in all construction joints as shown or where directed by the Design Team unless a construction joint without reglets is specifically called for on the drawings.

.13 Control Joints

.1 Construct control joints at the location shown and accurately place reglet so that the cut in the discontinuous longitudinal bars falls at the joint. Accurately align vertical control joints above and below horizontal construction joints.

.14 Tolerances

.1 Construct forms for architectural concrete so that all concrete surfaces exposed to view shall be visually straight.

.15 Release Agent

.1 Coat surface of forms to be in contact with concrete with an approved material which provides complete bond breaking action. Apply surface treatment strictly in accordance with manufacturer's instruction. Re coat surface of forms after use as necessary.

.16 Stripping of Forms

.1 Forms for architectural concrete shall not be stripped until at least 7 days after concrete is poured. Take particular care when stripping to ensure that no damage occurs at corners, arises or the like.

.2 To help avoid colour variation, the length of time between pouring and stripping shall be approximately the same for each portion of the Work.

.17 Re Use of Forms

.1 Thoroughly clean forms and treat with the parting agent as required before re use.

.2 Forms may not be re used if they are damaged in any way which shall leave blemishes on the finished surface. Also, they may not be re used if the original tie holes are not re used.

3.6 STRIPPING OF FORMS AND RESHORING

.1 Where forms are stripped from horizontal or sloping members before concrete has reached its specified design strength, reshore the members so that they can safely support their own load plus construction loads. In addition, ensure that the stripped member is of sufficient strength to safely carry its own weight over the area stripped out at any instant, together with any superimposed construction loads.

.2 As a minimum conform to requirements of CSA S269.1 and the following:

.1 Reshores in the lower storeys shall be capable of safely carrying the full weight of the concrete and formwork posted to them prior to the removal of the first storey of shores supported by the ground or slab on grade;

.2 After reshores are removed from the first storey, the design and provision of reshores may be based on the assumption that each shored or reshored flexural member shares load in relation to its achieved strength, provided the flexural member has attained at least 70% of its specified 28 day strength;

.3 Install reshores so that they are supported on members which can safely support the reshore load;

.4 As a guide, under specified curing conditions, 70% of the 28 day strength should be attained 7 days after concreting in normal weather and 14 days after concreting in "Cold Weather";

.5 Base decision to strip forms upon satisfactory results of 7 day concrete cylinder tests and on site curing conditions;

.6 Stripping and reshoring shall proceed simultaneously so as not to leave an area greater than 80 m2 unsupported by either formwork or reshoring at any instant. Install reshores tight to construction above and below so that they shall not significantly shorten under load, but take care not to preload the construction below or raise the construction above by over tightening;

.7 Maintain reshoring or formwork in place for a minimum of 28 days or for such longer time as may be required to ensure that the concrete has reached its specified 28 day strength;

.8 Do not strip within one and a half bays of a construction joint until new concrete beyond the construction joint has reached 70% of its specified 28 day strength;

.9 Provide and install adequate shoring to safely support horizontal or inclined members after the 28 day specified strength is achieved where superimposed loads exceed design loads;

.10 Side forms for vertical members may be stripped as soon as the concrete is sufficiently strong to stand unsupported and safely resist imposed loads;

3.7 CONSTRUCTION JOINTS

.1 Coordinate with Contractor’s Consultant for location and details of construction joints not specified by the design.

3.8 MOVEMENT AND CONTROL JOINTS

.1 Construct movement and control joints at the locations indicated and in accordance with the details shown.

.2 Construct clean movement joints free of foreign material, likely to impair the proper operation of the joint.

.3 Provide non-extruding joint filler in movement joints for the full area between adjacent concrete members. Anchor the filler material to one of the adjacent members or between concrete members and adjacent members of other materials.

.4 Where shown, provide waterstops in movement joints.

3.11 BEARING ASSEMBLIES

.1 Remove laitance from the top surface of the bearing ledge and finish with a steel trowel to a dense level surface, to the elevations shown.

.1 Place the bearings in the location required, ensure that they are solidly bedded on the ledge, are set level, and are secured in position.

3.12 SEPARATION STRIPS

.1 Maintain bays containing separation strips and each adjacent bay fully formed and shored until the strip is complete, and has reached its 28 day specified strength. Ensure that the forms and shores are designed so that no settlement of the forms occur during the period that the strip is open.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

.1 Provide all labour, materials, methods and equipment to supply, fabricate, and place concrete reinforcement and accessories, specified herein, and as required for a complete and proper installation including, but not limited to, the following:

.1 black and epoxy coated deformed bar reinforcement;

.2 welded wire fabric;

.3 wire ties for columns or masonry core fills;

.4 mechanical connection tension couplers, mechanical connection compression couplers or end bearing splices;

.5 chairs and support bars

1.2 QUALITY VERIFICATION

.1 Reference Standards, Codes and Acts

.1 The latest edition of the following Reference Standards, Codes, and Acts shall govern Work of this Section. Standards referenced within the Standards noted below are to apply even if they are not included in the list.

.1 National Building Code of Canada 2010 (NBC)

.2 Ontario Building Code, 2012 (OBC)

.3 American Concrete Institute (ACI):

.1 ACI 315-99, Details and Detailing of Concrete Reinforcement;

.2 ACI 315R-04, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.

.4 American Society for Testing and Materials International (ASTM).

.1 ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

.2 ASTM A143/A143M-07, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.

.3 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

.4 ASTM A497-A497M-07, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.

.5 ASTM A775/A775M-07b, Standard Specification for Epoxy-Coated Steel Reinforcing Bars.

.6 ASTM D3963/D3963M-01(2007), Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.

.7 ASTM A820/A820M-11 Standard Specification for Steel Fibers for Fiber-Reinforced Concrete.

.8 ASTM C1116/C1116M-10a Standard Specification for Fiber-Reinforced Concrete.

.5 Canadian Standards Association (CSA)

.1 CAN/CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction, Methods of Test and Standard Practices for Concrete.

.2 CSA A23.3-04, Design of Concrete Structures.

.3 CSA G30.18-09 Carbon Steel Bars for Concrete Reinforcement.

.4 CSA G30.3-M1983 (R1998), Cold Drawn Steel Wire for Concrete Reinforcement.

.5 CSA G30.5-M1983 (R1998), Welded Steel Wire Fabric for Concrete Reinforcement.

.6 CAN/CSA-G40.20-04/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.7 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregular Shaped Articles.

.8 CSA S413-07, Parking Structures.

.9 CSA W186-M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.6 Ontario Provincial Standard Specification (OPSS)

.1 OPPS 1442, Material Specification for Epoxy Coated Reinforcing Steel Bars for Concrete.

.2 Ontario Provincial Standard Specification (OPSS) 1443 Material Specification for Organic Coatings for Reinforcing Steel Bars for Concrete.

.7 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

.2 Inspection and Testing

.1 As per SECTION 03 05 00

1.3 SUBMITTALS

.1 Submit documentation of recycled content of reinforcing bars. A breakdown of post-consumer and post-industrial recycled content shall be specified. A mill certificate shall be provided.

.2 Submit documentation of where the reinforcing bars were extracted, processed and manufactured. Materials should be selected from within an 800 km radius or be shipped by rail or water from within 2400 km of the place of Works.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Fabricate, transport and store reinforcement in a manner which shall prevent contamination which would reduce the bond between concrete and reinforcement.

.2 Fabricate, handle, transport, store and place epoxy-coated reinforcement in accordance with provisions of Reference Standards to prevent damage to epoxy coating.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Reinforcing Steel: deformed steel to CSA Standards of G30 Series and to the material specification.

.2 Epoxy Coating for Reinforcement: An electrostatic application of epoxy protective coating conforming to requirements of OPSS 1442 and 1443.

.3 Welded Steel Wire Fabric: conforming to ASTM A 497/A497M

.4 Chairs, bolsters, bar supports, spacers: to CSA A23.1. In the case of concrete exposed to view or weather the accessories shall be such that no metal is permitted to come closer than 40 mm (15/8") from a formed face and 50 mm (2") from a troweled surface. Use precast concrete supports for exposed concrete beams and soffits and concrete cast against soil/rock. Precast concrete supports shall be made of concrete of quality and strength at least equal to that specified for the member in which they are used.

.5 Support accessories for suspended parking garage slabs: An approved plastic or non-corroding type of chair, bolster or spacer of sufficient strengths to rigidly support the weight of reinforcement and construction loads. Do not use plastic coated or plastic tipped steel chairs.

.6 Tie wires and Support Accessories for Epoxy Coated Reinforcement: epoxy coated to requirements of MTO.

.7 Tie wires for provision for future cathodic protection shall be uncoated.

.8 Mechanical Tension Splices: LENTON COUPLERS, complete with bar end protectors and coupler end protectors, as supplied by Erico Canada Inc. or approved alternative.

.9 Mechanical Compression Splices: End-Bearing Compression Splice SPEED-SLEEVE as supplied by Erico Canada Inc. or approved alternative.

2.2 FABRICATION OF CONCRETE REINFORCEMENT

.1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1/A23.2, ACI 315, ACI 315R and RISC Reinforcing Steel Manual of Standard Practice.

.2 Fabricate reinforcing steel only in a permanent fabricating shop unless otherwise approved.

.3 Bend reinforcement once only and at room temperature of 18°C. Do not straighten or re-bend reinforcement. Do not use bars with kinks or bends not intended.

.4 Replace bars which develop cracks or splits.

.5 Clearly identify reinforcing bars to allow correlation with bar lists and placement in accordance with the Shop Drawings.

.6 Bundle and transport reinforcing bars, clearly identified in accordance with bar bending details and lists.

.7 Bundle and transport epoxy-coated reinforcing bars in accordance with ASTM A775/A775M.

PART 3 - EXECUTION

3.1 TOLERANCES

.1 Perform fabrication and setting so that completed work shall be within the tolerances set out in CSA A23.1.

.2 These tolerances are acceptable with regard to structural requirements. Interfacing tolerances may not be compatible with the above. Review and coordinate interfacing tolerances so that the various elements come together properly.

3.2 PLACING OF CONCRETE REINFORCEMENT

.1 Prior to concreting, accurately place reinforcement, support, and secure against displacement, as indicated on reviewed placing drawings and in accordance with CSA A23.1.

.2 Set column anchor bolts and wall dowels prior to concreting with wooden templates or other approved means.

.3 Do not drive or force reinforcement into fresh concrete.

.4 Secure reinforcement in columns and walls using sufficient spacers on each face to maintain the requisite distance between reinforcement and column or wall face and so that vertical bars are plumb.

.5 Where continuous drop panels or slab thickenings are used, place bottom slab reinforcement in the bottom of the continuous drop panel or slab thickening.

.6 Where toppings are placed on waterproof membranes, vapour barriers and the like, prevent reinforcement or tie wire contacting these items.

.7 Ensure that longitudinal bars in beams have adequate vertical spacing between layers in accordance with section 6.6.5.2 in CSA A23.1-04

.8 Pre-assemble column and beam cages as necessary. Do not "spring" or bend ties and stirrups in order to place longitudinal reinforcement.

.9 Provide splices only where shown on the Contract Drawings by Contractor’s Consultant. No other splices shall be permitted without approval of the Consultant.

3.3 ADJUSTING AND CLEANING

.1 Remove contaminants, including concrete residue from previous concrete placements, which lessen bond between concrete and reinforcement.

.2 Prior to placement of concrete, confirm that reinforcement is secured in correct location.

.3 Replace incorrectly fabricated reinforcement, relocate misplaced reinforcement, and install omitted reinforcement before concrete is placed, as directed by the Consultant.

.4 Touch up damaged and cut ends of epoxy-coated reinforcing steel with compatible finish to provide continuous coating.

3.4 FIELD BENDING

.1 Do not field bend reinforcement except where indicated or authorized in writing by the Consultant.

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 Replace bars which develop cracks or splits.

3.5 EPOXY COATED REINFORCEMENT

.1 Provide epoxy coated reinforcement where required by the design and in the following locations:

MEMBERS	EPOXY COATED REINFORCEMENT

Walls and columns supporting parking garage slabs and ramps	Dowels, verticals and ties within 600mm (24") of slab or ramp level and where required by the design.
Curbs, walls, and the like supported on parking garage slabs and ramps.	Where required by the design.

.2

.3 All systems for handling, transporting and storing coated bars shall be such that the coating shall not be damaged. Prevent bar to bar abrasion and excessive sagging. Do not drop or drag bars. Store on suitable non-metallic supports.

.4 During and after the installation of the bars into their location in the deck, repair all damaged portions of the coating with patching material conforming to OPSS 1443. Any damaged accessories shall also be repaired.

.5 Repair all damaged areas of the coated reinforcing steel and metallic accessories in accordance with Clause 12 of ASTM A775, before any rusting occurs. The Consultant may require that damaged bars be replaced instead of being repaired. If infrequent and small damaged areas do rust, completely remove the rust by an approved method before the areas are repaired.

.6 The cutting of coated bars by burning shall not be permitted.

.7 Do not weld coated bars.

3.6 ADDITIONAL REQUIREMENTS FOR ARCHITECTURAL CONCRETE

.1 Strictly maintain bar clearances for architectural concrete. Place spacers regularly and squarely against forms except that spacers shall not be used between reinforcement and an exposed vertical concrete face.

.2 The location of spacers shall not cause constriction adjacent to other inserts which may impede the placing of concrete.

.3 The cover to reinforcement shall be taken from the deepest penetration of arises or reglets.

.4 Use spacers and support accessories so that no metal comes closer than 40 mm (15/8") to an exposed surface.

.5 Ensure that no tie wires project within 40 mm (15/8") of an exposed face.

.6 Take particular care not to damage form sheathing surfaces during installation of reinforcement.

3.7 QUALITY CONTROL

.1 Provide a system of quality control to ensure that the minimum standards specified herein are attained.

.2 Bring to the attention of Contractor’s Consultant any defects in the work or departures from the Contract Documents which may occur during Construction. The Consultant shall decide on corrective action and give recommendations in writing.

.3 Project Co’s Consultant's general review during construction and inspection and testing by Independent Inspection and Testing Companies reporting to the Consultant are both undertaken to inform the Owner of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of contractual responsibility.

3.8 NOTIFICATION

.1 Prior to commencing significant segments of the work, give Contractor's Consultant and Independent Inspection and Testing Companies appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the Consultant to classify the work as defective.

3.9 DEFECTIVE MATERIALS AND WORK

.1 Where evidence exists that defective work has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections or surveys performed, analytical calculations of structural strength made, and the like, in order to help determine whether the work must be replaced. Tests, inspections or surveys or calculations carried out under these circumstances shall be made at the Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work may be acceptable.

.2 All testing shall be conducted in accordance with the requirements of the Ontario Building Code, except where this would, in the Consultant's opinion, cause undue delay or give results not representative of the rejected material in place. In this case, the tests shall be conducted in accordance with the standards given by the Consultant.

.3 Materials or works which fail to meet specified requirements may be rejected by the Consultant whenever found at any time prior to final acceptance of the work regardless of previous inspection. If rejected, defective materials or work shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

.1 Provide all labour, materials, accessories and equipment to prepare for, mix, transport, place, finish and cure cast-in-place concrete and grout necessary to construct structure required by the design, specified herein, and as required for the complete and proper provision of Work of this Section, including, but not limited to, the following:

- .1 concrete including cementing materials, fine and course aggregates, admixtures and water
- .2 steel or polypropylene reinforcing fibres
- .3 granular underbed and vapour barrier
- .4 curing and finishing
- .5 metallic, non-metallic and dry-pack grout, together with grouting of column base and beam bearing plates

1.2 QUALITY VERIFICATION

.1 Reference Standards, Codes and Acts

- .1 The latest edition of the following Reference Standards, Codes, and Acts shall govern Work of this Section. Where there are differences between the specifications and drawings and the codes, standards, or acts, the most stringent shall govern. Standards referenced within the Standards noted below are to apply even I they are not included in the list.
  - .1 National Building Code of Canada, 2010 (NBC)
  - .2 Ontario Building Code, 2012 (OBC)
  - .3 Canadian Standards Association (CSA)
    - .1 CSA A23.1-04, Concrete Materials and Methods of Concrete Construction
    - .2 CSA A23.2-04, Methods of Test and Standard Practices for Concrete
    - .3 CSA A23.3-04, Code for the Design of Concrete Structures for Buildings
    - .4 CSA A283-06, Qualification Code for Concrete Testing Laboratories
    - .5 CAN/CSA-A3000-08, Cementitious Materials Compendium
    - .6 CSA S413-07, Parking Structures

.2 Qualifications

- .1 Provide concrete only from sources for which plant, equipment and materials comply with CSA A23.1/A23.2.
- .2 Undertake preparation for and application of specified penetrant sealant only by personnel with a minimum of five years documented experience in the successful application of water-based penetrant sealers.

.3 Inspection and Testing

.1 As per SECTION 03 05 00

.2 Be aware that Contractor retains sole responsibility for quality control of Work and that performance or non-performance of Independent Inspection and Testing Company does not limit, reduce, or relieve Contractor of responsibility for complying with the requirements of the Project Agreement.

.3 Independent Inspection and Testing Company must be certified under CSA Standard A283, Qualification Code for Concrete Testing Laboratories, for Category 1 Certification.

.4 Project Records

.1 Concrete Pour Records – Record time, date, delivery slip serial number, and area of placement in building of each concrete pour, correlate with related test cylinders and maintain records on site until Project is completed.

.2 Delivery Records – File duplicate copies of concrete delivery slips recording supplier, serial number of slip, date, and truck number. Contractor, Project, Class of exposure, cementing materials content, air content, volume in load, time of first mixing of aggregate, cementing materials, added water and ambient air temperature.

.3 Record Drawings – Record on a set of Drawings:

.1 time and date of each pour

.2 high and low ambient air temperatures during each pour

.3 date of removal of forms in each area of Work

.4 founding elevations of all footings or drilled piers

.5 variations of foundation Work from that indicated on drawings

.4 Make Record Drawings available for Consultant's inspection at all times.

1.3 SUBMITTALS

.1 Concrete Producer's Certification

.1 Prior to submitting mix designs for review, submit certification that plant, equipment and materials to be used in concrete comply with requirements of CSA A23.1/A23.2

.2 Concrete Mix Designs

.1 Submit designs for concrete mixes required by Contract Documents.

.2 When optimum bulk density of aggregates is specified, provide supporting evidence of compliance with requirements.

.3 Be aware that review of concrete mix design is for general conformity and that Contractor retains responsibility for compliance with Contract Documents.

.3 Manufacturer's Certification

.1 Submit certificate from manufacturer certifying that product proposed conforms to specified performance requirements.

.4 Contractor's Quality Control

.1 Submit proposed quality control procedures for hot or cold weather conditions, for ensuring correlation of concrete mix with strength or

exposure classification for area of placement, and for finishing and curing methods.

.5 Joint Location Drawings

.1 Submit Drawings showing proposed location of construction and control joints in slab-on-grade in accordance with Typical Detail if joint layout is not detailed on Drawings.

1.4 ARCHITECTURAL CONCRETE

.1 Architectural Concrete is defined as concrete surfaces designated as "Architectural Concrete" in Project Agreement including surfaces specified to receive finish treatment such as sandblasting and bush-hammering.

.2 Place, finish, cure and strip Architectural Concrete to ensure hard, dense, smooth and true concrete surfaces of uniform appearance without damage, defects or blemishes.

1.5 ENVIRONMENTAL CONDITIONS

.1 Comply with the Cold and Hot Weather Requirements of CSA A23.1/A23.2 and additionally as specified herein.

.2 Provide protection or heat, or both, to ensure temperature of concrete at surfaces is maintained at not less than 21°C for three days after placing, not less than 10°C for the next two days and above freezing for the next two days.

.3 Provide protection or heat or both to prevent alternate freezing and thawing of concrete for fourteen days after placing.

.4 Vent exhaust gases from combustion type heaters outside of protection enclosures.

.5 Provide protection to maintain concrete continuously moist during curing period.

.6 Provide same hot or cold weather protection for storage of field cured cylinders demonstrating strength development of in-situ concrete as for area of concrete construction which it represents until cylinders are sent to testing laboratory.

.7 Do not commence placement of concrete when it is raining or rain is anticipated. Should rain commence during placing cover freshly placed concrete with waterproof material.

.8 Place bonded toppings on rough slabs only when surface temperature is at least 15°C [60°F].

.9 Do not grout at ambient air temperatures or concrete surface temperatures less than 5°C [40°F], or when air or surface temperature is expected to fall below 5°C [40°F] within 24 hours of grouting.

.10 Do not apply sealants, or penetrant sealer, at ambient air temperatures or concrete surface temperatures less than 5°C [40°F], or when air or surface temperature is expected to fall below 5°C [40°F] within 12 hours of application.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Cementing Materials

.1 Portland Cement: to CSA Standard A3000, Type 10 Cement unless noted otherwise.

.2 Cementitious Hydraulic Slag: to CSA Standard A3000.

.3 Flyash: to CSA Standard A3000.

.2 Fine Aggregate

.1 For slabs-on-grade, fineness modulus of fine aggregate to be between 2.7 and 3.1.

.3 Coarse Aggregates

.1 20 mm [3/4"] to 5 mm [No. 4 sieve] except as specified below.

.1 For Slabs-on-Grade

.1 Abrasion loss not to exceed 35%.

.2 Maximum petrographic number of 125 when tested in accordance with ASTM C295, as conducted by Ministry of Transport of Ontario.

.2 For Slabs-on-Grade 125 mm [5"] and Thicker

.1 40 mm [1 ½"] to 5 mm [No. 4 sieve]; combine at least two of the single sizes specified in Table 2 Group II of CSA A23.1/A23.2, one of which is to be 40 mm [1 ½"], to obtain maximum bulk density (unit weight) and optimum grading, in accordance with an approved procedure.

.3 For Slabs Over Steel Deck (Composite or Non-composite) and Bonded Toppings 50 mm [2"] Thick and Less:

.1 12 mm [1/2"] to 5 mm [No. 4 sieve].

.4 For columns less than 300 mm [12"] in least dimension, or less than 95,000 mm2 [150 in2] in cross-sectional area, walls less than 200 mm [8"] in width and concrete for grouting masonry:

.1 10 mm [3/8"] to 5 mm [No. 4 sieve].

.4 Water

.1 To conform to CSA A23.1/A23.2

.5 Admixtures

.1 Conform to Reference Standards for chemical and air-entraining admixtures.

.2 Provide only admixtures that are free of chlorides.

.3 Provide evidence acceptable to the Design Team that superplasticizer does not increase shrinkage of concrete.

.6 Steel Fibres

.1 Cold drawn carbon steel, corrugated profile or straight with hooked ends, with following performance requirements:

.1 Length: 51 mm ["] minimum

.2 Diameter: 0.75 mm [0.03"] minimum

.3 Aspect ratio: 75 minimum

.4 Yield strength: 965 MPa [140 ksi] minimum

.7 Polypropylene Fibres

.1 100 percent virgin polypropylene, collated, fibrillated fibres; 50 mm [2"] nominal length.

.8 Granular Underbed for Slabs-on-Grade

.1 As recommended by the Geotechnical Engineer

.9 Vapour Barrier

.1 0.152 mm [6 mil] thick polyethylene sheet to CAN/CGSB-S1.34-M, perforated with 8 mm [5/16"] diameter holes at 150 mm [6"] centres, each way.

.10 Curing / Sealing Compound:

.1 Water based acrylic emulsion membrane curing compound to ASTM C309, Type 1 generally.

.2 Curing / sealing compounds to be compatible with any specified floor hardeners, covering adhesives and waterproofing compounds.

.11 Grout

.1 Dry Pack Grout – under steel plates and where grout thickness does not exceed 75 mm [3"]

.1 One part Portland cement to two parts concrete sand that conforms to CSA A23.1/A23.2 with only sufficient water that mix will retain its shape when made into ball by hand.

.2 Premixed Grout:

.1 Mix with water in accordance with manufacturer's printed instructions.

.2 Must be non-shrink and may be metallic or non-metallic.

2.2 CONCRETE MIXES

.1 Concrete

.1 Ready mix with 28 day compressive required by the design.

.2 Air dry unit weight:

.1 Typically for normal weight concrete, minimum 2300 kg/m3 [145 lbs/ft3] adjusted proportionally for maximum air content listed in CSA A23.1/A23.2, Clause 14 - Table 10.

.3 Design concrete mix in conformance with CSA A23.1/A23.2, Clause 16 - Table 13 (Alternative 1), Clause 15 - Table 12, Clause 17 - Table 14, and as follows:

.1 Provide concrete meeting water / cementing materials ratio and air content of Tables 12 and 14 in accordance with Class of Exposure specified in Table of Concrete Properties on Drawings. Note that concrete designed in accordance with water/cementing materials ratio of Tables 12 and 14 may yield strength exceeding minimum strength specified on Drawings.

.4 Sulphate Exposure:

.1 If required, provide concrete mix in accordance with Clause 15, Table 10 of CSA A23.1/A23.2, for concrete subject to sulphate attack, such as drilled shafts or other concrete in contact with soil.

.5 Submit to Inspection and Testing Company if requested, acceptable evidence and material samples to verify that proposed concrete mix design will produce specified quality of concrete.

.2 Admixtures

.1 Chemical Admixture:

.1 Incorporate water-reducing admixture to ASTM C494 type A in all concrete.

.2 Air Entraining Agent:

.1 Incorporate air-entraining agent in addition to chemical admixture in concrete of relevant Class of exposure, in accordance with CSA A23.1/A23.2, Clause 15, Table 9.

.3 Calcium Chloride:

.1 Do not use calcium chloride or admixtures containing chloride in concrete.

.3 Architectural Concrete

.1 For concrete required to be Architectural Concrete obtain aggregate and cement for entire Project from same source at same time.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Confirm that subgrade of compacted fill conforms to requirements specified for backfilling before placing slab underbed.

.2 Confirm that surfaces on which concrete is to be placed are clean and free of debris, frost and water before placing.

.3 Confirm that concrete reinforcement, control joints, inserts and all other built-in Work is in place and secured, before commencing placement of concrete.

.4 Confirm that placement of conduct or pipe within concrete section conforms to requirements of CSA A23.1/A23.2 prior to commencement of placement of concrete

3.2 TOLERANCES

.1 Place and finish concrete to provide tolerances in accordance with CSA A23.1/A23.2 and ACI 117, and additionally as specified herein.

.2 Difference between elevation of high point and low point in specified area not to exceed:

.1 In any bay up to 100 m^2 [1100 ft^2]: .....12 mm [1/2"]

.2 In any bay up to 400 m^2 [4300 ft^2]: .....25 mm [1"]

.3 F-Number System:

.1 Finish floor slabs to meet tolerance classification in accordance with CSA A23.1/A23.2, Clause 22.1.3 and Table 16 deemed appropriate for the use of the space.

.2 Measure FL levelness tolerance at 72 □ 12 hours after completion of floor finishing, on formed slabs before removal of shores and on slabs-on-grade

3.3 PREPARATION FOR SLABS-ON-GRADE

.1 Granular Underbed:

.1 Obtain Geotechnical Consultant's written confirmation that prepared subgrade is acceptable for placement of granular underbed.

.2 Place granular underbed over entire area of building and compact to 100% ASTM D698 (Standard Proctor) optimum dry density.

.3 Obtain Geotechnical Consultant's confirmation that thickness, elevation and compaction of granular underbed are acceptable.

.2 Vapour Barrier:

.1 Use vapour barrier under slabs on grade only where the floor will be covered with finish material adhered with adhesives that may be adversely

affected by moisture or where materials will be stored that could be adversely affected by moisture.

.3 Remove foreign materials from underbed and forms before placing concrete.

3.4 PLACING CONCRETE

.1 Transport and place concrete in accordance with CSA A23.1/A23.2, and additionally as specified herein.

.2 Place concrete for entire floor framing system including beams, girders, slab drops, brackets, column capitals and haunches monolithically unless otherwise noted on Drawings.

.3 Transport and spread concrete over steel framing in a manner to prevent lateral deflection and twisting of members.

3.5 FINISHING CONCRETE

.1 Floor, Roof, Stair Treads, and Other Slab Surfaces

.1 Perform finishing operations on plastic concrete surfaces in accordance with CSA A23.1/A23.2, Clause 22, and as specified herein.

.2 Be aware that concrete for this Project may contain slag or flyash cement which results in delay of concrete set and onset of bleeding.

.3 Screed surface to an even, level, or sloped surface, to elevations indicated on Drawings or required for specified finishes or concrete toppings.

.4 Float surfaces by means of power or hand float when concrete has hardened sufficiently for worker to leave only slight footprint on surface, taking care to avoid bringing bleed water and fines to surface by overfloating.

.5 Do not commence finishing of slab surfaces while bleed water is on surface, or add water or cement to surface.

.6 Finish slab surfaces to match sample finishes approved by the Design Team.

.7 Unless otherwise required by the design, finish slab surfaces to provide a hard, smooth, dense steel trowelled surface, free of ridges or depressions, trowel marks or blemishes, and of uniform appearance.

.8 Non-Slip Floor Surfaces:

.1 Provide swirled finish of texture acceptable to Consultant by spin troweling final steel troweling.

.2 Control Joints in Slabs-on-Grade

.1 Sawcut control joints in slabs-on-grade along column grid lines and additionally to result in a maximum spacing of 30 times slab thickness, except where concrete mix incorporates 40 mm [1 ½"] aggregate proportioned to provide maximum bulk density in accordance with Clause 2.1.3.1.1, sawcut intermediate control joints to result in a maximum spacing of 40 times slab thickness.

.2 Commence sawcuting before slab temperature starts to fall and as soon as concrete may be cut without dislodging aggregate but within 18 hours of placement.

.3 Sawcut unreinforced slabs to a depth of 0.25 slab thickness, fibre reinforced slabs to 0.33 slab thickness.

.4 Grind edges of sawcuts to remove burrs but do not bevel or chamfer joint edges.

.5 Keep construction traffic which may erode concrete at edges of sawcuts off floor until joints have been filled and joint filler has cured.

.3 Formed Surfaces

.1 Treat formed surfaces in accordance with CSA A23.1/A23.2, Clauses 24.1 and 24.2, and as additionally specified herein

.1 Finish vertical surfaces to receive waterproofing membrane smooth with no ridges or depressions.

.2 Finish surfaces to receive a hot-applied rubberized asphalt membrane smooth with no ridges or depressions, using "Sack-Rubbed Finish" in accordance with CSA A23.1/A23.2, Clause 24.3.4.4 including cleaning surfaces of dust, oil, grease, chemical films, or other coatings or contaminants, and loose or spalled material, repairing any honeycombed areas and removing any projecting mortar or concrete fins.

.3 Finish surfaces to receive crystalline waterproofing smooth with no ridges or depressions, using "Sack-Rubbed Finish" in accordance with CSA
A23.1/A23.2, Clause 24.3.4.4 including cleaning surfaces of dust, oil, grease, chemical fills, or other coatings or containments, and loose or spalled material, repairing any honeycombed areas and removing any projecting mortar or concrete fins.

.4 Repair, re-rub, regrind or otherwise correct concrete surfaces to approval of Consultant and trade applying waterproofing or adhering finish to surface.

.5 Plugs at Recessed Ties

.1 Clean tie holes to remove all foreign matter.

.2 Coat plugs by dipping in adhesive and insert in hole.

.3 Remove excess adhesive immediately with thinner recommended by manufacturer to ensure that concrete surface is not stained or blemished in any way.

.6 Elastomeric Membrane

.1 Where fluid elastomeric waterproofing membrane turns up vertical surfaces, provide light sandblast finish.

.4 Curb Edging

.1 Finish external corners of curbs rounded, smooth and straight without undulations.

.5 Stair Tread Non-Slip Inserts:

.1 Install one non-slip insert specified in Paragraph 2.2.15 at each tread and landing, place 40 mm [1 1/2"] from edge of nosings and extend for full width of nosings except for 80 mm [3"] at each end.

.2 Set inserts in prepared grooves, secured with waterproof adhesive and with top set 1 mm [0.04"] above treads.

.6 Finishing Architectural Concrete

.1 Perform finishing of Architectural Concrete surfaces only by competent personnel with demonstrated experience in finishing of Architectural Concrete surfaces.

.2 Ensure that tools and handling equipment are completely clear of rust, chemicals, contaminants, hardened concrete and other foreign material which would cause discolouring or blemishes.

.3 Finish plastic Architectural Concrete surfaces in accordance with Article 1.4.2.

.4 When required by the design, sandblast Architectural Concrete surfaces specified to medium texture evenly over each surface and consistently throughout Project to match approved mock-up.

.1 Protect other surfaces and equipment against damage resulting from sandblasting operations.

.2 Use material that will minimize environmental contamination.

.5 When required by the design, bush-hammer Architectural Concrete surfaces specified to medium texture evenly over each surface and consistently throughout Project to match approved mock-up. Take care to avoid breaking external corners of bush-hammered concrete.

.1 Remove debris from finishing operations.

3.6 BONDED CONCRETE TOPPINGS

.1 Conform to CSA A23.1/A23.2, Clause 23, and as additionally specified herein.

.2 Be aware that thickness of topping required by the design is the nominal value and that actual thickness will vary depending on cambers or deflections of supporting framing.

.3 Place each section of bonded topping in one continuous operation taking special precautions against plastic shrinkage cracking, whenever rapid drying of the topping may occur, in accordance with CSA A23.1/A23.2, Clause 21.

.4 Control Joints in Topping

.1 Provide control joints for topping directly over construction joints in base slab.

.2 Provide control joints in toppings over precast slabs, on centre lines of supporting members, and at 5 m [16'-0"] maximum spacing parallel to span of slabs.

.3 In all other respects comply with sawcut control joint requirements for slabs-on-grade.

3.7 CURING AND SEALING

.1 Cure concrete in accordance with CSA A23.1/A23.2, Clause 21 and as specified herein.

.2 Be aware that proper curing is essential for durable concrete, and that failure to cure properly may result in accelerated deterioration including scaling, dusting and spalling.

.3 Curing Compound Method:

.1 Use curing and sealing compound specified in Clause 2.1.10 except:

.1 On surfaces specified to receive epoxy or similar paint finish.

.2 On surfaces specified to receive architectural finishes which require adhesives which are incompatible with the curing compound.

.3 Air-entrained concrete for exterior slabs and sidewalks placed between October 1 and April 1.

.2 Use specified water-based compound except that when temperature is below 5□C [40□F] use solvent-based compound acceptable to Consultant.

.3 Apply curing and sealing compound in strict accordance with manufacturer's instructions, ensuring complete and adequate coverage of surface.

.4 Plastic Film Method

.1 Where curing compound method cannot be used, and surfaces are not exposed to freezing and thawing or deicing chemicals, cure finished slab surfaces as follows:

.1 Cover with 0.102 mm [4 mil] thick polyethylene sheets, lap edges 100 mm [4"] minimum and seal laps.

.2 Leave in place for the "Basic Curing Period" in accordance with CSA A23.1/A23.2, Clause 21.1.2, but in no case for less than 3 days generally, except not less than 7 days for exposed warehouse and industrial floor surfaces.

3.8 PROTECTION

.1 Protect floor slabs and other concrete surfaces on which toppings or finishes are to be applied, from grease, oil, dirt and other materials or compounds which would impair bond of toppings or finish materials.

.2 Protect Architectural Concrete surfaces and surfaces exposed to view or painted from grease, oil, dirt and other materials or compounds which would create surface blemishes or impair bond of finishes.

3.9 GROUTING FOR STEEL MEMBERS

.1 Cooperate with Sections that supply and set base and bearing plates in scheduling and completing grouting.

.2 Provide and place grout under column base and beam bearing plates, and additionally as required by the design.

.3 Use non-shrink and shrinkage-compensating grouts only when grout will be contained against expansion and self-disintegration, and in strict accordance with manufacturer's instructions.

.4 Do not use grout with fluid or flowable consistency at beam bearing plates unless otherwise indicated, or approved by the Design Team.

.5 Dampen concrete surfaces immediately before installing grout.

.6 Install grout in a manner to ensure positive bearing for full area of steel base or bearing plate with no voids.

.7 Slope grout beyond edge of plate at 45 degrees unless otherwise required by the design.

.8 Provide same environmental protection and curing as specified for concrete.

3.10 SITE CLEAN UP

.1 Remove excess materials including waste hardened concrete, mock-up panels, sample areas, and other debris resulting from Work of this Section from site and leave premises in a condition acceptable to Consultant.

3.11 DEFECTIVE WORK

.1 Failure of materials or workmanship to meet requirements of the Project Agreement including failure to meet specified 28 day concrete strength, variations in hardened surface in excess of specified tolerances, marked, disfigured or honeycombed surfaces which do not meet surface finish requirements and cannot be repaired by approved methods, and failure of products to meet specified performance requirements, will be considered defective Work performed by this Section.

.2 Repair or replace defective Work as directed by the Sponsor.

.3 Pay for additional inspection and testing, redesign, corrective measures, and related expenses required to correct defective Work of this Section

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-25.20-[95], Surface Sealer for Floors.

1.2 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 concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.

.1 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content in g/L.

.2 Include application instructions for concrete floor treatment.

1.3 ENVIRONMENTAL REQUIREMENTS

.1 Temporary lighting:

.1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.

.2 Electrical power:

.1 Provide sufficient electrical power to operate equipment normally used during construction.

.3 Work area:

.1 Make work area water tight protected against rain and detrimental weather conditions.

.4 Temperature:

.1 Maintain ambient temperature of not less than 10 degrees C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.

.5 Moisture:

.1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.

.6 Safety:

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

.7 Ventilation:

.1 Ventilate area of work by use of approved portable supply and exhaust fans.

.2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.

.3 Provide continuous ventilation during and after coating application.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

.1 Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.

.2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

2.2 CHEMICAL HARDENERS

.1 Refer to Section 03 35 05 Concrete Floor Hardeners.

2.3 SEALING COMPOUNDS

.1 Surface sealer: to CAN/CGSB-25.20, Type 1 - solvent-based, clear.

.2 Sealants: maximum VOC limit 250 g/L.

.3 Surface sealers are not manufactured or formulated with hexavalent chromium and their compounds.

.4 Select compatible material for curing compounds specified in the Section and chemical hardeners specified in Section 03 35 05 - Concrete Floor Hardening, when chemical hardener is applied at a later date in schedule.

.5 Seal surfaces not receiving chemical hardener.

2.4 CURING COMPOUNDS

.1 Select low VOC, curing compounds.

2.5 MIXES

.1 Mixing ratios in accordance with manufacturer's written instructions.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verify that substrate surfaces are ready to receive work and elevations are as recommended by manufacturer's written instructions.

3.2 APPLICATION

.1 Apply concrete finishing floor hardener in accordance with manufacturer's written instructions.

.2 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.

.3 Apply floor treatment in accordance with Sealer manufacturer's written instructions.

.4 Clean over spray. Clean sealant from adjacent surfaces.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - 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 11 - Cleaning.

.3 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

3.4 PROTECTION

.1 Protect finished installation in accordance with manufacturer's instructions.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

1. Division One - General Requirements is part of this Section and shall apply as if repeated here.

1.2 REFERENCED STANDARDS

1. Do masonry mortar and grout work in accordance with latest CSA A179-M1994 edition except where specified otherwise.

1.3 SAMPLES

1. Samples of coloured mortar will be evaluated when built into mock-up wall. Three colours to be built into mock-up for exterior masonry mock-up for the Architect's review.

PART 2 PRODUCTS

2.1 MATERIALS

1. Masonry Cement shall conform to requirements of CAN/CSA-A8-M93, Masonry Cement.

2. Sand: Conform to requirements of C.S.A. A82.56-M1976 "Aggregate for Masonry Mortar".

3. Water: Potable, free from injurious or other substances detrimental to mortar, or will cause efflorescence.

4. Portland Cement: Conforming to CAN/CSA-A5-M88, white or grey as indicated.

5. Hydrated Lime: Conforming to ASTM C207-79 "Specifications for Hydrated Lime for Masonry Purpose" Type S. Hydrated lime shall be "soaked" 48 hours before paste is mixed with sand.

6. Mortar Colour: Pigment type as supplied by Harcott Pigment Ltd. or approved equal(s) (Davis Colors) colour to match masonry. Allow for three (4) colours at exterior areas where three (4) colours of masonry are used. Colour admixture not to exceed 10% of cement content by mass.

7. Use of any admixture to meet cold weather requirements is expressly forbidden.

8. 1:1:6 Masonry Mortar for Clay Brick: equal to 1:1:6 Type "N" mortar.

2.2 MORTAR TYPES

1. Mortar types shall be as designated and conform to latest C.S.A. A179-M1994 edition, "Mortar and Grout for Unit Masonry".

2. The following mortar types shall be used:

   1. Type S: For masonry foundation walls and masonry in contact with earth

   2. Type S: For interior block unit masonry above grade unless noted otherwise on plans.

   3. 1:1:6 Type "N" mortar: For clay brick masonry exterior (exposed) block veneer, quarried stone and glazed block

   4. Type S: For structurally reinforced masonry walls.

2.3 GROUT

1. To current CSA A179-M1994 standard.

2. The following grout types shall be used:

Type	Fine Grout	Coarse Grout
Portland Cement - cu. ft.	1	1
Hydrated Lime (optional cu.ft.)	1/10	1/10
Damp Loose Sand - cu. ft.	2¼ to 3	2¼ to 3
Pea Gravel - cu. ft.	-----	1 to 2

   Water - only enough to give creamy pouring consistency. Use a 1 cu. ft. (or metric box) in measuring portions for use in bond beams, lintels, and vertical cells.

3. Low lift grout as per structural drawings.

4. Grout Masonry components where indicated.

2.4 PARGING

1. Parging Mortar: Type M to latest CSA A179-M1994.

PART 3 EXECUTION

3.1 MIXING

1. Mortar used in the construction of unit masonry walls shall conform to C.S.A. A179-M1994.

2. Material proportions, acceptable compressive strengths, locations of use, incorporation of admixtures included in C.S.A. A-179-M1994, shall be modified as may be required by Jurisdictional Authorities.

3. Mix premixed 1:1:6 mortar as in strict conformance with directions provided by the manufacturer.

4. All grouting to conform to the requirements of CSA Standard CAN3-A371-M84.

3.2 MIXING OF COLOURED MORTAR

1. Premix colouring agents with dry cement in large batches (for best control) in strict accordance with pigment manufacturer's instructions, accurately measured to ensure constant and even colour of mortar throughout the job. Submit mortar colour "recipe" in operations and maintenance binders.

2. Maintain sufficient mixers on job site, one for regular mortar and one for each coloured mortar exclusively.

3. Three colours of mortar at exterior masonry may be selected by Architect at areas where three colours of masonry are used. Colours as selected by Architect.

3.3 TESTING

1. Testing of mortar materials will be carried out by testing laboratory designated by Architect.

2. Submit samples of sand and water for testing to ensure that mortar will not produce efflorescence.

3. Submit samples of sand and water and premixed mortar for testing to ensure that mortar will not produce efflorescence.

4. Mortar shall be tested in accordance with the requirements of clause 4.4.1 in CSA S304.1-94 and CSA A179-94.

5. Testing shall be completed for each 250 m² of masonry, for each storey.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

1. Division One - General Requirements are part of this section and shall apply as if repeated here.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

1. Conform to the latest Ontario Building Code, as currently amended and Local Bylaws, except where indicated otherwise on drawings or specified herein. In case of conflict between Codes, the Ontario Building Code will govern.

1.3 STANDARDS

1. Materials, equipment, and practice shall conform to CSA3-S304-04 and CSA-A371-04, Masonry Code of Practice and CAN/CAN/CSA-A82-06 for brick. Brick masonry units must comply to CAN3-A82.2 M78 and concrete masonry units shall comply to CSA A165 Series-14. Brick masonry units must not have a greater Saturation Coefficient than .78 as set by test method CAN3-A82.2 M78 and must meet specifications CAN/CAN/CSA-A82-06 for SW grade FBX type brick. Brick masonry units will be tested once they are delivered to the site and shall not be installed until testing is complete and units have surpassed the tests.

2. Work of this section to comply with "Plain and Reinforced Masonry-Canadian Structural Design Manual" Supplement to the National Building Code of Canada and CSA-A371-94.

3. Ensure fire rated walls, partitions or separations are in accordance with "Fire Performance Ratings Supplement" of the National Building Code of Canada.

1.4 DELIVERY AND STORAGE

1. Stockpile masonry units on platforms or other approved supports to keep units free from ground contact. Prevent staining of masonry units from contact with any material while stored. Secure waterproof covering entirely over each stockpile when masonry work not in progress.

2. Deliver, handle and store masonry units by methods which will guard against soiling or chipping. Protect all holes and reglets from water and ice during freezing weather.

3. Dry out units which fail to meet moisture content limitation during storage on job site and do not lay until tests prove satisfactory.

1.5 SPECIAL PROTECTION

1. Protect exposed masonry corners and projections by methods which will not mar finished surfaces.

2. Masonry stained or damaged shall be replaced as directed by Architect.

3. Cover tops of all walls with well-secured, approved, non-staining and waterproof material while work is not in progress and until satisfactorily covered by metal deck structure or roof membrane. Cover shall be at least 2'-0" (600 mm) wider than width of wall.

4. In cold weather protect masonry and heat materials as provided in CSA-A371-94 and "Recommended and Guide Specifications for Cold Weather Masonry Construction" available through Ontario Masonry Contractors Association. Maintain dry beds for masonry and use dry masonry units only. Do not wet masonry units in winter.

5. In hot weather, protect freshly laid masonry from drying too rapidly by means of waterproof, non-staining coverings.

1.6 DEFECTS DEFINED

1. In addition to non-compliance with specified requirements or other contract requirements, the following will be considered defects:

    1. shrinkage in individual units and erected work.
    2. spalling.
    3. poor colour of texture blending of units.
    4. surface deterioration, dusting.
    5. discolouration, crumbling and similar deterioration of mortar.
    6. failure of built-in items to remain anchored.
    7. chipped units - any chipped area on exposed surface.

PART 2 PRODUCTS

2.1 MATERIALS

1. Water: Clean, free from salts that will cause efflorescence and other substances detrimental to masonry.

2. Dampproof Coursing: Blueskin TWF by Bakor, ensure membrane is supported on a slope, where there is no support, copper TWF to be installed than Blueskin TWF over top and seal.

3. Sealant: Tremco Dymeric 240 as per Section 07900.

4. Asphalt Emulsion: Conform to CSGB-37-GP-2M.

5. Joint Filler: purpose-made elastomer to ASTM D. 2240-81 of size and shape.

6. Control Joint: "RS Series – Rubber Control Joint", sizing to suit masonry widths as required as manufactured by Hohmann & Barnard Inc. or approved equal.

11. Joint Reinforcement:

    1. Below Grade Walls: 3/16" (4.7mm) diameter ladder design stainless steel joint reinforcement at all below grade block walls by Hohmann & Barnard Inc. or Blok-Lok Ltd.

    2. Interior Walls: 9 ga. (3.66mm) ladder design mill galvanized joint reinforcement at all interior walls as manufactured by Hohmann & Barnard Inc. or Blok-Lok Ltd.

    3. Sizes: 2" (50 mm) less than wall thickness.

        1. Rod Size: Side rods 3/16" (4.7mm) and cross rods 3/16" (4.7mm) unless noted otherwise.

        2. Provide prefabricated tees and corners at all locations.

        3. Masonry Piers: 2" (50 mm) wide stainless-steel ladder masonry reinforcing. The brick shall be tied back to the block with stainless steel "Zee" ties.

    4. Nailing Inserts: 26-gauge hot dipped galvanized steel 1" x 2¼" (50 mm x 55 mm) all metal wall plugs.

    5. Galvanizing: In conformance with ASTM A153 Class B2.

    6. Masonry Angle Support / Shelf Angles & other angle supports:
    Fero Fast (Fero Angle Support Technology)
    Hot dipped galvanized with angle support depth to match / work with insulation thickness required.

12. Concrete Masonry Units: Standard Weight and Lightweight Units

    1. The following concrete masonry units are to be Carboclave masonry units as manufactured by Boehmers or Day & Campbell:

    2. Standard Weight Concrete Masonry Units: to CSA-A165.1.
        1. Classification: H/15/A/M.
        2. Size: CCMPA metric modular. Sizes as indicated on the drawings.
        3. Colour: To be confirmed

    3. Lightweight Concrete Masonry Units: to CSA-A165.1.
        1. Classification: H/15/C/M.
        2. Size: CCMPA metric modular. Sizes as indicated on the drawings
        3. Colour: To be confirmed

    4. Solid Concrete Masonry Units: to CSA-A165.1.
        1. Classification: S/15/A/M.
        2. Size: CCMPA metric modular. Sizes as indicated on the drawings
        3. Colour: To be confirmed

5. Bull Nose Cornering: For concrete block (other than architectural concrete block) all vertical exposed outside corners and door jambs shall have a 1" (25 mm) radius and window jambs shall be pencil round radius. Provide square edge block for first course above finished floor and pencil round edge from the base course on. Round off the edge of first block course above the top of the base to match bull-nosed edge of other courses.

13. Building Paper Felt: 30 lb. building paper felt, (13600 g.).

14. Grouting and Steel Reinforcement for Vertical Reinforced Masonry (VRM):

1. Grouting and reinforcement steel to be supplied and installed by this section. All materials and installations to conform to structural drawings and specifications. Provide a mechanical device to hold vertical reinforcement at centres of block cores.

PART 3 EXECUTION

3.1 ERECTION

1. General Workmanship

1. Install unit masonry work in complete conformance to governing requirements of Jurisdictional Authorities.

2. Lay face work from face side. Perform work by skilled mechanics according to best standard practice.

3. Lay masonry level, true to line, square, plumb, and as detailed. Vertical joints in perpendicular line.

4. Distribute exposed masonry of varying colours, tones and textures, evenly over wall surface to avoid patches and streaks and to produce a homogeneous blend. Avoid using units that are too contrasting in appearance for satisfactory blending.

5. Chipped or blemished units may only be used where concealed. Defective and broken units shall be rejected.

6. Make joints uniform in size and tool to match sample joints. Unless specified or indicated otherwise tool all interior joints whether or not they are behind cabinets or fitments or drywall. Close all cracks and crevices. Strike off flush all joints in unparged masonry covered by earth. Press in flush joints at exterior cavity side of inner block wythe so no voids occur. No mortar shall protrude from joints on wall surfaces to which insulation and waterproofing are to be applied. Rake out joints at juncture of masonry walls and columns on exterior and interior, as necessary to permit caulking detailed or specified, in walls to be plastered upon directly to

provide bond, and where otherwise noted on drawings.

7. Fill all joints completely with mortar including webs. Buttering corners of units, throwing mortar scraping into joints, slushing, deep or excessive furrowing of bed joints not permitted. Do not shift or tap units after mortar has taken initial set. When work is resumed on walls previously laid, and which are either partially or totally set, remove all loose brick and mortar from top and adjoining surfaces. Remove mortar completely when masonry is removed and replace with new.

8. Brace walls and piers during construction until structure provides sufficient lateral support.

9. Extend masonry walls to underside of structure above unless indicated otherwise. Cut and fit masonry work as required. Install anchors at top of masonry to provide lateral support, to Structural Consultant's approval. Fill space at block walls at underside of steel deck solid to conform to code and at all interior partitions and at fire separations. Install formed metal closures where top of block and bottom of metal deck is exposed.

10. Build in steel lintels, base plates and wall plates, as specified in Division 5 and reinforced concrete lintels as specified in Division 3. Set steel lintels in a bed or mortar. Install steel reinforcement and grouting as noted and detailed on structural drawings.

11. Install hollow metal door frames with lintels where specified in masonry walls, in accordance with manufacturer's instructions to present a rigid, true, plumb installation.

12. Note: Completely fill frames with mortar. Keep faces of frames free of mortar during installation and leave clean. Maintain protective coverings.

13. Build in water stops, bellows, bent closures, sheet metal flashings, accessories, access panels, and anchors required for frames, guards, sills, etc., and as otherwise provided in other sections. Cooperate in the setting and aligning of this work.

14. Work shall include damp-proof coursing and membrane reinforced flashing at base flashing as detailed.

15. Consult other trades and make necessary provisions to permit the installation of their work in a manner to avoid cutting, patching and fitting.

16. Supply and locate dovetail anchor slots in time for placing in concrete formwork at locations where masonry walls abut concrete and where anchorage is required. Install slots at 2'-0" (600 mm) on centre horizontally and install joint reinforcement ties at 16" o.c. vertically.

17. Chases shall be built, not cut.

18. Bearings and piers required for structural members shall be constructed as indicated on structural drawings.

2. Concrete Masonry Workmanship

1. Lay out work to minimize cutting of units.

2. Use power driven abrasive disc for coping units and splitting units, or for cutting units to accommodate flush mounted electrical outlets, grilles, pipes, etc. Leave 1/8" (3 mm) clearance between edge of item and opening in masonry unit.

3. Use solid unit where bonding is required if webs of hollow blocks do not align one over the other.

4. Concrete masonry units will be rejected if face blemishes, smears or slicks appear whether wall is painted or not. Do not use chipped block where exposed to view.

5. **Keep all cavity spaces free of mortar in cavity walls**.

6. Use blocks with 1" (25 mm) radius vertical edges for external corners including door jambs and pencil round at window jambs. At bottom block course where quarry tile base is to be installed, install square edge outer corner block at first course for quarry tile installation and grind block external corner edge round to 1" (25 mm) radius above quarry tile base to top of first course.

7. Where beams or lintels bear on concrete block walls, the blocks under the bearing shall be solid or filled with concrete for a depth of two courses and a width of 32" (800 mm) or as noted otherwise.

8. Where joists bear on hollow masonry walls provide minimum 5½" (140 mm) solid masonry under joist bearing, where concealed masonry may be brick.

9. Provide reinforced block lintels (where steel lintels are not indicated on Structural drawings):

1. over square head openings where noted and at all other locations as detailed on structural and architectural drawings.

2. over openings not exceeding 5'-0" (1500 mm) where no other support is shown, fill lintels solid with min. 3000 p.s.i. (21 m.p.a.) concrete and reinforce with min. two #5 steel bars; Note: Conform to structural drawings for bond beam reinforcing and concrete detailing

3. cast lintels at least 7 days before setting; provide bearing at ends as detailed on structural drawings min. 8" (200 mm).

1. Where walls 12" (300 mm) and thicker have exposed face on both sides, lay block using two units in wall thickness.

2. Exposed joints shall be concave unless indicated otherwise.

3. Use lightweight concrete units for all exposed interior walls.

4. Provide all structural work at masonry walls as indicated on structural drawings.

3. Damp-proof Course

1. Lay dampproof course over tops of all foundation walls. Lap strips a minimum of 4" (100 mm) at junction and angles and install sealant to secure joints.

2. Install dampproof course at floor level for all interior partition walls on floor slabs on grade

4. Shrinkage Control Joints

1. Work shall include shrinkage control joints in wall constructed entirely or partially of masonry units manufactured of concrete:

1. At all locations indicated on drawings.

2. Provide additional interior control joints at junction of walls and columns at maximum horizontal spacing not exceeding 20'-0" (6 m) in runs of walls where no openings occur at all locations where control joints are not indicated. Obtain Architect's approval of additional control joints prior to proceeding. Carry joints from support of wall to top of wall at structure above.

2. Control joints shall be constructed as detailed and shall provide a complete vertical separation through the wall. Joints shall be a nominal 3/8" (10 mm) wide.

3. Form control joints for interior block masonry walls by placing a layer of building paper up the height of the wall separating block on one side from adjacent block or column. Fill void between blocks with mortar. Rake joints back 3/8" (10 mm). Building paper shall not be exposed.

4. Form shrinkage control joints in exterior masonry walls by placing premoulded joint filler in continuous vertical joint, full height of wall. Leave pre-moulded filler back from face of wall to allow space for joint filler and sealant under Section 07900.

5. Joint Reinforcement

1. Reinforce all walls and partitions of concrete masonry units, solid and cavity, and single wythe block walls with joint reinforcement placed in horizontal joints at alternate courses 16" (400 mm) unless indicated otherwise. DO NOT extend joint reinforcement through control joints. Overlap all joints a minimum 8" (200 mm).

2. Where openings occur in these walls, place joint reinforcement in joints at every 8" (200 mm) course, within 32" (800 mm) above and below openings for a distance of 24" (600 mm) beyond opening.

3. Reinforce all masonry walls where thickness is reduced by a column or chase with a 48" (1200 mm) length of joint reinforcement placed in horizontal joints at 16" (400 mm) centres. Centre reinforcement on column or chase.

4. Install prefabricated corner sections in reinforced joints at corners and prefabricated tee sections at reinforced joints where partitions intersect other partitions or walls, unless lateral support is being provided or walls or partitions are erected on a different foundation.

5. Where intersecting walls are erected on different foundations and lateral support is not required, provide straight joint full height of wall with masonry ties at every second joint. Rake joint 3/8" (10 mm).

6. All exterior wall reinforcing to be stainless two wire ladder type with stainless steel Fero Block Shear Connector Tie with V-Tie leg. All interior partition wall reinforcing, and anchors mill galvanizing ladder design

7. Provide structural work as detailed on structural drawings.

8. Place masonry reinforcement according to CSA-S304-94.

6. Bonding

1. Wythes of masonry walls shall be bonded by means specified and/or shown on drawings, or as otherwise required by authorities having jurisdiction.

2. Use running bond unless otherwise indicated. Specialty bonding, banding, stack bonding, soldier coursing to be as indicated on drawings. Use stack bond where indicated on drawings.

3. Cavity wall wythes shall be bonded with joint reinforcement at 16" (400 mm) o.c. and staggered cross members of reinforcement at alternate courses.

7. Built-in Work

1. Set all loose and miscellaneous items of steel and iron, including all isolated beams, lintels, shelf angles, bearing plates, ventilators and all other loose iron and steel work specified for erection or setting by others when built into masonry work. These items shall be grouted in place using cement mortar.

2. Install 30-pound (13600 g) building paper felt under steel lintel bearing on one side only. Locate this bond breaker on the same as the control joint occurs.

3. Supply and install all vertical steel reinforcement and grouting indicated on the structural drawings. Grouting to be installed using at maximum 5'-0" lifts (1525 mm) using low lift grout.

3.2 POINTING AND CLEANING

1. Point using concave joint at all areas except at single scored block which shall be tooled to match square score in block and provide other joint finishes where directed by Architect.

2. Point all holes, except weepers in masonry. Cut out all defective joints and repoint them with mortar.

3. Clean exposed masonry to satisfaction of Architect after mortar has hardened.

4. Wire brushes or abrasives shall not be used for cleaning.

5. Use of muriatic acid shall not be used for cleaning.

6. Leave masonry clean and free of mortar daubs and with tight mortar joints. Submit data for Architect's approval of chemical cleaner to be used to remove excess mortar on bricks.

7. Rinse masonry surfaces with water immediately after cleaning.

8. Remove and replace defective material at Architect's direction and at no cost to the Owner.

9. Clean up masonry debris and remove from site.

END OF SECTION

PART 1 GENERAL

1. GENERAL REQUIREMENTS

    1. Division One, General Requirements, is a part of this section and shall apply as if repeated here.

2. SHOP DRAWINGS

    1. Submit shop drawings in electronic PDF format.

    2. Submit shop drawings for review by the Consultant prior to fabrication.

    3. Design Criteria-Applicable Standards:

        1. All standards in accordance with latest issue.

        2. CSA Standard CAN3-S16.1-M, "Steel Structures for Buildings" Limit States Design.

        3. CSA Standard W59, "Welded Steel Construction" (Metal Arc Welding).

        4. CSA Standard W.55.2, "Resistance Welding Practice."

        5. CSA Standard W55.3, "Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings."

        6. CSA Standard W.47, "Certification of Companies for Fusion Welding of Steel Structures."

        7. CSA Standard S.136, "Cold Formed Steel Structural Members".

        8. Ontario Building Code.

    4. Certificates:

        1. Provide a certificate signed and sealed by the licensed/registered professional engineer responsible for the stair designs and the detailed steel connections (including guards) stating that the stairs and connections have been designed, detailed and fabricated in accordance with the applicable standards.

        2. Certification must bear the original seal and signature of the engineer and be dated. Photocopies are not acceptable.

    5. Clearly indicate construction details, sizes of steel sections, thickness or gauge of steel sheet, connections, joints, method of anchorage, number of anchors, supports, reinforcement and accessories. Confirm all

dimensions on site.

3. STANDARDS

1. Materials and workmanship shall conform to the requirements of the Latest Ontario Building Code, as currently amended.

2. Do welding work to CSA W59, unless specified otherwise. Welders to qualify under CSA W47, CSA 55.2 and CSA W55.3.

3. Design of steel fabrications, unit stresses and workmanship to conform to CSA CAN3-S16 1-M.

4. DESIGN CRITERIA

1. Design stair: landing construction; guards and railings and connections to conform to the Ontario Building Code.

2. Design detail and fabricate in general to CSA CAN3-S16 1-M.

5. QUALITY ASSURANCE

1. WELDING APPLICABLE STANDARDS:

1. CSA Standard W59, "Welded Steel Construction" (Metal Arc Welding).

2. CSA Standard W.55.2, "Resistance Welding Practice."

3. CSA Standard W55.3, "Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings."

4. CSA Standard W.47, "Certification of Companies for Fusion Welding of Steel Structures."

2. QUALITY ASSURANCE

1. Fabrication and erection of all components to be by companies holding current C.W.B. Certification as Division 1 or Division 2.1. All welding by welders holding current certification for the required welding position.

6. SCOPE

1. Provide all miscellaneous steel angles, plates, lintels, etc., indicated on the architectural drawings & not indicated on the structural drawings or where noted on the structural drawings by others. Size according to loads, set plumb and true and securely fix. Continuously weld and grind smooth exposed connections. Others may be welded or bolted.

2. Provide all additional miscellaneous steel items as required to complete the above work.

3. Provide all miscellaneous metal work required by the work of other Trades. The General Contractor shall coordinate the work of this section with all other Trades for provision of miscellaneous metal work required but not provided by others.

PART 2 PRODUCTS

1. MATERIALS

    1. Ferrous Metals:

        1. Unless otherwise indicated, hot rolled mild steel in .15% to .25% carbon range.

        2. Steel sections and plate: CSA G40.21-/M1987, minimum 260W grade.

        3. Square steel tube: CSA G40.21-/M1987, Grade 350W.

        4. Steel pipe: ASTM A53-76, Type E, Grade A.

        5. Sheet Steel: hot dip galvanized, cold rolled, with stretcher level degree of flatness to ASTM A526; zinc coating designation Z275.

    2. Aluminum: CSA HA Series - M1980 for aluminum and aluminum alloys, Alcan 50S Alloy.

    3. Prime Paint: Oil alkyd type (shop coat) conforming to CGSB-1-GP-40M. Colour to be grey.

    4. Expansion Joints: as specified.

    5. Welding Materials: CSA W59-1984.

    6. Bituminous Enamel: Alkali resistant asphaltic coating conforming to CGSB1-GP-108M.

    7. Non-shrink Grout: Por-Rok by Hallemite Products Ltd., or SET 15 Minute Anchoring Cement by SET Products Ltd.

    8. Galvanized Touch-Up Paint: Zinc rich, Galvafroid by W.R. Meddows of Canada Ltd. or approved equal.

    9. Hot Dipped Galvanizing: conform to CSA G164-M1981.

10. Bolts and Anchor Bolts: to ASTM A307-82a.

11. Stainless Steel:

    1. To have brushed finish, Type 304 finish to be ornamental grade AISI No.4.

2. FABRICATION - GENERAL

1. Fabricate components in the shop in largest size practicable to minimize field jointing.

2. Fabricate components square, straight, true, free from warpage and other defects. Accurately cut, machine file and fit joints, corners, copes and mitres.

3. Reinforce fabricated components to safely withstand expected loads.

4. Make joints in built-up sections with hairline joints in least conspicuous locations and manner.

5. Make allowance for thermal expansion and contraction when fabricating exterior work.

6. Joints shall be welded unless otherwise indicated and unless details of construction do not permit welding. Exposed welds shall be continuous and shall be ground smooth.

7. Close exposed open ends of tubular members with welded on steel plugs.

8. Where work of other Sections is to be attached to work of this section, prepare work by drilling and tapping holes, as required to facilitate installation of such other work.

9. Work of this Section, supplied for installation under other Sections, shall be prepared as required ready for installation by: drilling, countersinking and tapping holes, forming shapes and cutting to required sizes.

10. Grind off mill stampings and fill recessed markings on steel components left exposed to view.

11. Make workmanship of best grade of modern shop and field practice known to recognized manufacturers specializing in this work. Fit joints and intersecting members accurately. Make work in true plumb, true, square, straight, level and accurate to sizes and shapes detailed, free from distortion or defects detrimental to appearance or performance.

12. Insulate metals where necessary to prevent corrosion due to contact between dissimilar metals and between metals and masonry, concrete or

plaster. Use bituminous paint, butyl tape, building paper or other approved means.

13. Supply all fastenings, anchors and accessories required for fabrication and erection of the work. Make exposed metal fastenings and accessories of same material, texture, colour and finish as base metal on which they occur unless otherwise shown or specified. Keep exposed fastenings to an absolute minimum and inconspicuous, spacing them evenly and setting them out neatly. Make fastenings of permanent type.

14. Draw mechanical joints to hairline tightness and seal countersunk screws and access holes for locking screws with metal filler where these occur on exposed surface.

5. FINISHES

1. Thoroughly clean steel of lose scale, rust, oil, dirt and other foreign matter. Suitable prepare steel surfaces by power tool cleaning to receive specified finishes.

2. Grind smooth sharp projections.

3. Remove oil and grease by solvent cleaning.

4. Apply coatings in the shop and before assembly. Where size permits, galvanize components after assembly.

5. Shop apply coat of primer to interior components after fabrication except where galvanized finish and stainless steel is required.

6. Hot dip galvanize exterior components and other components, where so indicated, after fabrication in accord with requirements of CSA Standard G164-M1981.

7. Apply coat of bituminous enamel to contact surfaces of metal components in contact with cementitious materials and dissimilar metals.

8. After erection and installation, thoroughly clean the work and apply field touch up of same formula as shop coat to all damaged or unpainted surfaces. Work all paint well into all joints, crevices and open spaces.

PART 3 EXECUTION

1. INSTALLATION

1. Install components plumb, square, straight and true to line. Drill, cut and fit as necessary to attach this work to adjoining work.

2. Provide temporary supports and bracing required to position components until they are permanently anchored in place.

3. Securely anchor components in place; unless otherwise indicated, anchor components as follows:

    1. To concrete and solid masonry with expansion shields and bolts.

    2. To hollow construction with toggle bolts.

    3. To thin metal with screws or bolts.

    4. To thick metal with bolts or by welding.

    5. Fill space between railing members and sleeves with non-shrink grout.

    6. To wood with bolts or lag screws.

4. Provide all components required for anchoring. Make anchoring in concealed manner wherever possible. Make exposed fastenings, where approved by Consultant neatly and of same material, colour, texture and finish as base metal on which they occur. Keep exposed fastenings evenly spaced.

5. Dissimilar metals and metals in contact with cementitious elements shall have contact surfaces coated with bituminous paint or be isolated by other means as approved by Consultant.

6. After installation, clean and refinish injured finishes, welds, bolt heads and nuts. Refinish with zinc rich paint or primer to match original finish.

END OF SECTION

PART 1 GENERAL

1. GENERAL REQUIREMENTS

    1. Division One, General Requirements, is a part of this section and shall apply as if repeated here.

2. STORAGE

    1. Materials shall be protected from damage and kept dry during delivery and while stored at job site.

    2. Do not store materials in areas where glazing is not complete or concrete completely dry.

3. STANDARDS

    1. Materials and workmanship shall conform to the requirements of the Ontario Building Code as currently amended.

4. SCOPE

    1. Provide all miscellaneous rough carpentry as required to complete the Work of this Contract.

PART 2 PRODUCTS

1. MATERIALS

    1. Sawn lumber shall be No. 2 spruce, pine or fir of best merchantable lumber, straight and sized, shaped to the correct dimensions from the nominal sizes noted on the drawings and specified herein. Lumber shall be well-seasoned stock, free from large loose resinous knots, shake, waned edges, splits, dry rot or other defects which would impair its strength or durability.

    1. Moisture content of all lumber for rough carpentry, at time of building-in, shall not exceed 17%.

    2. Wood Preservative: C.C.A. (chromium copper arseniate) by "Wolmanized".

    3. Rough Bucks, Battens, Blocking, Framing: Eastern Spruce, Jack Pine or Fir No. 2 or better.

    4. Exterior Rough Bucks Batten Blocking, Framing and Plywood and Interior Wood Attached to Masonry or Concrete: Jack Pine No. 2 or better "Wolmanized" pressure treated wood conforming to C.S.A. 081.1-M1983. Sizes as indicated on drawings and/or as required. All pressure treated

lumber shall bear the trademark "Wolmanized" and bear a mark certifying conformance with AWPB Standard LP-2 or LP-22.

5. Fire Retardant Lumber: to be CSA 080.20 DRICON FRT Lumber and plywood distributed by J. Brewer (Canada) Ltd; (519) 621-7701. Sizes as indicated on drawings and/or as required.

6. Grounds, Nailing Strips, Strapping, Furring: Eastern Spruce or Jack Pine Construction Grade allowing 10% to 15% standard grade.

7. Plywood Sheathing: Construction grade and paint grade good one side fir plywood sheathing, exterior type, conforming to C.S.A. 0121-M1978. Square edge or T&G as required.

8. Galvanized Nails and Spikes, Carriage Bolts, Screws and Washers: Hot dipped galvanized nails and spikes for exterior work and mill galvanized for interior work.

9. Nails, Spikes and Staples: To C.S.A. B111-1974, plain finish. Use spiral thread nails.

10. Adhesive: Waterproof wood adhesive.

PART 3 EXECUTION

1. WORKMANSHIP

1. Work shall be executed by skilled mechanics according to best practice, as specified herein and indicated on drawings.

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.

3. Bore holes for bolted work true to line and same size as bolts, drive into place for snug fit, use plate or washer to prevent nut from bearing directly on wood, and turn up nuts, bolts and lag screws tight at time of installation and again immediately before being concealed with other work or at completion of work.

4. Give painter sufficient notice so that untreated or unprimed carpentry items or materials shall be primed immediately upon delivery to site.

5. Co-operate with others engaged in work on the building to the end that proper unity of action will assure the orderly progress of the work. Do necessary boxing and protecting of sills, jambs, corners, and the like. Construct scaffold, ramps, and other temporary staging necessary.

2. WOOD PRESERVATIVE

1. Treat fresh cut ends of pressure-treated Jack Pine with two coats of end preservative.

3. ROUGH HARDWARE

1. Supply rough hardware such as nails, bolts, nuts, washer, screws, clips, strap iron, and hardware for temporary enclosures.

4. ROOF CURBS, BASES AND SUPPORTS

1. Construct pressure treated wood roof curbs for ventilation ducts, fan bases, etc., as detailed or required by other trades. Construct suitable approved pads to receive duct supports. Note tops of all curbs for roof top units shall be a minimum 14" (350 mm) above finished roof surface.

5. ROUGH BUCKS, GROUNDS, BLOCKING, STRAPPING, FURRING

1. Furring, blocking or strapping indicated is not to be regarded as exact or complete. Location and methods of securing these pieces to option of Contractor. Provide adequate nailing.

2. Cut grounds and screeds in long lengths as practical with square ends. Erect to create true, plumb planes and fasten rigidly in place.

3. Provide minimum 2" x 4" (38 mm x 89 mm) blocking as necessary for attachment of base, trim, cabinets, fixtures, hardware, miscellaneous specialties, equipment and the like unless indicated otherwise. Cut ends square and fasten rigidly to building structure.

4. Rough bucks shall be minimum 2" (38 mm) thick wood of width indicated, set straight, true and plumb, braced and fastened securely in place.

5. For general strapping, set treated wood strips vertically spaced 16" (400 mm) on centre, unless otherwise indicated. Shim so faces form a true plane. Provide intermediate horizontal strapping at all joints to wall finishes applied over grounds.

6. FRAMING

1. Frame walls, partitions, roofs, platforms, etc., as indicated. Note: metal studs supplied and installed under Section 09110.

2. Set wood joists 16" (400 mm) o.c. unless otherwise noted, using a single

bottom plate and double top plates. Double studs at openings and triple at corners and partition intersections. Provide one row of horizontal bridging of same material as studs.

7. BLOCKING

1. Provide minimum 2 x 4 (38 mm x 89 mm) blocking or size as required for secure attachment of base, trims, cabinets, fixtures, miscellaneous specialties, equipment etc. and the like unless specified otherwise. Cut ends square and fasten rigidly to building structure. Cut ends square and fasten rigidly to building structure. Coordinate blocking requirements with work of sections listed in 1.4 of this section.

8. FIRE RETARDANT WOOD

1. Electric and Telephone Backboards and Panel Boards: Supply and install 19 mm thick backboards and panel boards, fire pressure treated, fir plywood. Consult electrical drawings for locations and requirements. Provide wood strapping as required. Fasten to wall using fasteners and spacing suitable to wall type to provide secure, sturdy installation which will carry equipment load without damaging.

9. WINDOW SILLS

1. Supply and install first layer of plywood (pressure treated at window sills). Second layer, nosing and plastic laminate by Finish Carpentry. Refer to drawings for detail and locations.

END OF SECTION

PART 1 GENERAL

1. GENERAL REQUIREMENTS

    1. Division One - General Requirements, is a part of this Section, and shall apply as if repeated here.

2. REFERENCE STANDARDS

    1. Standard of finished carpentry, metal work and cabinet work in accordance with the "Architectural Millwork Standards" of the Architectural Woodwork Manufacturers Association of Canada (AWMAC).

3. QUALIFICATIONS

    1. The work of this trade shall be executed by a company having adequate equipment and skilled personnel. Refer to Instructions to Bidders for list of Prequalified Trades.

4. SCOPE OF WORK

    1. Miscellaneous finish carpentry and installations as required for final fit and finish of all work where not provided by the General Contractor or other Trades.
    2. All trims, copings, cappings to ensure a finished installation of all work including transitions between existing and new work.
    3. Installation of washroom accessories including Owner supplied items.
    4. Installation of hollow metal doors.
    5. The General Contractor shall have final determination of the scope of this section and coordinate the scope with the requirements of all other Trades.

5. SHOP DRAWINGS

    1. Submit Shop Drawings in electronic PDF format.

    2. Before Shop Drawings and fabrication are started, take critical measurements at the site to facilitate installation and fitting of work.

    3. Design Criteria - Applicable Standards:

        1. All standards in accordance with latest issue.

        2. Ontario Building Code

    4. Certificates:

        1. Provide a certificate signed and sealed by the licensed/registered professional engineer responsible for the Lobby Ceiling Feature

designs and the detailed wood and steel connections stating that the feature and connections have been designed, detailed and fabricated in accordance with the applicable standards.

2. Certificates must bear the original seal and signature of the engineer and be dated. Photocopies are not acceptable.

5. Clearly indicate construction details, sizes and wood and steel sections, thickness or gauge of wood and steel sheet, connections, joints, method of anchorage, number or anchors, supports, reinforcement and accessories. Confirm all dimensions on site.

6. DELIVERY AND STORAGE

1. Give Painter sufficient notice so that untreated or unpainted carpentry items or materials can be primed immediately upon delivery to site.

2. No equipment shall be delivered to the site until a portion of the building in which it is to be installed is completely ready for equipment as approved by the Architect.

3. Store finished work properly and keep under cover both in transit and at site. Finish woodwork shall not be delivered to site until concrete and masonry work has dried out.

4. Cover all plastic laminate and melamine faces at shop with heavy Kraft Paper.

5. Check access clearance at site before assembling.

7. SAMPLES

1. Submit duplicate 12" x 12" (300 mm x 300 mm) samples of each type of panelling and each type of solid wood or plywood to receive stain or natural finish.

2. Submit duplicate 12" (300 mm) long samples of each type of moulding.

3. Submit samples of construction methods and all hardware.

8. WARRANTY

1. The warranty period stipulated in the General Conditions of the Contract shall be extended five (5) years in writing against defects.

9. MOISTURE CONTENT

1. Finish material to be dried to a uniform maximum moisture content of 12% for exterior work and 6% to 8% for interior work.

PART 2 PRODUCTS

1. MATERIALS

1. Materials used for finish work shall be sound, free from defects that would mar finished appearance, well seasoned and air dried and of good quality for intended purposes. Wood laminates pressure bonded.

2. Plywoods: shall be rift cut or quarter sawn Oak and/or plain sliced Maple architectural grade "AA" No. 1 Face Grade and shall comply to C.S.A. 0115-M1982, with plywood core, laminated with waterproof adhesive. Plywood shall be good both sides.

3. Hardwoods - Shall be solid selected Oak / Maple Architectural Grade 'AA'. Wood shall be selected for uniform colours and graining when at stained and varnished items. Finger jointed woods will not be accepted.

4. Framing Lumber - No. 2 or better spruce, pine or fir best mercantile lumber.

5. Penetrating Sealer - "Penetrim" by Tremco Mfg. Co. (Canada) Ltd., or "1402" by MacNaughton Brooks Ltd.

6. Painted Hardwood: American Poplar ("White Wood") "C" select grade.

7. Adhesive: As recommended by manufacturer for required application and to conform to C.S.A. 0121-M1978.

8. Nails, Spikes and Staples: To C.S.A. B111-1974, plain finish nails. Use spiral thread nails and barbed staples.

9. Pressure Treated Wood: Conforming to Section 06100, sizes as indicated and detailed. **NOTE:** Warped, twisted, loose or missing knots in wood will not accepted.

10. Exposed fasteners: All exposed fasteners to be stainless steel. At exposed screw locations use stainless steel screws and cup washers.

11. Refer to drawings and details for complete list of materials to be installed.

PART 3 EXECUTION

1. WORKMANSHIP

1. Work shall be executed by mechanics skilled in their respective trade, according to best practice, or specified herein and indicated on drawings.

1. Check job dimensions and conditions and notify the Architect in writing of

unacceptable conditions. Do not proceed until remedial instructions are received. Commencement of work will imply acceptance of site conditions and re-working or modification of the work as deemed necessary by the Architect will be done at no extra cost to the Owner.

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.

4. Lay out work carefully as indicated 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.

5. Use treated lumber for studs, blocking nailers, furring and other wood permanently installed in building. Brush coat freshly cut ends with two coats of concentrated form of preservative.

6. Recess and conceal fasteners and anchor heads. Fill with matching wood plugs. Set nail heads and fasteners occurring within exposed interior carpentry work.

7. Provide wood members free from bruises, blemishes, mineral marks, knots, shake and other defects and select for uniform colour grain and texture. Machine and hand sand surfaces exposed in the finished work to an even, smooth surface free from defects detrimental to appearance.

8. Provide running members in the maximum lengths obtainable. Provide thickness of members in maximum dressed size of standard lumber. Where thickness of width indicated is not available in hardwoods, use glue laminations to obtain sizes required. Provide unexposed backs of veneers having the same physical characteristics as the face veneer.

9. Give painter sufficient notice so that untreated or unprimed carpentry items or materials can be primed immediately upon delivery to site. No exposed end grain of plywood shall be permitted; edging shall be solid 3/8" (10 mm) wide by thickness of plywood and of same species of wood. Finger jointed edging will not be accepted.

10. Co-operate with others engaged in work on the building to the end that proper unity of action will assure the orderly progress of the work. Do necessary boxing and protecting of sills, jambs, corners and the like. Construct scaffold, ramps, and other temporary staging necessary.

11. Chamfer edges of plastic laminate to avoid chipping.

2. INSTALLATION

1. Deliver Finish Carpentry to the site. Provide units of such sizes as will not present difficulty of entry to the place of installation. Where units are shipped in knock-down forms, provide clear instructions for assembly.

2. Install Finish Carpentry items plumb, square, true, rigid and secure with concealed fastening at exposed areas and with stainless steel screws and cup washers where secured inside of millwork units.

END OF SECTION

PART 1 GENERAL

1. GENERAL REQUIREMENTS

    1. Division One, General Requirements is part of this Section and shall apply as if repeated here.

2. SCOPE OF WORK

    1. Supply and install rigid insulation at all locations indicated on drawings.

3. SUBMITTALS

    1. Submit shop drawings and samples in accordance with CCDC Document 5B-2010 and Section 01300 - Submittals for items 2 below.

PART 2 PRODUCTS

1. INSULATION

    1. Below Grade foundation Locations: To conform to CAN/ULC S701 Type 4, ship lapped / square edged – buttered with waterproofing membrane backup, extruded polystyrene rigid insulation to be "Styrofoam SM" with RSI 0.87 (R-5.0) minimum thermal resistance values per inch by Dow or equal.

    2. Below Grade, Slab on Grade, Frost Slab, Door Threshold Locations: To conform to CAN/ULC S701 Type 4, square edge, extruded polystyrene rigid insulation to be "Styrofoam SM" with RSI 0.87 (R-5.0) minimum thermal resistance values per inch by Dow or equal.

    3. Foam Insulation: Sprayed polyurethane foam to flame spread rating of less than 500, min. RSI 1.05 (R 6/1") at density of 32.8 kg/cu.m (2lb/cu. ft). Spray foam at voids and broken areas in the rigid insulation. Spray foam is for repairs only.

4. ADHESIVE

    1. Cavity wall insulation board perimeter buttered edges: "Air-Bloc 21" by Bakor (air/vapour retarder, both)

        Note:
        Over exterior sheathing, on framed substrate systems where there is mineral wool insulation filling the voids with an continuous air/vapour barrier sealed on the interior side of the framing members, the exterior rigid insulation is not to be sealed around perimeters when the contractor does not install Cladmate as specified for breathability.

    2. Adhesive for perimeter insulation below grade: to be CGSB 71-GP-24m

equal to Bakor 230-3J.

PART 3 EXECUTION

1. WORKMANSHIP

    1. Work shall include rigid insulation in cavity walls, clear storey walls, roof parapets, roof curbs, below grade foundation perimeter and below concrete entrance slabs.

    2. Surfaces to receive rigid insulation shall be clean, free of grease and oil, and reasonably smooth with no mortar or concrete pin projections.

    3. Install insulation after building substrate materials are dry.

    4. Prime surfaces before using asphaltic type adhesives.

    5. Install all materials using adhesive or fasteners in strict accordance with manufacturer's installation instructions unless otherwise specified herein.

    6. Ensure a uniform, continuous thermal barrier effect. Where insulation is to be provided under other Sections, co-ordinate the work such that the thermal barrier continuity is achieved.

    7. Install insulation to maintain continuity of thermal protection to building elements and spaces.

    8. Fit insulation closely around electrical boxes, plumbing and heating pipes and ducts, and other protrusions.

    9. Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from damaged or broken edges. Use longest possible lengths to reduce number of joints. Keep insulation minimum 3" (75 mm) from heat emitting devices such as recessed light fixtures, and a minimum 2" (50 mm) from sidewalls of CAN4-S604 Type "A" chimneys and CAN1-B149.1 and CAN1-B149.2 Type "B" and "L" vents.

    10. In multiple layer applications offset both vertical and horizontal joints.

    11. Do not enclose insulation until it has been inspected.

2. BELOW GRADE/FOUNDATION WALL LOCATIONS

    1. Install 75mm (3") minimum rigid insulation using below grade adhesive. Backfill gently at below grade perimeter foundation locations.

    2. Repair all open joints and damaged edges with foam spray insulation to fill voids.

7. BELOW GRADE FROST SLAB LOCATIONS

1. Install 100mm (4") thick for 1220mm (4') horizontal out from all exterior frost slab foundation systems, then 50mm (2") for 1220mm (4') out from 4" thick insulation horizontal at all hard surface locations. Coordinate with typical frost slab plan detail.

2. Repair all open joints and damaged edges with foam spray insulation to fill voids.

END OF SECTION

1. GENERAL

1. GENERAL REQUIREMENTS

1. Division One, General Requirements is part of this Section and shall apply as if repeated here.

2. PRODUCTS

2.1 INSULATION

.1 Batt and Blanket Mineral Fibre Insulation (Exterior Wall -Stud Cavity):

1. Rockwool ComfortBatt mineral wool semi-rigid batt insulation with flexible edge. Thickness is to fill wall cavity solid unless specified / shown otherwise on wall types.

Typical thicknesses of 92mm – R14.5 and 140mm - R22.5
(provide minimum value of R13 as required to comply with OBC SB-10)

.2 Batt insulation at cavity wall:
1. Rockwool Cavityrock DD rockwool insulation board. 92mm
(provide minimum value of R15 continuous insulation as required to comply with OBC SB-10)

.3 Acoustic Sound Batt Insulation (Interior Wall Systems (Stud Cavity) & Sound Proofing Above Ceilings):

1. Rockwooll Acoustical Fire Batt (AFB) mineral wool insulation for fire rated assemblies and Rockwool Safe 'n' Sound for non-fire-rated assemblies. Thickness is to fill wall cavity solid unless specified / shown otherwise on wall types.

2. Rockboard 60 with foil face (facing upward into plenum) at sound rated ceiling systems where ceiling spaces are used for plenums.

.4 Curtain Wall Insulated Panel:
Rockwool Curtain Rock mineral fibre insulation with 'R' value of 4.2 / inch.
152 curtain wall framing to receive 114mm (4.5") thick insulation,
190mm curtain wall framing to receive 152mm (6") thick insulation.
Other conditions (different size back mullions which create different size sealed metal backpans) to receive insulation to fill entire void of sealed metal backpan from back side of exterior veneer sealed in curtain wall caps to face of back panel infill typical.

.5 Floor Slab Edges / Termination:
Rockwool Safe mineral fibre insulation to be installed at edge of floor slab / slab termination to back side of vertical curtain plane to fill the

remaining installation / deflection void to maintain fire resistance rating of the floor system. Install finish floor cap over & under to hold in place.

.6 Requests for approved alternative products must include technical information and be submitted not later than 7 days prior to tender closing.

2.2 ACCESSORIES

.1 Staples: ½" (13 mm) minimum leg.

3. EXECUTION

3.1 INSULATION INSTALLATION

.1 Install insulation to maintain continuity of thermal protection to building elements and spaces. Insulation to be friction fit between studs, joists or furring members.

.2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

.3 Do not compress insulation to fit into spaces.

.4 Do not install insulation in any part of the building where protection against inclement weather has not yet been provided and where the insulation could thereby be wet or damaged.

.5 Provide and install supports as required to keep insulation in place at soffits with floor above and around ducts in attic space.

.6 Keep insulation a min. 3" (75 mm) from heat emitting devices such as recessed light fixtures.

3.2 LOOSE FIBRE INSULATION

.1 Pack loose mineral wool insulation in crevices around lintels, frames, beams, around ducts at holes and other places where shown or required to minimize air infiltration.

.2 Pack loose mineral wool into voids around mechanical and electrical pipes and ducts where they pass through non-fire rated wall, floors and ceilings.

3.3 FIRE RATED MINERAL WOOL INSULATION

.1 Supply and install mineral wool at fire separations and where indicated on drawings.

.2 Refer to Section 07270 - Firestopping and Smoke Seals for mineral wool work by that Section.

3.4 SOUND INSULATION

.1 Fill all cavities full of mineral wool sound insulation where sound insulation is indicated on drawings.

.2 Sound insulation above acoustic tile ceilings supplied and installed by Section 09500 – Acoustical Treatment as per this Section.

3.5 BATT INSULATION

.1 Install mineral wool batt insulation at exterior or air/vapour barrier walls, ceiling spaces, between floor joists at perimeter wall locations and all other locations shown on drawings.

.2 Place batts in close contact with vapour barrier or air/vapour barrier facing the interior.

END OF SECTION

PART 1 GENERAL

1. GENERAL REQUIREMENTS

    1. Division One, General Requirements, is a part of this Section and shall apply as if repeated here.

2. DELIVERY

    1. Packaging of insulation shall indicate manufacturer, type, density, and insulation value.

3. SAMPLES

    1. Submit samples in accordance with Section 01300.

    2. Install sample installation min. 1'-0" (300 mm) long for each material proposed for project.

    3. Submit material safety data sheets for materials of this Section.

PART 2 PRODUCTS

1. MATERIALS

    1. Sprayed-On Insulation: Foam insulation equal to Froth-Pak 2 Component Polyurethane Foam by DOW with a min. R value of 5.5 per inch.

PART 3 EXECUTION

1. WORKMANSHIP

    1. Insulation shall be applied by skilled workers, in accordance with best trade practices and manufacturer's printed instructions.

    2. Do not install insulation in any part of the building where roof protection against inclement weather has not yet been provided and where the insulation could thereby be wet or damaged.

    3. Examine joints before sealing to ensure that configuration, surfaces, and widths are suitable for spray-on insulation and service and that execution of sealing and performance of spray-on insulation will not be adversely affected. Defective work resulting from application to unsatisfactory joint conditions will be considered the responsibility of those performing the work of this Section.

    4. Proceed with spray-on insulation only when air, substrate and surfaces in contact with spray-on insulation are completely dry.

    5. Prepare joints by brushing, scrubbing, scraping or grinding inner surfaces top remove loose mortar, dust, oil, grease, oxidation, mill scale, and other materials which will affect adhesion and integrity of spray-on insulation and

dry with clean cloths. Ensure that surfaces have not been coated with releasing agents, coating or other treatments, or that they are entirely removed.

6. Finished joints to be free of air pockets, imbedded foreign materials and cut back after curing to be flush with surrounding materials and recessed to sufficient depth for caulking.

7. Where spray-on insulation is to be applied at edges of insulation or at air/vapour barrier ensure that spray-on insulation is located to form seal at warm side of insulation and/or to form continuation of air/vapour barrier.

8. Protect all finished surfaces with appropriate covering during installation.

9. Install Sprayed-On Insulation and Sprayed Applied Fire Resistive Insulation as per manufacturer's recommendations.

2 LOCATIONS

1. Sprayed-On Insulation: Seal all joints where air leakage can occur, including window frames and rough openings, around electrical and plumbing boxes and conduits that penetrate vapour barriers. All other locations as specified and indicated on drawings, with foam spray-applied insulation where required to prevent movement or infiltration of air. Do also voids under window sills.

3. CLEANING

1. Remove from surfaces of other work sealant smears, droppings and masking tape immediately after sealant has cured to a hard surface film.

2. Clean surfaces soiled by work of this Section. Do not use cleaning methods that will damage surrounding surfaces. Make good work cleaning has damaged under work of this Section.

END OF SECTION

PART 1 GENERAL

1. GENERAL REQUIREMENTS

    1. Division One, General Requirements, is a part of this Section and shall apply as if repeated here.

2. WORK INCLUDED

    1. Firestopping and smoke seal at all existing and new wall(s)and floor(s). Mechanical and Electrical penetrations shall be by Mechanical and Electrical Contractors where their equipment and materials penetrated rated walls.

3. SAMPLES

    1. Submit samples in accordance with Section 01300 - Shop Drawings, Product Data, Samples and Mock-ups.

    2. Submit 1'-0" (300 mm) x 1'-0" (300 mm) sample of each actual firestop material proposed for project.

4. QUALITY ASSURANCE

    1. Applicator shall be licensed by the manufacturer of fireproofing materials for installing firestopping and smoke seal systems.

    2. Submit manufacturer's certification that materials meet or exceed specified requirements.

    3. Product manufactured under ULC Follow-up Program. Each container or package shall bear ULC label or listing mark.

5. SHOP DRAWINGS

    1. Submit shop drawings and product data in accordance with Section 01300 - Shop Drawings, Product Data, Samples and Mock-ups.

    2. Submit shop drawings to show proposed material, reinforcement, anchorage, fastenings and method of installation. Construction details should accurately reflect actual job conditions.

    3. Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site. Include manufacturer's printed instructions for installation.

6. SEQUENCING AND SCHEDULING

1. Sequence work to permit installation of firestopping and smoke seal materials to be installed after adjacent work is complete and before closure of spaces.

7. MUNICIPAL AUTHORITY APPROVAL

1. Discuss firestopping and smoke seal requirements with municipal building inspector to obtain their approval prior to installation. Determine which products and/or procedures will be required to obtain final approval.

2. Submit in writing, prior to commencing installation, full detailed descriptions of materials and methods to be employed for firestopping work to achieve full final approval of authorities having jurisdiction.

PART 2 PRODUCTS

1. MATERIALS

1. Firestopping and smoke seal systems: A/D FIREBARRIER Firestop Systems by A/D Fire Protection Systems Inc., capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of CAN4-S115-M85, and not to exceed opening sizes for which they are intended. Other manufacturers shall not be used unless approved in writing (5) days prior to tender closing. Approved Alternate Manufacturer: Tremco Ltd., Fire Stopping Systems and Hilti Firestopping Systems.

2. Mineral Wool Backing Insulation: ULC Labelled, preformed non-combustible material A/D FIREBARRIER Mineral Wool by A/D Fire Protection Systems Inc.

3. Firestopping Sealant: ULC labelled, single component silicone based, A/D Silicone FIREBARRIER Sealant by A/D Fire Protection Systems Inc.

4. Firestopping Seal: ULC labelled, single component water-based seal, A/D FIREBARRIER Seal by A/D Fire Protection Systems Inc.

5. Spray-On Firestopping Sealant: ULC labelled, high performance single component, water-based, elastomeric acrylic firestop sealant, "TREMstop Acrylic SP" (sprayable grade) by Tremco Ltd.

6. Fire resistance rating of installed firestopping assembly not less than the fire resistance rating of surrounding floor and wall assembly as indicated on the drawings.

7. Firestopping system at openings around penetrations for pipes, ductwork, conduit and other mechanical and electrical items requiring sound and vibration control; elastomeric sealant type with mineral wool; do not use a cementitious or rigid seal at such location.

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

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

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

11. Sealants for vertical joints: non-sagging.

12. Firestopping mortar is not acceptable.

PART 3 EXECUTION

1. EXAMINATION

    1. Examine existing conditions to receive this work prior to submitting shop drawings.

    2. Examine surfaces to receive work of this Section and report any defects which may affect the Work of this Section.

    3. Verify that openings are ready to receive the Work of this Section.

    4. Confirm compatibility of surfaces to receive firestopping and smoke seal materials.

    5. Beginning of installation means acceptance of existing surfaces and substrate.

2. PREPARATION

    1. Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are dry and frost free.

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

    3. Maintain insulation around pipes and ducts penetrating fire separation.

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

3. INSTALLATION

1. Install firestopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions.

2. Seal holes or voids made through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained. For vertical sections, sealant is required only on the top side of the mineral wool. It is required on both sides for horizontal sections except only one side on '0' hour rated walls.

3. Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

4. Tool or trowel exposed surfaces to a neat finish.

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

6. Install firestopping with smoke seal sealant on both sides of all fire rated walls except for '0' hour rated walls where sealants is required continuously only one side of mineral wool backing insulation.

4. INSPECTION

1. Notify architect when ready for inspection and prior to concealing or enclosing firestopping and smoke seal materials and service penetration assemblies.

2. Arrange for final inspection of the work of this Section by firestopping manufacturer and municipal building inspector prior to concealing or enclosing work. Make corrections required.

5. SCHEDULE

1. Fire and smoke seal at all areas where work is indicated on drawings (corridors, mechanical rooms, ceilings, janitor's room, washrooms, changerooms, servery, Library, gymnasium, etc. fire separations), and at locations as follows:

    1. Generally, all locations required by code.

    2. Penetrations through fire resistance rated (including 0 hour rated fire separations) masonry and concrete walls (except mechanical and electrical penetrations which will be firestopped by the mechanical and electrical contractors).

    3. Top of fire resistance rated masonry and gypsum rated partitions and walls (Includes corridors noted as 0 hr. fire rating)

NOTE: Refer to Architectural drawings for locations of vertical fire separations.

4. Intersection of fire resistance rated masonry.

5. Control and sway joints in fire resistant rated masonry.

6. Penetrations through all floor slabs and fire rated ceilings (except mechanical and electrical penetrations which will be firestopped by the mechanical and electrical contractors).

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

6. CLEAN-UP

1. Remove excess materials and debris and clean adjacent surfaces immediately after application.

2. Remove temporary dams after initial set of firestopping and smoke seal materials.

7. CERTIFICATION

1. The manufacturer of the firestopping and smoke seal products shall inspect each application on site and certify in writing its fire rating.

2. Costs for manufacturer's site inspection of firestopping and smoke seals application and certification shall be included in this Contractor's base bid.

END OF SECTION

PART 1 GENERAL

1. GENERAL REQUIREMENTS

    1. Division One, General Requirements, is a part of this section and shall apply as if repeated here.

2. SYSTEM DESCRIPTION

    1. Supply all labour, materials, and equipment necessary for the complete work of this Section as indicated on the drawings, specified herein, or as required by job conditions and normally considered as work covered by this Section.

    2. The term "sealant" to be synonymous with the term "caulking" where used on the drawings and/or specifications.

3. SUBMISSIONS

    1. Submit complete colour samples for Architect's approval.

    2. Supply a sample container of each type of caulking or sealant.

    3. Sample joints of each type and colour of caulking shall be prepared at the site in a location directed by the Architect and be approved by the Architect before work commences. Approved joints will represent minimum acceptable for the work. Cure samples and under conditions anticipated at job site during construction.

4. ENVIRONMENTAL CONDITIONS

    1. Sealant and substrata materials to be minimum 5 C (41 deg. F.).

    2. If necessary, to apply sealants below 5 C., consult sealant manufacturer and follow their recommendations.

5. DELIVERY AND STORAGE

    1. Deliver and store materials in manufacturer's original wrappings and containers.

6. PROTECTION

    1. Mask adjacent surfaces as necessary to prevent contamination.

    2. Protect all sealant against puncture or damage until sealant has attained its final set.

    3. Be responsible for any damage to adjacent surfaces caused by the work of this Section. Provide extra protection as required when sandblasting.

4. Provide temporary covers over joints where joints have been cleaned out, but not yet caulked.

7. WARRANTY

1. Provide a written warranty, signed and issued in the name of the Owner stating that caulking work of this section is guaranteed against leakage, cracking, crumbling, melting, shrinkage, running, loss of adhesion, or staining adjacent surfaces, for a period of five years from the date of Substantial Certificate of Completion and that any defective caulking will be replaced.

2. At completion of the work, provide a written statement from the manufacturer or authorized manufacturer's representative that material used in the various applications is the recommended one and that the final application is as recommended by the manufacturer for the construction conditions detailed and for the performance required. These requirements are applicable to every material included in the work of this Section.

8. QUALIFICATIONS

1. Applicator for the work of this section shall:

1. Be approved by the materials manufacturer and Architects.

2. Have adequate equipment and skilled personnel to expediently complete the work of this section in an efficient and very best workmanlike manner.

3. Be completely familiar with the published recommendations of the manufacturer of the caulking material being used.

2. Indication of lack of skill or defective work to be sufficient grounds for the Consultant to reject the installed caulking and to require its immediate removal and complete recaulking at no additional cost to the Owner during the guaranty period.

3. Co-operate with the Consultant and/or any inspection and testing agency he may appoint.

4. Materials to be utilized shall be inspected and tested as required.

5. Provide cut tests of 6 inches in length in order to ensure correct thickness, hardness, mixing and surface finish. Provide these cut test samples at times and from locations as directed by the Consultant and make good the areas from which the samples are taken.

6. All tests of the sealant installation shall be inspected by the sealant manufacturer's representative.

PART 2 PRODUCTS

1. MATERIALS

1. Primers: type recommended by sealant manufacturer.

1. Joint Fillers:

2. General: compatible with primers and sealants, outsized 30 to 50%.

3. Polyethylene: extruded closed cell foam, Shore A hardness 20, tensile strength 140 to 200 kPa.

3. Bond Breaker: pressure sensitive plastic tape, which will not bond to sealants.

4. Sealant Type A: Equal three-part polyurethane 'Tremco Dymeric 240' conforming to C.G.S.B. CAN2-19-24-M80. Colours to be tinted to specifically match wall colours. Maximum of five colours.

5. Sealant Type B: One-part silicone mildew resistant type equal to sanitary sealant 1702 by C.G.E. Silicones and conforming to CGSB 19-GP-22m or Dow Corning 786.

6. Sealant Type C: Equal to Sikaflex - 15 LM. Colours to be tinted to specifically match wall colours. Maximum of six colours.

7. Colour of Sealants: to be selected by the Architect. Colours of sealant to change where wall colours change (i.e., banding).

8. Joint Cleaner: xylol, methylethyleketon or non-corrosive type recommended by sealant manufacturer and compatible with joint forming materials.

9. Vent Tubing: 6 mm (1/4") inside diameter extruded polyvinyl chloride tubing.

10. Threshold Bedding: oil base caulking compound, to CGSB 19-GP-6.

11. Deliver materials to job site in sealed containers with manufacturer's original labels attached, and accompanied by certification of compliance with the specifications.

PART 3 EXECUTION

10. EXAMINATION

2. Examine all surfaces prior to application and notify the Architect of any conditions detrimental to satisfactory application.

3. Commencement of work shall imply acceptance of surfaces.

11. PREPARATION

2. Use a dry, clean, oil free compressed air stream to remove dust and other contaminants. Masonry surfaces shall be cleaned with wire brush and then blown clean. Any waterproofing treatments contaminating the joint must be completely removed.

3. Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sandblasting.

4. Remove oil, grease and other coatings from non-ferrous metals with joint cleaner.

5. Prepare concrete, masonry, glazed and vitreous surfaces to sealant manufacturer's instructions.

6. Examine joint sizes and correct to achieve depth ratio ½ of joint width with minimum width and depth of 6 mm (1/4"), maximum width 25 mm (1").

7. Before caulking, fill spaces deeper than 13 mm (½") with bedding material, packed tightly in place and set below finished surfaces to suit specified sealant depth. Provide joints less than 13 mm (½") deep with an approved joint breaker.

8. Where necessary to prevent staining, mask adjacent surfaces with tape prior to priming and caulking.

9. Apply bond breaker tape where required to manufacturer's directions.

10. Prime sides of joints to sealant manufacturer's instructions immediately prior to caulking.

11. Remove all existing caulking and prepare for replacement.

12. Check form release agent used on concrete for compatibility with sealant and primer. If they are incompatible inform Consultant and change sealant to compatible type approved by Consultant or clean concrete to Architect's approval.

12. APPLICATION

2. Before application of any sealants, confirm that sealant material is compatible with the materials and finishes of the surfaces to which the material is applied or is in contact with.

3. Apply sealants, primers, joint fillers, bond breakers, to manufacturer's instructions. Apply sealant using a gun with proper size nozzle. Use sufficient pressure to fill voids and joints solid. Superficial pointing with skin bead is not

acceptable.

4. Thoroughly mix caulking materials with a mechanical mixer capable of mixing at 80-100 rpm without mixing air into the material. Mix material in accordance with the manufacturer's directions and instructions.

5. Install caulking to the joints using manually operated or power operated guns. Use nozzles of the correct size and shape and provide sufficient pressure to completely fill the joints and make adhesive contact with the backs and sides of the joints. Caulk solidly around entire perimeter of openings.

6. Finish the surface of the caulking with a smooth, full bead, free from ridges, wrinkles, sags, air pockets and embedded impurities. Tool the finish bead with a water wet or dry tool as recommended by the manufacturer, to a slightly concave joint.

7. In masonry cavity construction, vent caulked joints from cavity to 3 mm (1/8") beyond external face of wall by inserting vent tubing at bottom of each joint and maximum of 1500 mm (5'-0") o.c. vertically. Position tube to drain to exterior.

8. Clean adjacent surfaces immediately and leave work neat and clean. Remove excess sealant and droppings using recommended cleaners as work progresses. Remove masking after tooling of joints. Finish work damaged due to this work shall be replaced at this contractor's expense to satisfaction of the Architect.

9. Set thresholds in a full bed of caulking compound at least 1/2" (12 mm) thick. Remove excess compound after threshold is set and neatly point joints.

10. All hidden joints or joints concealed by metal covers occurring in window and door frames, metal curtainwalls, other locations, to be clean, sealant applied and tooled, and inspected and approved prior to the installation of metal covers.

11. Use of sealants specified in the following locations:

    1. Type A:Use at all exterior locations and interior control joints and expansion joints. NOTE: this sealant **must not be** painted over.

    2. Type B: Joints between flooring (except carpet areas) and door frames; between countertops and walls; all high humidity locations at shower and changeroom locations.

    3. Type C: At all remaining interior locations.

13. <u>LOCATIONS</u>

    2. Do all caulking required (except where specified under other sections).

3. Caulk exposed control joints and expansion joints occurring in masonry and concrete walls. (See item 3.6)

4. Caulk along underside of projecting flashings, except at roof eave detail.

5. Caulk joints between aluminum panels, window or door frames to adjacent building components around perimeter of every external window or door opening at interior and exterior sides aluminum units which work shall be performed by Automatic Aluminum Doors - Section 08710, Aluminum Window Section 08520, and Section 07461 Aluminum Architectural Panel System, Aluminum Curtain Wall - Section 08900.

6. Caulk around exterior louvres.

7. Set windowsills in a bed of caulking compound by Sections 08400 and 08900.

8. Interior hollow metal where it abuts interior finishes.

9. Caulk where shown on drawings and not specified in other sections.

10. Caulk joints at junction of different materials and junction of surfaces in different planes as required or directed (i.e. concrete to metal, concrete to masonry, masonry to metal, masonry to drywall, etc.).

11. Caulking elsewhere to provide a water and weatherproof condition.

12. Caulk areas on interior walls to stop air infiltration.

13. Caulking between resilient/sheet flooring and masonry or concrete walls; and between resilient/sheet flooring and hollow metal frames (Type 'B' sealant).

14. Caulk joints between masonry and gypsum wallboard or plaster.

15. Caulk control joints in drywall partitions.

16. Caulk around access panels, built-in specialties, grilles, pipes, ducts, conduit, outlet boxes, etc. penetrating floors, walls and ceilings.

17. Caulk joints around metal items projecting from ceramic tile work (Type "B" sealant).

18. Caulk around toilets, urinals, sinks, bathtubs, showers, etc. at junction with floor and wall surfaces (Type "B" sealant).

19. Caulk joints as required to provide soundproofing where soundproofing walls are indicated.

20. Caulk joints between wood window and wall surfaces and wood door

frames and wall surfaces, etc.

21. Caulk perimeter of all countertops and window plastic laminate sills (including underside) with (Type "B" sealant).
22. Caulk around access panels and washroom accessories in ceramic tile faced walls.

14. CAULKING NOT TO BE DONE UNDER THIS SECTION

2. Caulking of Sidewalk Joints - Section 02600

3. Firestopping and smoke seals - Section 07270, Div. 15 and Div. 16

4. Caulking between aluminum work and aluminum work to surrounding surface - Section 07461, Section 08716, and Section 08520.

5. Caulking and sealants for glazing - Section 08800

6. Caulking of Acoustic Drywall Partitions - Section 09250

7. Caulking of Ceramic and Quarry Tile - Section 09300

8. Caulking of sheet flooring - Section 09624

15. CAULKING OF MASONRY CONTROL JOINTS

2. Caulk all Masonry Control Joints where shown on drawings. Refer to exterior elevations and interior elevations.

NOTE: For Base Price at each control joint shown on exterior wall elevation allow for control joint to also be located in back up masonry concrete block wall as per AD detail, backer rod and Caulking by this Section. Compressible joint filler by Masonry Section 04200.

NOTE: Linear quantity based on one side/face of exposed concrete block masonry wall.

NOTE: Verification of linear quantities of control joints to be made later. Locations of all additional required Concrete Block Joints to be finalized later after submission of proposed control joint locations on shop drawings to be submitted by Masonry Contractor as required by Specifications Section 04200.

END OF SECTION

1. GENERAL

1. GENERAL REQUIREMENTS

1. Division One, General Requirements is part of this Section and shall apply as if repeated here.

2. SHOP DRAWINGS

1. Submit shop drawings in electronic PDF format in accordance with GC 3.10 of CCDC Document 2, 2008 and Section 01300 – Submittals.

2. Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings, finishes and fire ratings.

3. Fire Ratings indicated on Door Finish Schedule are minimums. If door design cannot be satisfied at specified rating (i.e. 20 min), supply door or frame with acceptable higher rating (i.e. 45 min.).

3. QUALIFICATIONS OF MANUFACTURER

1. Products used in the Work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.

2. Qualified Manufacturers:

1. Vision Hollow Metal
2. Fleming Door Products
3. Baron Meta Industries Inc.
4. Daybar Industries Limited
5. Artek Door
6. Trillium Steel Doors Limited

4. PROTECTION

1. Use all means necessary to protect materials of this Section before, during and after installation and to protect installed work & materials of all other trades.

5. REPLACEMENTS

1. In the event of damage, immediately make all repairs & replacements necessary to the approval of the Architect and at no additional cost to the Owner.

6. WORK INCLUDED

1. Supply all hollow metal doors and frames as shown on drawings and on door schedule.

    1. Provide removable mullions where indicated. Refer to door and frame schedule.

2. Supply and install all hollow metal fire doors and frames shown on the drawings and on door schedule.

    1. Door cutouts, complete with reinforcing, stops, and closures required for glazing.

    2. Cut outs and reinforcing for finishing hardware including preparations for mortice type hardware.

    3. Cutouts for security system. Coordinate with Div.16.

3. Supply all necessary fastening and anchoring devices for above items.

4. Supply and install door grilles where indicated on drawings or sizes as indicated on the drawings. Refer to Mechanical drawings.

7. STANDARDS

1. Materials and workmanship to be in accordance with Canadian Steel Door and Frame Manufacturer's Association Specifications Standards for steel doors and frames.

8. REGULATORY REQUIREMENTS

1. Supply fire labelled steel doors and frames in accordance with NFPA-80, current edition, except where specified otherwise.

2. PRODUCTS

1. MATERIALS

Steel: cold rolled steel, double annealed patent levelled, fully pickled and free from scale and internal defect. Surfaces shall be free from perceptible waves, buckles and other imperfections.

1. Zinc Coating: wipe coated galvanizing in conformance with ASTM 527, Coating Class A01.

2. Primer for Touch-Up: conforming to CGSB 1GP-181M.

3. Labels: Provide ULC or Warnock-Hersey Labels for fire rated doors and frames.

4. Thermal Break: Polyvinyl Chloride (PVC) thermal break.

5. Reinforcing Channel: to CAN/CSA - G40.21-M7, grade 300W, 3.25 mm.

6. Glass for Hollow Metal Doors: as per 08800 Glass and Glazing Section.

7. Glass for Hollow Metal Frames and Screens: as per 08800 Glass and Glazing Section.

2. FABRICATION

1. Generally

1. Fit and assemble work in shop where possible. Execute according to details and approved shop drawings. Where shop fabrication is not possible, make trial assembly in shop.

2. Weld all components of doors and frames. File or grind exposed welds smooth and flush. Exposed welds shall be continuous. Knock-down frame not to be used on this project.

3. Workmanship shall be best grade modern shop and field practice known to recognized manufacturers specializing in this work. Joints and intersecting members accurately fitted made in true planes with adequate fastening.

4. Insulate where necessary to prevent electrolysis between metal to metal or metal to masonry or concrete.

5. Fabricate and erect work square, plumb, straight, true and accurately fitted. Provide adequate reinforcing and anchorage.

6. Clean, scrape and remove rust, mill scale, grease or extraneous material from frames and doors following fabrication. Flood coat with air-drying paste filler and again sand to eliminate all unevenness or irregularities. Apply in shop a full smooth coat of zinc chromate primer to all surfaces. Deliver work to site with primer undamaged and otherwise satisfactory for following work specified in Section 09900.

2. Doors

1. Provide hollow metal doors of type and size indicated on Door Schedule, and as detailed on Drawings.

2. Construct flush type continuously welded exterior doors conforming to ASTM A527 16 gauge (1.613 mm) hollow metal construction, steel stiffened with vertical steel ribs, all voids filled with semi-rigid fibrous insulation minimum density 24 kg/m^3 polystyrene polyurethane and complete with top and bottom caps. Finish shall be "wipe coat" galvanized steel.

3. Construct interior slab and stile and rail type doors and panels of 18 gauge (1.311 mm) cold rolled, roller levelled sheet "wipecoat" galvanized steel with honeycomb structural core consisting of pre-expanded, resin impregnated Kraft paper having 3/4" (20 mm) cell size to thickness indicated.

4. Doors shall be mortised, reinforced, drilled and tapped to receive templated hardware including mortise type hardware. Reinforce for surface mounted hardware.

5. Prepare doors to receive glass or grilles as required. Provide removable stops secured with countersunk tamperproof head screws at 6" (150 mm) o.c. Prepare exterior doors to receive 1" (25 mm) thick insulated sealed glass units.

6. Weld door and panel components together to provide integrated units, square, true and free from distortion or waves. All 18 gauge doors to have welded seams minimum 30% overall and 2" (50 mm) length welds. Weld above and below all hinge locations. All 16 gauge doors to be continuously welded. Grind and fill smooth welded seam.

7. Door head and bottom shall have channel shaped member, closing off top and bottom of door flush with face skins. NOTE: close off top and bottom of exterior doors even with outer edge of door.

3. Fire Rated Doors

1. Provide doors, frames and hardware with Underwriters Laboratories of Canada (ULC) labels, clearly visible, where required to be fire

rated or installed in fire rated assembly.

4. Door Frames

1. Provide steel hollow metal door and window frames for openings indicated on Door Schedule and as detailed elsewhere on drawings.

2. Form interior hollow frames to profile indicated of 16 U.S. gauge (1.613 mm) hot rolled "wipe coat" zinc coated steel. Construct exterior frames of 16 U.S. gauge (1.613 mm) hot rolled, zinc coated steel.

3. Cut mitres and weld corners continuously along inside frame profile. Fill corners of steel frames with metallic paste filler and sand smooth and uniform. Do not weld corner of removable stop.

4. Provide 10 gauge (3.51 mm) channel stiffeners in mullions each side of door openings occurring in screens, or as required to provide a rigid installation.

5. Prepare removable stops secured with counter-sunk tamperproof screws at 6" (150 mm) o.c.

6. Provide three (3) neoprene single stud bumpers for each interior door frame and (2) bumpers at head for pairs of doors.

7. Prepare frames for mortise type hardware at all doors. Blank, reinforce for butts with 1/4" (6.35 mm) steel plate, drill and tap as required. Reinforce both sides of every door closer, provide for concealed door closers where required.

8. Cover reinforcement plates or attachments and cut-outs with 22 gauge (0.853 mm) steel sheet boxes to protect against mortar. Provide channel or angle spreaders readily removable.

9. Provide adjustable "Tee" or wire masonry anchors with head of No. 6 gauge (4.94 mm) steel and body of 10 gauge (3.510 mm) corrugated steel where frames are built into masonry, except at thermal broken frames. Provide manufacturer recommended anchor at all other locations.

10. Supply three anchors for jambs between 4'0" (1219 mm) and 7'0" (2134 mm) and four anchors for jambs exceeding 7'0" (2134 mm)

high. Adjustable type shall be as recommended by manufacturer. Provide adjustable jamb anchors for fixing at floor.

11. Provide head reinforcement in frames wider than 4'-0" (1200 mm) and where indicated or recommended by manufacturer.

12. Prepare frames for electric hardware and security systems where required. Reinforce and drill and tap frames as required. Coordinate with Div.16.

13. Prepare frames for continuous door length type hinges where indicated on door schedule.

14. Provide 12 gauge (2.66 mm) reinforcing in frames for continuous door length type hinges where indicated on door schedule.

15. Provide removable mullions where indicated on door frame schedule.

1. EXECUTION

1. INSTALLATION

1. Frame Installation:

1. Allowable limit of distortion shall be 1/16" (1.5 mm) out of plumb each jamb, measured on face of frame, resulting in maximum twist of frame of 1/8" (3 mm) measured diagonally from upper to lower corner.

2. At masonry walls: install frames using the corrugated or wire masonry anchors. At preformed openings and exterior thermally broken doors use machine screws and expansion anchors as provided for this application. After installation, fill countersunk screw heads flush with frame and sand smooth ready for painting. Fill exterior frames with spray-on insulation by Section 07215. Co-operated with masonry trade who will fill interior frames with mortar.

3. Brace frames solidly in position while being built in. Install temporary spreader of wood at mid-height of frame until adjacent wall work is completed. Provide vertical support at centre of head for openings of 4'-0" (1200 mm) wide or wider.

4. Remove temporary jamb spreader bars and vertical supports only

after frames are securely anchored in place.

2. Door Installation:

    1. Install hollow metal doors plumb, true and level and at correct elevation.

    2. Co-ordinate installation of hardware.

    3. Adjust operable parts to ensure proper operation.

    4. Install hollow metal panels and closures with concealed fastenings.

    5. Install acoustical assembled doors and frames as per manufacturer's recommendation.

3. Install fire rated doors and frames in accordance with National Fire Codes, Volume 4, produced by National Fire Protection Association (NFPA 80).

4. Attach fire rating labels to doors and frames required to be fire rated. Ratings shown on door schedule are minimum. Attach temperature rise rated labels to doors required to be 90 MFR or greater.

5. Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

6. Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08700 - Finish Hardware.
7. Adjust operable parts for correct function.

8. Install glazed lites, stops and louvres.

9. Install door grilles provided by Mechanical Contractor.

2. TOUCH-UP

    1. Remove rust, clean and touch-up any damaged galvanizing with "Zincrich" or "Galvicon" paint.

    2. Remove rust, clean and touch-up any damaged paint with approved primer.

End of Section

GENERAL

1. GENERAL REQUIREMENTS

    1. Division One, General Requirements, is part of this Section and shall apply as if repeated here.

2. QUALIFICATIONS

    1. Manufacturers approved for the work of this section are:

        1. Commdoor Aluminum
        2. Kawneer Company, Canada Limited.
        3. Alumicor
        4. Aerloc
        5. Old Castle Building Enelope

    2. No other manufacturer or supplier, except those noted above, shall be used unless approved in writing by the Architect. Submit technical information not less than seven (7) days prior to tender closing to allow time to evaluate.

    3. **It is the responsibility of the approved manufacturers to *meet or exceed and submit OBC SB-10 Energy Efficiency Compatibility Results.***

        Note: The above mentioned submittal is to incorporate the specified sealed glazing unit and each opening component as a whole before the shop drawings are accepted or before any shop drawings are reviewed.

3. SHOP DRAWINGS

    1. Submit shop drawings in accordance with Section 01300 – Submittals.

    2. Submit shop drawings for the fabrication and installation of associated components of the work. Indicate anchors, joint system, expansion provisions, hardware, and other components not included in manufacturer's standard data. Include glazing details (where required).

    3. Before shop drawings and fabrication are started, take critical measurements at the site to facilitate installation and fitting of work.

    4. ***Shop drawings that are submitted are to be in the units of the tendered drawings with critical on center mullion dimensions (dimension string from datum level to top of opening noting center of mullions) noted along with all other regular shop drawing dimensions, no exceptions. Both units (metric and imperial) are allowed. Openings are to be identified with the corresponding tags on the tendered drawings.***

(Coordinate with typical A8 drawing notes)

4. SUBMITTALS

1. Submit samples of sections and finishes for Architect's approval before fabrication.

2. Furnish templates, diagrams, and other data to fabricators and installers of related work, as needed for coordination installation.

3. Coordinate with Electrical Sections, Section 08700 - Finishing Hardware and security subcontractor for any electrical provisions required.

5. DESIGN

1. Design for wind and snow loads as set out by the Ontario Building Code, 2012 as currently amended for the building location. Copies of any and all structural calculations made in connection with the supplementary design and/or detailing of the work of this section shall be promptly furnished to the Architect if requested.

2. Submit with shop drawings certification that window and entrance design and construction will meet the specified requirements. Certification shall be in the form of test reports on similar units performed by an independent testing laboratory and shall meet approval of Architect before fabrication commences.

6. WARRANTY

1. The work and materials of this section shall be under warranty in accordance with CCDC Document 2 - 2020 but for a period of five years and ten (10) years for hermetically sealed units from the date of Architect's Certificate of Substantial Completion.

2. PRODUCTS

1. MATERIALS

1. Aluminum: Extruded Members: 6063-T54 alloy and temper.

2. Fasteners, Screws & Bolts: 300 Stainless Steel or 400 series stainless steel cadmium plated and of sufficient size and quantity to perform their intended function.

3. Glazing Tape: Tremco 440 tape with built-in shim and as recommended by window manufacturer.

4. Weathering and Glazing Gaskets: Extruded black closed cell or dense elastomer of durometer appropriate to the functions.

5. Spacer Shims: oil resistant rubber or plastic acceptable to glass manufacturer, channel shaped and approximately 4" long (100 mm).

6. Silicone Sealant: Dow Corning #795 or as per manufacturers recommendations exceeding CAN2-19.13-M82 Class 40 requirements.

7. Isolating Coating: Black alkali resistant bitumastic enamel.

8. Spray-On Insulation: Supply and install by this section as per Section 07215 – Spray-on Insulation.

9. Miscellaneous: Supply all covers, copings, special flashings, filler pieces, termination pieces, caps closures and expansion joint covers as required and as indicated on drawings.

10. Glass for Aluminum Doors: as per 08800 Glass and Glazing Section.

11. Glass for Exterior Aluminum Entrance Framing: as per Section 08800 - Glass and Glazing.

12. Glass for Interior Aluminum Screens: as per Section 08800 - Glass and Glazing.

2. FABRICATION

1. General

1. Construct aluminum assemblies of extruded sections to size and profile shown on Drawings.

2. Build units square, true, accurate to size, free from distortions, waves, twists, buckles or other defects detrimental to performance or appearance.

3. Units too large for handling or shipping shall be prefabricated in shop, disassembled and marked for shipping and field assembly.

4. Use concealed fastenings. No exposed screws shall show in the finished work unless approved by the Architect. Such screws shall be countersunk and finish match surfaces in which they occur.

5. Joints shall be accurately cut and fitted to result in a tightly closed

joint.

3. DOORS, ENTRANCE SCREENS, EXTERIOR WINDOWS INTERIOR SCREENS

1. Frames

1. "Kawneer Trifab 451UT, Center, Interior Glazed" thermally broken framing at exterior windows and exterior entrance screens where the door system is stand alone.

2. "Kawneer Trifab 451, Center, Interior Glazed" framing at interior entrance screens where the door system is stand alone. Refer to drawings for locations required

3. For products listed above, coordinate with manufacturer and drawings for side light base heights (dimension to match doors) with associated aluminum sill flashing, metal liner, insulation and aluminum panels where indicated on drawings.

2. Conform to CAN3-A440-M90 performance standards Air Leakage to meet the Fixed rating, and Type A3, Water Leakage Type B5 and Wind Resistance Type C7.

3. Doors

1. Exterior entrance / vestibule doors to be insulated **"Kawneer 560 InsulClad"** with insulated double glazing. Clear anodized finish. (Coordinate with door schedules on Drawings)

2. Interior entrance / vestibule doors to be **"Kawneer 500 Wide Stile"** typical with single tempered glazing. Clear anodized finish. (Coordinate with door schedules on Drawings)

3. Interior entrance to library door to be **"Kawneer 190 Narrow Stile"**. Clear anodized finish. (Coordinate with door schedule on Drawings).

3. Interior screen doors to be coordinated with screen schedules and associated door type schedules.

3. Coordinate with door schedules for heads and stiles sizing and base height. Adjacent screens / curtain wall bases to be 100mm base height typical.

4. Provide concealed rod exit device at all full glazed doors that require panic devices, coordinate with door schedules for sizing.

5. The core shall be foamed-in-place urethane foam at density of 5.0 lb./cu.ft. (64 kg.m³). Provide insulated aluminum panel where indicated on drawings.

6. Stiles shall have a wall thickness of .125". (3.2 mm). Glazing mouldings shall be .050" thick (12.7 mm).

7. Use snap-in type square glazing stops with neoprene bulb type glazing. Do not use exposed screws to secure stops. Use lock-in, tamperproof type stops.

8. Equip door leaf with an adjustable mechanism in top rail near the lock stile, to provide for minor clearance adjustments after installation.

4. Door Hardware

1. Equip all aluminum doors with continuous weather stripping with adjustable weather stripping at the base; and thresholds, max. ½" (12.7mm)ht.. Closer cover to match door finish colour.

2. Equip all aluminum doors with full height (continuous) heavy-duty stainless steel hinge.

3. All other hardware including concealed closers, exposed closers, locksets, exit device, push/pulls, overhead stops, handicap automatic door openers to be supplied under Hardware Allowance Section 08700 – Finishing Hardware and installed under Section 06200 – Finish Carpentry.

5. Finish

1. Prepare and fabricate components as required before finishing.

2. Finish to be Black anodized typical.

3. Metals other than aluminum shall match colour finishes.

6. Closures, Flashings and Miscellaneous Covers

1. Provide .125" (3 mm) thick aluminum closures and caps where required.

7. Operating Vents:

1. Hinged awning style limited opening to max. 4" (100mm). Provide 1 pair of heavy duty Anderburg or Senator friction arms at all openings & 2 pair where opening is 500mm & wider. Polished US - #4 cam handle (for operation locate handle so that screen does not need to be removed to operate the vent). Finish to be black anodized typical and duranar colour where indicated on drawings.

8. Insect Screens:
1. Sized to match operator. Glass fibre mesh in aluminum frame with extruded polymer removable spline.

3. EXECUTION

1. INSTALLATION

1. Secure work adequately and accurately to the structure in required position and in manner not restricting thermal movement. Work shall be plumb, square and level, free of twist, warp or other superimposed loads. Provide shims as required.

2. All metal to metal joints shall be sealed to provide a weathertight assembly in accordance with manufacturer's instructions.

3. Use concealed fixings where possible, where not possible use flat head screws in countersunk holes. Exposed bolt or nut heads not permitted. Match exposed fastenings with surfaces on which they occur.

4. Isolate all aluminum coming in contact with unlike materials with heavy shop coating of black alkali resistant bitumastic enamel to prevent electrolytic or chemical reaction.

5. Fill voids between aluminum extrusions and wall surfaces at exterior doors and entrance framing with foam spray applied insulation where required to prevent movement or infiltration of air. Supply and install spray-on insulation as per Section 07215 – Spray-on Insulation.

6. Supply and install all caps and closures where required to create a complete installation and as indicated on the Drawings.

2. CAULKING

1. Caulking between aluminum and aluminum; aluminum and glass to conform to this section. Caulking to perimeter drywall masonry and concrete all by this section as per Section 07900 – Sealants.

2. Caulking by this Section shall be installed as per Section 07900 – Sealants.

3. GLAZING

1. Glaze windows in accordance with CAN3-A440-M90.

2. Set glazing tape against permanent stops, allow 1/8" for cap bead, set horizontal strips first using full width pieces of tape, then set vertical pieces. Butt tape at corners, do not lap tape or run continuous at corners.

3. Set glass on setting blocks, number as recommended by glass manufacturer. Set glass with draw lines horizontal.

4. Apply heal bead on interior, using sealant. Place spacer shims, set glazing tape against glass and install stops.

5. Apply cap bead to fill void on exterior. Tool sealant with a slight bevel, sloped away from the glass to create a water shed.

6. Mark each light with a large white cross to indicate the presence of glass.

7. Replace under this section defective, damaged or broken glass due to faulty setting, handling or storage.

8. Neoprene bulb type glazing in accordance with manufacturer's instructions.

4. ADJUST AND CLEAN

1. Adjust all hinges, closers and weather stripping for optimum condition. Lubricate operating equipment.

2. Clean surfaces promptly after installation, exercising care to avoid damage of the protective coating (if any).

3. Advise the contractor of protective treatment and other precautions required through the remainder of the construction period, to ensure that doors will be without damage or deterioration (other than normal weathering) at the time of acceptance.

4. Aluminum shall be isolated from concrete, mortar, plaster and dissimilar metal with bituminous paint. Windows shall be protected from other building materials during and after insulation until acceptance by the

General Contractor. Thereafter, it shall be the responsibility of the General Contractor to maintain protection and provide final cleaning.

END OF SECTION

PART 1 GENERAL

1. GENERAL REQUIREMENTS

1. Division One, General Requirements, is part of this Section and shall apply as if repeated here.

QUALIFICATIONS

2. Manufacturers approved for the work of this Section are:

    1. Kawneer Company Limited, Canada
    2. Alumicor

3. Only those manufacturers listed above shall be used.

4. It is the responsibility of the approved manufacturers to meet or exceed and submit OBC SB-10 Energy Efficiency Compatibility Results.

    Note: The above-mentioned submittal is to incorporate the specified sealed glazing unit and each opening component as a whole before the shop drawings are accepted or before any shop drawings are reviewed.

2. SHOP DRAWINGS

1. Submit shop drawings in electronic PDF format in accordance with GC 3.10 of CCDC Document 2- 2008.

2. Submit shop drawings for the fabrication and installation of associated components of the work. Indicate anchors, joint system, expansion provisions, hardware, and other components not included in manufacturer's standard data. Include glazing details (where required).

3. Before shop drawings and fabrication are started, take critical measurements at the site to facilitate installation and fitting of work.

4. Note that shop drawings for translucent glazing units to be part of this section.

5. Submit with shop drawings certification that window design and construction will meet the specified requirements. Certification shall be in the form of test reports on similar units performed by an independent testing laboratory and shall meet approval of Architect before fabrication commences.

6. Shop drawings that are submitted are to be in the units of the tendered drawings with critical on centre mullion dimensions (dimension string from datum level to top of opening noting centre of mullions) noted along with

all other regular shop drawing dimensions, no exceptions. Both units (metric and imperial) are allowed. Openings are to be identified with the corresponding tags on the tendered drawings.
(Coordinate with typical A8 drawing notes)

3. SUBMITTALS

1. Submit samples of window, glazing, fasteners, caulking and finishes / colours for Architect's approval before fabrication.

2. Furnish templates, diagrams, and other data to fabricators and installers of related work, as needed for coordination installation.

3. Coordinate with Division 16, Section 08700 Finish Hardware and security subcontractor for any electrical provisions required.

4. WARRANTY

1. The work and materials of this Section shall be under Warranty in accordance with GC 12.3 of CCDC Document 2 - 2008 but for a period of five (5) years from the date of Architect's Certificate of Substantial Completion. Hermetically sealed glazing units shall be guaranteed for a period of ten (10) years.

2. Warranty shall include: Warranty against excessive colour changes or surface deterioration of aluminum finishes; complete weather tightness of the curtain wall and aluminum panel system against unreasonable intensity and frequency, or both, of sound by the curtain wall and aluminum panel system installation or its anchorage system or loosening or deforming of any members of the installation.

5. PROTECTION

1. Mark each light with a large cross to indicate presence of glass (colour that stands out to the visible eye). Use material that will leave no residue after removal.

2. Replace under the work of this section defective, damaged, or broken glass due to fault setting, handling or storage.

6. OPERATION AND MAINTENANCE DATA

1. Upon completion of installation, supply standard parts service kit and service manual. Arrange with, and demonstrate to building maintenance staff window operation, sash removal, cleaning, re-glazing, and general maintenance procedures.

7. DESIGN

1. Conform to latest issue of CAN/CSA-A440 performance standards Air Leakage-Type A3, Water Leakage Type B7, Wind Resistance-Type C5 and a Condensation Resistance Factor - I factor 67.

2. Design for wind and snow loads as set out by the Ontario Building Code, 2012, as currently amended, for the building location. Copies of any and all structural calculations made in connection with the supplementary design and/or detailing of the work of this section shall be promptly furnished to the Architect if requested.

3. Supply all connections, brackets, angles and fasteners to tie curtain wall to main structure, floors, columns and beams.

4. Supply all covers, copings, special flashings, filler pieces, termination pieces, caps closures, expansion joint covers and metal bellows, as required and as indicated on drawings including interior side where indicated on drawing.

8. STANDARDS

1. **Kawneer AA5450** Thermally Broken, aluminum framed, mechanically operating, single hung window system.

    1. Sash Operation: Bottom lite, vertical slide up, fixed top lite.

    2. Sash hardware:

        (a) Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows, and sized to accommodate sash weight and dimensions.
        (b) Handle: continuous integral bottom sash lift handle.
        (c) Sash Lock: sweep lock and keeper on meeting rails. One or two per sash as required by size. Brushed nickel finish
        (d) Limit Device: Sash stop limit device; for bottom sash located at jamb; two per sash. Limit maximum opening to 100mm (4").
        (e) Insect Screening Mesh: extruded aluminum frames containing 14 x 18 mesh aluminum screen cloth, retained in place by turn clip type fixings. Provide insect screens for all operable sashes. Screen mounting shall be exterior.

    3. Aluminum Insulated Spandrel Panels:

        (a) Aluminum sheet panels and copings:
            (1) Minimum wall thickness: 3 mm (0.125").
            (2) Surface flatness: 0.38 mm (0.015") maximum deviation when measured with 150 mm (6") rule.
            (3) Squareness: 0.05 mm (0.002") maximum for each 25.4 mm (1") of length at panel edge.

(4) Finish: Anodized aluminum to match window frame

(b) Sheet metal backpans and air barriers: 0.91 mm (0.036") (20 gauge) thickness, galvanized sheet steel to ASTM A653/A653M-11, Designation G90/Z275.

(1) Fasteners: Corrosion resistant, zinc plated, covered and sealed to sheet metal with
silicone sealant.

(c) Insulation attachment: Galvanized stick-pins, welded to sheet metal backpans, located at
maximum spacing of 300 mm (12") o/c and within 150 mm (6") from edge of insulation
boards. Seal welds with 1 coat zinc-rich coating.

(d) Insulation: ASTM C612-10, Type IVB, non-combustible to CAN/ULC-S114-05, 5 kPa compressive strength at 10% compression.

(1) Acceptable Products:

(i) Owens Corning 'Fiberglas Type 703'.
(ii) Johns Manville 'MinWool Curtainwall'.
(iii) Roxul 'CurtainRock'.

PART 2 PRODUCTS

1. MATERIALS

1. Aluminum: Extruded aluminum alloy members 6063 T5 alloy, minimum 1.6 mm (0.62") thick. Sheet which is not to be exposed shall be Utility Grade.

2. Aluminum Flashing: Supply 0.125" (3.2 mm) thick aluminum to profiles as indicated on drawings.

3. Aluminum Sills: Model #451T-037 aluminum sills shall be complete with Kawneer typical sill anchors, joint covers, match Kawneer 526-008, chairs, anchoring devices and jamb drip deflectors. Extruded sills to have profile with minimum 1/8" (3 mm) thickness and depth of sill as required. Sills shall be in longest possible lengths, joints only at mullions.

NOTE: Aluminum sills to be provided at bottom of all windows and curtain wall locations as detailed.

4. Vision Glass: as per 08800 Glass and Glazing Section.

5. Glazing Tape: Tremco 440 tape with built in shim as recommended by manufacturer, colour selected by Architect.

6. Spacer Shim: oil resistant rubber of plastic acceptable to glass manufacturer, channel shaped and each approximately 4" (100 mm) long.

7. Thermal Break: virgin polyvinyl chloride.

8. Isolating Coating: Black alkali resistant bitumastic enamel.

9. Sealant Bond Breaker: Open cell foam backer rod sized to suit.

10. Silicone Sealant: Dow Corning #795 or as per manufacturer's recommendations exceeding CAN2-19.13-M87 Class 40 requirements. Min 2 colours as selected by Architect.

11. Sealant at Perimeter Masonry Openings: 3-part Tremco Dymeric 240 sealant in accordance with Caulking - Section 07900 (Type A sealant). Minimum 2 colours as selected by Architect.

12. Fasteners, Screws and Bolts: Stainless steel 300 Series or stainless steel 400 Series cadmium plated of sufficient size and quality to perform their intended function.

13. All other materials shall conform to NAAMM Standard SW-1-68T.

9. FABRICATION

1. General

1. Construct aluminum assemblies of extruded section to size and profile shown on drawings.

2. Build units, square, true, accurate to size, free from distortions, waves, twists, buckles or other defects detrimental to performance or appearance.

3. Units too large for handling or shipping shall be prefabricated in factory, disassembled and marked for shipping and field assembly.

4. Use concealed fastenings. No exposed screws shall show in the finished work where finished product is exposed to view, unless approved by the Architect. Such screws shall be countersunk and finished to match surfaces in which they occur.

5. Fabricate windows as follows:

1. Cope and butt all joints in main frame, neatly in weather tight manner and secure by means of screws anchored into integral screw ports.

2. Deburr and make smooth all sharp milled edges and corners of frames.

3. Provide sill members with minimum 7 degree slope. Aluminum sills shall be complete with required anchors,

joint covers, and drip deflectors. Extruded sill to profile shown in longest possible lengths. Provide upturn drip - deflectors at ends of sill.

4. Provide sill weep system which will facilitate drainage of water accumulating in sill area while preventing passage of air, dirt and insects to interior.

5. Fabricate and anchor frames using specific screw fasteners without violating the thermal break. Exposed fasteners or pop rivets are not acceptable.

6. Fabricate entire window in a manner that will allow easy replacement of any defective, damaged or worn components, hardware or weather stripping.

7. Fabricate windows so that the aluminum head and sill members are continuous for the entire length of the frame and extend over and beneath the jamb members.

2. Finish

1. All to be clear anodized finish (Kawneer #17 finish).

PART 3 EXECUTION

1. INSTALLATION

1. Install work in accordance with manufacturer's recommendations and with standards specified herein.

2. Work shall include all fixings, clips stiffeners, trim pieces, sills condensation gutter, etc., as required for a complete installation.

3. Install windows plumb, level and true relative to building structure. Do not exceed 1/8" (3 mm) in 10'-0" (3050 mm) variation from plumb and level.

4. Provide all required expansion joints.

5. Isolation: isolate all aluminum coming in contact with other metals, masonry or concrete with heavy shop coating of black alkali resistant bitumastic paint.

6. All fixings shall be concealed.

7. Wood shall not be used for shimming or blocking.

8. Fill voids in aluminum extrusions and between masonry surfaces at all perimeters with foam spray applied insulation as specified in Section 07215 to prevent movement or infiltration of air.

2. CAULKING

    1. Work shall include caulking at all joints between aluminum frame members. All perimeter window caulking to surrounding finishes to conform to Section 07900 and be installed by this Section 08520.

    2. Caulk in accordance with materials and procedures as Section 07900.

3. GLAZING

    1. Set glazing tape against permanent stops, allow 4 mm for heal bead, set horizontal strips first using fill width pieces of tape, then set vertical pieces. Butt tape at corners, do not run tape or run continuous at corners.

    2. Set glass on setting blocks, number as recommended by glass manufacturer. Set glass with draw lines horizontal.

    3. Apply heal bead on interior using sealant. Place spacer shims set glazing tape against glass and install stops.

    4. Apply cap bead to fill void on exterior tool sealant with a slight bevel, sloped away from the glass to create a water shed.

    5. Mark each light with a large white cross to indicate presence of glass. Use flour and water paste for markings.

    6. Replace under the work of this section defective, damaged, or broken glass due to faulty setting, handling or storage.

    7. Neoprene bulb type glazing in accordance with manufacturer's instructions.

4. ADJUST AND CLEAN

    1. Clean surfaces promptly after installation, exercising care to avoid damage of the protective coating (if any).

    2. Advise the Contractor of protective treatment and other precautions required through the remainder of the construction period, to ensure that windows will be without damage or deterioration (other than normal weathering) at the time of acceptance.

    3. Aluminum shall be isolated from concrete, mortar, plaster and dissimilar metal with bituminous paint. Windows shall be protected from other building materials during and after installation until acceptance by the Contractor. Thereafter, it shall be the responsibility of the Contractor to maintain protection and provide final cleaning.

END OF SECTION

PART 1 GENERAL

1. GENERAL REQUIREMENTS

    1. Division One, General Requirements, is a part of this section and shall apply as if repeated here.

2. WARRANTY

    1. The Work under this Section shall be warrantied in accordance with GC 12.3 of CCDC-2 as currently amended but for a period of 10 years on insulated units and 5 years on all other work from the date of Consultant's Certificate of Substantial Completion.

3. PROTECTION

    1. Mark each light with a large cross to indicate presence of glass (colour that stands out to the visible eye). Use material that will leave no residue after removal.

    2. Replace under the work of this section, defective, damaged or broken glass due to faulty setting, handling or storage.

4. SUBMITTALS

    1. Submit shop drawings in accordance with CCDC-2 as currently amended and Section 01300 - Submittals.

5. STANDARDS

    1. Design in conformance with CAN/CGSB-12.20-M, structural design of glass for buildings.

PART 2 PRODUCTS

1. MATERIALS (all exposed glass edges shall be polished and chamfered typical)

    1. Tempered Glass: 1/4" (6 mm) minimum clear glass tempered conforming to CAN/CGSB - 12.1 M90 equal to Ford Glass.

    2. Glazing Tape: Tremco 440 tape and as indicated in other glass sections, also to be confirmed by manufacturer's written recommendations.

    3. Sealant: CWS by Dow Corning.

    4. Heal Bead Sealant: One-part polysulphide or acrylic sealant conforming to CGSB 19-GP-5 and as indicated in other glass sections.

    5. Spacer Shims: neoprene, Shore "A" durometer hardness 80, 3" (75 mm) long x 0.08" (2.4 mm) thick and 3/8" (9 mm) high.

6. Setting Blocks: neoprene, Shore "A" durometer hardness, 4" (100 mm) long x ¼" (6 mm) high x width to suit glass thickness.

7. Primer: Sealers and cleaners to glass manufacturer's standard

8. Vision Glass: Sealed insulated glass units, ten (10) year guarantee, ½" (12.7 mm) 90% argon and 10% air space, hermetically sealed, insulating units conforming to CAN/CGSB - 12.8 - M90 and with thermally broken stainless-steel glazing spacer. Warm edge spacer is only allowed in curved glazing units.

   NOTE: colour selection of glass to be confirmed by Consultant prior to manufacturing.

   1. Outer Light Glass Types:

      1. 6mm (1/4") Tempered Solargray with Solarban 70XL (Surface 2) by P.P.G. Canada or approved equal at all vision locations. Colour to be confirmed with Architect prior to fabrication.

   2. Inner Light Glass Type:

      1. 6mm (1/4") Clear Tempered by P.P.G. Canada or equal.

9. NOTE: Applicable to all glass and glazing, contractor shall verify and provide thickness to be confirmed by manufacturer for the assembly in which the glazing is installed, to be submitted in shop drawings stamped by a professional engineer before any manufacturing. Glazing tape to be as per manufacturer's written recommendations.

PART 3 EXECUTION

1. WORKMANSHIP

   1. Installation of glass shall be by workmen skilled in this trade and done in strict accordance with material manufacturer's directions to produce a first-class installation.

   2. Accurately cut glass to fit opening and provide for glass expansion.

   3. Carefully remove glazing stops and replace after glazing. Exercise care to prevent damage to stops.
   4. Collect all glass cuttings in boxes and remove when cleaning up debris.

   5. Cut glass and mirrors from dimensions taken in field.

   6. Remove protective coatings and clean contact surfaces with solvents and wipe dry.

7. Apply primer-sealer to contact surfaces.

2. FINISHING

1. Immediately remove sealant and compound droppings from finished surfaces. Remove labels after work is completed and inspected by Consultant.

END OF SECTION

1. GENERAL

1. GENERAL REQUIREMENTS

1. Division One, General Requirements, is part of this Section and shall apply as if repeated here.

2. QUALIFICATIONS

1. Manufacturers approved for the work of this section are:

1. Kawneer Company, Canada Ltd.
2. Old Castle Building Envelope
3. Alumicor
4. Commdoor
5. Aerloc

2. Only those manufacturers listed above shall be used unless an alternative manufacturer submits technical information for approved alternative status to the Architect in writing a minimum of 7 days prior to tender closing. All proposed equivalent products shall comply fully with the product performance requirements / finishes / all options specified and detailed on the drawings.

3. It is the responsibility of the approved manufacturers to *meet or exceed and submit OBC SB-10 Energy Efficiency Compatibility Results.*

Note: The above mentioned submittal is to incorporate the specified sealed glazing unit and each opening component as a whole before the shop drawings are accepted or before any shop drawings are reviewed.

3. SHOP DRAWINGS

1. Submit shop drawings in accordance with Section 01300 – Submittals.

2. Submit shop drawings for the fabrication and installation of associated components of the work. Indicate anchors, joint system, expansion provisions, hardware, and other components not included in manufacturer's standard data. Include glazing details (where required).

3. Before shop drawings and fabrication is started, take critical measurements at the site to facilitate installation and fitting of work.

4. Note that shop drawings for translucent glazing units to be part of this section.

5. Submit with shop drawings certification that window design and construction will meet the specified requirements. Certification shall be in

the form of test reports on similar units performed by an independent testing laboratory, and shall meet approval of Architect before fabrication commences.

6. ***Shop drawings that are submitted are to be in the units of the tendered drawings with critical on center mullion dimensions (dimension string from datum level to top of opening noting center of mullions) noted along with all other regular shop drawing dimensions, no exceptions. Both units (metric and imperial) are allowed. Openings are to be identified with the corresponding tags on the tendered drawings.***
(Coordinate with typical A8 drawing notes)

4. SUBMITTALS

1. Submit samples of curtain wall, panel sections, glazing, fasteners, caulking and finishes / colours for Architect's approval before fabrication.

2. Furnish templates, diagrams, and other data to fabricators and installers of related work, as needed for coordination installation.

3. Coordinate with Electrical Sections, Section 08700 - Finishing Hardware and security subcontractor for any electrical provisions required.

5. WARRANTY

1. The work and materials of this Section shall be under Warranty in accordance with CCDC Document 2 - 2020 but for a period of five (5) years from the date of Architect's Certificate of Substantial Completion. Hermetically sealed glazing units shall be guaranteed for a period of ten (10) years.

2. Warranty shall include: Warranty against excessive colour changes or surface deterioration of aluminium finishes; complete weather tightness of the curtain wall and aluminium panel system against unreasonable intensity and frequency, or both, of sound by the curtain wall and aluminium panel system installation or its anchorage system or loosening or deforming of any members of the installation.

6. PROTECTION

1. Mark each light with a large cross to indicate presence of glass (colour that stands out to the visible eye). Use material that will leave no residue after removal.

2. Replace under the work of this section defective, damaged or broken glass due to fault setting, handling or storage.

7. OPERATION AND MAINTENANCE DATA

1. Upon completion of installation, supply standard parts service kit and service manual. Arrange with, and demonstrate to building maintenance staff window operation, sash removal, cleaning, re-glazing, and general maintenance procedures.

8. DESIGN

1. Aluminium Curtain Wall shall be designed to safely withstand a wind load normal to the plane of the wall of twenty (20) pounds per square foot (0.95 kPa.) and shall meet the standards of the latest Ontario Building Code as currently amended in regard to increased design pressure due to height and negative pressures. All components shall be able to withstand the loads with maximum deflection of L/200 of the span. Aluminium curtain wall shall be designed to accommodate thermal movement over an ambient temperature range of -40 F. to +120 F.

   Copies of any and all structural calculations made in connection with the supplementary design and/or detailing of the work of this Section shall be promptly furnished to the Architect if requested.

   Supply all connections, brackets, angles and fasteners to tie curtain wall to main structure, floors, columns and beams.

2. The entire exterior skin execution shall be based on the "Rain Screen" principle and the system shall provide:

   1. Such gaskets, baffles, overlaps and seals as required to provide a "Rain Screen" barrier to effectively deter rain water entry into the cavities of the system.

   2. The necessary "air seals" to minimize air passage from the system cavities into the building and vice-versa to assure adequate pressure equalization of the system cavities with the outside.

   3. The "air and vapour seals" required to minimize air borne vapour exfiltration from the building into the system cavities.

   4. Openings between these cavities and the outside of sufficient cross-section to provide pressure equalization. All openings must be effectively baffled or otherwise guarded to minimize direct water entry.

   5. Thermally, the grid members shall have a resistance to heat transfer equal to or better than that of the area along the bottom of the 1" (25 mm) sealed glass units.

3. Performance:

1. Air in-or-Exfiltration performance shall exceed industry standards of .06 c.f.m./ft^2 (.0003 m^3/s-m^2) when tested in accordance with ASTM E283 at a 6.24 p.s.f. (300 Pa) pressure difference.

2. There shall be no water infiltration into the building when tested in accordance with ASTM E331 with a pressure differential of 15.0p.s.f. (720Pa) whichever is higher.

3. No condensation shall form on any interior surfaces of the aluminium members before any of the exposed area of the 1" (25 mm) sealed units reaches the dew point temperature.

4. Thermal expansion allowance at aluminium panel system: The system has to take a temperature difference of 185 degrees F. (85 degrees C) without putting stress into any member of sealant.

5. Erected aluminium panel system shall have flatness criteria not to exceed 1/4" (6mm) in 20'-0" (6000mm). Units have rippling, waving, or oil canning exceeding the above criteria shall be subject to reflection if the condition cannot be satisfactorily repaired and corrected in the field.

9. STANDARDS

1. Kawneer 1600UT (System 1 & 2 where applicable refer to drawings)
Thermally Broken Curtain Wall System with silicone structural glazing or fiberglass perimeter pressure plates - 7 ½" (190.5mm) or 6" (152.4mm) deep frames (manufacturer to approve in writing with tender submission prior to start of construction in regard to loading on the system(s)) with 2 ½" (63.5 mm) sightline tubular mullions with 3/4" deep cap or 100mm sloped cap with drip edge and Cap-Less (combination of horizontal and vertical) as indicated on drawings and/or as recommended otherwise by manufacturer.

1. Provide GlassVent UT (Ultra Thermal), top pivoting awning projecting out window operation with operator assembly and complete with removable insect screens. Operator to work from the interior without removing insect screen. Finish to be black anodized typical and Duranar colour where indicated on the drawings.

   NOTE:
   Maximum operable opening not to exceed 4" (100mm) on any floor level from above ground (Main, Level 1) floor and up.

2. Provide Air barrier in the form of a sealed insulated metal back pan for all

spandrel glazing locations, at aluminium panel locations and plywood infill locations. Install air/vapour barrier transition membrane over plywood infill locations, both to be sealed in curtain wall framing. Provide finished aluminium cover inside on the surface of the sealed metal back between and flush with interior face of mullions.

3. Fabricate and install Curtain Wall in accordance with NAAMM Standard SW-1-68T published by the National Association of Metal Manufacturers. Only those provisions of the Standard applicable to the Curtain Wall shown on drawings and as specified herein shall govern.

4. Comply to CAN3-S157 as currently amended.

5. Aluminium doors at exterior and interior curtain wall locations shall be doors as per Section 08400 - Aluminium Entrance Framing and Doors.

10. DESCRIPTION

1. ALUMINUM CURTAIN WALL

1. Work included: furnish labour, material and other services to complete the fabrication and installation of the framing, including material and fitments required for the operation of any entrance units included, in the manner, direction and performance shown on the shop drawings and specified herein.

2. Work included: furnish all labour material to provide and install the following items:

1. Aluminium uninsulated panels.

2. Aluminium flashings, trim pieces, fascia and closer members.

3. Formed subjects.

4. All necessary clips, fastening devices, required accessories needed to attach the composite aluminium pieces indicated on the drawing into position.

5. Aluminium metal weeping channels.

6. All necessary caulking conforming to 19-GP-24M and all necessary gaskets, etc. to weather seal all joints.

7. All necessary flanges and supports as required to keep panels rigid and stable to conform with design as indicated on the drawings.

8. Intermediate galvanized steel stud panel and girt supports.

9. All aluminium framing including "Z" girts, channels, clips, angles or blocking to secure aluminium composite panels.

10. Cutting, reinforcing, closing, trimming of openings.

11. All glass, spandrels and glazing.

12. All caulking and sealants.

13. Aluminium panels, aluminium and galvanized steel air barrier liners and insulation.

14. 1/8" (3mm) aluminium or 1/4" (6mm) aluminium composite panels at walls and entrance canopy and soffit locations and above curtain wall areas below roof parapets.

15. Aluminium Operators as indicated on drawings.

16. Oversized 200mm x 64mm caps complete with Duranar colour finish where indicated on drawings. Allow for 3 colours.

3. Curtain wall supplier engineer to verify all required curtain wall systems, spans, loads etc. prior to tender closing.

2. PRODUCTS

1. MATERIALS

1. Aluminium: Extruded aluminium alloy members 6063 T5 alloy, minimum 1.6 mm (0.62") thick. Sheet which is not to be exposed shall be Utility Grade.

2. Aluminium Flashing: Supply 0.125" (3.2 mm) thick aluminium to profiles as indicated on drawings.

3. Aluminium Sills: Sills are to be extruded aluminium in colour to match exterior colour of frame and shall be complete with required anchors, joint covers, end caps or returns, chairs, anchors, anchoring devices and jamb drip deflectors. Extruded sills are to be the profile shown with minimum ⅛" (3mm) thickness with safety / drip edges. Sills shall be in longest possible lengths, joints only at mullions; all joints are to be sealed with slip joint.

NOTE: Aluminium sills to be provided at bottom of all windows and curtain wall locations as detailed.

4. Cavity inuslation in Metal Air-barrier Liner / Back Pan: See Section 07213 - Mineral Fibre Insulation.

5. Metal Air-barrier Liner / Metal Back Pan: 3.2mm clear anodized aluminium with all corners of panels sealed where exposed to interior areas. All other locations shall be 20 gauge thick steel air/barrier liner with 1.25 oz./sq. ft. (458 g/m^2) galvanizing with corners of panel sealed. Panels to be flat; stiffen as required.

6. Vision Glass: as per Section 08800 Glass and Glazing Section.

7. Operating Vents: Finish to be Black anodized typical and Duranar finished where indicated on the drawings. Hinged awning style limited opening to max. 4" (100mm). 1 pair heavy duty Anderburg or Senator Friction Arms with polished US-4 cam handle and keeper for 500mm wide and less and 2 for all windows greater than 500mm wide.
(or operation handle that the screen does not have to be taken out in order to open the operable window)

8. Insect Screens: Size to match operable window vent as per manufacturer, glass fibre mesh in clear anodized aluminium frame with extruded elastomer removable splines.

9. Spandrel Glass Panels: as per Section 08800 Glass and Glazing Section.

10. Glazing Tape: Tremco Visionstrip co-extruded EPDM gasket with integral glazing tape on the exterior and a black, closed cell elastomeric glazing gaskets appropriate to the function on the interior. Colour of glazing selected by Architect.

11. Spacer Shims: 1/4" (6 mm) x ½" (12.7 mm) Norton tape. Shims for frame are to be oil resistant rubber or plastic acceptable to glass manufacturer, channel shaped and each approximately 4" (100 mm) long.

12. Thermal Break: Soft PVC, compressed to seal between main sections and pressure plates.

13. Isolating Coating: Black alkali resistant bitumastic enamel.

14. Sealant Bond Breaker: Open cell foam backer rod sized to suit.

15. Silicone Sealant: Dow Corning #795 or as per manufacturer's recommendations exceeding CAN2-19.13-M87 Class 40 requirements. Min 2 colours as selected by Architect.

16. Sealant at Perimeter Masonry Openings: 3 part Tremco Dymeric 240 sealant in accordance with Caulking - Section 07900 (Type A sealant).

Minimum 2 colours as selected by Architect.

17. Sprayed-on Urethane Insulation: Supply and installation by this section as specified under Section 07215 – Spray-on Insulation.

18. Fasteners, Screws and Bolts: Stainless steel 300 Series or stainless steel 400 Series cadmium plated of sufficient size and quality to perform their intended function.

2. FABRICATION

1. General

1. Construct aluminium assemblies of extruded sections to size and profile shown on drawings.

2. Build units square, true, accurate to size, free from distortion, waves, twists, buckles or other defects detrimental to performance or appearance.

3. Units too large for handling or shipping shall be prefabricated in factory, disassembled and marked for shipping and field assembly.

4. Use concealed fastenings. No exposed screws shall show in the finished work where finished product is exposed to view, unless approved by the Architect. Such screws shall be countersunk and finished to match surfaces in which they occur.

5. Joints shall be accurately cut and fitted to result in a tightly closed joint.

6. Provide additional reinforcing at location of handrail brackets and at stair and landing areas to withstand O.B.C. horizontal loading designs.

7. Vertical and horizontal members shall be tubular extrusions designed for shear block corner construction.

8. All joints shall be accurately machined, assembled and sealed to provide neat weathertight joints. Shielded drainage and pressure equalization vents shall be provided where required. All horizontal members shall be sealed to vertical members to provide individual compartments within the system in accordance with the rain

screen principle

2. Assembly

1. Assembly shall be Kawneer 1600 UT System 1 & 2 Curtain Wall System or approved equal. See item 1.6.

2. Mullion Depth Sizes exclusive of cap: See Item 1.6

3. Cap Depth Sizes and Locations:

1. Exterior horizontal caps 3/4" (19 mm).

2. Typical exterior vertical caps 3/4" (19 mm). Oversized 8" (200mm) caps where indicated on the drawings.

3. Do not provide vertical or horizontal caps where single lines are indicated on drawings, these shall be structural silicone glazed and capless.

4. Aluminium caps for mullion assembly to be without gap.

5. All horizontal members must form individually pressure equalized and sealed gutter members.

6. Vertical expansion and construction joints shall be provided and designed for baffled overlaps with a compressed resilient air seal laid in between the mullion ends.

7. At aluminium and spandrel panel locations provide 20 gauge thick steel air/barrier liner with 1.25 oz./sq. ft. (458 g/m2) galvanizing with corners of panel sealed at all concealed locations. Provide 16 ga. clear anodized air/barrier liner panels at all interior exposed locations. Panels to be stiffened as required to maintain a flat surface.

8. Insulation shall be fitted into the air-barrier liners / metal back pans and secured by being impaled onto welded pains and retained by integral discs. Insulation to always extend out to thermal break in framing members. All void spaces to have spray in place insulation installed, this includes where indentations have been created by integral disc compression (where insulation does not fluff up to original shape, thickness), and from thermal break in curtain wall framing sealed to batt insulation, all perimeters of back pan.

9. Structural anchors shall have three-way adjustment and be welded after curtain wall alignment. Field paint touch-up shall

follow the welding operation.

10. Provide thermally broken door frame adaptors for all doors in aluminium curtain wall framing.

11. Provide 10" (254 mm) height side light bases with sill flashing by doors where indicated on drawings.

3. Closures, Flashings and Miscellaneous Covers

1. Provide .125" (3 mm) thick aluminium closures, caps and flashings where indicated

4. Aluminium Finish

1. The aluminium frame finish to be black anodized.

2. Caps to be black anodized typical unless noted otherwise on drawings. Provide Duranar finished oversized caps where indicated on the drawings. Allow for 3 custom colours for oversized caps.

3. Exterior of operable window perimeters to be Black anodized finish.

5. Aluminium Sills

1. Provide continuous extruded aluminium sills at bottom of curtain wall set in bed of caulking. Sills to match finish of curtain wall caps above and be manufactured by curtain wall supplier.

6. Aluminium Door Adapters

1. Provide 19mm perimeter door adapters to suit door installation in curtain walls wherever aluminium doors are indicated on drawings.

7. Aluminium Panel Joints

1. Aluminium panel joints to be aligned with centre line of curtain wall mullions or other panel joints (to be verified at site) and to be coordinated with Architectural drawings prior to manufacturing; also coordinate with drawings for joint detailing, if not on drawings, contractor to ask for detail during shop drawing submission.

3. EXECUTION

1. INSTALLATION

1. Install curtain wall in accordance with manufacturer's recommendations and with standards specified herein.

2. Isolate all aluminium coming in contact with other metals, masonry or concrete with heavy shop coating of black alkali resistant bituminous paint to prevent electrolytic or chemical action.

3. Fill voids between aluminium extrusions and masonry or concrete surfaces with sprayed-on urethane insulation where necessary to prevent movement or infiltration of air. Drill and fill aluminium extrusions with sprayed-on urethane insulation where indicated on drawings.

4. Installation of aluminium panel system:

    1. Erection shall be by skilled personnel only as directed by Panel Manufacturer. Joints shall be thoroughly sealed against entrance of weather to interior of assembly.
    2. Install work, plumb, straight, even and true to required lines, levels and slopes. Reject and replace bent, scratched, dented mismatched, loose, or out-of-true work.
    3. Provide custom structural supports and aluminium shims.
    4. Fasten panels by system of support and fasteners according to manufacturer's recommendation to provide true surface free from undulations.
    5. Install adequate expansion joints to accommodate thermal movement wall.
    6. Install copings, closures, drips, and flashings unless specified otherwise. Finish shall match exterior panels.
    7. Tape or backpaint contact surfaces where galvanized & aluminium metal & concrete come in contact to prevent corrosion
    8. Replace all panels with mars, scratches, and cut edges with new panel etc.
    9. Install aluminium doors as per Section 08400 - Aluminium Entrance Framing and Doors.

2. <u>CAULKING</u>

1. Glazing and aluminium caulking to be under this section as per manufacturer's instructions and as per details on drawings in accordance with procedures specified under Section 07900 – Sealants.

2. Caulking around perimeter of curtain wall between curtain wall and masonry to be done by this section as per Section 07900 - Sealants using Tremco Dymeric 240 (Type 'A') sealant.

3. Caulking to be done between panels including air-barrier liners / metal back pans under this Section using silicone sealant and installed as per

Section 07900. All caulking of panels to surrounding masonry, concrete, etc. shall be by Section 07900 – Sealants.

3. GLAZING

1. Glazing shall be in strict conformance with manufacturer's instructions and shop drawings.
2. Units shall be manufactured by an I.G.M.A.C. certified facility.
3. Mark each light with a large white cross to indicate the presence of glass.
4. Replace under this Section defective, damaged or broken glass due to faulty setting, handling, storage or cleaning.
5. Glass supplied and installed under this section in accordance to Section 08800 – Glass and Glazing.

4. PROTECTION AND CLEANING

1. Aluminium shall be isolated from concrete, mortar, plaster and dissimilar metals with bituminous paint.

2. Framing shall be protected from other building materials during and after installation until acceptance by the Architect.
3. General Contractor to maintain protection and provide final cleaning.

4. Upon completion of erection all aluminium panel surfaces shall be cleaned to the satisfaction of the Architect.

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

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS:

1. Division One, General Requirements, is a part of this Section and shall apply as if repeated here.

1.2 DESCRIPTION

1. This section specifies subsurface preparation requirements for areas to receive the installation of applied and resinous flooring. This section includes removal of existing floor coverings, testing concrete for moisture and pH, remedial floor coating for concrete floor slabs having unsatisfactory moisture or pH conditions, floor leveling, and repair as required.

2. **Note**: where new vinyl tile floor finishes are being applied to existing floor substrates other than slab on grade conditions, refer to Section 09650 for leveling material.

1.3 SUBMITTALS

1. Submit in accordance with Section 01300 – Submittals.

2. Written approval confirming product compatibility with subfloor material manufacturer and the flooring manufacturer.

3. Product Data:

    1. Moisture remediation system
    2. Underlayment Primer
    3. Cementitious Self-Leveling Underlayment
    4. Cementitious Trowel-Applied Underlayment (Not suitable for resinous floor finishes)

4. Test Data:

    1. Moisture test and pH results performed by a qualified independent testing agency or warranty holding manufacturer's technical representative.

2.4 DELIVERY AND STORAGE

1. Deliver materials in containers with labels legible and intact and grade-seals unbroken.

2. Store material to prevent damage or contamination.

1.5 APPLICABLE PUBLICATIONS

1. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by basic designation only.

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

D638-10 (2010)	Test Method for Tensile Properties of Plastics
D4259-88 (2012)	Standard Practice for Abrading Concrete to alter the surface profile of the concrete and to remove foreign materials and weak surface laitance.
C109/C109M-12 (2012)	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens) Modified Air Cure Only
D7234-12 (2012)	Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
E96/E96M -12 (2012)	Standard Test Methods for Water Vapor Transmission of Materials
F710-11 (2011)	Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
F1869-11 (2011)	Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
F2170-11 (2011)	Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
C348-08 (2008)	Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars
C191-13 (2013)	Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle

PART 2 - PRODUCTS

2.1 MOISTURE REMEDIATION COATING (SLAB ON GRADE LOCATIONS ONLY):

1. System Descriptions:

1. High-solids, epoxy system designed to suppress excess moisture in concrete prior to an overlayment. For use under resinous products, VCT, tile and carpet where issues caused by moisture vapor are a concern.

2. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up.

3. System Components: Verify specific requirements as systems vary by manufacturer. Verify build up layers and installation method. Verify compatibility with substrate. Use manufacturer's standard components, compatible with each other and as follows:

    1. Liquid applied coating:
        1. Resin: epoxy.
        2. Formulation Description: Multiple component high solids.
        3. Application: Per manufacturer's written installation requirements.
        4. Thickness: minimum 10 mils

4. Material Vapor Permeance: Application shall achieve a permeance rating of less than 0.1 perm in accordance with ASTM E96/E96M.

5. Maximum RH requirement: 100% testing in accordance with ASTM F2170.

Property	Test	Value
Tensile Strength	ASTM D638	4,400 psi
Volatile Organic Compound Limits (V.O.C.)	SCAMD Rule 1113	25 grams per liter
Permeance	ASTM E96	0.1 perms
Tensile Modulus	ASTM D638	$1.9X10^5$ psi
Percent Elongation	ASTM D638	12%
Cure Rate	Per manufacture' s Data	4 hours Tack free with 24hr recoat window
Bond Strength	ASTM D7234	100% bond to concrete failure

2.2 CEMENTITIOUS SELF-LEVELING UNDERLAYMENT (AT LOCATIONS WHERE EXISTING FLOOR SURFACE VARIES MORE THAN 3MM OVER 3000MM):

1. System Descriptions:

    1. High performance self-leveling underlayment resurfacer. Single component, self-leveling, cementitious material designed for easy application as an underlayment for all types of flooring materials. It is used for substrate repair and leveling.

    2. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up. Gypsum-based products are unacceptable.

2. System Characteristics:

    1. Wearing Surface: smooth

    2. Thickness: Confirm existing conditions, ranging from feathered edge to 1", per application. Applications greater than 1" require additional 3/8" aggregate to mix or as recommended by manufacturer.

3. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.

4. Compressive Strength: Minimum 4100 psi in 28 days in accordance with ASTM C109/C109M.

5. Flexural Strength: Minimum 1000 psi in 28 days in accordance with ASTM C348.

6. Dry Time: Underlayment shall receive the application of moisture insensitive tile in 6 hours, floor coverings in 16 hours, and resinous flooring in 3-7 days.

7. Primer: compatible and as recommended by manufacturer for use over intended substrate.

8. System Components: Manufacturer's standard components that are compatible with each other and as follows:

    1. Primer:
        1. Resin: copolymer
        2. Formulation Description: single component ready to use.
        3. Application Method: Squeegee and medium nap roller. All puddles shall be removed, and material shall be allowed to dry, 1-2 hours at 70F/21C.
        4. Number of Coats: (1) one.

2. Grout Resurfacing Base:

1. Formulation Description: Single component, cementitious self-leveling high-early and high-ultimate strength grout.
2. Application Method: colloidal mix pump, cam rake, spike roll.
   1) Thickness of Coats: Per architectural scope, 1" lifts.
   2) Number of Coats: More than one if needed.
3. Aggregates: for applications greater than 1inch, require additional 3/8" aggregate to mix.

Property	Test	Value
Compressive Strength	ASTM C109/C109M	2,200 psi @ 24 hrs 3,000 psi @ 7 days
Initial set time Final Set time	ASTM C191	30-45 min. 1 to 1.5 hours
Bond Strength	ASTM D7234	100% bond to concrete failure

2.3 CEMENTITIOUS TROWEL-APPLIED UNDERLAYMENT(NOT SUITABLE FOR RESINOUS FLOOR FINISHES)

1. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.
2. Compressive Strength: Minimum 4000 psi in 28 days
3. Trowel-applied underlayment shall not contain silica quartz (sand).
4. Dry Time: Underlayment shall receive the application of floor covering in 15-20 minutes.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

1. Maintain ambient temperature of work areas at not less than 16 degree C (60 degrees F), without interruption, for not less than 24 hours before testing and not less than three days after testing.

2. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation.

3. Do not install materials when the temperatures of the substrate or materials are not within 60-85 degrees F/ 16-30 degrees C.

3.2 SURFACE PREPARATION

1. Existing concrete slabs with existing floor coverings:

    1. Conduct visual observation of existing floor covering for adhesion, water damage, alkaline deposits, and other defects.

    2. Remove existing floor covering and adhesives. Comply with local, state and federal regulations and the RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to the floor covering being removed.

2. Concrete shall meet the requirements of ASTM F710 and be sound, solid, clean, and free of all oil, grease, dirt, curing compounds, and any substance that might act as a bond-breaker before application. As required prepare slab by mechanical methods. No chemicals or solvents shall be used.

3. General: Prepare and clean substrates according to flooring manufacturer's written instructions for substrate indicated.

4. Prepare concrete substrates per ASTM D4259 as follows:

    1. Dry abrasive blasting.
    2. Wet abrasive blasting.
    3. Vacuum-assisted abrasive blasting.
    4. Centrifugal-shot abrasive blasting.
    5. Comply with manufacturer's written instructions.

5. Repair damaged and deteriorated concrete according to flooring manufacturer's written recommendations.

6. Verify that concrete substrates are dry.

7. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of per flooring manufactures formal and project specific written recommendation.

8. Perform in situ probe test, ASTM F2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity per flooring manufacture's formal and project specific written recommendation.

9. Provide a written report showing test placement and results.

10. Prepare joints in accordance with 07900 – Sealants.

11. Alkalinity: Measure surface pH in accordance with procedures provided in ASTM F710 or as outlined by qualified testing agency or flooring manufacturer's technical representative.

12. Tolerances: Subsurface shall meet the flatness and levelness tolerance specified on drawings or recommended by the floor finish manufacturer. Tolerance shall also not to exceed 1/4" deviation in 10'. As required, install underlayment to achieve required tolerance.

13. Other Subsurface: For all other subsurface conditions, such as wood or metal, contact the floor finish or underlayment manufacturer, as appropriate, for proper preparation practices.

3.3 MOISTURE REMEDIATION COATING:

1. Where results of relative humidity testing (ASTM F2170) exceed the requirements of the specified flooring manufacturer, apply remedial coating as specified to correct excessive moisture condition.

2. Prior to remedial floor coating installation mechanically prepare the concrete surface to provide a concrete surface profile in accordance with ASTM D4259.

3. Mix and apply moisture remediation coating in accordance with manufacturer's instructions.

3.4 CEMENTITOUS UNDERLAYMENT:

1. Install cementitious self-leveling underlayment as required to correct surface defects, floor flatness or levelness corrections to meet the tolerance requirements as or detailed on drawings, address non-moving cracks or joints, provide a smooth surface for the installation of floor covering, or meet elevation requirements detailed on drawings.

2. Mix and apply in accordance with manufacturer's instructions.

3.5 PROTECTION:

1. Prior to the installation of the finish flooring, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, tempered hardwood, or other suitable protection course.

3.6 FIELD QUALITY CONTROL

1. Where specified, field sampling of products shall be conducted by a qualified, independent testing facility.

END OF SECTION

PART 1 - GENERAL

1. GENERAL REQUIREMENTS:

    1. Division One is part of this Section and shall apply as if repeated here.

2. REFERENCE STANDARDS:

    1. Do tile work to Installation Manual 2000 "Quarry Tile and Ceramic Tile", produced by Terrazzo Tile and Marble Association of Canada (TTMAC), except where specified otherwise.

    2. Contractor shall have been and still be a current member of the TTMAC.

3. MAINTENANCE DATA:

    1. Provide maintenance data for tile work.

4. MAINTENANCE MATERIALS:

    1. Provide minimum 2% of each type and colour of porcelain tile required for project maintenance use. Store where directed.

    2. Maintenance material to be of same production run as installed material.

5. ENVIRONMENTAL REQUIREMENTS:

    1. Air temperature and structural base temperature at porcelain tile and ceramic installation area must be above 54°F (12°C) for 48 hours before, during and 48 hours after installation.

6. SAMPLES:

    1. Submit 1'-0" x 1'-0" (300 mm x 300 mm) samples of each type, colour, texture, size and pattern of tile to be used for the approval of the Architect before installation.

7. SHOP DRAWINGS:

    1. Porcelain and Ceramic Tile: submit shop drawings showing expansion joint, control joint locations and pattern layouts for Architect's approval.

8. ASSEMBLY:

    1. All installation assemblies will compose of materials from the same manufacturer and be completely compatible. The completed assembly will pass the service requirements "Extra Heavy Duty" (Passing ASTM C627 - Cycles 1 through 14) as described in the TTMAC Specification Guide and

TCA Handbook (Page 10).

PART 2 - PRODUCTS

1. Tiles:

   1. Tile: Conforming to CGSB 75-GP-1A.

   2. Colours: Indicated for ceramic, porcelain and glass tiles are for tendering purposes. Final colour selection to be confirmed by Architect prior to installation. Three colours to be selected from full range with one colour as the field from price group 2 and two colours as accent from price group 4.

   3. NOTE: Provide round edge, round edge both sides, cove base, nosing's and tiles to do all work as per drawings and as required.

   4. Porcelain Tiles: (coordinate with room finish schedules)

      .1 PT1 - Wall Tile: Equal to Daltile, Imagica, light polished 12" x 24" (305mm x 610mm). Colour to be selected, complete with Schluter, Schiene. Base to be of same wall tile.

      .2 PT2- Floor Tile: Equal to Stone Tile, Woodtalk 100mm x 100mm (4" x 4"), and cut tile base 4" x 36" at PT2 locations. Colour to be selected.

      .3 PT3 – Base Tile: Equal to 4" x 24" (100mm x 610mm) cut tile of field porcelain tile.

      moldings or Stainless Architectural Supply www.sasmfg.com

   5. Tactile Warning Surface Indicator (TWSI) Tile:

      .1 12" x 12" x 7/16" (300mm x 300mm x 10mm) tile by Kinesik Engineered Products (905-330-9233). Tile to have truncated domes conforming to latest OBC requirements. Colour to be selected

      .2 Mortar Beds:

         1. For Walls: 1 part Portland Cement: 1/5 to ½ parts

hydrated lime; 4 parts sand; gauged with Custom - Flex latex by Custom Building Products as per manufacturer's directions. All Custom Building Products are distributed by Brolain Distributors Ltd. 519-740-9311. Approved equal manufacturer is TEC. NOTE: Adhesive application will not be accepted.

2. For Floors: 1 part Portland Cement: 4 parts sand: gauged with Custom - Flex latex by Custom Building Products as per manufacturer's directions. Approved equal manufacturer is TEC. NOTE: Adhesive application will not be accepted.

.3 Thin Set Mortar: Master Blend Thin-Set Mortar gauged with Custom - Flex latex by Custom Building Products as per manufacturer's directions. Approved equal manufacturer is TEC

.4 Porcelain Tile Grout and Joint Filler: Classic-Blend Grout by Custom Building Products floor grout and joint filler mixed with Custom's Acrylic Mortar Admix grout as per manufacturer's directions in colours as selected by Architect. Approved equal manufacturer is TEC. One colour to be selected by Architect.

.5 Ceramic Tile Grout and Joint Filler: Custom 100% Solids epoxy by Custom Building Products grout system. Approved equal manufacturer is TEC. One colour to be selected by Architect.

.6 Glass Tile Grout & Joint Filler: Laticrete, Spectra LOCK 2000 IG 3 part 100% solids epoxy, as recommended by manufacturer for floor installation.

8. Caulking:

.1 Flexible caulking conforming to CGSB 19-GP.22M: Dow Corning 786 and CGE 1702 Sanitary Sealant. Colours as selected by Architect.

.2 Metal Transition Strips: 14 gauge zinc divider strip. Add the following transition strips types by Schluter for the following locations (height of transition strips to suit tile thickness):

.3 Between PT and Concrete: Reno Ramp (satin aluminum finish) by Schluter Systems.

.4 Between PT and Epoxy Coated Seamless Floor: Reno U-AEU (satin aluminum finish) by Schluter Systems where PT is installed first with a coat of epoxy installed second; Reno-Ramp (satin aluminum finish) by Schluter Systems where PT is installed second on top of epoxy coat.

.5 Between PT and Linoleum, VCT, Sheet Vinyl, Rubber Floor: Reno U, AETK (satin aluminum finish) by Schluter Systems.

.6 Renovation:
Between PT and Linoleum, VCT, Sheet Vinyl, Rubber Floor: Reno V, model Reno-AEV T/B by Schluter Systems.

.7 Between PT and Sport Flooring: Reno-T by Schluter Systems.

.8 Between PT and Carpet: SCHIENE, AETK (satin aluminum finish) by Schluter Systems and Reno-TK by Schluter Systems. Verify depth of carpet and substrate, SCHIENE for thick carpet, Reno-TK for thinner carpet.

.9 Between PT and CET: Reno-U, AETK (satin aluminum finish) by Schluter Systems.

.10 Between PT and Terrazzo: Schiene by Schluter Systems.

9. Waterproof Membrane System at shower ceramic tile areas:

.1 Waterproof membrane shall be Laticrete liquid applied waterproof Membrane 9235 by Laticrete and rot-proof, hi-tensile cloth specifically treated for use with Laticrete Waterproofing as manufactured by Laticrete International Inc. and distributed by Ceratec Inc., Weston, Ontario (416) 743-5514. Approved equal is Schluter Kerdi matting system distributed by Centura and installed as per Schluter printed installation instructions.

.2 Finished membrane application shall meet the following requirements:

1.	Thickness	0.02" (20 mils) min.
2.	Water Permeability	Nil
3.	Service Temperatures	-20 deg. F. to +180 deg. F. -23 deg. C to + 82 deg. C.
4.	Tensile Strength	415 lbs. per lineal in. (74 kg/cm)

5. The membrane shall be resistant to urine, sugar, brine and milk waste products.

.3 Where waterproof membrane is installed, tile is to be installed using Laticrete 4237 Latex thin set method and Laticrete latapoxy S.P.100 stainless epoxy grout.

NOTE: Other manufacturers must obtain approval from the Architect at least seven (7) days prior to tender closing. Approval must be in writing.

.4 Wire Mesh Reinforcing: 2" x 2" (51 mm x 51 mm x 1.6 mm) galvanized wire mesh reinforcing.

.5 Floor Sealer and Protective Coating: Aqua Mix Penetrating Sealer by Aqua Mix Inc.

.6 Cleaner: Aqua Mix Miracle Cleaner by Aqua Mix Inc. or as recommended by tile and grout manufacturers.

2. Uncoupling membrane – Under Floor Layment:

.1 Schluter®-DITRA
1/8" (3 mm) thick, orange, high-density polyethylene membrane with a grid structure of 1/2" x 1/2" (12 mm x 12 mm) square cavities, each cut back in a dovetail configuration, and a polypropylene anchoring fleece laminated to its underside. Conforms to definition for uncoupling membranes in the Tile Council of North America Handbook for Ceramic Tile Installation; and meets or exceeds the requirements of the "American national standard specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10," and is listed by cUPC®, and is evaluated by ICC-ES (see Report No. ESR-2467 and PMG 1204).

.2 Waterproofing seaming membrane:
Provide with Schluter®-KERDI-BAND Seams and Corners material 0.004" (4 mil) thick, orange polyethylene membrane, with polypropylene fleece laminated on both sides.

3. Control Joints:

1. Porcelain Tile:

.1 Floor to Floor: Schluter Dilex KSN (height to suit tile thickness). Colour as selected by Architect, stainless steel.

.2 Floor to Wall: Schluter Dilex KSA (height to suit tile thickness). Colour as selected by Architect, stainless steel.

PART 3 - EXECUTION:

1. EXAMINATION:

1. Examine substrates before commencing work to ensure they are satisfactory. Defective work resulting from installation on unsatisfactory surfaces will be considered the responsibility of those performing the work of this section.

2. WORKMANSHIP:

1. Regard recommendations, installation methods specified and illustrated in Terrazzo, Tile and Marble Association Manual No. 2000, and applicable manufacturer's instructions as minimum acceptable standard accept as varied by this Specification.

2. Fit tile units around corners, fitments, fixtures, drains and other built-in objects to maintain uniform joint appearance. Make cut edges smooth, even and free from chipping. Edges resulting from splitting not acceptable.

3. Maximum surface tolerance 1:800.

4. Make joints between tiles uniform. Tile joints shall be approximately 1/4" (6 mm) wide for porcelain tile, plumb, straight, true, even and with adjacent units flush. Align patterns.

5. Drill holes for fixing accessories of other trades.

6. Finish surfaces flat and level (ensure leveler is used to accomplish this) or sloped and graded to drain where floor drains occur.

7. Sound tiles after setting and replace hollow sounding units to obtain full bond.

8. Make internal angles square, external angles bull nosed.

9. Install transition strips at junction of tile flooring and dissimilar material. Where transition occurs in a doorway, transition strip to be below door.

10. Clean installed tile surfaces progressively as work proceeds. Do not allow mortar to stain absorbent tile. Do not use acids for cleaning. Seal in

accordance with manufacturer's approved products and in accordance with TTMAC certified products only.

11. Layout borders, defined lines, accent patterns and bands wherever they occur prior to setting tile. Keep inner edges of borders against fields or wall panels straight.

12. Install base trim, control joints, and beveled reducing strips as per manufacturer's instructions.

3. EXPANSION AND CONTROL JOINTS:

1. Control joints to be located directly on block control joints and concrete floor control joints and expansion joints.

2. Control joints are also to be placed where tile abuts other hard materials.

3. Install control joints in tile floors at 10'-0" (3050 mm) max. o.c. and at 20'-0" (6100 mm) max o.c. at wall locations. Align joints at concrete floor and masonry control joint locations as well.

4. Allow for control joints at the perimeter junction to all walls, around all columns.

5. Submit shop drawings to indicate layout of control joints. Porcelain tile control joints shall occur directly above a concrete floor control joint therefore minimizing the cutting of porcelain tile.

6. The approved control joint shop drawing layout shall be marked onto the concrete floor slabs by the porcelain tile contractor and the actual cutting of the control joints in the concrete floor slab shall be done by the concrete floor finisher.

7. It is the responsibility of the porcelain tile contractor and the concrete floor finisher to co-ordinate through the project manager the exact location of floor control joints.

8. At expansion joint locations install back to back metal transition strips at each side of joint then caulk between.

4. UNDER FLOOR LAYMENT:

1. Installation of the uncoupling membrane as per written manufacturer’s instructions.

2. Apply the thin-set mortar using recommended notched trowel.

3. Apply the uncoupling membrane & embed the matting into the mortar, making sure to observe the open time of the bonding mortar.

4. Use the recommended roller weight to ensure bonding of the membrane to the bonding mortar.

5. Install tile as per written manufacturer's instructions.

5. WATERPROOF MEMBRANE SYSTEM:

1. Install Laticrete 9235 Waterproof Membrane System with reinforced fabric at all new ceramic tile on levelling coats over concrete and masonry locations at shower walls, floors and ceilings and Drying Area, and as indicated on drawings.

2. Installation shall be made in strict accordance with the manufacturer's instructions.

3. Surface Preparation: Surface to be waterproofed should be plumb and true within 1/4 inch (6 mm) in 10 ft.(3m) as per 3.4 (b) above. Dry, dusty concrete slabs must be dampened and swept off. Installations may be made on a damp surface. Surface should be smooth, clean and free from dirt, grease, concrete sealers or curing compounds.

6. Installation:

1. Install the waterproofing liquid and fabric at ceilings, walls, floors and into the drains according to the approved details.

2. Use a brush or roller to apply a layer of liquid waterproofing slightly wider than the width of the fabric.

3. Immediately install the reinforcing fabric into the liquid. Install a final layer of liquid to completely seal the fabric.

4. Set tile with Laticrete 4237 Latex Thin Set method and grout with Latapoxy SP-100 stainless grout. Colour as selected by Architect.

7. PORCELAIN TILE:

1. Refer to TTMAC Specifications and Detail No. 311F-2000 Detail A, thin set method of porcelain tile floor to concrete slab, and Detail No. 303W-2000

thin set method of porcelain tile base to wall.

2. Install tile using thin set mortar, in accordance with manufacturer's instructions.

3. Provide levelling coat where required to achieve a level sub-floor prior to installation. Existing wood sub-floors may require additional plywood flooring coverage and shimming to achieve this, install as required.

4. Provide leveling coat at all wall tile locations.

5. Wall to wall, floor to wall, wall to ceiling tiles should not touch to stop transfer of noise and vibrations from one plane to the other, all joints are to be caulked (wall tile should start above floor tile with caulking space typical).

6. Porcelain tile base to be installed on first course of block without rounded corners (i.e. square). Block to be ground above base to match radius of block courses above first course.

7. Install porcelain tile base using Schluter, Jolly stainless steel cap (thickness to suit tile) complete with 90 degree corner return caps installed as per manufacturer's instructions.

8. Install porcelain tile base using Schluter, Jolly stainless steel at all vertical outside corners (thickness to suit tile) installed as per manufacturer's instructions.

8. GROUTING OF PORCELAIN TILE AND GLASS MOSAIC TILE:

1. Pack joints solid with grout at porcelain tile using a plastic or non-staining trowel.

2. Allow joints to stiffen before finishing.

3. Remove excess grout with clean cloths.

4. Grout shall be mixed according to manufacturer's instructions. Colours as selected by Architect.

5. Clean all surfaces with clean solution specified as per manufacturer's instructions.

9. CAULKING:

1. Install continuous caulking neatly and tool concave around base of all door frames and at all inside corners at 'wall to wall' and 'wall to ceiling' and 'wall to floor' (install at 'floor to wall' locations even where there is a base noted to cover this joint up) transition locations to stop transfer of noise and vibrations. Tiles at plane transitions should not touch, wall tile should start above floor tile with caulking space, etc. typical.

10. CLEANING AND REMEDIAL WORK:

1. Clean tile surfaces upon completion of grouting as per tile manufacturer printed instructions using cleaning agents and procedures recommended by the manufacturers of tile and grout.

2. Remove all grout haze, observing tile manufacturer's recommendations as to use of acid and chemical cleaners. (Do not use muriatic acid on tile work or pavers.)

3. Rinse tile work thoroughly with clean water before and after using chemical cleaners.

4. After setting, all tile surfaces shall be sounded and visually inspected and wherever any hollow backed or damaged tiles are found they shall be removed and replaced with matching tiles.

11. PROTECTION FROM CONSTRUCTION DIRT:

1. Seal cementitious grout joints and unglazed tile with "Aqua Mix Penetrating Sealer" by Aqua Mix Inc. or as recommended by manufacturer.

2. Cover all tile floors with heavy duty non-staining cotton reinforced paper or 6 mil vapour barrier taped into place.

3. Prior to final acceptance of tile work, remove paper and clean with "Aqua-Mix Miracle Cleaner" by Aqua Mix Inc. or as recommended by manufacturer.

12. PROTECTION FROM TRAFFIC:

1. Prohibit all foot and wheel traffic from using newly tiled floors for at least three days, preferably seven days after grouting is completed.

2. Place large, flat boards in walkways and wheel ways for seven days, where use of newly tiled floor is unavoidable.

3. Leave finished installation clean and free of cracked, chipped, brock,

unbonded or otherwise defective tile work. Replace damaged or defective work.

4. Provide cardboard walkway using recycled boxes to protect finished work during construction.

END OF SECTION

PART 1 - GENERAL

1. GENERAL REQUIREMENTS

    1. Division One, General Requirements, is a part of this Section and shall apply as if repeated here.

2. QUALIFICATIONS

    1. The Company performing the work of this Section shall be a member of the Terrazzo, Tile and Marble Association of Canada.

3. SAMPLES

    1. Submit 4" x 6" (100 mm x 150 mm) samples of each colour and type of terrazzo intended for use on this project. Colours to match the following standard terrazzo plate numbers: Terrazzo 1 Plate No. 751G, Terrazzo 2 Plate No. 752G, Terrazzo 3 Plate No. 743G, and Terrazzo 4 Plate No. 746G.

    2. Final colours of terrazzo to be selected by Architect.

    3. See drawings for quantity of four colours to be used to create floor patterns as indicated on drawings.

4. MAINTENANCE MANUAL

    1. Provide the Owner three brochures containing Maintenance and Stain Removal instructions approved by the Terrazzo, Tile and Marble Association of Canada.

5. SPECIAL PROTECTION

    1. Prohibit traffic on terrazzo floors during installation and for a minimum of 24 hours after installation.

    2. Protect newly ground floors from damage and staining.

    3. Protect finished corners exposed to construction operations and traffic.

    4. Before final acceptance of the work all damaged or defective work of this Section shall be made good and the entire work cleaned down and waxed in an approved manner so that it shall be turned over in perfect condition in all respects.

6. SHOP DRAWINGS

    1. Submit shop drawings in reproducible vellum form showing expansion joints, control joints, and divider strip locations for Architect's approval.

2. Locate joints above sawcut joints in concrete slab below. Refer to structural slab shop drawings for locations of control joints and expansion joints.

3. This shop drawing shall be co-ordinated with the concrete slab contractor and the Structural Engineer to finalize exact locations of control joints prior to concrete slab being installed and control joints cut.

PART 2 – PRODUCTS

1. MATERIALS

1. Cement: Portland Cement to CAN/CSA-A5.

2. Sand: Sharp, screened sand to CAN/CSA-A23.1.

3. Water: Clean, potable water free from oil, acids, alkali or organic matter.

4. Marble and Granite Chips: Clean and sound No. 1 and No. 2 crushed from sound marble with dust screened out. Size as per T.T.M.A.C. recommended standardization of chip sizes.

5. Colour Pigments: Non-fading mineral pigments to British Standard 1014.

6. Divider Strips: 1/8" (3 mm) x 1 1/4" (32 mm) deep except where specified otherwise, brass divider strips provided with anchorage devices.

7. Curing Compound: Type 11 non-staining to CGSB specification, 90-GP-1. Moisture retention shall not exceed 0.015 grams.

8. Cleaners, Sealers, and Floor Finish: Terrazzo, Tile and Marble Association of Canada Types 1001, 1002, 1003, 1004, 2001, 2002, and 3001 as applicable.

9. Slip Sheet: 6 mil (25 um) polyethylene film to CGSB Specification 70-GP-1, Type 1.

10. Reinforcing Mesh: 50 mm x 50 mm No. 16 x No. 16, steel mesh, electrical welded, galvanized after fabrication, conforming to CSA Standard G30.5.

2. MIXES/PROPORTIONS

1. Underbed: one part of cement to four parts sand by volume. Wet and mix thoroughly. Generally use no more than 4 gal. (18 litres) of water per bag of cement for underbed mix.

2. Standard Terrazzo Topping: 90 lb. (40 kg) bag of cement and 200 lb. (90 kg) of chips, mixed dry. Chip sizes 70% No. 2 and 30% No. 1 as directed to obtain colour and finish as approved by Architect. Mix with no more than 4 gal. (18 litres) of water per bag of cement.

3. TERRAZZO COLOURS

1. Allow for four terrazzo colours to be from the standard colour range as per 1.4 a.

2. The Architect shall finalize colour selection prior to sample submittals.

3. Cement pigment colour to match existent terrazzo.

PART 3 - EXECUTION

1. EXAMINATION OF SURFACES

1. Examine surfaces upon which the work of this section is to be installed and report any defects to the architect.

2. PREPARATION

1. Concrete slab below underbed to have a light broom finish to allow for proper bonding. Provide additional roughness to slab where required to allow for good bonding.

2. Floating Terrazzo: broom clean base slab, fill all voids with loose sand. Apply 1 ply polyethylene film over sand. Lap joints 4" (100 mm). NOTE: Make total thickness of floating terrazzo not less than 2 ½" (64 mm) thick. See Detail No. 2 in TTMAC Portland Cement Terrazzo Manual.

3. INSTALLATION

1. Underbed: Apply over prepared substrate and screed level making allowances for applicable terrazzo topping. Permit underbed to cure minimum 24 hours prior to receiving terrazzo topping.

2. Divider Strips

.1 Set divider strips while underbed is semi-plastic. Set strips accurately, straight and to exact finished floor level at

approximately 30" (750 mm) o.c. both ways except where indicated otherwise and to patterns indicated on drawings. Set shelf type dividing strips at junctions of resilient flooring and terrazzo surfaces. Install applicable strips under centre line of doors, to separate terrazzo from adjacent different floor finishes.

.2 Provide 500 feet (150,000 mm) of straight double divider strip at control joint locations directly above concrete slab control joints. See Structural drawings for suggested locations of control joints.

.3 Provide curved divider strips where required to form patterns indicated on drawings.

3. Standard Terrazzo Topping to TTMAC Detail No. 2

.1 When underbed has sufficiently set, apply terrazzo topping, consisting of chips and cement proportioned to produce a surface showing at least 85% marble aggregate. Add integral colouring as required. Thoroughly compact topping with a 200 lb. (90 kg.) roller where possible, tamp inaccessible areas where rolling is not possible. Add dry aggregate as required to obtain a compact mass and the proportion of exposed aggregate specified. Install terrazzo topping to provide colours and patterns indicated on drawings.

.2 Steel trowel to true even surface exposing dividing strips. Cure for at least 6 days.

.3 After curing machine grind surface using No. 60 to No. 80 carborundum grit until at least 85% of aggregate exposed.

.4 Immediately after grinding, fill voids and pores with cement grout coloured same as original mix. Maintain moist for minimum of 24 hours.

.5 Final polishing shall not proceed within 72 hours after placing grout.

.6 Remove grout and rub to a polished surface using No. 120 carborundum grit. Clean surface using a soap emulsion and warm water. Scrub to Architect's approval. Rinse terrazzo with clean water and then dry thoroughly. Dry clean terrazzo with industrial vacuum cleaning machine, removing all traces of dust. Apply first coat of sealer as soon after cleaning as possible. Apply sealer in accordance with manufacturer's written directions, and wipe off excess sealer before it dries. Apply second coat of sealer in same manner as first, but not until all other work is complete and terrazzo has been cleaned again as previously specified above. Then apply two coats of surface finish as approved by Owner's maintenance staff TTMAC.

4. PATCHING

.1 Remove and replace all defective or damaged work promptly and when directed by Architect.

END OF SECTION

PART 1 GENERAL

1. GENERAL REQUIREMENTS

    1. Division One is a part of this Section and shall apply as if repeated here.

2. DESCRIPTION OF SYSTEMS

    1. Lay-in Tile System: Exposed suspended tee-bar system accommodating 2'-0" x 4'-0" (610 mm x 1220 mm), acoustical panels in areas as indicated drawings and reflected ceiling plans as acoustical tile ceiling.

    2. All tile and suspension systems shall comply to U.L.C. Design as indicated on drawings.

3. SAMPLES

    1. Submit for approval, two samples (to match existing as closely as possible) of tile to be used in the project.

4. WORK INCLUDED

    1. This contractor shall supply and install all acoustic tile and required accessories as indicated on the working drawings, room finish schedule, including the following:

        1. All non-combustible ceiling boards.

        2. All exposed "T" grid suspension systems.

5. MAINTENANCE MATERIALS

    1. Deliver acoustical units in packages for maintenance use amounting to 3% of gross ceiling area for each lay-in panel type. Store where directed. Clearly identify packages.

    2. Maintenance materials shall be of same production run as installed materials.

6. ENVIRONMENTAL CONDITIONS

    1. Commence installation only after building has been enclosed and dust generating activities have been completed.

    2. Permit wet work to dry completely before commencement of installation.

    3. Ensure that a uniform minimum temperature of 15 deg. C. and humidity of 20-40% before, during, and after installation is maintained.

7. LETTER OF CERTIFICATION

1. The Contractor, together with manufacturer, shall submit a written confirmation, signed by manufacturer's registered professional engineer, stating that the suspended ceiling system will provide adequate support for electrical fixtures, as required by current bulletin of the ESA of Ontario Hydro. NOTE: all electrical fixtures to have independent supports in fire rated ceilings.

8. WARRANTY

1. Provide 10-year warranty on ceiling tiles for humidity and sag resistance.

PART 2 PRODUCTS

1. Lay-in Tile System:

1. Hangers: Min. No. 12 (2.5 mm) SWG galvanized mild steel hanger wire - 24" (600 mm) o.c. or galvanized steel wire of size capable of safety supporting anticipated ceiling system and loading.

2. Tees: Donn Suspension Systems by C.G.C. (Typical Lay In)

3. Tees: Armstrong Prelude XL 15/16" suspension Systems for square lay in tile system

1. Main Tees: .021" (.53 mm) thick cold rolled steel, double web, with rectangular bulb section at least I 1/2" (38 mm) high. Fabricate with punched cross tee holes at not greater than 16" (400 mm) o.c. and hanger wire holes at 2" (50 mm) o.c. Exposed flange shall be 15/16" (23.8 mm) wide and not less than .009" (.23 mm) thick cold rolled steel.

2. Cross Tees: Double web design with rectangular bulb; web extending to form a positive interlock with main tees in same exposed flange width.

3. See lay-in panel types for width of Tees to be used with each tile type.

4. Accessories:

1. Miscellaneous approved clips, splicers, screws, nails and other standard types to suit applicable conditions. Provide special accessories as required. Accessories shall be galvanized after forming.

2. Standard edge moulding as manufactured by system manufacturer to suit applicable details. Moulding shall be formed of zinc coated steel.

3. Provide Armstrong Impact Clip System Item No. 414 system. Provide accessible type clips where access is required (coordinate with mechanical and electrical for locations)

5. Finish:

   1. Tees, edge mouldings, and exposed accessories shall be finished with baked, non-yellowing, low sheen colour to match colour of lay-in panels. Colour to be White.

6. Lay-in Panels:

   1. Install tile types where acoustic tile is indicated on room finish schedule. Mineral tile types are as listed below:

      1. ACT1: Fine Fissured 1729, Square Lay-in 15/16 grid- 24" x 24" x 5/8" (610mm x 610mm x 16mm) with square lay-in edge detail as manufactured by Armstrong or equal by C.G.C. or Celotex. CO.
      2. ACT2: "Ultima Health Zone High NRC" – 24" x 24" x 1" (610mm x 610mm x 25mm), with square tegular lay-in edge detail as manufactured by Armstrong.

7. Tie Wire: 1.2 mm galvanized annealed steel wire.

8. Inserts and attachments to Structure for Hanger Connections: to suit conditions and loadings, galvanized after fabrication.

PART 3 EXECUTION

1. WORKMANSHIP

   1. Installation shall be by skilled mechanics and in strict accordance with system manufacturer's printed directions to produce a first class, flush finished surface in true plane and free from drooping, warped, uneven joints, damaged tile or panels. Butt joints tightly.

   2. Consult with mechanical and electrical trades to co-ordinate and arrange work to accommodate recessed fixtures, diffusers, grilles, and other similar items, where indicated on mechanical and electrical drawings. Recessed items shall replace or be centred in acoustical units.

   3. Frame around recessed fixtures, diffusers, grilles and openings and where normally required in good standard practice.

   4. Provide all furring required and construct drywall bulkhead, incorporated as part of best standard practice to Architect's approval.

5. Provide and install protection panels and/or five-sided box enclosures at recessed lighting fixtures, speaker boxes, diffusers, duct openings, firestop flaps, etc. as specified in the applicable ULC assembly specification. Approval of enclosures and protection will be by Architect and/or Municipal Authorities.

2. ERECTION

1. Lay-in Tile System

1. Install ceiling suspension system to ASTM C636-76 and manufacturer's instructions, except where specified otherwise.

2. Supply hangers and inserts to support the grid in time to be installed in structural system if required.

3. Hangers for acoustic systems shall be spaced to comply to U.L.C. Design, approximately 4 ft. (1200 mm) centres both ways and where normally required in good standard practice.

4. Secure hangers firmly.

5. Erect carrying channels for suspended systems of required elevation and level to tolerance of 1/8" (3.2 mm) over 12 ft. (3650 mm). Frame around recessed fixtures, diffusers, grilles and openings and where normally required in good standard practice. Furr around ducts, beams, bulkheads or the like, as shown or required by U.L.C. Standard.

6. Ensure that the suspension system supports the completed assembly, including all superimposed loads, such as lighting fixtures, diffusers and grilles, with a maximum deflection of 1/360 of the span. Provide supplemental hangers within 6" (150 mm) of each corner and at maximum 2'-0" (610 mm) around perimeter of light fixtures.

7. Attach exposed tees at centres required in good standard practice.

8. Install expansion joints in all main beams as required by U.L.C.

9. Provide angle wall mouldings at junctions of ceilings and vertical surfaces.

10. Provide spring clips to ensure tight installation, in rooms having an area less than 20 sq. ft. (1800 mm2).

11. Provide lay-in tile and grid to meet fire rating at all fire rated ceilings.

12. Erect ceiling system at required elevation and level to tolerance of 1/8" (3 mm) in 12'-0" (3660 mm).

13. Cut reveal edges to match factory detail at all reveal edge lay-in ceiling that needs cutting to fit grid size.

3. FIXTURE SUSPENSION

1. Make provisions for carrying flush mounted and recessed fixtures on suspended ceilings, using 4 hangers per fixture. Consult and coordinate with Electrical and Mechanical Trades.

2. The suspended ceiling system must comply with the current bulletin from the Electrical Inspection Department of Ontario Hydro regarding "Lighting Fixtures in Suspended Ceilings".

3. It is the responsibility of this contractor to supply the Architect with a letter stating that the suspension system is capable of holding the electrical fixtures as shown on the electrical drawings and as required by the above bulletin of the Electrical Inspection Department of Ontario Hydro.

4. MITRED JOINTS

1. "T" bar ceiling grid to be mitred at the outside corners.

5. ACOUSTICAL UNITS

1. Install acoustical units parallel to building lines to produce uniform borders and with edge units not less than 50% of unit width.

2. Accurately scribe and cut acoustical units to fit recessed items and adjacent work. Butt joints tight; terminate edges with moulding.

6. SPECIAL CLEANING

1. Keep acoustical panel installation and all components clean.

2. Remove and replace damaged or improperly installed units.

7. MECHANICAL EQUIPMENT ACCESS

1. Install "T" bar system to allow it to be removed easily at areas where mechanical units occur to allow units to be easily removed. NOTE: Stop main "T" on each side of equipment access.

8. IMPACT CLIPS

1. Install Impact Clip System at all acoustic tile ceiling areas.

9. CERTIFICATION

1. Provide at completion of work a written certification that all ceiling conforms to the requirements of the ULC design criteria for fire rated assemblies and that the suspended ceiling will provide adequate support electrical fixtures as per current bulletin of the ESA of Ontario Hydro.

END OF SECTION

PART 1 GENERAL

1. GENERAL REQUIREMENTS:

    1. Division One is a part of this Section and shall apply as if repeated here.

2. SAMPLES:

    1. Submit full size tiles in duplicate, in each colour or design to be used, for approval of the Architect.

3. MAINTENANCE INSTRUCTIONS:

    1. Submit 3 copies maintenance manual at completion of work in accordance with Section 01015.

4. DELIVERY, STORAGE AND HANDLING:

    1. Deliver materials in original containers with manufacturer's seals and labels intact. Maintain temperature of storage area at 70°F (21°C) for 48 hours prior to installation.

5. ENVIRONMENTAL REQUIREMENTS:

    1. Maintain minimum 70°F (21°C) air temperature at flooring installation area during installation and for 72 hours prior to and until floor area is occupied by Owner.

6. MAINTENANCE MATERIALS:

    1. Leave 2% of each colour, type and size of tile installed, with Owner for replacement purposes. Clearly mark containers. Material shall be from same production run as the material installed.

7. PROTECTION:

    1. General Contractor's Responsibility: In each location immediately following installation, protect new floors, if work is to be done after flooring installed with heavy cotton reinforced paper or polyethylene taped at joints and maintain in place until Architect gives instructions for the removal of temporary protection. Work shall be handed over to the Owner free of blemishes and in perfect condition.

PART 2 PRODUCTS

1. MATERIALS:

    1. Primers and Adhesives: Environmentally friendly materials as

recommended in writing by Flooring and base manufacturer, and approved by the Architect before application, to suit type of sub floor and wall finish for this project. Adhesive shall produce good and waterproof bond between applicable substrate and flooring.

1. Sub-Floor Filler: Adrex SD-F Feather Finish portland cement-based filler by Ardex Engineered Cements and distributed by Brolain Distributors Ltd. (519-740-9311). Levelrock brand Super Smooth Patching Compound by C.G.C.is an approved alternative product. Coordinate with flooring manufacturer for compatibility.

2. Sheet Flooring: 'IQ Optima' by Tarkett conforming to C.S.A. A126-1984. Provide in roll size suitable for minimum number of seams. All seams to be welded.
   Note colors below to be confirmed with Architect prior to ordering for installation:

   1. Colour: To be selected by the Architect
   2. Acceptable Alternates: SPHERA ELEMENT by Forbo, ACCORD by Gerflo, 2000 PUR by PolyFlor.

3. Rubber Base: 1/8" (3.2 mm) thick, 4" (100 mm) as indicated, rubber cove base at resilient locations by Johnsonite. Colour to be Pebble 32 by Johnsonite/Tarkett. Use continuous coil rubber base not 4'-0" (1220 mm) lengths. Approved alternate manufacturers are Amtico and Roppe.

4. Cleaner: Neutral chemical compound as approved by tile manufacturers that will not damage tile or affect its colour.

5. Sealers and Waxes: Type recommended by flooring manufacturers for material type and location and shall be compatible with Owner's sealer and wax. Obtain Owner's approval of sealer and wax product prior to installing VCT.

6. Reducing Strip: strips in thickness as required. Colour as selected by Architect.

7. Metal Edge Trim: Aluminum or brass alloy with lip of edge extending under and with shoulder finishing flush with top of resilient flooring.

8. Concrete Floor Sealer: to C.G.S.B. 25-GP-20m Type 1.

9. Reducers / Transitions: One-piece homogeneous polyvinyl chloride, installed using materials and methods per Manufacturer's written installation instructions. Colour: from Manufacturer's complete line. Style: SSR-XX-B by Johnsonite Inc.

PART 3 EXECUTION

1. INSPECTION:

    1. Ensure floor surfaces are smooth and flat to plus or minus 1/8" (3.2 mm) over 10 ft. (3050 mm).

    2. Ensure concrete floors are dry by using test methods recommended by manufacturer, and exhibit negative alkalinity, carbonization or dusting. 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.

    3. Installation of any part shall constitute acceptance of these surfaces as satisfactory.

2. PREPARATION:

    1. Remove sub floor ridges and bumps by light buff grind. Fill low spots, cracks, joints, holes and other defects with sub floor filler.

    2. Clean floor and apply trowel and float filler to leave smooth, flat hard surface. Prohibit traffic until filler cured.

    3. Split, bumpy or otherwise deformed tile resulting from improperly prepared base, will not be accepted.

    4. Prime/seal concrete slab to resilient floor tile manufacturer's printed instructions.

    5. Fill all low spots in flooring with high grade latex cement base flashing compound and gently blend in floor level at a rate of 1/8" per 1'-0" (10.5 mm per 100000 mm) to flush resilient flooring with ceramic tile, quarry tile, etc.

    6. Power sand concrete floor smooth then dry vacuum clean entire floor area.

3. INSTALLATION - RESILIENT FLOOR TILES:

    1. Apply adhesive uniformly to tile manufacturer's directions. Do not spread more adhesive than can be covered by tile before initial set takes place.

    2. Lay flooring with joints and seams parallel to building lines to produce a symmetrical tile pattern unless noted otherwise. Tile pattern as indicated

on drawings.

3. Install flooring with minimum tile width half full sizes
4. Distribute tiles having varying tones or texture evenly over entire floor area to avoid patches or streaks, and to produce homogeneous blend. Reject tiles having undue variations in colour, shade and texture.

5. Make tile joints flush, uniform, in straight lines and as inconspicuous as possible.

6. Install tile and colours to form patterns indicated on 9 series drawings.

7. Set flooring in place, press with 100 lb. (45 kg.) minimum roller to ensure full adhesion.

8. Cut tile and fit neatly around fixed or excessively heavy objects.

9. Terminate flooring at centre line of door in door openings where adjacent floor finish is dissimilar.

10. Install metal edge strips at unprotected edges of flooring.

11. Use reducing strips at centre line below doors where resilient flooring meets concrete floor or quarry tile.

12. Allow for random pattern and border in each classroom

4. <u>INSTALLATION – BASE:</u>

1. Layout base to keep number of joints to a minimum.

2. Install straight and level to variation of plus or minus 1/8" (3.2 mm) over 10'0" (3050 mm) straight edge.

3. Fill cracks and level irregularities of surfaces to which base is to be applied with filler approved by adhesive manufacturer so as to provide solid backing over entire area behind base. Cement cove base to vertical surfaces so that gaps do not occur behind base, so that front lip of base cove bears firmly and uniformly on floor surface, and so that good and permanent bond is produced between base and surface to which it is applied. Set base tightly in adhesive by using a 7 lb. (3 kg.) roller against wall and floor surfaces. Make end joints flush with gap.

4. Scribe and fit to door frames and other obstructions.

5. Cope internal corners.

6. Use full length pieces where possible. Accumulated short lengths at base not permitted.

7. Supply rubber base for all millwork bases.

8. Gaps below bottom edge of base will not be accepted.

5. SPECIAL CLEANING:

1. Clean off excess adhesive as work progresses from floor, base and wall surfaces without damage. Upon completion, remove all markings and heel scuffs.

2. Upon completion, clean floors in accordance with manufacturer's printed instructions.

6. PROTECTION OF FINISHED WORK:

1. Prohibit traffic on floor for 48 hours after installation.

2. Protect floors as per item 1.7.1 in this Section.

3. Clean floors and wax during final cleaning just prior to Owner occupying building.

7. WARRANTY

1. Provide minimum 2 year material and installation warranty.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this Section, and must be read in conjunction with the requirements of this section and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 ENVIRONMENTAL REQUIREMENTS

.1 Provide materials in this specification section based on but not limited to the following criteria:

.1 Option: Materials of this section may conform to performance standards for recycled material content (7.5% post-consumer + ½ post industrial) and distance to the job site (500 km).

.2 Requirement: Materials of this section and accessory materials such as adhesives used in their installation must conform to performance standards for low VOC content.

.3 Requirement: carpet products must meet or exceed the requirements of the Carpet and Rug Institute's Green Label Indoor Air Quality Test Program.

.2 Refer to Section 01560 Environmental Protection for additional criteria not listed above.

1.3 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide carpet floor finish, including primers, mastics and leveling fillers, adhesives, carpet material, underlay, carpet base, accessories, and protection.

1.4 REFERENCES

.1 CAN/CGSB-4.2- 92, Textile Test Methods.
.2 CAN/CGSB-4.129- 93, Carpets for Commercial Use.
.3 CAN/CGSB-25.20- 95, Surface Sealer Floors.
.4 CAN/ULC-S102- M88, Surface Burning Characteristics of Building Materials and Assemblies.

.5 CAN/ULC-S102.2- M88, Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies.
.6 Carpet and Rug Institute (CRI) - Contract Carpet Manual, No.001.
.7 Carpet and Rug Institute (CRI) - IAQ Carpet Testing Program.
.8 ASTM D 1055- 90, Specification for Flexible Cellular Materials - Latex Foam.
.9 ASTM E 84- 95, Test Method for Surface Burning Characteristics of Building Materials.

1.5 QUALITY ASSURANCE

.1 Installer shall have a minimum of five (5) years documented experience in the installation of commercial carpet, and be certified by the Manufacturer. Documentation shall be submitted to the General Contractor.

1.6 SUBMITTALS

.1 Submit control submittals in accordance with Section 01300 - Submittals.

.2 Submit certificate to demonstrate compliance with CAN/ULC S102 and CAN/ULC S102.2.

.3 Submit proof that carpet has been tested and passed the Indoor Air Quality (IAQ) Carpet Testing Program requirements of the Carpet and Rug Institute.

.4 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures.

.5 Product Data

.1 Submit product data in accordance with Section 01300 – Submittals.

.2 Submit product data sheet for each carpet tile, adhesive, carpet protection and subfloor filler.

.3 Submit WHMIS MSDS - Material Safety Data Sheets acceptable to Labour Canada and Health and Welfare Canada for carpet adhesive and seam adhesive. Indicate VOC content.

.6 Samples

.1 Submit samples in accordance with Section 01300 - Submittals.

.2 Submit duplicate full size pieces of each type carpet tile, duplicate pieces for each selected colour.

.7 Closeout Submittals

.1 Submit operation and maintenance data for incorporation into manual specified in Section 01700 Project Close-Out.

.2 Include information on recycling of carpet including manufacturer's reprocessing program. Indicate which portions of materials are recyclable.

.8 Extra Materials

.1 Provide extra materials of carpet tile and adhesives in accordance with Section 01700 - Project Close-Out.

.2 Provide minimum 2% of each colour, pattern and type of carpet tile. Provide in one continuous full width roll or from same dye lot.

.3 Extra materials to be from same production run as installed materials.

.4 Identify each package of carpet and each container of adhesive.

.5 Deliver and store where directed by Owner.

1.7 REGULATORY REQUIREMENTS

.1 Prequalification: tested to CAN/ULC-S102.2.

.2 Indoor Air Quality: compliance with CRI Indoor Air Quality Program, CRI - IAQ requirements for maximum total volatile chemicals released into air. Label each carpet product with CRI -IAQ label.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Label packaged materials. For tile products indicate nominal dimensions of tile.

.2 Store packaged materials in original containers or wrapping with manufacturer's seals and labels intact.

.3 Store carpeting and accessories in location as directed by Owner.

.4 Prevent damage to materials during handling and storage. Keep materials under cover and free from dampness.

.5 Maintain temperature of store room at a minimum of 20C, for at least 24 hours immediately before the installation.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01560 Environmental Protection.

1.10 PROJECT/SITE ENVIRONMENTAL REQUIREMENT

.1 Moisture: ensure substrate is within moisture limits prescribed by manufacturer.

.2 Temperature: Maintain ambient temperature of not less than 18°C from 72 hours before installation to at least 72 hours after completion of work.

.3 Relative humidity: Maintain relative humidity between 10 and 65% RH for 48 hours before, during and 48 hours after installation.

.4 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

1.11 VENTILATION

.1 Ventilate area of work as directed by General Contractor by use of approved portable supply and exhaust fans.

.2 Ventilate enclosed spaces in accordance with Section 01560 Environmental Protection.

.3 Provide continuous ventilation during and after carpet application. Run ventilation system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of carpet installation.

1.12 EXTENDED WARRANTIES

.1 System Warranty

.1 Provide manufacturer's certificate warranting the specified carpet products against defects in materials and manufacture including deterioration of backing, delamination, stretching, wrinkling, fading, or other conditions detrimental to appearance or performance, for a minimum period of 10 years from the date of the Certificate of Substantial Performance. Warranty shall cover complete replacement of affected area including carpet, adhesives, and removal/installation costs.

2. Installation Warranty

.1 Provide a written warranty stating that carpet installation is guaranteed against defects for two (2) years from the date of the Certificate of Substantial Performance.

PART 2 - PRODUCTS

2.1 CARPET TILE

1. Carpet (CP): 1830mm x 32m roll; 678g/m2 face weight, 100% solution dyed, patterned loop; pile height 4.7mm, CLASS 1.
   a. Acceptable Material:
      Cartography #04843 with Powerbond® Cushion backing, as manufactured by Tandus-Centiva; Colour to be selected by consultant.

2.2 ACCESSORIES

.1 Adhesive: Acrylic release type: recommended by carpet tile manufacturer; Low VOC content in accordance with CRI requirements.

.2 Carpet protection: non-staining heavy duty kraft paper, or cardboard.

.3 Concrete Floor Sealer/Moisture Barrier: Planiseal™ MRB, by Mapei or approved equal product.

.4 Subfloor Filler and Patch: Portland cement based, premix latex requiring only water to produce cementitious paste; "Planipatch®" by Mapei or approved equal product.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine substrates for defects and determine level of preparation required prior to commencement of installation.

.2 Report any major defects such as cracks greater than 1.5mm in width, and variations in elevation greater than 6mm in 3m in any direction or excessive moisture content in concrete slabs.

.3 Ensure concrete floors are dry by using test methods recommended by flooring manufacturer, and exhibit negative alkalinity, carbonization or dusting.

.4 Moisture test results shall meet or exceed the flooring manufacturer's warranty requirements but in no instance shall exceed 0.4kg/100m2/24 hours. Alkali readings shall be 5 to 9.

3.2 PREPARATION

.1 Remove ridges and bumps.

.2 Apply sub-floor filler/patch to low spots and cracks to achieve floor level to a tolerance of 1:500. Allow to cure.

.3 Where moisture tests result in values higher than those specified above, apply floor sealer/moisture barrier to concrete floor surface prior to installation. Re-test moisture levels.

.4 Prepare floor surfaces in accordance with Contract Carpet Manual, Standard for Installation of Textile Floorcovering Materials No.001.

.5 Pre-condition carpeting following manufacturer's printed instructions.

.6 Install resilient base before proceeding with carpeting.

3.3 INSTALLATION

.1 Install in accordance with manufacturer's printed instructions and in accordance with Contract Carpet Manual, Standard for Installation of Textile Floorcovering Materials No.001.

.2 Install carpeting after finishing work is completed but before demountable office partitions and telephone and electrical pedestal outlets are installed.

.3 Finish installation to present smooth wearing surface free from conspicuous seams, burring and other faults.

.4 Use material from same dye lot. Ensure colour, pattern and texture match within any one visual area.

.5 Cut and fit neatly around architectural, mechanical, electrical and telephone outlets, and furniture fitments, around perimeter of rooms into recesses, and around projections.

.6 Cut and install carpet tile in pan type floor access covers.

.7 Carpet Tile:

.1 Apply acrylic release type adhesive and install carpet tile in accordance with manufacturer's written instructions.

.2 Lay tiles with butt seams.

3.4 PROTECTION OF FINISHED WORK

.1 Vacuum carpet clean immediately after completion of installation. Protect traffic areas.

.2 Prohibit traffic on carpet until adhesive is cured.

.3 **Install carpet protection to satisfaction of Architect.**

END OF SECTION

PART 1 GENERAL

1. GENERAL REQUIREMENTS

    1. Division One, General Requirements, is a part of this Section and shall apply as if repeated here.

2. SUBMITTALS

    1. Samples

        1. Prepare samples of various finishes for Architect's approval either on site or by submitting samples as directed, at least thirty days before materials are required. Submit samples in triplicate on 8" x 12" (200 mm x 300 mm) material. Identify each sample as to job, finish, formula, colour name, number, sheen name and gloss units, date and name of Subcontractor.

3. PRODUCT HANDLING

    1. Delivery and Storage

        1. Deliver materials to site in their original containers with label intact and store in spaces directed by Architect. Keep stored materials covered at all times and take all necessary precaution against fire.

        2. Provide C02 fire extinguisher of minimum 20 lbs. (9 kg.) capacity in storage area.

4. ENVIRONMENTAL CONDITIONS

    1. Do not paint or finish in unclean or improperly ventilated areas. Do not paint in temperatures lower than 50 degrees F. (10 degrees C.) or varnish in temperatures lower than 65 degrees F. (18 degrees C.) for 24 hours before, during and 48 hours after application.

    2. Do not undertake exterior painting at temperatures under 50 degrees F. (10 degrees C.) for 24 hours before, during and 48 hours after application or immediately following rain, frost or dew. Safe levels shall be determined by use of an electronic metre.

    3. Test for moisture content in each location immediately before commencing application of paint. Do not apply paint on surfaces where moisture content exceeds 14%. Promptly notify Consultant if such conditions are encountered.

    4. Provide approved equipment for testing moisture content of surfaces to receive paint finishes and have available on Site at all times during Work of this Section.

5. Do not apply paint finish in areas where dust is being generated.

5. PROTECTION

1. Provide metal pans or adequate tarpaulin to protect floors in areas assigned for the storage and mixing of paints.

2. Use sufficient drop cloths and protective coverings for the full protection of floors, furnishings and work not being painted.

3. Leave above areas clean and free from evidence of occupancy upon completion of painting.

4. Protect paint materials from fire and freezing.

5. Keep waste rags in metal drums containing water and remove from building at end of each working shift.

6. FINISH CARPENTRY & ARCHITECTURAL MILLWORK

1. All cabinet millworks must be finished in the shop by Section 06400. All other finish carpentry materials (including miscellaneous brackets for benches) to be finished by Section 09900.

7. SCOPE OF WORK

1. With exceptions noted above or specifically called for in other Sections of the Specification, all paintwork is included in the scope of this Section.

2. NOTE: In locations where Drawings do not call for paint or similar finish on walls and/or ceilings, the intent of this Specification is that all exposed unpainted metal surfaces shall be painted.

3. Paint exposed drywall and the like in locations where finish is not otherwise specified or noted. Do not paint such surfaces in mechanical shafts, unless specifically noted.

4. In locations where Drawings do not call for paint or similar finish on walls and/or ceilings, the intent of this Specification is that items such as new work, including miscellaneous metal work, shall be painted.

5. Paint pipes, conduit, ducts and related thermal insulation and all prime painted mechanical and electrical equipment and supports located in mechanical and electrical storage and maintenance rooms in allocations where Drawings call for paint or similar finish on walls and/or ceilings.

6. Do not paint pipe, conduit, ducts, insulation and the like where concealed above ceilings (except louvred type ceilings) or in-service shafts.

7. Make good paint finish on shop coated work where damaged.

8. Paint visible portions of steel shelf angles, lintels and structural steel.

9. Paint all edges and all faces of doors where primed for paint supplied.

10. Stain all top, bottom and side edges of all plastic laminate doors.

11. Interior of ducts and diffusers visible from exterior on room side.

12. Paint all roof top equipment, stairs, pipes, conduit, vents, ducts, pipe insulation, etc. exposed on roofs (including primed and prefinished items).

13. Allow for ten (10) different paint colours to be used in the building - including field, accent walls and bulkheads and four (4) exterior paint colours.

5. QUALITY ASSURANCE AND REFERENCES

1. Paint work shall meet or exceed standards set out in C.G.S.B. Specification No.'s 85-GP-1M to 85-GP-33A and C.P.C.A. Canadian Painting Contractors Association - Painting Manual.

2. Employ fully trained workers who are regularly employed in this field.

3. Manufacturer's sales representative shall perform inspections on the Owner's behalf in order to ensure compliance with product specifications.

6. RETOUCHING

1. Do all retouching, etc. to ensure that the building may be handed over to the Owner in perfect condition, free of spatter, fingerprints, rust, watermarks, scratches, blemishes or other disfiguration.

11. TEST AREA

1. A room or area in the building will be designated by the Architect as a test area to establish standard of workmanship, texture, gloss and coverage.

2. Prior to any painting being started, request a meeting on Site between Architect, Contractor, Subcontractor and Material Manufacturer's Representative to review conditions, surfaces, anticipated problems and to clarify quality of workmanship acceptable to Architect.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.

3. Retain test area until after completion of Work. Test area to be minimum

standard for the Work.

4. Failure to comply with the above will be cause for Architect to request all Work previously painted to be repainted.

PART 2 PRODUCTS

1. MATERIALS
   1. "Top Line" products only are acceptable. Use only products of manufacturers whose best quality lines meet or exceed CGSB Specifications for the particular type of material required. Approved manufacture and product unless specifically indicated otherwise in specification:

      1. Paints, stains and varnish:
         a) General Paint
         b) Benjamin Moore
         c) Sherwin Williams
         d) Zinsser
         e) Glidden/Devoe Coatings

      2. Latex Water Based Epoxy
         - Sherwin Williams B70W00211 - Waterbased catalyzed epoxy extra white/
           Tint base A/B60V00025 - Waterbased Catalyzed epoxy Semi-Gloss Hardner Part B
         - Glidden - 4420 - True Glaze Waterborn epoxy / 4426 True Glaze semi-gloss converter

      3. Latex Supper Adherent Primer,
         - General Paint 51-050 Premium Latex Plastic Primer
         - Benjamin Moore #23-00 Freshstart Acrylic Primer Sealer
         - Zinsser 1-2-3 Acrylic Primer Sealer
         - Sherwin-Williams - B51WQ8850 - Adhesion Prm White
         - Glidden Latex super undercoat 94280

      4. Interior Latex Block Filler, C.G.S.B. Standard #-GP-188M
         - General Paint 70-224 Premium Latex Block Filler
         - Benjamin Moore #595-01 Latex Block Filler
         - Glidden #362650 Concrete Block Filler
         - Sherwin-Williams B42W00046 Heavy Duty Block Filler

      5. Stain Suppressant Sealer/Primer Hi-Hide, C.G.S.B. #1-GP-119M (where required)
         - General Paint 60-200 X-Terminator 2 Latex Sealer
         - Zinsser BIN Primer, hi-hide (spot prime only)
         - Zinsser Bullseye Odourless
         - Sherwin-Williams - B49WQ8820 Multipur LTX Pr Wh
         - Glidden/Jammer 200

6. Clear Wood Trim and Panel Finish
   - General Paint 25-011 Urethane Semi-Gloss
   - Benjamin Moore & Co. Ltd. #435 Low Lustre Alkyd Urethane.
   - Glidden #90333 Urethane Varnish.

7. Fire Retardant Clear Coat at all exposed wood panels: Quantum Safe Coat Clear Fire-Retardant Coating or equal by Ocean Products.

8. Typical Furniture Finish of all Wood Millwork, wood trim, panels, etc. (by Sections 06200 and 06400): shall be polymerizing two component catalytic varnish system equal to "Duravar Plus" manufactured by M. L. Campbell. The individual components of the system used must be chemically compatible to assure perfect adhesion and a top quality, durable final finish.

9. Thinners, cleaners: Type and brand recommended by the paint manufacturer.

10. Materials to be new and first line of manufacturer.

11. Deliver materials to site in original unbroken containers bearing brand and manufacturer's name.

PART 3 EXECUTION

1. CONDITION OF SURFACES

   1. Check all surfaces with electric moisture metre and do not proceed if reading is higher than 12-15 without written permission from Architect.

   2. Proceed with work only when surfaces and conditions are satisfactory for production of a first-class job.

   3. Clean and remove dust, grease, rust and extraneous matter from all surfaces (except that rust occurring on items specified to be primed under other sections shall be removed and worked reprimed under these sections).

   4. The commencing of work in a specific area shall be construed as acceptance of the surfaces, and thereafter the contractor shall be fully responsible for satisfactory work as required herein.
   5. All surfaces shall be prepared in accordance with Chapter 2 for Interior Work of the Master Painters and Decorators Association Painting Manual latest edition.

   6. Prepare surfaces in accordance with paint covering manufacturer's instructions.

2. PREPARATION

1. Concrete and Masonry

1. Test surfaces for alkalinity with pink litmus paper or other recognized method.

2. Where extreme alkalinity occurs, wash surface with 4% solution tetrapotassium pyrophosphate (5 oz. per gallon (31 ml./l.) of water) where latex base paint is to be used and with zinc sulphate solution (3 lbs. per gallon (300 g./l.) of water where other paint bases are to be used.)

3. Etch normal concrete surfaces to receive alkyd paint with muriatic acid solution (1 part commercial) 31.45% to 3 parts water. Neutralize and allow to dry before painting.

4. Prepare masonry concrete surfaces to CGSB 85-GP-31M.

2. Metal

1. All metal surfaces to receive coatings shall be cleaned to SSPC-SP1 (solvent washing) prior to painting as specified herein.

2. Touch-up shop primed metal after first removing loose primer, rust, oil, grease and other contaminants.

3. All metal surfaces exposed and/or exhibiting rust shall be cleaned to SSPC-SP2 or SSPC-SP3 standards and primed with an approved rust inhibitive primer prior to recoating as specified.

4. Feather edges to make touch-up inconspicuous when applying new primer.

5. Conform to CGSB 1-GP40d.M to CGSB 85-GP-14M.

3. Galvanized Surfaces

1. For Primer Application Type C Corrosive ensure that all surfaces to be painted are clean, dry, and free of all contaminants.

2. Cleaning of existing surfaces to be conducted according to SSPC-SP-4 Flame Cleaning procedure. Pass high temperature, high velocity, oxyacetylene flames over entire surface and then wire brushing. Primer is to be applied before surface is cool.

3. Phosphatize galvanized metal surfaces using CGSB 31-GP-105M pretreatment or prime with galvanized metal primer.

4. Woodwork

    1. Inspect millwork, trim and panels to assure surfaces are smooth, free from machine marks and that nailheads have been countersunk. Seal all knots and sapwood in surfaces to receive paint, with a vinyl sealer compatible with finish specified conforming to CGSB 1-GP-125b.

    2. Sand smooth all woodwork which is to be finished and clean surfaces free of dust before applying first coat. Fill nail holes, splits and scratches with non-shrinking filler conforming to CGSB 1-GP-103b after first coat is dry. When these occur on a transparent surface, filler shall be stained to match the finish as approved by Architect. Between coats, sand lightly with No. 00 sandpaper and remove dust.

    3. Prime all wood noted for paint finish immediately on delivery to site.

    4. Back paint all wood noted for stain, varnish or Intumescent fire-retardant clear coating or natural finish.

    5. Prepare all wood surfaces to CGSB-85-GP-1M.

5. Hardware

    1. Remove finishing hardware, electric cover plates and accessories, mask any that are not removable. Replace these when paint is dry and clean them. Do not clean hardware with solvent that will remove permanent lacquer finish.

6. Gypsum Wallboard

    1. For small holes, scratches or other surface marks fill with patching compound and sand smooth.

    2. For larger holes or damaged areas do not proceed until trade for original work has filled or repaired surfaces to acceptable levels.

    3. Prepare wallboard surfaces to CGSB-85-GP-33M.

7. Copper

    1. Prepare copper piping and accessories to CGSB 85-GP-20M.

8. General

    1. Mask specification plates occurring on equipment, switch boxes, and similar items requiring painting.

2. Protect, remove and replace hardware, accessories, lighting fixtures and similar items as required.

3. Conform with Architect's colour schedules and exactly match approved samples.

3. APPLICATION

1. Finishes and number of coats specified in the schedule are intended to cover surfaces perfectly. If they do not, apply further coats until perfect coverage and colour are achieved as required.

2. Any areas exhibiting incomplete or unsatisfactory coverage shall have the entire plane painted. Patching will not be acceptable.

3. Walls needing repainting, entire wall (plane) shall be painted to the satisfaction of the Architect. See drawings for extent of work.

4. Spray painting will not be permitted (except at metal deck and joist areas) unless specifically approved in writing by the Architect in each instance. Architect may withdraw approval at any time and prohibit spray painting for reasons such as carelessness, poor masking or protection measures drifting paint fog, disturbance to other Trades or failure to obtain a dense, even, opaque finish. Spray painting shall be full double coat, i.e., at least two passes for each coat. Do not use spray or roller on wood or metal surfaces, brush only unless approved in writing by Architect. Spray painting and backroll may be permitted on concrete blocks.

5. Arrange to have traffic barred from completed areas wherever possible.

6. Apply materials in strict accordance with manufacturer's directions and specifications and be familiar with these directions and specifications.

7. Prime woodwork as soon as possible after woodwork is delivered to site. Prime all surfaces, whether exposed or not, before installation. In case of woodwork, which is to be stained, apply one coat of penetrating sealer to all finish surfaces of wood having uneven absorption, such as birch. Woods of uniform density such as oak shall be left unsealed. Back prime stained and varnished woodwork with one coat of gloss varnish reduced 25%. Fill open grain woods with filler tinted to match wood when transparent finish is required and work well into grain. Before filler sets, wipe excess from surface.

8. Apply primer-sealer coats by brush or roller method. All primers and undercoats to be tinted to no more than 25% of intensity of the finish colour.

9. Permit paint to dry before applying succeeding coats, touch up suction

spots and sand between coats with No. 00 sandpaper.

10. Where two coats of the same paint are to be applied, the first coat shall be the same colour as the finish coat and be inspected by the Architect before application of final coat, to allow the Architect to make reasonable modification of colour if necessary. Furnish Architect with a schedule showing expected completion of the respective coats of paint for the various areas and surfaces. Keep this schedule current as the job progresses.

11. Exterior paints and deep/intense interior and exterior colours shall be from the nearest factory premixed colour selection and shall be alterable to match required colours.

12. Flat and semi-gloss finishes on gypsum wall board, block and other surfaces of large areas shall be applied by roller and to all other surfaces applied by brush.

13. Paint shall be uniform in sheen, colour and texture, free from brush or roller marks, sags, runs or other defects.

14. Finish edges of doors (top, bottom, sides and cutouts) with paint or stain treatment as required to match face of door. Stain top and bottom edges a different colour and seal with one coat of shellac and one coat gloss varnish or two coats paint. Refinish tops and edges of wood doors after fitting.

15. Even up stained woodwork in colour as required by nature of wood and as directed by Architect. Apply same finish on trim, fitments, cupboards and other protecting ledges as on surrounding work, disregard sight lines.

16. 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.

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. After first coat, fill nail holes, splits, and scratches, using putty coloured to match finish.

19. Clean castings with wire brush before application of first paint coat.

20. Do not etch galvanized metal. Prepare prime and paint elsewhere in this section. This includes metal door frames and the like with wiped zinc coating.

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 metal ceilings in black matt finish.

23. Conform with Architect's colour schedule and exactly match approved samples.

24. Mechanical and Electrical Materials

    1. Refer to Mechanical and Electrical Sections of the Specifications and note the instructions regarding painting and finishing of materials and equipment supplied and installed by those trades.

    2. Remove grilles, covers, access panels for mechanical and electrical systems from location and paint separately, if these items are not factory finished.
    3. Paint work to match adjacent walls and ceilings unless directed otherwise. Note: This includes trim on fixtures exposed, speaker covers, emergency lights, grilles, diffusers, louvres, vents, fire extinguisher cabinets, electrical panels, etc.

    4. Paint interior surfaces that are visible through grilles and louvres with one coat of flat black metal paint to limit of sight line.

    5. Where walls and ceilings are not scheduled to be painted, the work described above shall be painted a colour selected by Architect.

    6. Unless factory painted, all exposed piping, conduits, ductwork hangers, insulation and mechanical equipment shall be painted.

25. Rooms without finished ceilings will have decks, joists, beams, ducts, etc., painted.

26. Paint graphics as shown on drawings. All graphics to be semi-gloss minimum two coat application.

4. ADJUST AND CLEAN

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 5'-0" (1500 mm).

2. If patch painting not acceptable repaint entire wall or ceiling surface.

3. At completion clean entire area of surplus materials and equipment.

5. FIELD QUALITY CONTROL

1. Locate testing area in building to establish standard of workmanship, texture, gloss and coverage where designated.

2. Apply samples of all finishes on each type of surface to be coated with correct material, number of coats, colour, texture and degree of gloss required.

3. Retain test area until completion of work. Use approved work in test areas as standard for corresponding work throughout building. Correct and refinish work which does not compare with approved finishes.

6. FINISH SCHEDULE

1. General

1. Finish the listed exposed surfaces, wherever they occur unless such surfaces are specifically noted to be left unfinished.

2. Exposed means visible in the completed work and includes the interior of closets, cabinets and drawers.

3. The Architect shall have the option of having wood painted or with transparent finish and of which finish shall be used.

4. In instances where materials specified are not suitable for a particular job application or are contrary to manufacturer's recommendations for use on a particular surface, such condition shall immediately be brought to the attention of the Architect for clarification and instructions.

5. Finishes shall match approved samples, but Architect reserves the right to make reasonable changes to finish specifications to obtain desired results without additional cost or obligation of Owner.

6. Where surfaces have been disturbed the entire plane shall be painted.

2. Exterior Schedule

1. Metal (Ferrous): One coat rust inhibitive primer (metal surfaces already primed need not receive a field prime coat except for touch up). Two coats exterior Aura paint by Benjamin Moore.

Note: All roof top equipment, pipes, conduit, vents, ducts, grilles, pipe insulation, etc. to be painted.

2. Galvanized Steel: One coat galvanized primer. Use a Polyamide converted epoxy primer by Devoe Coatings, "4170-1000 with 4170-999 - catalyst". Two coats of galvanized Finish Coat. Use a single package tough, durable alkyd modified urethane coating with water, chemical and solvent resistance by Devoe Coatings "Devoe" Glid Shield Urethane Gloss Enamel No. 4328-0100 Series (installation within 72 hours of installing primer).

   Note: All exterior areas are to be painted including stairs, masonry lintels, etc.

3. Painted Wood Surfaces: One coat wood primer. Two coats exterior Aura paint by Benjamin Moore.

4. Stained Pressure Treated Wood or Cedar: Two coats solid hide Aborite stain and one Clear Topcoat both by Benjamin Moore.

3. Interior Schedule

1. Metal (Ferrous): One coat latex super adherent primer (metal surfaces already primed need not receive a field prime coat except for touch up). Apply two coats latex water-based epoxy 2 coats.

2. Hot Ferrous Metal - (Valve bodies, strainers, etc., on high temperature lines.) - One coat primer, latex super adherent heat resistant - Two coats latex water-based epoxy.

3. Galvanized Steel: One coat galvanized primer. Use a Polyamide converted epoxy by Devoe Coatings "4170-1000 with 4170-9999-catalyst". Two coats of galvanized Finish Coat. Use a single package tough, durable alkyd modified urethane coating with water, chemical and solvent resistance by Devoe Coatings "Devoe Glid Shield Urethane Gloss Enamel No. 4328-0100 Series (install within 72 hours of installing primer).

4. Woodwork Painted: One coat super adherent primer. Two coats latex Ultra "94800" by Glidden.

5. Natural or Stained Close Grain Wood: One coat non-bleeding alkyd stain. One coat sanding sealer.
   Approved Finish Clear Coats are as follows:

   .1 General Paint 25-011 Urethane Semi-Gloss. Apply two coats: spread rate, 350 square feet per 3.78 litre container. Each coat wet film thickness: 4.0 mils. Each coat dry thickness: 1.5 mils.

   OR

.2 Benjamin Moore & Co. Ltd. #435 Low Lustre Alkyd Urethane. Apply two coats: spread rate, 575 square feet per 3.79 litre container. Each coat wet thickness: 2.8 mils. Each coat dry thickness: 1.1 mils.

OR

.3 Glidden #90333 Urethane Varnish. Apply two coats: spread rate, 638 square feet per 3.78 litre container. Each coat wet thickness: 2.5 mils. Each coat dry thickness: 1.0 mils.

6. Natural Cedar Slat Ceilings: natural finish.

7. Natural or Stained Open Grain Wood: One coat stain filler. One coat sanding sealer.
Approved Finish Clear Coats are as follows:

.1 General Paint 25-011 Urethane Semi-Gloss. Apply two coats: spread rate, 350 square feet per 3.78 litre container. Each coat wet film thickness: 4.0 mils. Each coat dry thickness: 1.5 mils.

OR

.2 Benjamin Moore & Co. Ltd. #435 Low Lustre Alkyd Urethane. Apply two coats: spread rate, 575 square feet per 3.79 litre container. Each coat wet thickness: 2.8 mils. Each coat dry thickness: 1.1 mils.

OR

.3 Glidden #90333 Urethane Varnish. Apply two coats: spread rate, 638 square feet per 3.78 litre container. Each coat wet thickness: 2.5 mils. Each coat dry thickness: 1.0 mils.

10.1 Concrete Block: One coat latex block filler, applied at the minimum rate of 80 sq. ft per gallon (1.63 m2 per litre), or as required by block texture to completely fill block. **Pinholes will not be accepted.** Apply more block filler if necessary to completely fill the block before applying finish coats. Note that lightweight block requires more block filler to fill than standard weight block does and adjust application rate as required. Two coats interior Latex Semi-Gloss "Ultra 94800" by Glidden.

11, Exposed Insulated Pipes and Ductwork: One coat size. One coat super adherent primer undercoat. Two coats Ultra "94800" by Glidden eggshell.

12. Gypsum Wallboard: One coat of Latex super adherent primer. Two coats semi-gloss Ultra "94800" by Glidden. Velvet or eggshell at walls and Low gloss at ceilings.

13. Surfaces Behind Grilles and Duct Work Where Visible Within 12' (300 mm) of Grille:

    1. Two coats vinyl latex matt black.

14. Painted Light Trims, Emergency Lights, Louvres, Diffusers, Vents, Concealed Sprinkler Covers, Fire Extinguisher Cabinets, and Electrical Panels, Etc.

    1. One coat super adherent primer. Two coats Ultra "94800" by Glidden to match surrounding wall and ceiling colours or as specified by Architect.

15. Exposed Sealed Concrete Floors to be Painted

    1. One coat Sikafloor 2001 Primer

    2. One coat Sikafloor polyurethane UV in colour as selected by Architect from complete colour range.

    3. Install floor primer and finish coat as per manufacturer's printed installation instructions.

17. General Notes

    1. See drawings for locations of areas where more than one colour occurs on one wall and one ceiling plane.

    2. Each ceiling bulkhead section or level may be a different colour.

    3. At stairwells and metal railings, allow for flat bars, pickets and stringers at stairs to be each painted a different colour. Maximum three colours to be chosen by Architect. Clarification detail will be issued with colour schedule after tender.

    4. Door frames may be one colour and door another colour.

7. WOOD FURNITURE FINISHES (By Section 06400)

    1. Natural or Stained Transparent Wood Furniture Finish: One coat non-bleeding alkyd stain. One coat sanding sealer. Two coats polymerizing two component catalytic conversion varnish system. "Duravar Plus" manufactured by M.L. Campbell and distributed by W. E. Saunders & Sons Painters Ltd. (519-582-2621). Flat, stain or gloss finish as directed by Architect.

    2. Interior of Wood Drawers: Three coats tinted sealer to inside sides, back and bottom.

    3. Unexposed Millwork Surfaces: Two coats of tinted sealer including backs of all base and wall cabinets, enclosures, etc.

8. MAINTENANCE MATERIAL

    1. Provided one sealed can of four 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. Provide Owner 3 copies of paint formula for each colour and type of paint for Owner's maintenance manual.

END OF SECTION

CRETVIEWPART 1 GENERAL

1.1 GENERAL REQUIREMENTS

1. Division One, General Requirements, is part of this Section and shall apply as if repeated here.

1.2 SHOP DRAWINGS

1. Submit shop drawings in electronic PDF format.

2. Submit catalogue illustrations as required by Architect.

3. Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details anchors for grab bars.

1.3 SUBMITTALS

1. Submit samples of all accessories for approval by the Architect.

2. Approved manufacturers are American Specialties, Inc. (ASI).

1.4 DELIVERY, STORAGE AND HANDLING

1. Package accessories and label with description of contents and installation location. Each accessory to be individually wrapped complete with all fixings as required.

2. Deliver accessories where designated at Site by Contractor.

1.5 MAINTENANCE AND OPERATING INSTRUCTIONS

1. Provide for inclusion in data book, three (3) printed copies of maintenance and operating instructions of all accessories.

PART 2 PRODUCTS

2.1 MATERIALS

1. Sheet Steel: Commercial grade, stretcher levelled sheet steel to ASTM A526-71 (1975) with G90 zinc coating to ASTM A525-79.

2. Stainless Steel Sheet: To ASTM A666-72 (1979) type 302 with No. 4 finish, minimum 0.9 mm (0.036"/20 gauge).

3. Stainless Steel Tubing: AISI Type 304, commercial grade, seamless welded, 1.2mm (0.047") wall thickness.

4. Fasteners: Screws and bolts hot dip galvanized. Expansion shields fibre lead or rubber as recommended by fixture manufacturer for component and its intended use.

5. Fasteners: Screws and bolts stainless steel. Expansion shields lead or rubber as recommended by fixture manufacturer for component and its intended use.

2.2 FINISHES

1. Chrome and Nickel Plating: to ASTM B456-79 satin finish.

2. Stainless Steel: to AISI No. 4 satin lustre finish.

3. Baked enamel: condition metal by applying one coat of metal conditioner to CGSB 31-GP-107a, apply one coat Type 2 primer to CGSB 1GP-81M and bake apply two coats Type 2 enamel to CGSB 1-GP-88e and bake to hard, durable finish. Sand between final coats. Colour selected from standard range by Architect.

2.3 KEYING

1. All accessories to be keyed alike. Provide six keys.

2.4 TRADEMARKS AND LABELS

1. Trademarks and labels shall not be visible in the finish exposed surfaces.

2.5 MANUFACTURER

1. Provide accessory items manufactured by companies as noted or approved equal; Bobrick, Frost and ASI are approved manufacturers.

2.6 ACCESSORIES

1. Toilet paper, paper towel dispensers and soap dispensers will be supplied by the board but installed by the contractor. All other items to be supplied by contractor and installed by them.

2. **CCH** - Collapsible Coat Hooks: Bobrick Model No. B-983 surface mounted collapsible coat hook, satin finished stainless steel. Provide one in each universal washroom, barrier free washroom and unisex / single washroom unless otherwise indicated on drawings.

3. Grab Bars: Refer to Architectural drawings for locations.

4. At Barrier Free Accessible Water Closets:

    1. 1 1/2" (38 mm) dia. peened satin finished stainless steel, 24" (610 mm) long straight bar, standard flange position at back of water closet.

    2. L-shaped bar 1 1/2" (38 mm) dia. peened satin finished stainless steel, 30" (760 mm) long horizontal and vertical 30" (760 mm) at side of water closet.

    3. Install item 1 and 2 grab bars noted above at each universal / barrier free water closets.

5. Mirrors: Provide at least one for every lavatory. Provide one fixed mirror mounted at 1000mm AFF in every washroom with a handicapped accessible water closet. All mirrors to be tempered glass. Install one per each washroom lavatory location unless otherwise indicated on drawings.

    a. Fixed Mirror (M): Bobrick Model No. B-165-1836, stainless Steel Channel Frame Mirror, 18" (456mm) wide x 36" (914mm) high.

    b. Fixed Mirror (M2): Bobrick Model No. B-165-1848, stainless Steel Channel Frame Mirror, 18" (456mm) wide x 48" (914mm) high.

6. SHF - Shelf: Equal to Franke shelf STRX624. Wall mounted stainless steel shelf 4-¼" x 24" (110mm x 600mm). Provide one in each Barrier Free Washroom stall unless otherwise indicated on drawings.

7. GD - Surface Mounted Waste Receptacle: To be provided and installed by this contractor. Install where indicated on drawings; minimum one in each washroom.

8. Deodorizer: Model 1100 by Frost. One will be provided in each universal washroom, barrier free washroom, unisex washrooms and for female and male gang washrooms unless otherwise indicated on drawings.

2.7 FABRICATION

1. Weld, ground flush and smooth joints of fabricated components. Use mechanical fasteners only when approved.

2. Form exposed surfaces from one sheet of stock, free of joints.

3. Brake form sheet metal with 2 mm radius bends.

4. Form flat surfaces without distortion. Maintain flat surfaces without scratches or dents.

5. Paint back of components where contact is made with building finishes to prevent electrolysis.

6. Hot dip ferrous metal anchors and fastening devices to conform with CGSB G164.

7. Shop assemble, and package components complete with anchors and fittings.

8. Deliver inserts and rough-in frames to site at appropriate time for building in. Provide templates or rough-in measurements as required.

9. Provide steel anchor plates and components for installation on studding and building framing.

10. All exposed stainless steel edges to be hemmed.

11. All stainless steel units to be double panned.

PART 3 EXECUTION

3.1 INSTALLATION

1. Installation of all miscellaneous specialties by this Section. Install all items to secure backing.

2. Securely fasten accessories level and plumb in the locations shown on the drawings and as specified herein. Mounting heights as shown on drawings, or as directed by Architect.

3. Co-ordinate installation with the work of trades providing adjacent construction as required to achieve the reveals or other edge conditions shown where front faces of units are flush with the finished wall surfaces.

4. Perform drilling of steel, masonry and concrete necessary to install the accessories.

5. Insulate accessory surfaces to prevent electrolysis due to contact with masonry, concrete or dissimilar metal surfaces. Use bituminous paint, building paper or other approved means.

6. Clean all accessories in conformance with Division 1.

3.2 LOCATION AND QUANTITY

1. Provide washroom accessories as noted as indicated on drawings and/or called for within this section. Installations shall meet the minimum requirements of the OBC, as currently amended.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

1. Division One - General Requirements is a part of this section and shall apply as if repeated here.

1.2 DESCRIPTION

1. Work included: Provide as a separate price option (refer to supplementary tender form) manually operated rolling shade systems in all classrooms, offices. Library and wherever else indicated on drawings.

   Provide included in the base bid amount, motorized rolling shade systems in the Gymnasium. Provide in the base bid amount Privacy screens for doors and sidelights into all classrooms. Provide all components as needed for a complete and proper installation.

1.3 RELATED WORK

1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

2. Masonry - Section 04200

3. Wood Blocking - Section 06100

4. Finish Carpentry - Section 06200

5. Aluminum Entrance Framing, Windows & Doors – Section 08800

6. Aluminum Window Curtain Wall System - Section 08900

7. Electrical – Refer to Electrical Sections

1.4 QUALITY ASSURANCE

1. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.5 SUBMITTALS

1. Product Data: Within 60 calendar days after the General Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.

2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

3. Shop Drawings in sufficient detail to show fabrication, installation, anchorage and interface of the work of this Section with the work of adjacent trades.

4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.

2. Construct one complete light proof window shade with attachments and accessories for approval by the Architect.

1.6 WARRANTY

1. Three-year written warranty against mechanical and fabric failure (including fabric fading) under normal conditions.

1.7 ACCEPTANCE

1. All manual and motorized shades remain the property of the supplier until accepted in place by the Architect.

1.8 SCOPE

1. Supply and installation of Manual Rolling Shades with 3% opening weave in all Classrooms, Library and Offices. Supply and install motorized black out rolling shades in the Gymnasium.

2. Provide privacy screens at glazing in all doors and sidelights into all classrooms. Product equal to Velo PS and Velo PSL by Activar Inc. 1-800-554-6077.

PART2 PRODUCTS

2.1 MOTORIZED SHADE SYSTEM

1. ElectroShade motorized shading system. Specifications are based on products manufactured by:

1. Sun Project Canada Inc. – www.altex.com
500 Applewood Crescent
Vaughan, ON, Canada L4K 4B4
1.888.836.6980 | 905.660.3117

2. Provide Moduline Electra Tandem 105 120VAC where required for layout of multiple blinds.

3. Approved equal product/manufacturer is Solarfective Products Ltd.

4. Motorized Sunshades locations: Gymnasium.

2.2 ELECTROSHADE MOTOR SYSTEM

1. Switches: Internal limit switches are adjusted by two external thumbscrews to allow exact setting of travel in both the raised and lowered positions. Micro switches provide circuit braking at the end of the run. The limit-switch setting cannot be disturbed by the action of the roller tube.

2. Brake: A solenoid activated disc brake mechanism stops and holds in any position. The brake automatically disengages when the motor is operating.

3. Motor: An asynchronous motor with built-in reversible capacitor start-and-run is made to be operated with 95 to 125 V. A.C. at 60 hz., single phase, temperature Class-A (maximum temperature rating of 140 degrees C.), thermally protected, totally enclosed, maintenance free with locking disconnect plug assembly furnished with each operator. Provide Electra tandem 105 120VAC where required for multiple blinds.

4. Gear Box: Three levels of satellite gears are provided for load distribution (planetary gears) and machined to close tolerance of tempered steel.

5. Installation: A single pin locks the drive end of the motor to the tube. A notched section in the tube turns the ring which counts the turns and activates the limit switch. To interchange motors, the pin is pressed out of the tube and the motor slides out.

6. Sizes: The motors are available in torques of 35-435 in lbs. (lifting capacity), 12-30 r.p.m. speed, to meet specified requirements and shall not exceed 60 mm in diameter.

7. Warranty: The manufacturer provides warranty that the motor is free of manufacturing defects for three (3) years from the date of installation. This warranty is void if the products have been improperly installed or subjected to improper care.

2.3 HARDWARE AND ACCESSORIES REQUIRED FOR A TOTAL INTEGRATED SYSTEM

1. Shade Roller: Extruded aluminum tube, 6063-ST6 alloy, 2.55 in. OD with internal keyway to receive tubular motor. The tube is extruded with two fabric-mounting channels designed so that the shade cloth does not disengage from the tube itself.

2. Mounting Spline: Extruded vinyl with asymmetrical locking channels and embossed fabric guide for use with 2.55 in. OD tube. Spline has sufficient capacity to hold shade and additional weight without disengaging from the tube.

3. End Brackets: Consist of 1/8" in. thick sheet steel. Wall, jamb or ceiling mounted as required and permanently installed.

4. Centre Support Brackets: supplied to meet span or weight requirements. Ceiling or wall mounted.

e. Weights: Mill-finished aluminum, flat bars, single lengths for each shade panel.

5. Fascia: Extruded aluminum 6063T5 with clear anodized finish. Used for surface mounted applications at east wall cafetorium 128. Snap on with concealed fastenings that hide the bracket assembly and appears to be a continuous unit when mounted side to side.

6. Recessed Housing: is specifically designed for acoustical or plaster ceilings with removable closure plate for access to the recessed and concealed roller system.

7. Finishes: All exposed aluminum parts have a clear anodized finish. Steel parts are either cadmium plated, satin finished or have been bonderized prior to painting with a baked enamel finish.

8. Exterior hembars shall be rectangular 6 mm x 37 mm, with internal grooves to accommodate a fabric guide carrier at each end.

9. Side channel shall be a heavy-duty two-piece Snap-On 75 x 22 side channel for inside or frontal mount.

10. Fabric shall be hot laser cut and reinforced at the edges with a high frequency thermoweld seal. Fabric is reinforced with heat sealed spring tempered stainless steel batten stiffeners positioned approximately every 900 mm insuring that fabric cannot escape or be pulled out of the side channel.

2.4 BLACKOUT SHADE FABRIC

1. To be located at Gymnasium only. Lightproof shades to be 100% opaque blackout flame retardant. Architect to choose colour when shop drawings are submitted. Seams shall be equally spaced vertically to form equal widths. Note two levels are required to mount above and below the horizontal beam located as a brace to the curtain wall system in the Gymnasium.

2.5 SUNSHADE FABRIC

1. Provide manual rolling shades in all other areas fabric to be 3% open weave flame retardant. Architect to choose colour when shop drawings are submitted. Seams, if required, shall be equally spaced vertically to form material in equal widths.

2.6 AUTOMATIC OPERATOR

1. 3 position remote control switch with "up", "down", and "stop" control. Mount operator in shade frame with control switch located where indicated. Include all components for proper unit operation. Control each shade in one room from individual control stations for each shade.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

1. Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

1. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interfaced with the work of this Section.

2. Install the work of this section in strict accordance with the original design, the approved Shop Drawings, pertinent requirements of government agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position for long life under hard use.

3. Install the work plumb, level, and in proper operating condition.

4. Upon completion of the installation, put each operating component through at least five complete cycles, adjusting as required to achieve optimum operation and complete blackout at all edges (at blackout locations).

5. Touchup scratches and blemishes to be completely invisible to the unaided eye from a distance of five feet (1500 mm) or replace item.

END OF SECTION

1. GENERAL:

1. GENERAL REQUIREMENTS:

1. Conform to Division 1, General Requirements, and all related sections.

2. INSTRUCTIONS:

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

2. QUALIFICATIONS:

1. STANDARDS:

1.1.1. 1. To establish a standard for tendering purposes, the Drawings and Specifications are based on DELTA Elevator Co Ltd - Electric Gearless Traction Elevator(s) rated at: **1134 kg**

Approved alternates:

1. Vertechs, is an acceptable manufacturer by matching the specified model.

2. QUALITY ASSURANCE:

1. Employ fully trained mechanics who are regularly employed in this field and elevator contractors who have been satisfactorily supplying and installing similar elevator installations over a period of at least the immediate past five years.

3. SHOP DRAWINGS:

1. Submit five (5) copies of all shop drawings for the Architect to review.
2. Do not commence work until reviewed drawings have been returned.
3. Include on shop drawings:
.1 Size and location of machine, controller and piping.
.2 Size and location of car, hoisting beam, guide rails, buffers and other components
in hoistway.
.3 Rail bracket spacing and maximum loads on guide rails.
.4 Reactions at points of support.
.5 Weights of principal components.
.6 Top and bottom clearance and overtravel of car.

.7 Location of circuit breaker, switchboard panel or disconnect switch, light switch and feeder extension points in machine room.
.8 Location in hoistway machine room for connection of travelling cables for car lightand telephone.
.9 Location and size of access doors.
.10 Loads on hoisting beams.
.11 Expected heat generation of equipment in machine room.
.12 Outside diameter and wall thickness of cylinder, plunger and piping, and working pressure.
.13 Length of plunger and cylinder.
.14 Seismic design data.
.15 Each shop drawing submitted shall bear stamp of qualified professional engineer registered in Province of Ontario.
.16 Include on general arrangement drawings:
.1 Type, size, location of hoistway entrances showing details of fastening to hoistway structure.
.17 Provide detailed calculations for seismic design.

4. WARRANTY:

1. The Elevator Contractor shall warranty the work and materials and will make good any defects, not due to ordinary wear and tear, or to improper use or care, which may develop within one year from the date of completion provided same has been properly used, oiled and cared for, and provided all payments due by the terms of this contract shall have been made in full when due.

2. Workmanship and any materials supplied and used in this work to be in strict accordance with this specification.

5. MEASUREMENTS:

1. General Contractor to confirm all hoist way measurements and plumbness as per Elevator shop drawings.

6. MAINTENANCE:

1. A quality maintenance service consisting of regular examinations at least once a month, adjustments and lubrication of the elevator equipment shall be provided by the Elevator Contractor for a period of **twenty (24)** months after the elevator has been turned over for the owner's use and this service shall not be subcontracted. All work shall be performed by competent employees during regular working hours of regular working days and shall include emergency 24 hour call back service. This service shall not cover adjustments or repairs due to negligence, misuse, abuse or accidents caused by persons other than the Elevator Contractor. Only genuine parts and supplies as used in the manufacture and installation of

the original equipment shall be provided. This service shall be supplied by the elevator contractor and shall not be subcontracted.

7. SCOPE OF WORK

1. ELEVATOR CONTRACTOR SHALL DO ALL WORK RELATED TO THE ELEVATOR FROM THE MAIN POWER DISCONNECT TO THE FINISHED INSTALLATION OF ELEVATOR AND ACCESSORIES EXCEPT FOR ITEMS LISTED IN S.2.9. WORK BY OTHERS.

8. WORK NOT INCLUDED UNDER THIS CONTRACT BUT SUPPLIED AND/OR INSTALLED BY OTHER SECTIONS:

1. A properly framed and enclosed legal hoistway, including adequate guards and protection of hoistway during the erection period.

2. Hoistway, and control room / control space / machine room (as required) and all applicable fire ratings in accordance with elevator, safety, electrical and building Codes. The hoistway must be plumb within 25 mm and not less than the dimensions shown on this layout. All ledges over 100 mm to be bevelled 75° to the horizontal (top and bottom).

3. No conduit, wiring, or piping other than that pertaining to the elevator(s) is permitted in the hoistway, or control room / control space / machine room.

4. Sleeves for oil and electric ducts from machine room to hoistway as required. All other blockouts, underpinning, pockets, patching, cutouts, grouting and concrete work where required. For Remote Machine Room, provide fire rated service space around elevator electrical conduit as required by the applicable building code

5. Access to the control room / control space / machine room space as required by the governing Code or Authority Having Jurisdiction.

6. Suitable control room / control space / machine room space with legal access and ventilation, with concrete floor. Temperature of control room / control space / machine room space to be thermostatically controlled and maintained between 10° C and 32° C. Maximum allowed humidity is 95% non-condensing.

7. Machinery space in hoistway lighting level to be minimum 200 LX. Space to contain a 120 VAC light fixture, switch, and GFCI convenience outlet. Switch placed as shown on drawings.

8. A lockable fused disconnect switch with auxiliary contact for each elevator in the control room / control space / machine room per the

Canadian Electric Code with feeder or branch wiring to controller(s) or starter. Permanent single phase and permanent or temporary three-phase power must be available for elevator equipment installation. Temporary power must meet the specified power requirements.

9. A fused 120 VAC, 15 Amp, single phase, disconnect to each controller for cab lighting. Additional, fused 120 VAC, 15 Amp, single phase disconnect for dispatch controller (required for triplex and greater installations) any in-car GFCI duplex receptacles (one disconnect per elevator), oil cooler and / or oil heater.

10. Hoistway ventilation and temperature control required to maintain temperature between 10° C to 32° C. Maximum allowed humidity is 95% non-condensing. Ventilation to be according to local Codes.

11. Adequate supports for, buffers, hydraulics, rail brackets, including spreader beams between multiple hoistway if required. Maximum bracket spacing as required by Elevator Contractor. Design for the reaction forces shown on elevator drawings.

12. Front entrance partition walls are not to be constructed until after door frames are in place. If front walls are poured concrete bearing walls, rough openings are to be provided to accept entrance frame and filled in after frames are set. Entrance frames are not designed to support overhead wall loads. Suitable supports for these loads must be provided. If decorative material is applied to listed/certified frames it shall conform to the requirements of the certifying organization.

13. Recesses, as required, to accommodate hall signal fixtures.

14. Entrance wall pocket at rear serving floor(s) as shown. Furring where required.

15. Dry pit reinforced to sustain normal vertical forces from rails and impact loads from buffers and hydraulic jack systems. Pit waterproofing, where required.

16. Pit drain always required for elevators with Firefighters' Emergency Operation. Sump pump external to the shaft, where required. Sump hole to be outside hoistway and 600 mm deeper than pit, with trap and backwater check valve. Pit drain/sump pump minimum capacity to be 11.4 m^3/hr (3000 usg/hr) per elevator. Design to handle possible oil in sump discharge for hydraulic elevators.

17. Where access to a pit over 900 mm in depth is by means of the lowest hoistway entrance, elevator pit ladder(s) extending a minimum of 1220 mm above the sill of the lowest access door, with centreline of rung 115 mm from wall with 300 mm vertically between rungs. Ladder width is 400

mm. Ladder location as shown on elevator shop drawings. Ladder and attachments shall sustain a minimum load of 135 kg.

18. Any cutting, patching, and painting of walls, floors, or partitions together with finish painting of entrance doors and frames.

19. Necessary electric power for light, tools, hoists, etc., during erection as well as electric current for starting, testing and adjusting the elevator.

20. A hoist beam must be installed in the hoistway overhead as per drawing requirements for elevator construction and maintenance.

21. Pit lighting level to be minimum 100 LX. Pit to contain a 120 VAC light fixture, switch and GFCI convenience outlet. Switch to be accessible from pit access. All conduits in hoistway to be EMT. Light and convenience outlet to be on a dedicated circuit

22. A self-closing, self-latching, fire rated machine room, control room or control space door, a minimum of 750 mm wide x 2030 mm high with a minimum of 2286 mm clear height below all equipment.

23. Elevator feeders, dedicated ground wire and lockable, fused disconnects wired to the elevator controller.

24. Control room / control space / machine room lighting level to be 200 LX minimum. Must contain a 120 VAC light fixture, switch and GFCI convenience outlet. Switch to be on the lock jamb side of door. All conduits to be EMT.

25. Elevator signalling device in each car wired to terminals in the elevator controller (by Elevator Contractor). Others to provide communication wiring from the elevator controller to the following: 1) For buildings with a rise of less than 18 m – single or multiple elevators – Each to have a separate connection to a location staffed by authorized personnel (may be on or off site). Multiple elevators may be connected to an on-site consolidator (by others). 2) For buildings with a rise of 18 m or more – single and multiple elevators – To a connection at a location within the building that is readily accessible to authorized personnel. A communication control station (supplied by Elevator Contractor) to be provided. General Contractor to supply suitable installation location, others to supply and install wiring from the communication station to elevator controller(s). Depending upon communication station model, a 120VAC, 15 Amp power supply may be required (by others).

26. Provide telephone connection except for the wire from the controller in the machine room, control room or control space to elevator.

27. For elevators with hall or car security features, general contractor to

provide (1) "NORMALLY OPEN" dry contact per secure hall or car call in the machine room rated for 120 VAC @ 1 Amp.

28. Fire alarm initiating devices (FAIDs) to be smoke or heat detectors not pull stations. All FAIDs to be wired to a building fire panel (by others). Building fire panel to have (4) "normally open" dry contacts rated for 24 VDC @ 1 Amp. Contact #1 - for main recall level lobby. Contact #2 - for other building floor levels combined. Contact #3 - this is a common contact for a) machine room / control room / control space not located at the recall level and / or b) all hoistway FAIDs above the recall level. Contact #4 - this is a common contact for a) machine room / control room / control space at the recall level and / or b) all hoistway FAIDs at or below recall level. Appropriate contact to close when alarm is initiated. If required, additional fire recall switch (supplied by Elevator Contractor) to be installed by others in building fire panel. All wiring and conduit from building fire panel to elevator controller(s) for FAIDs and additional recall switch by others.

29. Where an emergency or standby power system is provided to operate an elevator in the event of normal power supply failure, then (2) "NORMALLY OPEN" dry contacts rated for 120 VAC @ 1 Amp are to be provided from the emergency power transfer switch and wired (by others) to the elevator controller. One contact (E-POWER) to close when emergency or standby power is in effect. Other contact (pending) to close 10 seconds prior to E-POWER testing to allow elevator to stop at nearest landing. In addition, the following is also required during testing (from normal to e-power and vice versa) and prior to switching from e-power to normal power under regular operation: After the (pending) contact time period has elapsed, e-power system to remove all power from the elevator controller for 15 seconds prior to restart.

30. Finished flooring in elevator cab.

31. Continuous chemical applied pit waterproofing, install Volclay Water stop-RX on all footings to foundations and other concrete forming joints.

32. General Contractor to pay for the elevator licence at time of inspection.

33. Backfill around pit.

34. Provide sand.

9. CODES:

1. Installation, elevator, components, accessories and operation must comply with CSA B44-19 Elevator Code currently in effect and all governing Codes and By-Laws.

2. All welding of elevator components shall be done by a CWB certified company according to CSA Standards W47 and W59.

10. PERMIT AND INSPECTIONS:

1. The elevator contractor shall furnish all licenses and permits and shall arrange for and make all inspections and tests required thereby.

2. The General Contractor must complete the TSSA pre-inspection checklist prior to an initial inspection being scheduled.

3. Submit T.S.S.A. Inspection Report at Owner takeover time indicating all work is complete and accepted or listing work still outstanding. All items outstanding to be completed within 30 days and submit an updated T.S.S.A. report at that time.

11. KNOW SITE CONDITIONS:

1. The Elevator Contractor to be familiar with job conditions on the site.

12. MAINTENANCE CONTROL PROGRAM

1. The Elevator Contractor must provide and leave on site a Maintenance Control Program in compliance with the requirements of the CSA B44 -19 Elevator Code. The procedures and logbook of records must be available to the TSSA upon request.

13. SCOPE OF WORK:

1. The Elevator Contractor shall do all work for elevator from main power disconnect controller to finish installation of elevator and accessories except finish flooring.

2. Electrical Contractor to provide main power disconnect and install wire connection into controller.

3. Elevator Contractor shall obtain and pay for all inspections by T.S.S.A. and other local authorities.

3. PRODUCTS:

1. ELEVATOR:

1. MRL Gearless Traction

1. Wide Orientation, side doors. On boths sides.

2. Rated Load: 1134 Kg

1. Dual Jack (1134 kg, maximum of 13700 mm travel) Confirm with supplier

3. Rated Speed:

   1. minimum 1.00 m/s

4. Car Inside Dimensions:

   1. 1134 kg – 2032 mm wide x 1300 mm deep

5. Hoistway Size:

   1. 2845 mm W x 2030mm D. To be confirmed with supplier.

   2. Coordinate with Architectural drawings.

6. Operation: Selective Collective (Simplex)

7. Car Controls: Illuminated type with faceplate, stainless steel #4 finish.

8. Hall Call Stations: Illuminated type, stainless steel #4 cover plates.

9. Hoistway Entrances Size: 1067 mm wide by 2134 mm high. Coordinate with shop drawings.

10. Type: Single Slide (Wide Car), Two Speed (Deep Car)

11. Door Operator: Automatic ECI operator for hoistway and car. Opening and closing speed to suit Accesibility requirements.

12. Travel: Coordinate with Architectural Drawings

13. Stops: Coordinate with Architectural Drawings

14. Openings: Coordinate with Architectural Drawings

15. Power Supply: 208 Volts, 3 phase, 60 Hertz

16. Lighting Supply: 120 Volts, 60 Hertz, 15 amp.

17. Elevator must comply with CSA-B44-19 (Latest Version Including Supplements) Code for Passenger and Freight Elevators. Elevators must meet the appendix E Accessibility requirements.

2. CAR CAB SPECIFICATIONS:

1. Shell Enclosure:

    1. Car Top: Min 16ga. (1.5 mm) steel, white enamel finish

    2. Shell Walls: 16 ga. (l.52mm) furniture steel - cage frame type construction

    3. Strike Column: 16 ga. (l.52mm) Stainless steel #4.

    4. Fascia: 16 ga. (l.52mm) Stainless steel #4, full width, straight type.

    5. Car Doors: 16 ga. (l.52mm) Stainless steel #4 clad car door.

2. Architectural Features:

    1. Side Walls: baked enamel E9999. Panels Plastic Laminate M999.

    2. Front Return: Stainless steel #4

    3. Car Door: Stainless steel #4

    4. Base: None

    5. Reveals: None

    6. Flooring: Other

    7. Hoistway Doors and Frames: Stainless Steel #4

3. Supplementary Features:

    1. Lighting: Stainless Steel #4 panels with LED down lights, 6 panel drop ceiling

    2. Ventilation: Two speed fan

    3. Emergency Exit: Top exit in car in accordance with CSA B44 -19 Elevator code.

    4. Car Sills: Extruded Aluminum

    5. Overall Height: 2438mm (8' 0") (2286mm clear inside)

    6. Car Operating Station Buttons: Top row of buttons located in compliance with CSA B44 Elevator Code Appendix E for accessibility, maximum 1420mm (4' 8") from floor for accessibility by

the handicapped.

7. Handrail: Located on all non-entrance walls: 38mm Round exterior diameter, Stainless Steel #4.

8. Pad Hooks: Required / included

9. Protective Pads: One set

4. Other Control Features:

1. Other Buttons: Emergency stop switch, door open button, door close button, phone button to activate conversation.

5. Service Cabinet. Provide the following:

1. Fan toggle or key switch
2. Light Key switch
3. Emergency light key switch
4. Run stop key switch
5. Access key switch
6. 110 vac receptacles

6. Emergency Car Lighting: An emergency power unit employing a 6 volt sealed rechargeable battery and totally static circuits shall be provided that shall illuminate the elevator car and provide current to the alarm bell in the event of normal power failure. The equipment shall comply with the requirements of the current CSA B44 -19Code.

7. Labels: Entrances shall be manufactured in accordance with procedures established by Under-Writers laboratories and shall be so labelled.

8. Sight Guards: Sight guards shall be furnished on the leading edge of the doors to conceal the hoist way beyond the doors. Finish to match door panels.

9. Car Floor Indicator: One (1) to be installed in car as part of the car station

10. Hall Floor Indicator: One (1) to be installed at each landing

11. Certificate Frame: Stainless Steel #4, mounted on elevator cab wall

12. Car Lantern and Gong: A directional lantern visible from the corridor shall be provided in the car entrance on the same side as the car operating station.

13. Low Pressure Switch

14. Firefighters emergency Operation: Provide all requirements for FEO Phase 1 and Phase 2 in each elevator.

15. Emergency Power Sequencing: Automatic Standby Building Emergency Power Operation to conform to CSA B44 Elevator Code to allow automatic and manual selection of individual cars to run on emergency power.

3. CYLINDER AND PLUNGER (JACK UNIT):

1. The jack shall be designed and constructed by Kone Elevators in accordance with the applicable requirements of the CSA B44 Code. It shall be of sufficient size to lift the gross load the height specified, and shall be factory tested to insure adequate strength and freedom from leakage.

2. The jack unit shall consist of the following parts: A plunger of heavy seamless steel tubing accurately turned and polished; a stop ring electrically welded to the plunger to prevent the plunger from leaving the cylinder; a packing seal of suitable design and quality; a drip ring around the cylinder top; a cylinder constructed of steel pipe complete with a pipe connection and air bleeder.

4. ROPED HOLE-LESS PLUNGER (JACK UNIT)

1. Safety: An instantaneous safety shall be provided which will be actuated by a friction governor and governor tension sheave. The instantaneous safety shall be automatic, and reset by running the car in the up direction.

2. Governor: The governor shall be located in the hoistway overhead. The governor shall include an electrically activated means of manually tripping the governor from the machine room for annual no-load and five-year full-load safety tests. The design shall not require a governor access door.

3. Plunger(s), Cylinders(s), and Sheave(s): A sheave shall be located at the top of each plunger and shall be guided through its travel by a set of plunger rails. Each plunger and cylinder shall be installed plumb and shall operate freely with minimum friction.

4. Ropes: Ropes shall be fastened to the cylinder jack stands, travel over the plunger sheave(s) and attach to the bottom of the elevator car frame.

5. PUMPING UNIT :

1. The pumping unit shall be a ThyssenKrupp Elevator unit of integral design and shall include an electric motor connected to a pump, a hydraulic control system, a storage tank, necessary piping connections, and a controller, all compactly designed as a single

self-contained unit. The motor and pump assembly shall be mounted on a rubber isolated inner base.

6. PUMP:

1. The pump shall be a positive displacement screw type to give smooth operation and shall be especially designed and manufactured for elevator service.

7. MOTOR:

1. The motor shall be of the alternating current, polyphase squirrel cage induction type and shall be of a design especially adapted to electro-hydraulic requirements.

8. HYDRAULIC CONTROL SYSTEM:

1. The hydraulic control system shall be of compact design suitable for operation under the required pressures. The control valve shall be a manifold with up, down, and check valve sections. A control section including solenoid valves will direct the main valve and control up and down starting, transition from full speed to levelling speed, up and down stops, pressure relief and manual lowering. Down speed and up and down levelling will be controlled at the main valve sections. All of these functions shall be fully adjustable for maximum smoothness and to meet contract conditions. All control systems shall be pre-adjusted at the factory.

2. The manual lowering feature shall permit lowering the elevator at slow speed in the event of power failure or for adjusting purposes.

9. LEVELLING DEVICE:

1. The elevator shall be provided with an automatic levelling device which will bring the car to a stop within 6mm (1/4") of the landing level regardless of load or direction of travel. Landing level will be maintained within the levelling zone irrespective of the hoistway doors being open or closed.

10. STORAGE TANK:

1. The storage tank shall be constructed of steel, and shall be provided with a cover, a protected vent opening and oil fill, a filter screen mounted over the suction inlet and a drain connection. Tank design shall incorporate a reserve capacity of no less than 45 litres (10 gallons). An initial supply of oil sufficient for proper operation shall be provided. A heater, thermostatically controlled, shall be provided in the storage tank to

maintain proper oil temperature.

11. PIPING:

1. Pipe of adequate size and thickness shall be installed between the pumping unit and the cylinder head. A shut off valve shall be provided for maintenance and adjusting purposes.

12. CONTROLLER:

1. A ThyssenKrupp Elevator microprocessor controller shall be provided. Including necessary starting switches of adequate size together with all relays, switches and hardware required to accomplish the operation specified. Overload protection shall be provided to protect the motor against overloading.

13. CAR STALL PROTECTIVE CIRCUIT:

1. A protective circuit shall be provided which will stop the motor and the pump and return the car to its lowest landing in the event the car does not reach its designed landing with a predetermined time interval. This circuit will permit a normal exit from the car but prevent further operation of the elevator until the trouble has been corrected.

14. WIRING:

1. All wiring and electrical interconnections shall comply with the governing codes. Insulated wiring shall have flame retardant and moisture proof outer covering, and shall be run in conduit, tubing or electrical wireways. Travelling cables shall be flexible and suitably suspended to relieve strain on individual conductors.

15. HOISTWAY OPERATING DEVICES:

1. Normal terminal stopping devices shall be provided. When an emergency terminal stopping device is also required, it shall be furnished and the controller switches and circuitry arranged in accordance with the requirements of the Code.

16. PIT SWITCH:

1. An emergency stop switch shall be located in the pit.

17. PLATFORM:

1. The car platform shall have a fabricated frame of formed and structural steel shapes, rigidly welded. Sub-flooring shall be min. 75mm (3/4") G1S fir

plywood sub floor. The underside of the platform will be fireproofed. The platform shall be manufactured by a CWB certified shop and be equipped with an aluminum threshold.

18. CAR FRAME:

1. A suitable car frame fabricated from formed or structural steel members shall be provided with adequate bracing to support the platform and car enclosure. The car frame shall be isolated from the platen plate by means of rubber isolation mounts. Shoe or slipper guides shall be mounted on top and bottom of the car frame to engage the guide rails. The crosshead shall be of sufficient strength to lift the fully loaded car when slung in the centre.

19. GUIDES:

1. Steel elevator guide rails shall be furnished to guide the car, erected plumb and securely fastened to the building structure.

20. DOOR OPERATION:

1. Doors on the car and at the hoistway entrances shall be power operated by means of a quality operator mounted on top of the car. The motor shall have positive control over the door movement for smooth operation. The car door shall have a safety shoe to cause instant re-opening should contact be made with any obstruction during the closing cycle.

2. Door operation shall be automatic at each landing with door opening being initiated as the car arrives at the landing and closing taking place after expiration of a time interval. A car door electric contact shall prevent starting the elevator away from the landing unless the car door is in its closed position.

3. An approved positive interlock shall be provided for each hoistway entrance which shall prevent operation of the hydraulic unit unless all doors for that elevator are closed and shall maintain the doors in their closed position while the elevator is away from the landing. Provide emergency access to the hoistway as required by governing codes.

4. The elevator contractor shall install at each landing served, a hoistway entrance of the type and size as previously described. Each entrance shall consist of flush hollow metal doors with build in hanger assembly, frames assembled for one piece unit installation, extruded aluminum sill, fascia, toe guard, hanger cover, header, hanger track assembly, and formed structural strut supports. Entrance design and construction must be in compliance with NBC 2005 requirements for fire labels.

5. Sill supporting angles required for flush hoistway construction shall be

furnished by the elevator contractor.

21. TELEPHONE:

1. An ADA-approved AUTODIAL telephone shall be furnished and installed as part of the car station. A separate phone line to the elevator controller shall be provided and located in the elevator machine room under another section of the specifications.

22. PAINTING:

1. All exposed metal work furnished under this section shall be properly painted after erection by the elevator contractor unless otherwise specified. All painting to conform to Section 09900.

23. OPTIONAL FEATURES

1. Battery Powered Emergency Lowering Operation
2. Oil Heater
3. Oil Cooler
4. Provide equipment according to Seismic zone.
5. Roller Guides
6. Pit scupper drain (where sanitary line grades allow gravity feed), pit sump pit where scupper drain option does not have suitable slopes – both have back flow preventer and feed to oil interceptor where by connecting to sanitary lines.

24. LOBBY PANEL:

1. Provide lobby panel in the central control room. Lobby panel to include for Special Emergency Service Phase I and Phase II, emergency power and one (1) position indicator per elevator.

25. NON-PROPRIETARY CONTROLS:

1. Elevating device control equipment must be non-proprietary. If a site specific service tool or on-board diagnostic tool is required to render the control equipment non-proprietary, it must be provided with the elevating device. The tool must allow full access to fault codes and maintenance related parameters and must allow complete and thorough maintenance service to be performed by any properly licensed and qualified Elevator Contractor. The tool must come with a user's manual that also defines and explains all error codes, including required fixes. The service tool must remain property of the building owner.

3. EXECUTION

3.1 EXAMINATION

1. Pre-inspect the construction and all requirements for work by others before the installation commences.

3.2 INSTALLATION

1. Install all components of the elevator system that are specified in this Section to be provided and that are required by jurisdictional authorities to licence the elevator.

2. All installation work of this Section will be performed by trained employees of the manufacturer.

3. Obtain and pay for all inspections by T.S.S.A. and other local authorities.

3.3 ARRANGEMENT OF EQUIPMENT

1. Arrange equipment in machine room so that equipment can be removed for repairs or replacement without dismantling or removing other equipment components.

2. Accommodate equipment in space indicated.

3.4 GUIDE RAILS AND BRACKETS

1. Erect guide rails plumb and parallel with maximum deviation of 3 mm.

2. Use material shims only and provide lock washers under all nuts and tapped bolts.

3. Compensate for expansion and contraction of guide rails.

4. Use splice plate and guide rails with contact surfaces accurately machined to form smooth joints.

5. Include steel reinforcement and backing for car guide rails where necessary.

3.5 ERECTION

1. Set entrances in perfect alignment with car openings and true with plumb hoistway lines.

2. Erect elevator closures to labelling requirements.

3.6 PROTECTION

1. Provide protective coverings for finished surfaces.

3.7 TOUCH-UP

1. Upon completion, touch-up and restore to new condition, damaged or defaced factory finished surfaces.

2. Remove protective coverings and clean exposed surfaces after completion and leave in first class condition.

3.8 FIELD QUALITY CONTROL

1. Perform and meet tests required by latest issue of CAN3 B44.

2. Submit test and approval certificates issued by jurisdictional authorities.

3. Demonstrate complete operation of elevator to Owner's representative.

3.9 MACHINE ROOM

1. The machine room will be located on the second floor adjacent to the elevator shaft as indicated on the drawings.

END OF SECTION

Division 20 Common Requirements for Mechanical

Division 22 Plumbing

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

Division 25 Integrated Automation

END OF SECTION

Part 1 General

1.1 GENERAL PROVISIONS

.1 This section covers items common to all sections of Mechanical Division.

.2 Conform to Division 1 General Conditions.

.3 Furnish labour, materials, and equipment necessary for completion of work as described in contract documents.

.4 Unless specifically indicated, all materials and equipment provided under this contract shall be new and shall be manufactured in the project year.

1.2 INTENT

.1 Mention herein or indication on Drawings of articles, materials, operations or methods requires: supply of each item mentioned or indicated, of quality, or subject to qualifications noted; installation according to conditions stated: and, performance of each operation prescribed with furnishing of necessary labour, equipment, and incidentals for mechanical work.

.2 Where used, words “Section” and “Division” shall also include other Subcontractors engaged on site to perform work to make building and site complete in all respects.

.3 Where used, word “supply” shall mean furnishing to site in location required or directed complete with accessory parts.

.4 Where used, word “install” shall mean secured in place and connected up for operation as noted or directed.

.5 Where used, word “provide” shall mean supply and install as each is described above.

1.3 REGULATIONS, PERMITS AND FEES

.1 All materials and quality of work shall meet all current and latest Provincial, Municipal and Fire Marshall requirements, regulations, codes and by-laws in force in the area of the project.

.2 Each contractor shall give all necessary notices, obtain all necessary permits, and pay all fees in order that the work shown or specified may be carried out. Each contractor shall furnish any certificates necessary as evidence that the work installed conforms with the laws and regulations of all authorities having jurisdiction.

.3 In the event that changes, or alterations are required on completed work by authorized inspectors, these changes shall be made at the contractor’s expense.

.4 Special equipment which does not have a standard CSA label shall be inspected by the local electrical authority having jurisdiction and the Approval Certificate shall be submitted to the Consultant as soon as possible. All costs and fees for inspections shall be borne by this contractor.

.5 Submit a copy of all final certificates in the maintenance manuals.

1.4 DRAWINGS

.1 Mechanical Drawings do not show structural and related details. Take information involving accurate measurement of building from building drawings, or at building. Make, without additional charge, any necessary changes, or additions to runs of piping, conduits and ducts to accommodate structural conditions. Location of pipes, ducts, conduits and other equipment may be altered by Consultant without extra charge provided change is made before installation and does not necessitate major additional material.

.2 As work progresses and before installing piping, ductwork, heating units, registers, diffusers, fixtures and any other fittings and equipment which may interfere with interior treatment and use of building, provide detail drawings, or obtain directions for exact location of such equipment and fittments.

.3 Mechanical Drawings indicate general location and route of pipes, ducts and conduits which are to be installed. Where required work is not shown or only shown diagrammatically, install same at maximum height in space to conserve head room (minimum 2200 mm (88") clear) and interfere as little as possible with free use of space through which they can pass. Follow building lines, conceal piping, conduits and ducts in furred spaces, ceilings and walls unless specifically shown otherwise. Install work close to structure so furring will be small as practical.

.4 Install piping and ductwork to clear structural members and any fireproofing. Locate mechanical work to permit installation of specified insulation. Do not remove or damage structural fireproofing. Leave space to permit fireproofing and insulation to be inspected and repaired.

.5 Before commencing work, check and verify all sizes, locations, grade and invert elevations, levels, and dimensions to ensure proper and correct installation. Verify existing/municipal services.

.6 Locate all mechanical and electrical equipment in such a manner as to facilitate easy and safe access to and maintenance and replacement of any part.

.7 In every place where there is indicated space reserved for future or other equipment, leave such space clear, and install piping and other work so that necessary installation and connections can be made for any such apparatus. Obtain instructions whenever necessary for this purpose.

.8 Relocate equipment and/or material installed but not co-ordinated with work of other Sections and/or installed incorrectly as directed, without extra charge.

.9 Where drawings are done in metric and product not available in metric, the corresponding imperial trade size shall be utilized.

1.5 INTERFERENCE AND 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 consultant.

.5 Due to the nature of the building and the complexity of the building systems provide the following:

.1 Interference drawings, showing coordination of architectural, structural, mechanical, and electrical systems for the consultant's review prior to fabrication.

.2 Detailed layout drawings, clearly showing fasteners and hangers.

.6 Provide CAD drawings (minimum release AutoCAD 2007) in addition to hard copies.

1.6 QUALITY ASSURANCE

.1 Perform work in accordance with applicable provisions of local Plumbing Code, Gas Ordinances, and adoptions thereof for all mechanical systems. Provide materials and labor necessary to comply with rules, regulations, and ordinances.

.2 In case of differences between building codes, provincial laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Consultant in writing of such differences.

1.7 ALTERNATES AND SUBSTITUTIONS

.1 Throughout Mechanical Division are lists of "Alternate Equipment" manufacturers acceptable to Consultant if their product meets characteristics of specified described equipment. Submitted Bids shall be based on the supply of named articles and or products as specified in the Bid Documents.

.2 Each bidder may elect to use "Alternate Equipment" from lists of Alternates where listed. Include for any additional costs including all costs for revisions to electrical contract to suit Alternate used. Prices are not required in Tender for Alternates listed except where specifically noted as "Separate Price". Complete the Supplementary Tender Form.

.3 When two or more suppliers/manufacturers are named in the Bid Documents, only one supplier/manufacturer of the products named will be acceptable; however, it is the responsibility of this Division to ensure "Alternate Equipment" fits space allocated and gives performance specified. If an "Alternate Equipment" nor "equal" specified product unit is proposed and does not fit space alloted in Consultant's opinion, supply of specified described equipment will be required without change in Contract amount. Should electrical characteristics for "alternate" or "equal" equipment differ from equipment specified it shall be the responsibility of the equipment manufacturer to pay all costs associated with the revisions to the electrical contract. Only manufacturers listed will be accepted for their product listing. All other manufacturers shall be quoted as substitution stating conditions and credit amount.

.4 If item of material specified is unobtainable, state in Tender proposed substitute and amount added or deducted for its use. Extra monies will not be paid for substitutions after Contract has been awarded.

.5 If pipe or item, of size or weight indicated, is unobtainable, supply next larger size or heavier weight without additional charge.

1.8 ALTERNATES AND SUBSTITUTIONS (THIS SECTION FOR WRDSB JOBS)

.1 Throughout Division 15 are lists of "Alternate and equal Equipment" manufacturers acceptable to Consultant if their product meets characteristics of specified described equipment.

.2 Each bidder may elect to use "Alternate or equal Equipment" manufacturers from lists of Alternates where listed. Include for any additional costs including all costs for revisions to electrical contract to suit Alternate used. Prices are not required in Tender for Alternates listed except where specifically noted as "Separate Price" in which case contractor will complete the Supplementary Tender Form.

.3 It is responsibility of this Division to ensure "Alternate Equipment" fits space allocated and gives performance specified. If an "Alternate Equipment" nor "equal" specified product unit is proposed and does not fit space allotted in Consultant's opinion, supply of specified described equipment will be required without change in Contract amount. Should electrical characteristics for "alternate" or "equal" equipment differ from equipment specified it shall be the responsibility of the equipment manufacturer to pay all costs associated with the revisions to the electrical contract. Only manufacturers listed will be accepted for their product listing. All other manufacturers shall be quoted as substitution stating conditions and credit amount.

.4 If pipe or item, of size or weight indicated, is unobtainable, supply next larger size or heavier weight without additional charge.

1.9 EXAMINATION

.1 Site Inspection

.1 Examine premises to understand conditions, which may affect performance of work of this Division before submitting proposals for this work.

.2 No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

.2 Drawings:

.1 Mechanical Drawings show general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.

.2 Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Plumbing, Mechanical, and Fire Protection Drawings.

.3 Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories, which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.

.3 Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.

1.10 SEQUENCING SCHEDULING AND COORDINATION

.1 It is understood that while Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for installation of systems according to the true intent and meaning of Contract Documents. Anything not clear or in conflict will be explained by making application to Consultant. Should conditions arise where certain changes would be advisable, secure Consultant's approval of these changes before proceeding with work.

.2 Coordinate work of various trades in installing interrelated work. Before installation of mechanical items, make proper provision to avoid interferences in a manner approved by Consultant. Each Contractor shall refer to all sections of the specification for their responsibilities with other trades. Changes required in work specified in Mechanical Division caused by neglect to do so shall be made at no cost to Owner.

.3 Arrange pipes, ducts, and equipment to permit ready access to valves, unions, traps, starters, motors, control components, and to clear openings of doors and access panels.

.4 Furnish and install inserts and supports required by Mechanical Division unless otherwise noted. Furnish sleeves, inserts, supports, and equipment that are an integral part of other Divisions of the Work to Sections involved in sufficient time to be built into construction as the Work proceeds. Locate these items and see that they are properly installed. Expense resulting from improper location or installation of items above shall be borne by Mechanical Division.

.5 Be responsible for required excavation, backfilling, cutting, and patching incident to work of this Division and make required repairs afterwards to satisfaction of Consultant. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.

.1 Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.

.2 Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.

.3 Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.

.6 Adjust locations of pipes, ducts, equipment, fixtures, etc, to accommodate work from interferences anticipated and encountered. Determine exact route and location of each pipe and duct prior to fabrication.

.1 Make offsets, transitions, and changes in direction of pipes, ducts, and electrical raceways as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.

.2 Furnish and install traps, air vents, sanitary vents, pull boxes, etc, as required to effect these offsets, transitions, and changes in direction.

.7 Slots and openings through floors, walls, ceilings, and roofs shall be provided by this contractor but performed by a trade specializing in this type of work. This Division shall see that they are properly located and do any cutting and patching caused by its neglect to do so.

1.11 CONTRACT BREAKDOWN

.1 Provide breakdown of contract exclusive of HST to acceptance of consultants prior to first draw submission.

.2 Provide labour and material cost for each item.

.3 Breakdown shall indicate total contract amount.

.4 Contract breakdown shall be as follows as a minimum.

Mobilization and shop drawings (max. $2000.00)
Demolition
Inside buried plumbing and drainage
Above grade rough-in plumbing and drainage
Roof drainage system
Plumbing Fixtures
Split A/C and Refrigerant Piping
Wet Heat Equipment/Radiation
Heating piping
Piping Insulation
Ductwork
Duct Insulation
Grilles & Diffusers
Fire Stopping
Fans & Equipment
Building Automation Systems
Testing Adjusting and Balancing
HVAC system commissioning
Mechanical contractor closeout requirements (min. of 3% but not 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.

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 Provide a complete list of shop drawings to be submitted prior to first submission.

.3 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.

.4 If material or equipment is not as specified or submittal is not complete, it will be rejected by Consultant.

.5 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.

.6 Submit all shop drawings for the project as a package. Partial submittals will not be accepted.

.7 Catalog data or shop drawings for equipment, which are noted as being reviewed by Consultant or his Engineer shall not supersede Contract Documents.

.8 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.

.9 Check work described by catalog data with Contract Documents for deviations and errors.

.10 Shop drawings and product data shall show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances. e.g., access door swing spaces.

.11 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.

.12 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.

.13 Shop drawings shall be submitted electronically as per the following directions:

- .1 Electronic Submissions:
  - .1 Electronically submitted shop drawings shall be prepared as follows:
    - .1 Use latest software to generate PDF files of submission sheets.
    - .2 Scanned legible PDF sheets are acceptable. Image files are not acceptable.
    - .3 PDF format shall be of sufficient resolution to clearly show the finest detail.
    - .4 PDF page size shall be standardized for printing to letter size (8.5"x11"), portrait with no additional formatting required by the consultant. Submissions requiring larger detail sheets shall not exceed 11"x17".
    - .5 Submissions shall contain multiple files according to section names as they appear in Specification.
    - .6 File names shall include consultant project number and description of shop drawing section submitted.

.7 Each submission shall contain an index sheet listing the products submitted, indexed in the same order as they appear in the Specification. Include associated PDF file name for each section.

.8 On the shop drawing use an "electronic mark" to indicate what is being provided.

.9 **Each file shall bear an electronic representation of the "company stamp" of the contractor. If not stamped the file submission will not be reviewed.**

.2 Email submissions shall include subject line to clearly identify the consultants project number and the description of the shop drawings submitted.

.3 Electronic attachments via email shall not exceed 10MB. For submissions larger than 10MB, multiple email messages shall be used. Denote related email messages by indicating "1 of 2" and "2 of 2" in email subject line for the case of two messages.

.4 Electronic attachments via web links (URL) shall directly reference PDF files. Provide necessary access credentials within link or as username/password clearly identified within body of email message.

.5 On site provide one copy of the "reviewed" shop drawings in a binder as noted above.

.6 Contractor to print copies of "reviewed" shop drawings and compile into maintenance manuals in accordance with requirements detailed in this section.

1.13 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 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.

.4 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.

.5 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.

.6 Miscellaneous data to include:

.1 Letter of contractor’s warranty and guarantee.

.2 Index sheet.

.3 Tabbed format for each section.

.4 Manufacturers approved shop drawings.

.5 Spare parts list and source.

.6 List of Manufacturers and suppliers address for each piece of equipment.

.7 Approvals:

.1 Submit 1 copy of Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless so directed by Consultant.

.2 Make changes as required and re-submit as directed by Consultant.

.3 Provide two (2) copies of final operation maintenance manuals, as well as a PDF file of the entire approved manual on a USB stick. Only one USB stick is to be provided containing both the approved manual and as-built drawings.

.8 Additional data:

.1 Prepare and insert into operation and maintenance manual when need for same becomes apparent during demonstrations and instructions specified above.

1.14 AS-BUILT DRAWINGS

.1 Site records:

.1 Contractor shall provide 2 sets of reproducible mechanical drawings. Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection at all times.

.2 As-Built drawings:

.1 Prior to start of Testing, Adjusting and Balancing (TAB), finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 3 mm (1/8") high as follows: - "AS-BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).

.3 TAB to be performed using as-built drawings.

.1 Submit hard copy to Consultant for approval. When returned, make corrections as directed.

.2 Once approved, submit completed reproducible paper as-built drawings as well as a scanned pdf file copy on USB stick with Operating and Maintenance Manuals.

1.15 WARRANTIES

.1 In addition to guarantee specified in General Conditions, guarantee heating, cooling, and plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.

.2 Provide certificates of warranty for each piece of equipment made out in favor of Owner. Clearly record "start-up" date of each piece of equipment on certificate. Include certificates as part of Operation & Maintenance Manual.

.3 Contractor shall rectify any installation deficiencies in the boiler or pressurized other systems identified by a TSSA Inspector for a period of three (3) years from substantial completion.

.4 Warranty period shall start from date of substantial completion and shall be for two (2) years.

1.16 SUBSTANTIAL PERFORMANCE

.1 Complete the following to the satisfaction of the consultant prior to request for submission of substantial performance.

.1 As-Built Drawings.

.2 Maintenance Manuals

.3 System Start up

.4 TAB Reports

.5 HVAC System Commissioning

.6 Instructions to Owners

.7 Final Certificates (required prior to consultant's release of conformance letter).

.1 Potable Water Test (Refer to domestic water piping – Copper section – Part 3)

.2 Backflow Test Certificate (for all testable devices)

1.17 OCCUPANCY REQUIREMENTS

.1 The contractor shall provide the following documentation to the consultant prior to receiving occupancy. Failure to provide the proper documentation will result in the occupancy not being granted. List of required documentation:

.1 Final Certificates (required prior to consultant's release of conformance letter).

.1 Potable Water Test (Refer to domestic water piping – Copper section – Part 3).

.2 Backflow Test Certificate (for all testable devices).

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 & HANDLING

.1 Follow Manufacturer's directions in delivery, storage, and protection, of equipment and materials.

.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.

1.20 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 mechanical systems of this building must achieve the energy efficiency levels by conforming to ANSI/ASHRAE/IESNA 90.1 “Energy Standard for Buildings Except Low-Rise Residential Buildings” and Chapter 2 of Division 3 of SB-10 prescriptive method from the Ontario Building Code.

.2 All equipment, products, and installations must conform to the Codes and Standards.

END OF SECTION

Part 1 General

1.1 TESTS

.1 Give 48 hours written notice of date for tests.

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

.3 Conduct tests in presence of Consultant.

.4 Bear costs including retesting and making good.

.5 Piping:

- .1 General: maintain test pressure without loss for 4 h unless otherwise specified.
- .2 Hydraulically test steam and hydronic piping systems at 1-1/2 times system operating pressure or minimum 860 kPa, whichever is greater.
- .3 Test natural gas systems to CSA-B149.1-00, TSSA requirements and requirements of authorities having jurisdiction.
- .4 Test fuel oil systems to CSA B139 1976, CSA B139S1-1982 and authorities having jurisdiction.
- .5 Test drainage, waste and vent piping to Ontario Building Code and authorities having jurisdiction.
- .6 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.
- .7 Test fire systems in accordance with authorities having jurisdiction and as specified elsewhere.

.6 Equipment: test as specified in relevant sections.

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

1.2 SYSTEM START UP

.1 Provide adjusting testing and start up of all equipment prior to testing and balancing (TAB) specified elsewhere.

.2 Provide consultant with written notice verifying all equipment operation and installation is complete.

.3 Start up shall be in presence of the following: owner or representative, contractor, building automation systems (BAS) contractor, and manufacturer's representative. Each person shall witness and sign off each piece of equipment. Consultant's attendance will be determined by consultant.

.4 Simulate system start up and shut down and verify operation of each piece of equipment.

.5 Arrange with all parties and provide 72 hours notice for start up procedure.

.6 Arrange with building automation systems contractor to sequence all components and ensure system operation.

1.3 COMMISSIONING

.1 Co-ordinate and direct each step of the commissioning process and recommend acceptance or non-acceptance to the Owner/Owner's Representative.

.2 Prepare, in writing, documentation of any deficiencies discovered during the commissioning process. Submit to consultant and Owner/Owner's Representative.

.3 The Commissioning Process is detailed in *ASHRAE Guideline 1-1996 HVAC Commissioning Process.* The commissioning plan may be modified to reflect the actual construction schedule and design.

.4 Provide a pre-functional test of all HVAC mechanical system and sub-system elements, including control devices, shall be checked for the following:

.1 Verify that each element has been properly installed, properly identified, and that all connections (including electrical) have been made correctly.

.2 Verify that each element has been checked for proper lubrication, drive rotation, belt tension, control sequence, flow direction, or other conditions which may cause damage or reduce system performance.

.3 Verify that tests, meter readings, and specific mechanical/electrical performance characteristics agree with those required by equipment or system manufacturer.

.4 Controls calibration to be completed in accordance with the specification.

.5 The TAB shall be done in accordance with the specifications.

.5 A functional performance testing shall be done during two separate periods – one during the cooling season and one during the heating season. The first (cooling) testing period shall occur as soon after completion of installation as practical. The heating testing period shall occur as soon as weather conditions make it practical to test warm-up, zone heating and economizer functions. These tests ensure that all equipment and systems operate in accordance with design intent. The tests are dynamic tests, and test the systems through all possible modes of operation.

.6 Reports:

.1 The contractor shall be responsible for recording, documenting, and maintaining detailed inspection and testing data on the test documentation reports. The data record shall be comprehensive and concise.

.2 All data must be recorded as soon as possible during the course of the inspection and testing.

.3 All documentation shall have the date, time, and names of persons participating in the inspection and testing.

.4 All test instruments shall be documented for valid calibration.

.5 The recording work sheets, inspection check lists, and Performance Testing plans must all be approved by the Engineer and the owner's representative prior to the start of the testing.

.6 Include all commissioning documentation in the maintenance manuals.

.7 Mechanical System Execution:

.1 Operate equipment and systems shall be tested in the presence of the owner's representative and the consultant to demonstrate compliance with specified requirements. To minimize the time of Commissioning Team members, testing shall be done in four seasonal single blocks of time insofar as possible.

.2 Notify the consultant, in writing, fourteen (14) days prior to tests scheduled under requirements of this Section.

.3 Testing shall be conducted under specified design operating conditions as recommended or approved by the consultant.

.4 All elements of systems shall be tested to demonstrate that total systems satisfy all requirements of these Specifications. Testing shall be accomplished on hierarchical basis. Test each piece of equipment for proper operation, followed by each sub-system, followed by entire system, followed by any inter-ties of other major systems.

.5 All special testing materials and equipment shall be provided by the appropriate contractor.

.6 Provide three copies of all test reports and records to the consultant.

.8 The verification testing procedures shall address all operating characteristics of all mechanical equipment and systems, including:

Equipment Checklist
Exhaust Fans
Controllers/Valves/Dampers
Relays/Sensors/Transducers

1.4 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTION

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Mechanical contractor to schedule and coordinate the demonstration all on the same day, starting at a pre-approved time and continuing consequently until complete.

.3 Where specified elsewhere in Mechanical Division, qualified manufacturers' representatives who are knowledgeable about the project to provide demonstrations and instructions.

.4 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.

.5 Instruction duration time requirements as specified in appropriate sections.

.6 Where deemed necessary, Consultants may record these demonstrations on video tape for future reference.

1.5 TRIAL USAGE

.1 Consultant or owner may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to following equipment and systems:

.1 HVAC

.2 Exhaust air

.3 Domestic water

.4 Plumbing and drainage.

1.6 DEFICIENCIES

.1 During the course of construction, the consultants will monitor construction and provide written reports of work progress, discussions, and instruction to correct work.

.2 Instruction to correct work shall be done within the work period before the next review.

.3 The contractor shall not conceal any work until inspected.

.4 The contractor shall expedite 100% complete rough-in work and have inspected prior to concealing services and equipment especially above ceiling.

.5 Upon completion of the project the consultant will do a final review. Upon receiving the final inspection report, the contractor must correct and sign back the inspection report indicating the deficiencies are completed. A re-inspection will only be done once consultant receives this in writing.

1.7 EQUIPMENT INSTALLATIONS

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

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

.3 Equipment drains: pipe to floor drains.

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

1.8 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to equipment unless specified or indicated otherwise. Coordinate with block coursing (if applicable).

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install mechanical equipment at following heights unless indicated otherwise.

.1	Standard water closets	350 (14") to top of bowl
.2	Barrier-free water closets	400 (16") to top of bowl
.3	Barrier-free water closets	450 (18") to top of seat lid
.4	Wall hung lavatory	787 (31") to rim
.5	Barrier-free wall hung lavatory	840 (33") max to top of rim 737 (29") min underside of rim front 685 (27") clear at 400 (8") from basin front 350 (14") min clear under waste trap
.6	Fire extinguisher	1350 (4'– 0") to hanger
.7	Fire extinguisher cabinets	1500 (5'– 0") to top of cabinet
.8	**Hydronic heating elements**	**200 mm (8") to bottom of cabinet**
.9	**Backflow preventors**	**900 – 1200 (3'– 4') to centerline of unit**
.10	Thermostats: Barrier Free (operable)	1200 mm (47.25")
	Non Barrier Free	1500 mm (59")

Also follow direction of architectural drawings and where discrepancies occur clarify prior to rough-in.

1.9 ANCHOR BOLTS AND TEMPLATES

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

1.10 PROTECTION OF OPENINGS

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

1.11 ELECTRICAL

.1 Electrical work to conform to Electrical Division including the following:

.1 Supplier and installer responsibility and related mechanical responsibility is indicated in Equipment Schedule on mechanical and/or electrical drawings.

.2 Power wiring and conduit is specified in Electrical Division except for conduit, wiring and connections below 50 V which are related to control systems specified in Mechanical Division. Follow Electrical Division for quality of materials and workmanship.

.3 Electrically operated equipment shall be C.S.A. approved label. Special Inspection Label of Provincial Authority having jurisdiction will be accepted in lieu of C.S.A. approval. Each motor shall have an approved starter. Starter will be supplied and installed by Electrical Division unless otherwise indicated.

1.12 CONTROL WIRING

.1 Furnish and install all components, devices, and control wiring for all plumbing, fire protection, HVAC equipment, HVAC systems, lighting, and other electrical loads to make all equipment operable to satisfaction of owner and consultant and to manufacturer's requirements and recommendations.

.2 All electrical wiring, mechanical wiring and installations shall comply with local and national electrical and mechanical codes.

.3 Supply and install wiring as required for all devices and systems. Install wiring in EMT conduit and otherwise comply with all requirements of the Electrical Division. Approved plenum wire may be used for sensor and network communication wiring where it complies with appropriate building codes and regulatory authorities.

.4 All wiring concealed in walls and chases, and all exposed wiring shall be run in conduit.

.5 Provide recessed conduit and backer boxes where controls are wall mounted. Surface mounted boxes and conduit are acceptable in mechanical or service rooms.

.6 Free-run plenum rated cable shall be run in cable hangers where provided by electrical division or tied neatly to pipe and duct hangers in the ceiling. Avoid wiring that droops. Follow building lines and do not run wiring "as the crow flies".

1.13 MOTORS

.1 Provide high efficiency motors for mechanical equipment as specified.

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

.3 Motors under 373 W, (1/2 hp): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, voltage as indicated.

.4 Motors 373 W, (1/2 hp) and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40°C (72°F), 3 phase, voltage as indicated.

1.14 BELT DRIVES

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

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

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

.4 For motors 7.5 kW 10 hp and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.

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

.6 Motor slide rail adjustment plates to allow for centre line adjustment.

.7 Provide sheave changes as required for final air balancing.

1.15 GUARDS

.1 Provide guards for unprotected devices.

.2 Guards for belt drives:

.1 Expanded metal screen welded to steel frame.

.2 Minimum 1.2 mm (18 gauge) thick sheet metal tops and bottoms.

.3 40 mm (1 1/2") diameter holes on both shaft centres for insertion of tachometer.

.4 Removable for servicing.

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

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

.5 Guard for flexible coupling:

.1 "U" shaped, minimum 1.6 mm (16 gauge) thick galvanized mild steel.

.2 Securely fasten in place.

.3 Removable for servicing.

.6 Unprotected fan inlets or outlets:

.1 Wire or expanded metal screen, galvanized, 20 mm (3/4") mesh.

.2 Net free area of guard: not less than 80% of fan openings.

.3 Securely fasten in place.

.4 Removable for servicing.

.7 Duct Openings in Floor

.1 Provide reinforced expanded mesh grating, style 3 (3 lbs/sq.ft.) cover on accessible unprotected duct openings over 300 mm (12”) wide and as indicated. This includes all ductwork terminating in air handling units and plenums.

.2 Securely Fasten in place.

.3 Removable for servicing.

1.16 PIPING AND EQUIPMENT SUPPORTS

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

.2 Piping and equipment supports not supplied by equipment manufacturer: fabricate from structural grade steel meeting requirements of - Structural Steel Section. Submit structural calculations with shop drawings.

.3 Mount base mounted equipment on chamfered edge housekeeping pads, minimum of 100 mm (4") high and 150 mm (6") larger than equipment dimensions all around. Concrete specified elsewhere.

.4 Where housekeeping pads incorporate existing pads provide 10 mm dowels into existing pads. New pad height shall match existing.

1.17 ROOF MOUNTED PIPE SUPPORT

.1 Provide zero penetration pipe support on roof where indicated.

.2 Base shall be made of high density polypropylene with UV protection. Maximum loading shall be 50 lb/sq.ft.

.3 Frames shall be galvanized. All fastenings, rods, nuts, washers, hangers, etc. shall be stainless steel.

.4 Provide shop drawings as specified. Install to manufacturers recommendations.

.5 Acceptable material:
Portable pipe hanger
Bigfoot systems
Miro rooftop supports

1.18 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.

1.19 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 cementious or rigid seals around penetrations for pipe, ductwork, or other mechanical items.

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

.5 Provide materials and systems capable of maintaining effective barrier against flame, smoke and gases. Ensure continuity and integrity of fire separation.

.6 Comply with the requirements of CAN4-S115-M35, and do not exceed opening sized for which they have been tested.

.7 Systems to have an F or FT rating (as applicable) not less than the fire protection rating required for closures in a fire separation. Provide “fire wrap” blanket around services penetrating fire walls. Extent of blanket must correspond to ULC recommendations.

.8 The fire stopping materials are not to shrink, slump or sag and to be free of asbestos, halogens and volatile solvents.

.9 Firestopping materials are to consist of a component sealant applied with a conventional caulking gun and trowel.

.10 Fire stop materials are to be capable of receiving finish materials in those areas which are exposed and scheduled to receive finishes. Exposed surfaces are to be acceptable to consultant prior to application of finish.

.11 Firestopping shall be inspected and approved by local authority prior to concealment or enclosure.

.12 Install material and components in accordance with ULC certification, manufacturers instructions and local authority.

.13 Submit product literature and installation material on fire stopping in shop drawing and product data manual. Maintain copies of these on site for viewing by installers and consultant.

.14 Manufacturer of product shall provide certification of installation. Submit letter to the consultant.

.15 Acceptable Manufacturer:
Minnesota Mining and Manufacturing

.16 Acceptable Alternate Manufacturers to approval of local authority:
Fryesleeve Industries Inc.
General Electric Pensil Firestop Systems
International Protective Coatings Corp.
Rectorseal Corporation (Metacaulk)
Proset Systems
3M
AD Systems
Hilti

.17 Ensure firestop manufacturer representative performs on site inspections and certifies installation. Submit inspection reports/certification at time of substantial completion.

1.20 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.

1.21 PAINTING

.1 Refer to Section Interior Painting and specified elsewhere.

.2 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.

.3 Apply two coats of paint to exposed piping service in mechanical room, base colour as specified in Mechanical Identification Section.

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

.5 Restore to new condition, or replace equipment at discretion of consultant, finishes which have been damaged too extensively to be merely primed and touched up.

1.22 SPARE PARTS

.1 Furnish spare parts in accordance with general requirements and as follows:

.1 One glass for each gauge glass.

.2 One set of belts for each type or each size of machinery.

.3 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.

1.23 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.

1.24 ACCESS DOORS

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

.2 Flush mounted 600 x 600 mm (24" x 24") for body entry and 300 x 300 mm (12" x 12") for hand entry unless otherwise noted. Doors to open 180°, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.

.3 Material:

.1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Consultant.

.2 Remaining areas: use prime coated steel.

.3 Fire rated areas: provide ULC listed access doors.

.4 Washrooms or high moisture area ceilings: Aluminum with mill finish suitable for painting.

.4 Installation:

.1 Locate so that concealed items are accessible.

.2 Locate so that hand or body entry (as applicable) is achieved.

.5 Acceptable materials:
Le Hage
Zurn
Acudor
Nailor Industries Inc.

1.25 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.

1.26 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.

1.27 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.

1.28 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.

1.29 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.

1.30 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.

1.31 OWNER SUPPLIED EQUIPMENT

.1 Connect to equipment supplied by the owner and make operable.

1.32 LOCATION OF EXISTING UNDERGROUND SERVICES

.1 This contractor shall locate existing services prior to starting any work in the affected area.

.2 This contractor shall use a video camera for the existing storm and/or sanitary drainage at the indicated connection point to confirm location, size and invert of the existing piping.

1.33 EXISTING CONCRETE SLAB X-RAY/SCANNING

.1 This contractor shall retain the services of a qualified company to provide and X-Ray and/or scan of the existing buried services in wall and/or floors prior to starting any work in the affected area.

.2 Failure to locate existing piping, conduit rebar etc., shall not relieve this contractor of repair of same prior to installing his service.

.3 This contractor shall be responsible for all repairs and/or replacement of existing services caused by cutting the existing concrete slabs and/or walls.

1.34 EXCAVATING AND BACKFILLING

.1 Provide all excavating and backfilling inside and outside the building for plumbing pipes, drains and equipment. All backfilling shall be new clean granular ‘A’ fill brought in specifically for the purpose of backfilling to the underside of floor slab. All backfilling shall be compacted at intervals not more than 150 mm (6") layer to the satisfaction of the Consultant.

.2 Provide excavating and backfilling outside the building with granular A brought in specifically for backfilling to a minimum of 450 mm (18") over the pipe. Backfilling outside building over and above the 450 mm (18") backfill as previously specified herein shall be by the Mechanical Contractor as specified under Division 2. Where backfilling outside the building is not specified under Division 2 the mechanical contractor shall provide new clean granular ‘A’ fill to grade level.

.3 Bottoms of trenches shall be excavated so that the pipe will be supported on a 150 mm (6") compacted bed of clean granular ‘A’ fill. Provide all necessary pumping to maintain excavation free of water.

.4 Should water be encountered during excavation, the mechanical contractor shall provide all labour and material, including all equipment required for dewatering the excavation. After the water has been removed, this Contractor shall install a 300 mm (12") base of compacted 50 mm (2") clear stone covered with filter cloth before installing backfill as detailed and/or as specified.

.5 Be responsible for all weather protection required to install piping and/or equipment to the satisfaction of the Consultant.

.6 Be responsible for providing all clear stone or granular 'A' material suitable for application to replace existing soil not suitable for backfilling above the 450 mm (18") bedding material.

1.35 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".

1.36 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.

1.37 INTEGRATED LIFE SAFETY SYSTEMS TESTING

.1 Mechanical systems in this building, including but not limited to smoke control dampers, smoke control fans, high speed low velocity ceiling fans, makeup air units, heat tracing for fire protection systems and fire protection system components may be subject to Integrated Life Safety Systems testing.

.2 The Mechanical Contractor shall co-ordinate with the Integrated Life Safety Systems Testing Agent as follows:

.1 Confirm which mechanical systems are to be included as part of the testing process.

.2 Verify in writing to the Integrated Life Safety Systems Testing Agent that mechanical commissioning of the affected systems/devices is complete prior to the scheduled testing date(s).

.3 Participate in the Integrated Life Safety Systems Testing to confirm proper operation of all associated systems.

.4 This contractor shall work with the Integrated Life Safety Systems Testing Agent to reset all systems back to normal operating mode after the testing is complete.

.3 Include all costs associated with Integrated Life Safety System Testing in the tender value.

.4 Refer to Division 1/Division 26 Integrated Life Safety Systems Testing specifications for additional information/requirements.

END OF SECTION

Part 1 General

1.1 GENERAL PROVISIONS

.1 Conform to the General Provisions of General Requirements Section.

.2 This project is one of a retrofit nature in part, and which will require some demolition.

.3 Allow for all remedial work in areas indicated on the drawings and as generally defined in the relevant sections of the specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

.1 Electrical Division.

1.3 SCOPE OF WORK

.1 The scope of work is essentially the selected disconnection and/or removal of services and/or equipment, piping ductwork etc. as indicated or required to complete the work.

Part 2 Products

2.1 GENERAL

.1 This Division is to liaise with the Owners or Consultant for equipment being removed that may be suitable for reuse to that specified or handed over to the owner.

.2 This Division to take full responsibility for any special tools or equipment required to disassemble or remove material from building.

Part 3 Execution

3.1 GENERAL

.1 The general requirements are indicated on the drawings and on the outline specification in Division 1.

.2 The general execution of the demolition is to be carried out in a clean and efficient manner.

.3 Demolition of existing ceiling, walls etc., to facilitate removal of existing services or equipment or installation of new to be kept to a minimum and then restored to match existing.

.4 All openings or holes created by removal of existing mechanical systems which are not being reused are to be patched with the same material surrounding surfaces.

.5 All new holes and openings to facilitate mechanical systems are to be patched to match surrounding surfaces.

.6 Protect all existing furnishings materials and equipment. Any damage occurring as a result of the work of this Division shall be repaired or replaced at the expense of this Division.

.7 Where work involves breaking into or connecting to existing services, carry out work at times directed by the Owners in an expedient manner with minimum disruption to the facility and systems downtime.

.8 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.

.9 Where the location of any services has been shown on the plans, such information is not guaranteed. It is this Division's responsibility to verify locations, invert elevations, etc., immediately after moving on site. Should for any reason the information obtained necessitates changes in procedure or design, advise the Consultant at once. If verification of existing conditions is not done at the outset and any problems arise, the responsibility for same is entirely this Division's.

.10 Disconnect and/or remove equipment piping, ductwork, etc. as indicated.

.11 Cap and conceal all redundant and obsolete connections.

.12 Provide a list of equipment to be removed to the owner, for his acceptance of same. Remove all equipment from site which the owner does not retain.

.13 Maintain equipment to be retained by owner on site where directed by consultant.

.14 Demolition of all parts of the work must be completed within the confines of the work area and in such a way as the dust produced and risk to injury of will not adversely affect the building users.

.15 Demolished areas of the existing building will remain in their current use in some cases. Demolition in these areas must be kept to the minimum required to complete the work.

.16 Demolition shall take place within areas isolated from all other areas with appropriate hoarding, scaffolding, netting, fencing or other means of security between building users and the work.

.17 Co-ordinate making safe electrical devices, capping plumbing and removal of fixtures prior to commencement of demolition.

.18 All piping and equipment to be removed and/or abandoned shall be drained prior to capping and/or abandoning. Disposal of all liquids shall be to the approval of authority of having jurisdiction and/or provincial regulations.

3.2 EXISTING SYSTEM DRAINAGE

.1 Drain all existing piping and drainage systems including all related equipment as required to facilitate system renovations.

.2 Disposal of existing system shall be to the requirements of the local and/or provincial regulations.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 American Society for Testing and Materials

.1 ASTM A53/A53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A105/A105M, Specification for Carbon Steel Forgings for Piping Applications.

1.2 PRODUCT DATA

.1 Submit product data in accordance with general requirements.

.2 Indicate for each item as applicable:

.1 Manufacturer, model number, line contents, pressure and temperature rating.

.2 Movement handled; axial, lateral, angular and the amounts of each.

.3 Nominal size and dimensions including details of construction and assembly.

1.3 CLOSEOUT SUBMITTALS

.1 Submit maintenance data in accordance with general requirements.

.2 Data to include:

.1 Servicing requirements, including any special requirements, stuffing box packing, lubrication and recommended procedures.

Part 2 Products

2.1 SLIP TYPE EXPANSION JOINTS

.1 Application: for axial pipe movement, as indicated.

.2 Repacking: under full line pressure.

.3 Body and packing housings: Class 150, 1Mpa carbon steel pipe to ASTM A53/A53M, Grade B. Wall thickness to match pipe and with raised face slip-on flanges to match pipe.

.4 Slip or traverse sleeves: carbon steel pipe to ASTM A53/A53M, Grade B, hard chrome plated.

.5 Anchor base: construction steel, welded to body.

.6 Guides (internal and external): embody into packing housing with concentric alignment of slip or traverse sleeve with packing housing.

.7 Extension limit stop: stainless steel, to prevent over-extension with accessible and removable pins.

.8 Packing rings: 6 minimum, P7FE (teflon) or graphite impregnated non-asbestos fiber.

.9 Thermal plastic packing: P7FE (teflon) or graphite impregnated non-asbestos fiber slug supplied loose.

.10 Lubricating fittings: pet cocks with grease nipple.

.11 Plunger body and plunger:

.1 Plunger body: heavy wall carbon steel welded to body.

.2 Plunger: carbon steel with hex head for use with socket wrench.

.12 Lubricant: to manufacturer's recommendations.

.13 Lubricant gun: complete with hose assembly.

.14 Drip connection: 20 MPa (2900 psi) forged steel to ASTM A105. Include half coupling with drain plug.

.15 Lubricant fittings, plunger, gun not required for low friction self lubricating packing.

2.2 FLEXIBLE CONNECTION

.1 Application: to suit motion.

.2 Minimum length in accordance with manufacturer's recommendations to suit offset.

.3 Inner hose: stainless steel corrugated.

.4 Braided wire mesh stainless steel outer jacket.

.5 Diameter and type of end connection: as indicated.

.6 Operating conditions:

.1 Working pressure: 1034 kPa (150 psi).

.2 Working temperature: 250°C (482°F).

.3 To match system requirements.

2.3 ANCHORS AND GUIDES

.1 Anchors:

.1 Provide as indicated.

.2 Alignment guides:

.1 Provide as indicated.

.2 To accommodate specified thickness of insulation.

.3 Vapour barriers, jackets to remain uninterrupted.

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

.1 All welded packless guided construction complete with multi ply stainless steel bellows.

.2 Operating temperature (700°F).

.3 Provide model HP3 for steel pipe and model HBFF3 for copper pipe.

.4 Movement capability of 4" axial. Welded ends.

.5 Material to match piping system.

.6 Acceptable materials:
Metraflex HP
Mark David Canada
Senior Flexonics

Part 3 Execution

3.1 INSTALLATION

.1 Install expansion joints with cold setting, as indicated as instructed by Consultant. Make record of cold settings.

.2 Install expansion joints and flexible connections in accordance with manufacturer's instructions.

.3 Install pipe anchors and guides as indicated. Anchors to withstand 150% of axial thrust.

3.2 APPLICATION

.1 Provide on all vibration isolated equipment.

.2 Provide where requested by equipment manufacturers installation manuals.

.3 Install in accordance with manufacturer’s recommendations.

.4 Provide expansion compensators (exp.) on radiation heating element exceeding 3.6 M (12' – 0") in length. Provide one expansion compensators on each length of return piping in cabinet.

3.3 THERMAL EXPANSION

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

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME)

.1 ANSI/ASME B31.1, Power Piping, (SI Edition).

.3 American Society for Testing and Materials (ASTM)

.1 ASTM A 125, Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A 563, Specification for Carbon and Alloy Steel Nuts.

.4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.1 MSS SP-58, Pipe Hangers and Supports - Materials, Design, Manufacture Selection, Application, and Installation.

1.2 DESIGN REQUIREMENTS

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP-58.

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP-58.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with general requirements.

.2 Submit shop drawings and product data for following items:

.1 All bases, hangers and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

1.4 MAINTENANCE DATA

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

Part 2 Products

2.1 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS-SP-58.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports: to ANSI & ULC requirements

.2 Ensure steel hangers in contact with copper piping are copper plated.

.2 Upper attachment structural: Suspension from upper flange of I-Beam or joist.

.1 Cold piping NPS 50 mm (2") maximum: Ductile iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.

.1 Rod: 10 mm (3/8") UL listed

.2 Cold piping NPS 65 mm (2 1/2") or greater, all hot piping: Malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed & FM approved.

.3 Upper attachment structural: Suspension from upper flange of I-Beam.

.1 Cold piping NPS 50 mm (2") maximum: Ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed.

.2 Cold piping NPS 65 mm (2 1/2") or greater, all hot piping: Malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nuts.

.4 Upper attachment to concrete.

.1 Ceiling: Carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm (1/4") minimum greater than rod diameter.

.2 Concrete inserts: wedge shaped body with knockout protector plate ULC listed. Note: Rapidex and Siporex are <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 RISER CLAMPS

.1 Steel or cast iron pipe: black carbon steel to MSS-SP-58, type 42, UL listed.

.2 Copper pipe: carbon steel copper plated to MSS-SP-58, type 42.

.3 Bolts: to ASTM A 307.

.4 Nuts: to ASTM A 563.

2.4 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping:

.1 64 kg/m² (13.12 lbs/ft²) density insulation plus insulation protection shield to: MSS SP-69, galvanized sheet carbon steel. Length designed for maximum 3 m (10') span.

.2 Insulated hot piping:

.1 Curved plate 300 mm (12") long, with edges turned up, welded-in centre plate for pipe sizes NPS 300 mm (12") and over, carbon steel to comply with MSS SP-58.

2.5 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of miscellaneous metals, specified herein. Submit calculations with shop drawings.

2.6 ROOF MOUNTED EQUIPMENT

.1 Install as per manufacturers' 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.

2.7 OTHER EQUIPMENT SUPPORTS

.1 From structural grade steel meeting requirements of structural steel section specified herein.

.2 Submit structural calculations with shop drawings.

2.8 MANUFACTURER

.1 Acceptable materials:

.1 Grinnell

.2 Anvil

.3 Myatt

.4 Taylor

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with:

.1 Manufacturer's instructions and recommendations.

.2 Vibration Control Devices:

.1 Install on piping systems at pumps, boilers, chillers, cooling towers, elsewhere as indicated.

.3 Clamps on riser piping:

.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

.2 Bolt-tightening torques to be to industry standards.

.3 Steel pipes: Install below coupling or shear lugs welded to pipe.

.4 Cast iron pipes: Install below joint.

.4 Clevis plates:

.1 Attach to concrete with 4 minimum concrete inserts at each corner.

.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

3.2 HANGER SPACING

.1 Plumbing piping: most stringent requirements of Canadian Plumbing Code, Provincial Code, or authority having jurisdiction.

.2 Fire protection: to applicable fire code.

.3 Gas and fuel oil piping: up to NPS 15 mm (1/2"): every 1.8 m (6').

.4 Copper piping: up to NPS 15 mm (1/2"): every 1.5 m (5').

.5 Within 300 mm (12") of each elbow and:

Maximum Pipe Size: NPS	Spacing Steel	Maximum Spacing Copper
up to 32 mm (1 1/4")	2.1 m (7')	1.8 m (6')
40 mm (1 1/2")	2.7 m (9')	2.4 m (8')
50 mm (2")	3.0 m (10')	2.7 m (9')
65 mm (2 1/2")	3.6 m (12')	3.0 m (10')
80 mm (3")	3.6 m (12')	3.0 m (10')
90 mm (3 1/2")	3.9 m (13')	3.3 m (11')
100 mm (4")	4.2 m (14')	3.6 m (12')
125 mm (5")	4.8 m (16')	
150 mm (6")	5.1 m (17')	
200 mm (8")	5.7 m (19')	
250 mm (10")	6.6 m (22')	
300 mm (12")	6.9 m (23')	

.6 Pipework greater than NPS 300 mm (12"): to MSS SP-69.

3.3 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

.4 Do “NOT” support piping, ductwork and equipment from roof deck, on bottom chord of floor and/or roof joist and/or from OWSJ bridging. Provide structural member between joist.

3.4 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4mm (5/32") from vertical.

.2 Where horizontal pipe movement is less than 15 mm (1/2"), offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.5 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:

.1 Hammer jaw firmly against underside of beam.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS

.1 Submit shop drawings in accordance with general requirements.

.2 Provide separate shop drawings for each isolated system complete with performance and product data.

Part 2 Products

2.1 GENERAL

.1 Size and shape of bases type and performance of vibration isolation to be as indicated.

.2 To be of the same manufacturer for all isolation.

.3 Acceptable materials:
Korfund
Vibro-Acoustics
Vibron

2.2 ELASTOMERIC PADS

.1 Type EP1 - neoprene waffle or ribbed; 10 mm (3/8") minimum thick; 50 durometer; maximum loading 350 kPa (50.8 psi).

.2 Type EP2 - rubber waffle or ribbed; 10 mm (3/8") minimum thick; 30 durometer natural rubber; maximum loading 415 kPa (60.2 psi).

.3 Type EP3 - neoprene-steel-neoprene; 10 mm (3/8") minimum thick neoprene bonded to 1.5 mm (16 gauge) steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa (50.8 psi).

.4 Type EP4 - rubber-steel-rubber; 10 mm (3/8") minimum thick rubber bonded to 1.5 mm (16 gauge) steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa (60.2 psi).

.5 Acceptable materials:
Korfund
IAC Acoustics
Vibro-Acoustics
Vibron

2.3 HANGERS

.1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30° arc without metal to metal contact.

.2 Type H1 - neoprene - in-shear, molded with rod isolation bushing, which passes through hanger box.

.3 Type H2 - stable spring, elastomeric washer, cup with molded isolation bushing which passes through hanger box.

.4 Type H3 - stable spring, elastomeric element with pre-compression washer and nut [with deflection indicator].

.5 Performance as indicated.

.6 Acceptable materials:
Vibron
IAC Acoustics
Korfund
Vibro-Acoustics

Part 3 Execution

3.1 INSTALLATION

.1 Install vibration isolation equipment in accordance with manufacturers instructions and adjust mountings to level equipment.

.2 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.

.3 Unless indicated otherwise, support piping connected to isolated equipment with spring mounts or spring hangers with 25 mm (1") minimum static deflection as follows:

.1 Up to NPS 100 mm (4"): first 3 points of support. NPS 125 mm (5") to NPS 200 mm (8"): first 4 points of support. NPS 250 mm (10") and Over: first 6 points of support.

.2 First point of support shall have a static deflection of twice deflection of isolated equipment, but not more than 50 mm (2").

.4 Where isolation is bolted to floor use vibration isolation rubber washers.

.5 Block and shim level bases so that ductwork and piping connections can be made to a rigid system at the operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

3.2 TESTING

.1 Experienced and competent sound and vibration testing professional engineer to take vibration measurement for HVAC systems after start up and TAB of systems to Testing Adjusting and Balancing Section.

.2 Vibration measurements shall be taken for equipment-listed below:

.3 Provide Consultant with notice 48 h in advance of commencement of tests.

.4 Establish adequacy of equipment isolation and acceptability of noise levels in occupied areas and where appropriate, remedial recommendations including sound curves.

.5 Submit complete report of test results including sound curves.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3, Identification of Piping Systems.

.3 Canadian Standards Association (CSA).

.1 Natural Gas and Propane Installation Code CSA B149.1.

.4 National Fire Protection Association

.1 NFPA 13, Installation of Sprinkler Systems.

.2 NFPA 14, Standpipe and Systems.

1.2 PRODUCT DATA

.1 Submit product data in accordance with General Requirements.

.2 Product data to include paint colour chips, all other products specified in this section.

1.3 PRODUCT LITERATURE

.1 Submit product literature in accordance with General Requirements.

.2 Product literature to include nameplates, labels, tags, lists of proposed legends.

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic lamicoid nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers to be raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: Manufacturer's name, model, size, serial number, capacity.

.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:

.1 3 mm (1/8") thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

Size	No. of Sizes mm (")	Height of Line mm (")	Letters mm (")
1	10 x 50 (3/8" x 2")	1 (3/64")	3 (1/8")
2	15 x 75 (1/2" x 3")	1 (3/64")	6 (1/4")
3	15 x 75 (1/2" x 3")	2 (5/64")	3 (1/8")
4	20 x 100 (3/4" x 4")	1 (3/64")	10 (3/8")
5	20 x 100 (3/4" x 4")	2 (6/64")	6 (1/4")
6	20 x 200 (3/4" x 8")	1 (3/64")	10 (3/8")
7	25 x 125 (1" x 5")	1 (3/64")	15 (1/2")
8	25 x 125 (1" x 5")	2 (5/64")	10 (3/8")
9	32 x 200 (1¼" x 8")	1 (3/64")	20 (3/4")

.2 Use maximum of 25 letters/numbers per line.

.4 Locations:

.1 Terminal cabinets, control panels: Use size #5.

.2 Equipment in Mechanical Rooms: Use size #9.

.3 Roof top equipment: use size #9.

.4 Equipment above ceiling: use size #1 riveted to ceiling suspension system.

2.3 FIRE DAMPER/FIRE STOP FLAP NAMEPLATES/FIRE SMOKE DAMPER

.1 Colours:

.1 Black letters, yellow background.

.2 Construction:

.1 Self adhesive 50 mm x 25 mm, matte finish, with round corners.

.3 Locations:

.1 Install on adjacent ceiling grid. Where fire stop flap is installed in gypsum ceiling install on diffuser/grille frame. Where fire damper is installed above gypsum ceiling install on adjacent wall.

2.4 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from Consultant.

.4 Upon completion of this project all references to room names and numbering shall be to the Owner's requirements which may or may 'NOT' be the numbering system used on the drawings. Each contractor shall verify the proper numbering scheme to be used prior to project completion.

.5 All equipment shall be identified in sequence from the existing equipment and "NOT" duplicate numbering of equipment.

2.5 PIPING SYSTEMS GOVERNED BY CODE

.1 Identification:

.1 Natural and propane gas: To CSA B149.1-00 and authority having jurisdiction and as indicated elsewhere.

.2 Sprinklers: To NFPA 13.

.3 Standpipe and hose systems: To NFPA 14.

2.6 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Legend:

.1 Block capitals to sizes and colours listed in CAN/CGSB-24.3.

.3 Arrows showing direction of flow:

.1 Outside diameter of pipe or insulation less than 75 mm (3"): 100 mm (4") long x 50 mm (2") high.

.2 Outside diameter of pipe or insulation 75 mm (3") and greater: 150 mm (6") long x 50 mm (2") high.

.3 Use double-headed arrows where flow is reversible.

.4 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate pictogram, full length of legend and arrows.

.5 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 20 mm (3/4") and smaller: Waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 All other pipes: Pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150°C (300°F) and intermittent temperature of 200°C (395°F).

.6 Colours and Legends:

.1 Where not listed, obtain direction from Consultant.

.2 Colours for legends, arrows: To following table:

Background colour:	Legend:	Arrows:
Yellow	White	Black
Green	White	Black
Red	White	Black

.7 Background colour marking and legends for piping systems:

CONTENTS	BACKGROUND COLOUR MARKING	LEGEND
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HW recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS
Domestic tempered supply	Green	DOM. TEMPERED
Trap Primer	Green	TRAP PRIMER
Storm water	Green	STORM
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
Condensate	Green	CONDENSATE
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration hot gas	Yellow	REF. HOT GAS
Conduit for low voltage Control wiring	White	CONTROL WIRING___VOLTS

2.7 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm (2") high stencilled letters and directional arrows 150 mm (6") long x 50 mm (2") high.

.2 Colours: Black, or co-ordinated with base colour to ensure strong contrast.

2.8 VALVES, CONTROLLERS

.1 Brass tags with 15 mm (1/2") stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

.3 Provide adhesive coloured tab (max. size 15 mm) indication on ceiling to locate valves/equipment above. Same applies to grid. Colour to be approved by consultant.

2.9 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

.3 Provide equipment identification and/or indication on ceiling to locate devices/equipment above ceiling. Install identification on grid. Colours to be approved by consultant.

2.10 LANGUAGE

.1 Identification to be in English.

Part 3 Execution

3.1 TIMING

.1 Provide identification only after all painting specified has been completed.

3.2 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and/or CSA registration plates as required by respective agency.

3.3 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection

.1 Do not paint, insulate or cover in any way.

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels not more than 1.7 m (5'-8") intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, other confined spaces, at entry and exit points, and at each access opening.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification to be easily and accurately readable from usual operating areas and from access points.

.1 Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.5 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Consultant. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively. Where existing numbering system is installed start new numbering system at 100.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do all other work as specified in this section including all air handling systems and equipment, all plumbing systems and equipment and all temperature controls system, building automation systems and equipment.

.2 This contractor must co-ordinate their work with that of the TAB contractor.

1.2 QUALIFICATIONS OF TAB AGENCIES

.1 Names of all personnel it is proposed to perform TAB to be submitted to and approved by Consultant within 30 days of start of work.

.2 Provide documentation confirming qualifications, successful experience.

.3 Only the following NEBB (National Environmental Balancing Bureau) TAB contractors may quote:

.1 Air Audit Inc.
110 Turnbull Court, Unit 11
Cambridge, Ontario
N1T 1K6
(519) 740-0871

.2 Air Velocities Control Ltd.
100 Premium Way
Mississauga, Ontario
L5B 1A2
(905) 279-4433

.3 Flowset Balancing Ltd.
431 Willis Dr.
Oakville, Ontario
L6L 4V6
(416) 410-9793

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 TAB REQUIREMENTS

.1 General requirements applicable to all work specified this paragraph:

.1 Qualifications of TAB personnel: as for air systems specified this section.

.2 Quality assurance: as for air systems specified this section.

.3 Smoke management systems:

.1 Test for proper operation of all smoke and fire dampers installed as component parts of air systems specified.

.4 Provide duct testing as specified.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 The Mechanical Contractor shall provide the labour and material to conduct the closeout process as outlined in this specification section.

.2 The mechanical contractor shall perform the closeout requirements specified in conjunction with the independent commissioning consultant (CC) retained by the owner.

Part 2 Products

2.1 GENERAL

.1 The mechanical contractor and manufacturers shall provide all instrumentation and equipment necessary to conduct the tests specified. The Mechanical Contractor shall advise the Mechanical Consultant of instrumentation to be used and the dates the instruments were calibrated.

Part 3 Execution

3.1 THE CONTRACT CLOSE OUT PROCESS

.1 The mechanical contractor close out process shall consist of:

- Shop Drawings and As-built Drawings
- Installation inspection and equipment verification
- Plumbing and drainage system testing
- Testing of piping systems
- Independent contractor balancing of water systems
- Testing of air systems
- Independent contractor balancing of air systems
- Testing of equipment and systems
- BAS Commissioning
- Operating and maintenance manuals
- Training
- Systems Demonstration and turnover
- Testing forms
- Warranties
- Contractor to provide list of equipment maintenance including schedule of maintenance parts, quantities, and model fixtures, etc.

3.2 SHOP DRAWINGS AND AS-BUILT DRAWINGS

.1 Conform to General Requirements Section for shop drawings and as-built drawings requirements.

3.3 INSTALLATION INSPECTION AND EQUIPMENT VERIFICATION

.1 The Mechanical Contractor shall co-ordinate with the Consultant who will inspect the mechanical installation.

.2 The Mechanical Contractor shall complete the equipment verification forms for each piece of equipment. The forms shall be included in the operating and maintenance manual. The equipment data shall include:

- Manufacturers name, address and telephone number
- Distributors name, address and telephone number
- Make, model number and serial number
- Pumps - RPM, impeller sizes, rated flow
- Fans - belt type and size, shive type and size
- Electrical - volts, amps, fuse size, overload size
- Any other special characteristics.

3.4 PLUMBING AND DRAINAGE SYSTEM TESTING

.1 The plumbing and drainage system shall be tested in accordance with the Plumbing Code under the Ontario Water Resources Act and the specification.

.2 The Mechanical Contractor shall notify the Building Inspector when systems are available for testing. The Mechanical Contractor shall document all tests performed and shall arrange for the Building Inspector to sign for tests completed. The forms shall be forwarded to the Consultant.

3.5 THE CONTRACTOR'S TESTING OF PIPING SYSTEMS

.1 Test all piping systems in accordance with all applicable plumbing codes and General Requirements section.

.2 All tests for the systems shall be performed in the presence of the Consultant or Commissioning Consultant. Complete the testing forms and forward to the Consultant.

3.6 THE INDEPENDENT CONTRACTORS TESTING AND BALANCING OF WATER SYSTEMS

.1 Conform with the specification section, Testing, Adjusting and Balancing.

.2 The Independent Contractor shall be hired by The Mechanical Contractor and shall report to the Commissioning Consultant.

3.7 THE CONTRACTORS TESTING OF AIR SYSTEMS

.1 Conform with the specification section, Testing, Adjusting and Balancing.

.2 All tests shall be performed in the presence of the Mechanical Consultant or the Commissioning Consultant. Complete the testing forms and forward to the Consultant.

3.8 THE INDEPENDENT CONTRACTORS TESTING AND BALANCING OF AIR SYSTEMS

.1 Conform with specification section, Testing, Adjusting and Balancing.

.2 The Independent Contractor shall be hired by The Mechanical Contractor and shall report to the Commissioning Consultant.

3.9 TESTING OF EQUIPMENT AND SYSTEMS

.1 General:

.1 The Mechanical Contractor shall hire the services of the manufacturers technicians to test the equipment and associated systems. The technician shall record the results of the tests on the testing forms. The tests shall be witnessed by the Consultant or Owners representative. When the tests have been completed satisfactorily the technician and witnessing authority shall sign the forms. A copy of the forms shall be forwarded to the Consultant. The original shall be inserted into the operating and maintenance manual.

.2 Should equipment or systems fail a test, the test shall be repeated after repairs or adjustments have been made. The additional tests shall be witnessed.

.3 Tests which have not been witnessed shall not be accepted and shall be repeated.

.4 The equipment and systems to be tested shall include:
- Condensing Units
- Life Safety and Fire Protection Systems
- Water Treatment Systems
- Building Automation Systems (BAS)

.2 BAS Testing:

.1 The BAS Contractor shall test the system as described in General Requirements and/or Controls Sections.

.2 Co-ordinate with the Consultant and submit completed test forms monthly.

.3 Demonstrate to the Owner and Consultant the operation of the BAS when all tests have been completed.

3.10 CLOSEOUT SCHEDULE

.1 The Mechanical Contractor shall include the schedule for all tests and equipment start-up tests in the construction schedule.

.2 All testing forms and reports associated with the mechanical systems shall be directed to the Consultant with copies to the Owner and Consultant.

.3 The forms and reports to be issued shall include:

- Shop drawings, issued and accepted
- Equipment verification forms
- Testing forms
- Reports resulting from tests
- Testing schedule
- Equipment Start-up Forms

3.11 OPERATION AND MAINTENANCE MANUAL

.1 Conform to General Requirements section for the Operating and Maintenance Manual requirements.

3.12 OPERATOR TRAINING

.1 Conform to General Requirements section for requirements for Instruction to Operating Staff.

.2 The training shall be conducted in a classroom and at the equipment or system.

.3 Training will begin when the operating and maintenance manuals have been delivered to The Owner and approved by the Consultant.

.4 Each training session shall be structured to cover:

The operating and maintenance manual
- Operating procedures
- Maintenance procedures
- Trouble-shooting procedures
- Spare parts required
- Submit a course outline to the Mechanical Consultant before training commences. Provide course documentation for up to eight people.

.5 The training sessions shall be scheduled and co-ordinated by the Mechanical Contractor.

.6 Training shall be provided for the following systems:

System	Minimum Training Times
Condensing Units	2 hours
Life Safety & Fire Protection Systems	2 hours
Water Treatment Systems	2 hours

.7 The minimum training for the BAS shall be 16 hours. The training shall include:

- A walk through of the installation for the Building Owner to review the installation and equipment
- Operation of the central computer
- Operation of portable terminals
- Control sequences
- Report set-up and generation
- Managing the system
- Maintenance requirements

Refer to Controls specification section for further information.

.8 The training requirement for the mechanical system shall include a walk-through of the building by the Mechanical Contractor. During the walk through the Mechanical Contractor shall:

- Identify equipment
- Identify starters associated with equipment
- Identify valves and balancing dampers
- Identify access doors
- Review general maintenance of equipment
- Review drain points in pipework systems
- Identify maintenance items

.9 When each training session has been completed The Owner shall sign the associated form to verify completion.

3.13 MECHANICAL SYSTEM DEMONSTRATION AND TURNOVER

.1 Refer to General Requirements section, Mechanical Project Completion.

.2 The system demonstration and turnover to The Owner shall occur when:

- The installation is complete
- The acceptance test conducted by the Mechanical Consultant has been completed successfully
- Training has been completed
- Operating and Maintenance Manuals have been accepted
- Shop-drawings have been updated
- As-built drawings have been completed

.3 The systems demonstration shall be conducted by the Mechanical Contractor and the manufacturers. The demonstration shall cover a demonstration of equipment installation and operation.

3.14 TESTING FORMS

.1 The Mechanical Contractor and manufacturers shall provide forms for testing. The forms must be approved by the Consultant and The Owner before they are used.

3.15 WARRANTIES

.1 Equipment and system warranties shall not begin until the system demonstration and turnover has been conducted successfully and accepted by The Owner.

.2 The Mechanical Contractor shall fill out the warranty form listing the equipment and systems and the start and finishing dates for warranty.

.3 Refer to the general conditions specification section for the requirements during the warranty period.

3.16 CLOSEOUT PROCESS ALLOCATION

.1 The mechanical contractor closeout process shall be allocated a value equal to a minimum of 3% but not less than $5,000.00.

.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 C 335, Test Method for Steady State Heat Transfer Properties of Pipe Insulation.

.2 ASTM C 921, Practice for Determining the Properties Jacketing Materials for Thermal Insulation.

.3 ASTM B 209M, Specification for Aluminum and Aluminum Alloy Sheet and Plate.

.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): National 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.

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 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.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 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 C 335.

.3 Type A-1: Rigid moulded mineral fibre with factory applied vapour retarder jacket.

.1 Mineral fibre: to ASTM C553.

.2 Jacket: to CGSB 51-GP-52 Ma.

.3 Maximum "k" factor: to ASTM C553.

.4 Type A-2: Mineral fibre faced with factory applied vapour retarder jacket.

.1 Mineral fibre: to ASTM C553.

.2 Jacket: to CGSB 51-GP-52 Ma.

.3 Maximum "k" factor: to ASTM C553.

.5 Materials:

.1 All materials must be supplied by the same manufacturer.

.2 Acceptable Materials:
Fibreglass Canada
Knauf
Manson
Pittsburgh Corning

2.3 INSULATION SECUREMENT

.1 Tape: Self-adhesive, aluminum, reinforced, 50 mm (2") wide minimum.

.2 Contact adhesive: Quick setting.

.3 Canvas adhesive: Washable.

2.4 CEMENT

.1 Thermal insulating and finishing cement:

.1 To ASTM C553.

.2 Hydraulic setting or Air drying on mineral wool, to ASTM C 449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.6 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 JACKETS

.1 Polyvinyl Chloride (PVC):

.1 One-piece moulded type [and sheet] to CAN/CGSB-51.53 with pre-formed shapes as required.

.2 Colours: white.

.3 Minimum service temperatures: -20°C (-4°F).

.4 Maximum service temperature: 65°C (150°F).

.5 Moisture vapour transmission: 0.02 perm.

.6 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.

.2 Tacks.

.3 Pressure sensitive vinyl tape of matching colour.

2.8 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 National 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.

3.3 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: At expansion joints, valves, primary flow measuring elements, flanges, and unions at equipment.

.2 Design: To permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

.3 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	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	25 (1")	25 (1")	25 (1")	25 (1")	25 (1")
Horizontal Cast Iron Sanitary Piping	A-1	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 ANSI/ASME B16.15, Cast Copper Alloy Threaded Fittings, Classes 125 and 250.

.3 ANSI B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.

.4 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

.5 ANSI B16.24, Cast Copper Alloy, Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500, and 2500.

.6 ASTM B88M, Specification for Seamless Copper Water Tube (Metric).

.7 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.

.8 MSS-SP-71, Cast Iron Swing Check Valves, Flanged and Threaded Ends.

.9 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.

1.2 SHOP DRAWINGS

.1 Submit shop drawing data in accordance with general requirements.

1.3 MAINTENANCE DATA

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

Part 2 Products

2.1 PIPING

.1 Domestic hot, cold and recirculation systems, within building.

.1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.

2.2 FITTINGS

.1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI B16.24.

.2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.

.3 Cast copper, solder type: to ANSI B16.18.

.4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

.5 Tee drill NPS 25 mm (1") and larger.

2.3 JOINTS

.1 Solder: 95/5.

.2 Teflon tape: for threaded joints.

.3 Dielectric connections between dissimilar metals: dielectric fitting to ASTM F1545, complete with thermoplastic liner.

.4 Tee drill fittings shall be brazed with silver solder, 45% Ag - 15% Cu or copper phosphorous, 95% Cu, 5% P and non-corrosive flux.

2.4 VALVES

.1 All valves shall be of commercial grade and of same manufacturer, Lead-Free.

.2 Acceptable materials:
Milwaukee
Crane
Kitz

2.5 BALL VALVES

.1 All valves shall be of commercial grade and of same manufacturer.

.2 NPS 80 mm (3") and under, soldered:

.1 To ANSI B16.18, Class 150.

.2 Bronze body, full port stainless steel ball, PTFE Teflon adjustable packing, brass gland and PTFE Teflon seat, steel lever handle, with NPT to copper adaptors.

2.6 GATE VALVES

.1 NPS 50 mm (2") and under, soldered:

.1 Rising stem: to MSS SP-80, Class 125, 860 kPa (125 psi), bronze body, screw-in bonnet, solid wedge disc.

.2 NPS 50 mm (2") and under, screwed:

.1 Rising stem: to MSS SP-80, Class 125, 860 kPa (125 psi), bronze body, screw-in bonnet, solid wedge disc.

2.7 SWING CHECK VALVES

.1 NPS 50 mm (2") and under, soldered:

.1 To MSS SP-80, Class 125, 860 kPa (125 psi), bronze body, bronze swing disc, screw in cap, regrindable seat.

.2 NPS 50 mm (2") and under, screwed:

.1 To MSS SP-80, Class 125, 860 kPa (125 psi), bronze body, bronze swing disc, screw in cap, regrindable seat.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with Provincial Plumbing Code and local authority having jurisdiction.

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

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

.4 Install tubing close to building structure to minimize furring, conserve headroom and space. Group exposed piping and run parallel to walls.

.5 Install CWS piping below and away from HWS and HWC and all other hot piping so as to maintain temperature of cold water as low as possible.

.6 Connect to fixtures and equipment in accordance with manufacturers instructions unless otherwise indicated.

.7 Bent tubing is not acceptable.

3.2 VALVES

.1 Isolate equipment, fixtures and branches with ball valves.

.2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.3 PRESSURE TESTS

.1 Conform to requirements of general requirements.

.2 Test pressure: greater of 1½ times maximum system operating pressure or 860 kPa (125 psi).

3.4 FLUSHING AND DISINFECTING

.1 Maintain testable RP backflow preventor between municipal water and new plumbing system.

.2 Ensure a minimum of 90% of plumbing fixtures are installed.

.3 Flush water mains through available outlets with a sufficient flow of potable water to produce a velocity of 1.5 m/s, within pipe for 10 min, or until foreign materials have been removed and flushed water is clear with backflow protection.

.4 Provide connections and pumps for flushing as required.

.5 Open and close valves, and operate fixtures to ensure thorough flushing.

.6 When flushing has been complete to satisfaction of Consultant introduce a strong solution of Chlorine into water system and ensure that it is distributed throughout entire system.

.7 Rate of chlorine application to be proportional to rate of water entering pipe.

.8 Chlorine injection to be close to point of filling water main or at building water service and to occur simultaneously.

.9 Confirm adequate chlorine residual not less than 50 ppm has been obtained, leave system charged with chlorine solution for 24 h. After 24 h, further samples shall be taken to ensure that there is still not less than 10 ppm of chlorine residual remaining throughout system.

.10 Upon 10 ppm confirmation and 24 hr elapsed time flush line to remove chlorine solution.

.11 Measure chlorine residuals at extreme end of pipe-line being tested.

.12 Perform bacteriological tests on water main, after chlorine solution has been flushed out. Take samples daily for minimum of two days. Should contamination remain or reoccur during this period, repeat disinfecting procedure. Specialist contractor shall submit certified copy of test results.

.13 Take water samples at remote fixtures and service connections.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 CAN/CSA – B64.10/B64.10.1 – Selection and Installation of Backflow Preventers/Maintenance and Field Testing of Backflow Preventers.

1.2 SUBMITTALS

.1 Complete the required cross connection survey form and submit to authority having jurisdiction. Provide a copy to the consultant.

.2 Incorporate data into maintenance manual.

Part 2 Products

2.1 GENERAL

.1 Provide backflow prevention devices in all new and existing fixtures and equipment as indicated and as required by the authority having jurisdiction.

.2 Acceptable materials:
Watts
Wilkins

Part 3 Execution

3.1 INSTALLATION

.1 Install devices in accordance with acceptable engineering practices, the requirements of the Ontario Building Code and the requirements of the authority having jurisdiction.

3.2 TESTING

.1 Provide testing to requirements of authority having jurisdiction.

.2 Provide copy of test report for each device in the maintenance manual.

.3 Provide tag on each device.

.4 Provide a list of devices complete with tag number on a framed chart. Locate chart in Water Entrance Room.

.5 Provide additional testing on all devices at one year warranty period. Provide documentation to owner and consultant.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 ASTM A126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

.3 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.

.4 PDI-WH201, Water Hammer Arresters.

.5 CAN/CSA-B64 Series, Backflow Preventers and Vacuum Breakers.

1.2 SUBMITTALS

.1 Submit shop drawings and product data in accordance with general requirements.

.2 For shop drawings, indicate dimensions, construction details and materials.

.3 For product data, indicate dimensions, construction details and materials for all items specified herein.

1.3 MAINTENANCE DATA

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

.2 Data to include:

.1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

Part 2 Products

2.1 WATER HAMMER ARRESTORS

.1 Copper construction, bellows type: to PDI-WH 201.

.2 Acceptable material:
Zurn Z-1700
Mifab MWH-100
Ancon No. 15

2.2 BACK FLOW PREVENTORS

.1 The backflow preventor shall prevent backflow by either backpressure or backsiphonage from a cross-connection between potable water lines and substances that are objectionable.

.2 To CAN/CSA-B64.

.3 Application: as indicated.

.4 Reduced pressure principle type up to 50 mm (2") (RP):
Rated to 180°F and supplied with full port ball valves. The main body and access covers shall be bronze (ASTM B584), the seat ring and all internal polymers shall be NSF® Listed Noryl™ and the seat disc elastomers shall be SILICONE. The first and second check shall be orientated at a 45° angle up-wards and accessible for maintenance without removing the relief valve. Supplied with an air gap adapter.

.1 Acceptable materials:
Watts 009 ½" - 2"
Wilkins 975 XL ½" - 2"
Conbraco 40-200 Series

.5 Double check valve assembly (DCVA):
The double check type backflow preventer shall be ASSE 1015 approved, and supplied with full port ball valves. The main body and access covers shall be bronze (ASTM B584), the seat rings and all internal polymers shall be NSF® Listed Noryl™ and the seat disc elastomers shall be silicone. The first and second checks shall be accessible for maintenance without removing the device from the line.

.1 Acceptable materials:
Watts 007 ½"- 2"
Wilkins 950XL ¾ "- 2"
Conbraco 40-100 Series

.6 Back flow preventor with intermediate atmospheric vent:

.1 Acceptable material:
Watts Series 9D
Wilkins 750
Conbraco 40-4A Series

2.3 VACUUM BREAKERS

.1 To CAN/CSA-B64 Series.

.2 Atmospheric vacuum breaker (A-VB):

.1 Acceptable materials:
Watts 288A
Conbraco 38-103 Series
Wilkins 35

.3 Hose connection vacuum breaker (HCVB):

.1 Acceptable materials:
Watts Series 8
Conbraco 38-304-AS
Wilkins BFP-8

2.4 PRESSURE REGULATORS

.1 Capacity: as indicated.

.1 Inlet pressure: 1034 kPa (150 psi).

.2 Outlet pressure: 41 kPa (5.9 psi).

.2 Up to NPS 40 mm (1 1/2") bronze bodies, screwed: to ASTM B62.

.1 Acceptable material:
Watts Series 25AUB (1/2" - 2")

.3 NPS 50 mm (2") and over, semi-steel bodies, Class 125, flanged: to ASTM A126, Class [B].

.1 Acceptable materials:
Watts PV-10
Conbraco 36 Series

.4 Semi-steel spring chambers with bronze trim.

.1 Acceptable materials:
Watts PV-10
Conbraco 36 Series

2.5 STRAINERS

.1 860 kPa (125 psi), Y type with 20 mm (3/4") mesh, bronze or stainless steel removable screen.

.2 NPS 50 mm (2") and under, bronze body, screwed ends, with brass cap.

.1 Acceptable materials:
Watts Series 777SI
Crane/Powers
Colton 125 YTB
Wilkins S Series

2.6 SOLENOID VALVES

.1 Two (2) way normally closed all bronze construction.

.2 Voltage shall be suitable for controlling function.

.3 Acceptable material:
Asco

2.7 OWNER SUPPLIED EQUIPMENT

.1 The mechanical contractor shall supply and install all water, gas, condensate and sanitary piping to the owner supplied equipment. Connection to equipment shall be by this contractor.

.2 Provide flexible riser stops to all sinks and ball valves to all other equipment.

.3 Provide backflow preventors on equipment required by the local plumbing inspector.

.4 Provide flexible gas piping to all gas equipment.

.5 All equipment in store equipment schedule will be supplied and set in place by Mechanical Contractor unless otherwise noted.

.6 Coordinate all rough-ins and connection with the supplier on site.

.7 Owner supplied equipment includes existing relocated equipment.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with provincial codes, and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.2 WATER HAMMER ARRESTORS

.1 Install on branch supplies to each fixture or group of fixtures and where indicated.

3.3 BACK FLOW PREVENTORS

.1 Install in accordance with CAN/CSA-B64 Series, where indicated and elsewhere as required by code.

.2 Pipe discharge to terminate over nearest drain and or service sink.

.3 Provide test results in manual and leave tag with test results on device.

3.4 STRAINERS

.1 Install with sufficient room to remove basket.

.2 Strainer size to match pipe size.

3.5 COMMISSIONING

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

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

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

.4 Adjust to suit site conditions, including, but not necessarily limited to, following:

.1 Water hammer arrestors:

.1 Verify accessibility.

.2 Backflow preventors, vacuum breakers:

.1 Verify installation of correct type to suit application.

.2 Adjust as necessary to ensure proper operation.

.3 Verify visibility of discharge.

.3 Pressure regulators:

.1 Adjust settings to suit installed locations, required flow rates.

.4 Pipeline strainers:

.1 Verify accessibility of basket.

.2 Clean out during commissioning until system clean.

.5 Commissioning reports:

.1 Record all results on approved report forms.

.2 Include signature of tester and supervisor.

.3 To be countersigned by Consultant.

.6 Verification:

.1 Notify Consultant 48 h before commencing tests.

.2 All tests and procedures to be witnessed by Consultant.

.3 All reported results subject to verification by consultant.

.7 Training:

.1 Train O&M personnel in start-up, operation, monitoring, servicing, maintenance and shut-down procedures.

.8 Demonstrations:

.1 Demonstrate full compliance with Design Criteria.

.2 Demonstrations also to show completeness of O&M personnel training.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 ASTM A126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

.3 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.

.4 CAN/CSA-B79, Commercial and Residential Drains and Cleanouts.

1.2 SUBMITTALS

.1 Submit shop drawings and product data in accordance with general requirements.

.2 For shop drawings, indicate dimensions, construction details and materials.

.3 For product data, indicate dimensions, construction details and materials for all items specified herein.

1.3 MAINTENANCE DATA

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

.2 Data to include:

.1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

Part 2 Products

2.1 FLOOR DRAINS

.1 Floor drains and trench drains: to CAN/CSA-B79.

.2 For sizes and types refer to drawing schedules.

2.2 CLEANOUTS

.1 Cleanout plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.

.2 Wall access: face or wall type, stainless steel round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.

.1 Acceptable material:
Zurn ZSS-1469
Mifab C1400-RD
Watts CO-480-RD-3
Jay R. Smith 4710

.3 Floor access: rectangular, round, as indicated, cast iron body and frame with adjustable secured 15 mm (½") thick flush mounted heavy duty nickel bronze top and:
Plugs: bolted bronze with neoprene gasket.

.1 Cover for unfinished concrete floors: nickel bronze round, gasket, vandal-proof screws.

.1 Acceptable material:
Zurn ZN-1400 – HD or Zurn ZXN-1612
Mifab C1100-XR-6
Watts CO-200-RX-1-6
Jay R. Smith SQ-4-1753-XNBCO-SP-U

.2 Cover for terrazzo finish: round polished nickel bronze with recessed cover for filling with terrazzo, vandal-proof locking screws.

.1 Acceptable materials:
Zurn ZN-1400-Z
Mifab C1100-UR-6
Watts CO-200-U-1-6
Jay R. Smith SQ-4-1753-NBRT-SP-U

.3 Cover for VCT tile and linoleum floors: square polished nickel bronze with 15 mm (1/2") thick flush mounted heavy duty nickel bronze cover, complete with vandal-proof locking screws.

.1 Acceptable materials:
Zurn ZN-1400-T – HD
Mifab C1100-TS-6
Watts CO-200-TS-1-6
Jay R. Smith 4200-U

.4 Cover for ceramic tile floors: 15 mm (½") thick heavy duty nickel bronze square, cover complete with gasket, vandal-proof screws, for flush finish.

.1 Acceptable material:
Zurn ZN-1400 – T-HD or Zurn ZXN-1612
Mifab C1100-S-6
Watts CO-200-S-1-6
Jay R. Smith SQ-4-1753-NBCO-SP-U-Y

2.3 BACKWATER VALVES

.1 Coated extra heavy cast iron body with bronze seat, revolving bronze flapper and threaded cover. Backwater valves shall be accessible from elevator pit/drain.

.1 Acceptable materials:
Zurn Z-1090
Mifab BV1200-R
Watts BV200
Jay R. Smith 7012

2.4 TRAP SEAL PRIMERS

.1 All brass, with integral vacuum breaker, NPS 15 mm (1/2") solder ends, NPS 15 mm (1/2") drip line connection.

.2 Acceptable materials:
Zurn Z-1022
Mifab
Watts MS-810
Jay R. Smith 2699

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with provincial codes, and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.2 CLEANOUTS

.1 In addition to those required by code, and as indicated, install at base of all soil and waste stacks.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 100 mm (4").

3.3 BACKWATER VALVES

.1 Install where indicated.

3.4 TRAP SEAL PRIMERS

.1 Install for all floor, hub and trench drains and elsewhere, as indicated.

.2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Consultant.

.3 Install soft copper tubing to floor drains above grade and polyethylene piping to floor drains below grade.

3.5 COMMISSIONING

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

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

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

.4 Adjust to suit site conditions, including, but not necessarily limited to, following:

- .1 Floor, hub and trench drains:
  - .1 Verify proper operation of trap primer, flushing features.
  - .2 Verify security and removability of strainers.
- .2 Cleanouts:
  - .1 Verify covers are gastight, secure and easily removable.
  - .2 Verify that cleanout rods can probe as far as next cleanout.
- .3 Backwater valves:
  - .1 Verify accessibility of cover, valve.
- .4 Trap seal primers:
  - .1 Verify operation.
  - .2 Adjust flow rate to suit site conditions.
- .5 Acid dilution devices:
  - .1 Verify operation.

.5 Commissioning reports:

- .1 Record all results on approved report forms.
- .2 Include signature of tester and supervisor.
- .3 To be countersigned by Consultant.

.6 Verification:

- .1 Notify Consultant 48 h before commencing tests.
- .2 All tests and procedures to be witnessed by Consultant.
- .3 All reported results subject to verification by consultant.

.7 Training:

- .1 Train O&M personnel in start-up, operation, monitoring, servicing, maintenance and shut-down procedures.

.8 Demonstrations:

- .1 Demonstrate full compliance with Design Criteria.
- .2 Demonstrations also to show completeness of O&M personnel training.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 ASTM B32, Specification for Solder Metal.

.3 ASTM B306, Specification for Copper Drainage Tube (DWV).

.4 ASTM C564, Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.5 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.

.6 CAN/CSA-B125.3, Plumbing Fittings.

Part 2 Products

2.1 COPPER TUBE AND FITTINGS

.1 Above ground sanitary, and vent, maximum 65 mm (2½") Type DWV copper to: ASTM B306.

- .1 Fittings.
  - .1 Cast brass: to CAN/CSA B125.3.
  - .2 Wrought copper: to CAN/CSA B125.3.
- .2 Solder: tin-lead, 50:50, to ASTM B32, type 50A.

2.2 CAST IRON PIPING AND FITTINGS

.1 Above ground sanitary, and vent, minimum NPS 80 mm (3"), cast iron to: CAN/CSA-B70.

- .1 Mechanical joints (vents)
  - .1 Neoprene or butyl rubber compression gaskets: to ASTM C564 or CAN/CSA-B70.
  - .2 Stainless steel clamps (2 band).
- .2 Mechanical joints (sanitary)
  - .1 Heavy duty neoprene or butyl rubber compression gaskets to: ASTM C1540.
  - .2 Stainless steel clamps (4 band min).

2.3 VENT FLASHINGS

.1 Thaler or equal spun aluminum complete with insulation, cap, and rubber gasket.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with Provincial Plumbing Code and local authority having jurisdiction.

.2 Install above ground piping parallel and close to walls and ceilings to conserve headroom and space, and to grade as indicated.

.3 Place Cleanouts

- .1 Where shown on Drawings and near bottom of each stack and riser.
- .2 At every 90 degree change of direction for horizontal lines.
- .3 Every 15 m (50') of horizontal run.
- .4 Extend clean out to accessible surface. Do not place cleanouts in carpeted floors. In such locations, use wall type cleanouts.

.4 Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have a seal trap in connection with a complete venting system so gases pass freely to atmosphere with no pressure or syphon condition on water seal.

.5 Vent entire waste system to atmosphere.

- .1 Discharge 500 mm (20") above roof. Join lines together in fewest practicable number before projecting above roof.
- .2 Set back vent lines so they will not pierce roof near an edge or valley.
- .3 Venting shall be 7.5 m (25’-0”) from any outdoor air intakes.
- .4 Provide copper vent piping through roof as per detail.

.6 Use torque wrench to obtain proper tension in cinch bands when using hubless cast iron pipe. Butt ends of pipe against centering flange of coupling.

.7 Flash pipes passing through roof with 453 g (16 oz) sheet copper flashing fitted snugly around pipes and caulk between flashing and pipe with flexible waterproof compound.

- .1 Flashing base shall be at least 600 mm (24") square.
- .2 Flashing may be a 24 kg/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 Buried sanitary, and vent piping to:

- .1 80 mm (3”) and smaller: ABS drain waste and vent pipe to CAN/CSA-B181.1.
- .2 100 mm (4”) and larger: SDR-35 PVC drain waste and vent pipe to CAN/CSA-B181.2.
- .3 Vent piping: any size, PVC-DWV plastic drain and sewer pipe and fittings CAN/CSA-B181.2.

.2 Above grade sanitary and vent piping:

- .1 80 mm (3”) and smaller: IPEX: PVC-XFR drain waste and vent pipe to CAN/CSA-B181.2.
- .2 100 mm (4”) and larger: IPEX: PVC-XFR drain waste and vent pipe to CAN/CSA-B181.2.
- .3 Vent piping: any size, IPEX: PVC-XFR plastic drain and sewer pipe and fittings CAN/CSA-B181.2.

.3 Where piping pierces a fire separation an approved fire stop system to the approval of authority having jurisdiction shall be used.

2.2 JOINTS

.1 Solvent weld for PVC: to ASTM D2564.

.2 Solvent weld for ABS: to ASTM D2235.

2.3 EXPANSION

.1 Provide solvent welded expansion joints as required by manufacturer's recommendations.

2.4 VENT FLASHINGS

.1 Thaler Stack Jack spun aluminum complete with insulation, cap, and rubber gasket.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with Provincial Plumbing Code and local authority having jurisdiction. Install in accordance with manufacturer's instructions.

.2 Installation of underground pipe

- .1 Provide all excavation, bedding, backfill, and compaction.
- .2 Install materials in accordance with Manufacturer's instructions.
- .3 Use jacks to make-up gasketed joints.
- .4 Stabilize unstable trench bottoms.
- .5 Bed pipe true to line and grade with continuous support from firm base.
  - .1 Bedding depth - 100 mm to 150 mm (4" to 6").
  - .2 Material and compaction to meet ASTM standard noted above.
- .6 Excavate bell holes into bedding material so pipe is uniformly supported along its entire length. Blocking to grade pipe is forbidden.
- .7 Trench width at top of pipe -
  - .1 Minimum 450 mm (18") or diameter of pipe plus 300 mm (12"), whichever is greater.
  - .2 Maximum - Outside diameter of pipe plus 600 mm (24").
- .8 Piping and joints shall be clean and installed according to manufacturer's recommendations. Break down contaminated joints, clean seats and gaskets and reinstall.
- .9 Do not use back hoe or power equipment to assemble pipe.
- .10 Initial backfill shall be 300 mm (12") above top of pipe with material specified in referenced ASTM standard.

.3 Place Cleanouts

- .1 Where shown on Drawings and near bottom of each stack and riser.
- .2 At every 90 degree change of direction for horizontal lines.
- .3 Every 15 m (50 ft) of horizontal run.
- .4 Extend clean out to accessible surface. Do not place cleanouts in carpeted floors. In such locations, use wall type cleanouts

.4 Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have a seal trap in connection with a complete venting system so gases pass freely to atmosphere with no pressure or syphon condition on water seal.

.5 Before piping is covered, conduct tests in presence of Consultant and correct leaks or defective work. Conduct test prior to placing floor slab but after backfill is placed.

.1 Fill waste and vent system a minimum of 1.8 m (6 ft) above finished floor with water and show no leaks for 2 hours.

.2 Conduct ball test in presence of consultant to ensure proper grade and clear of obstructions.

.6 Install solvent welded expansion joints as per manufacturer's recommendation. Care is to taken to accommodate ambient temperatures at time of install.

.7 Vent entire waste system to atmosphere.

.1 Discharge 350 mm (14") above roof. Join lines together in fewest practicable number before projecting above roof.

.2 Set back vent lines so they will not pierce roof near an edge or valley.

.3 Venting shall be 7.5 m (25'-0") from any outdoor air intakes.

.8 Flash pipes passing through roof with Thaler insulated Stack Jack flashing.

.1 Flashing base shall be at least 600 mm (24") square.

.9 Install above ground piping parallel and close to walls and ceilings to conserve headroom and space, and to grade as indicated.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 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 storm maximum 65 mm (2½") Type DWV copper to: ASTM B306.

.1 Fittings.

.1 Cast brass: to CAN/CSA B125.3.

.2 Wrought copper: to CAN/CSA B125.3.

.2 Solder: tin-lead, 50:50, to ASTM B32, type 50A.

2.2 CAST IRON PIPING AND FITTINGS

.1 Above ground storm minimum NPS 80 mm (3"), cast iron to: CAN/CSA-B70.

.1 Mechanical joints (storm)

.1 Heavy duty neoprene or butyl rubber compression gaskets to: ASTM C1540.

.2 Stainless steel clamps (4 band min).

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with Provincial Plumbing Code and local authority having jurisdiction.

.2 Install above ground piping parallel and close to walls and ceilings to conserve headroom and space, and to grade as indicated.

.3 Place Cleanouts

.1 Where shown on Drawings and near bottom of each stack and riser.

.2 At every 90 degree change of direction for horizontal lines.

.3 Every 15 m (50') of horizontal run.

.4 Extend clean out to accessible surface. Do not place cleanouts in carpeted floors. In such locations, use wall type cleanouts.

.4 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.

.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 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 Acrylonitrille-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

.3 ASTM D2564, Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.

.4 CAN/CSA-B181.1, ABS Drain, Waste and Vent Pipe and Pipe Fittings.

.5 CAN/CSA-B181.2, PVC and CPVC Drain, Waste and Vent Pipe and Pipe Fittings.

.6 CAN/CSA-B182.1, Plastic Drain and Sewer Pipe and Pipe Fittings.

Part 2 Products

2.1 PIPING AND FITTINGS

.1 Buried storm piping to:

.1 80 mm (3”) and smaller: ABS drain pipe to CAN/CSA-B181.1.

.2 100 mm (4”) and larger: SDR-35 PVC drain pipe to CAN/CSA-B181.2.

.2 Above grade storm piping:

.1 80 mm (3”) and smaller: IPEX: PVC-XFR fire rated drain storm pipe to CAN/CSA-B181.1.

.2 100 mm (4”) and larger: IPEX: PVC-XFR storm pipe to CAN/CSA-B181.2.

.3 Where piping pierces a fire separation an approved fire stop system to the approval of authority having jurisdiction shall be used.

2.2 JOINTS

.1 Solvent weld for PVC: to ASTM D2564.

.2 Solvent weld for ABS: to ASTM D2235.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with Provincial Plumbing Code and local authority having jurisdiction.

.2 Installation of underground pipe

.1 Provide all excavation, bedding, backfill, and compaction.

.2 Install materials in accordance with Manufacturer's instructions.

.3 Use jacks to make-up gasketed joints.

.4 Stabilize unstable trench bottoms.

.5 Bed pipe true to line and grade with continuous support from firm base.

.1 Bedding depth - 100 mm to 150 mm (4" to 6").

.2 Material and compaction to meet ASTM standard noted above.

.6 Excavate bell holes into bedding material so pipe is uniformly supported along its entire length. Blocking to grade pipe is forbidden.

.7 Trench width at top of pipe -

.1 Minimum 450 mm (18") or diameter of pipe plus 300 mm (12"), whichever is greater.

.2 Maximum - Outside diameter of pipe plus 600 mm (24").

.8 Piping and joints shall be clean and installed according to manufacturer's recommendations. Break down contaminated joints, clean seats and gaskets and reinstall.

.9 Do not use back hoe or power equipment to assemble pipe.

.10 Initial backfill shall be 300 mm (12") above top of pipe with material specified in referenced ASTM standard.

.3 Place Cleanouts

.1 Where shown on Drawings and near bottom of each stack and riser.

.2 At every 90 degree change of direction for horizontal lines.

.3 Every 15 m (50 ft) of horizontal run.

.4 Extend clean out to accessible surface. Do not place cleanouts in carpeted floors. In such locations, use wall type cleanouts

.4 Before piping is covered, conduct tests in presence of Consultant and correct leaks or defective work. Conduct test prior to placing floor slab but after backfill is placed.

.1 Fill waste and vent system a minimum of 1.8 m (6 ft) above finished floor with water and show no leaks for 2 hours.

.2 Conduct ball test in presence of consultant to ensure proper grade and clear of obstructions.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 ASTM A126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

.3 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.

.4 CAN/CSA-B79, Commercial and Residential Drains and Cleanouts.

1.2 SUBMITTALS

.1 Submit shop drawings and product data in accordance with general requirements.

.2 For shop drawings, indicate dimensions, construction details and materials.

.3 For product data, indicate dimensions, construction details and materials for all items specified herein.

1.3 MAINTENANCE DATA

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

.2 Data to include:

.1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

Part 2 Products

2.1 ROOF DRAINS

.1 For types and sizes refer to drawing schedules.

2.2 CLEANOUTS

.1 Cleanout plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.

.2 Wall access: face or wall type, stainless steel round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.

.1 Acceptable material:
Zurn ZSS-1469
Mifab C1400-RD
WATTS CO-480-RD-3
Jay R. Smith SQ-A-1753-XNBCO-SP-U

.3 Floor access: rectangular, round, as indicated, cast iron body and frame with adjustable secured 15 mm (½") thick flush mounted heavy duty nickel bronze top and:
Plugs: bolted bronze with neoprene gasket.

.1 Cover for unfinished concrete floors: nickel bronze round, gasket, vandal-proof screws.

.1 Acceptable material:
Zurn ZN-1400 – HD or Zurn ZXN-1612
Mifab C1100-XR-6
WATTS CO-200-RX-1-6
Jay R. Smith SQ-4-1753-XNBCO-SP-U

.2 Cover for terrazzo finish: round polished nickel bronze with recessed cover for filling with terrazzo, vandal-proof locking screws.

.1 Acceptable materials:
Zurn ZN-1400-Z
Mifab C1100-UR-6
WATTS CO-200-TS-1-6
Jay R. Smith SQ-4-1753-NBRT-SP-U

.3 Cover for VCT tile and linoleum floors: square polished nickel bronze with 15 mm (1/2") thick flush mounted heavy duty nickel bronze cover, complete with vandal-proof locking screws.

.1 Acceptable materials:
Zurn ZN-1400-T – HD
Mifab C1100-TS-6
WATTS CO-200-S-1-6
Jay R. Smith 4200-U

.4 Cover for ceramic tile floors: 15 (½") thick heavy duty nickel bronze square, cover complete with gasket, vandal-proof screws, for flush finish.

.1 Acceptable material:
Zurn ZN-1400 – T-HD or Zurn ZXN-1612
Mifab C1100-S-6
WATTS CO-200-RC-1-6
Jay R. Smith SQ-4-1753-NBCO-SP-U-Y

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with provincial codes, and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

.3 Install roof drains in lowest point of roof. Co-ordinate location with architectural, structural, and mechanical drawings.

3.2 CLEANOUTS

.1 In addition to those required by code, and as indicated, install at base of all soil and waste stacks, and rainwater leaders.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 100 mm (4").

3.3 COMMISSIONING

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

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

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

.4 Adjust to suit site conditions, including, but not necessarily limited to, following:

.1 Roof drains:

.1 Verify installation at low points in roof.

.2 Verify security and removability of dome.

.3 Adjust weirs to suit actual roof slope and meet requirements of design.

.4 Verify provision for movement of roof and integrity of roof drain piping system.

.2 Cleanouts:

.1 Verify covers are gastight, secure and easily removable.

.2 Verify that cleanout rods can probe as far as next cleanout.

.5 Commissioning reports:

.1 Record all results on approved report forms.

.2 Include signature of tester and supervisor.

.3 To be countersigned by Consultant.

.6 Verification:

.1 Notify Consultant 48 h before commencing tests.

.2 All tests and procedures to be witnessed by Consultant.

.3 All reported results subject to verification by consultant.

.7 Training:

.1 Train O&M personnel in start-up, operation, monitoring, servicing, maintenance and shut-down procedures.

.8 Demonstrations:

.1 Demonstrate full compliance with Design Criteria.

.2 Demonstrations also to show completeness of O&M personnel training.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with general requirements.

.2 Indicate:

.1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

.2 Wiring and schematic diagrams.

.3 Dimensions and recommended installation.

.4 Pump performance and efficiency curves.

1.3 CLOSEOUT SUBMITTALS

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

.2 Data to include:

.1 Manufacturer's name, type, model year, capacity, and serial number.

.2 Details of operation, servicing, and maintenance.

.3 Recommended spare parts list with names and addresses.

Part 2 Products

2.1 THERMOSTATIC WATER CONTROLLER (3 Port)

.1 ½" inlets ½" outlets thermostatic controller with swivel action check stops, removable cartridge with strainer, stainless steel piston and liquid fill thermal motor with bellows mounted out of water. Volume control shut off valve, bimetal dial thermometer (3" face, range 20° – 240°F), brass pipe, fittings and unions. Standard valve and piping finish is rough bronze.

.2 Acceptable materials:
Powers LM490
DELTA R3070-MIXLF

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 Conform to Sections of Division 1 and to General Mechanical Requirements Section.

1.2 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 Perform work in accordance with the recommendations of and the requirements of:

.1 Local and district bylaws and regulations.

.2 N.F.P.A.14 “Installation of Standpipe and Hose Systems".

.3 The Ontario Building Code.

.4 U.L.C. or Factory Mutual approval for hose, valve and extinguisher requirements.

.5 N.F.P.A.10 “Standard for Portable Fire Extinguishers”.

.6 The Ontario Fire Code.

1.3 SUBMITTALS

.1 Submit shop drawings and maintenance data in accordance with general requirements.

1.4 COORDINATION

.1 Confirm fire extinguisher cabinet locations and quantities from both architectural and mechanical drawings and report any discrepancies to consultant prior to bid close.

.2 Coordinate location of cabinet with other trades and provide protection against damage during construction.

Part 2 Products

2.1 MULTI-PURPOSE DRY CHEMICAL EXTINGUISHERS (CLASS ABC)

.1 Stored pressure rechargeable type with hose and shut off nozzle, ULC labelled for A, B and C class protection as indicated. Size of extinguishers shall be as follows:

.1 Storage Rooms 10 lb ABC rating

.2 Corridor/Finished Areas 5 lb ABC rating complete with cabinet

.3 Acceptable materials:

.1 Wilson & Cousins

.2 National

2.2 CABINETS

.1 Recessed mounted type of a size sufficient to contain all necessary components. Tub to be constructed of 1.5 mm (16 gauge) steel and finished with Wilco "Pro-Tech" Premier white painted finish. Adjustable frame comprising of 180° opening door and trim to be separate assembly adaptable to any type of finished wall. Trim to have 6 mm (1/4") return on outer edges with full length semi-concealed piano hinge, and Corbin style latching device.

.2 Doors and trim to be 1.5 mm (16 gauge) white painted finish. Door glass to be 6 mm (1/4") Duo Lite Safety Glass.

.3 Cabinet to maintain fire resistive rating of construction in which they occur.

.4 Do not provide cabinets for mechanical room and service area fire extinguishers unless indicated.

.5 Acceptable material:

.1 Wilson & Cousins Model IE - 105R (5 and 10 lb. Class)

.2 National

2.3 IDENTIFICATION

.1 Identify extinguishers in accordance with recommendations of NFPA 10.

.2 Attach tag or label to extinguishers indicating month and year of installation and provide space for the addition of recording service dates.

Part 3 Execution

3.1 INSTALLATION

.1 Provide portable fire extinguisher cabinets and mount in wall during construction. Cabinet to be surface or recessed mounted as indicated on the drawings. Install cabinets so that the door will not obstruct normal traffic when open.

.2 Hang extinguishers in cabinets with wall mounting bracket.

.3 Prior to installing the extinguisher cabinets, confirm the mounting height and exact location with the Consultant. Mount extinguisher so top of unit is not more than 1.5 m (5’).

.4 Install wall mounted fire extinguishers complete with wall mounting bracket where indicated and/or directed on site by consultant.

.5 Caulk perimeter of fire extinguisher cabinets after acceptance.

3.2 TESTS

.1 Fire protection equipment shall be tested to the requirements of NFPA10, NFPA13, NFPA14 and comply with the requirements of the authorities having jurisdiction.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 CAN/CSA B45S1, Supplement #1 to CAN/CSA B-45 Series Plumbing Fixtures.

.3 CAN/CSA-B45 Series, CSA Standards on Plumbing Fixtures.

.4 CAN/CSA-B125.3, Plumbing Fittings.

.5 CAN/CSA-B651, Accessible Design for the Built Environment.

1.2 SHOP DRAWINGS

.1 Submit shop drawings and product data in accordance with general requirements.

.2 Indicate, for all fixtures and trim:

.1 Dimensions, construction details, roughing-in dimensions.

.2 Factory-set water consumption per flush at recommended pressure.

.3 For water closets, urinals: minimum pressure required for flushing.

1.3 CLOSEOUT SUBMITTALS

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

.2 Include:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

1.4 PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION

.1 Install rough-in for equipment supplied by others, complete with valves on hot and cold water supplies, waste and vent.

.2 Equipment installed by others.

.1 Connect with unions.

.3 Equipment not installed.

.1 Capped with valves for future connection by others.

Part 2 Products

2.1 MANUFACTURED UNITS

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.3.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: Architectural drawings to govern.

.5 Fixtures in any one location to be product of one manufacturer and of same type.

.6 Trim in any one location to be product of one manufacturer and of same type.

2.2 FIXTURE CARRIERS

.1 Provide factory manufactured floor-mounted carrier systems for all wall-mounted fixtures.

.2 Acceptable materials:

.1 Zurn

.2 Smith

.3 Ancon

2.3 PLUMBING FIXTURES

.1 Refer to plumbing fixture schedule on the drawings for fixture type, manufacturer, trim, drainage supply, and accessories.

2.4 FIXTURE PIPING

.1 Hot and cold water supplies to each fixture/faucet:

Chrome plated flexible supply pipes each with screwdriver stop, reducers, escutcheon and chrome plated nipple.

.1 Acceptable materials:

.1 Delta 47T900 Series

.2 McGuire

.2 Waste:
Open grid strainer, or pop up as indicated, offset open grid strainer on Barrier-Free fixtures, cast brass fittings with tubular piping, chrome plated, rubber gasket compression fitting, and overflow flange.

.1 Acceptable materials:

.1 Delta 33T200 Series

.2 McGuire

.3 'P' Traps:

Cast brass P trap with cleanout on each fixture not having integral trap.

Chrome plated in all exposed places.

.1 Acceptable materials:

.1 Delta 33T300 Series

.2 McQuire

Part 3 Execution

3.1 INSTALLATION

.1 Mounting heights:

.1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified. Confirm mounting height(s) with consultant prior to rough-in.

.2 Wall-hung fixtures: measured from finished floor.

.3 Physically Barrier-Free: to comply with most stringent of either NBCC or CAN/CSA B651.

.2 Drinking fountains:

.1 In accordance with CAN/CSA B45S1.

3.2 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments.

.1 Adjust water flow rate to design flow rates.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Adjust flush valves to suit actual site conditions.

.4 Adjust urinal flush timing mechanisms.

.5 Adjust water cooler, drinking fountain flow stream to ensure no spillage.

.6 Automatic flush valves for water closets and urinals: set controls to prevent unnecessary flush cycles during silent hours.

.3 Checks.

.1 Water closets, urinals: flushing action.

.2 Aerators: operation, cleanliness.

.3 Vacuum breakers, backflow preventors: operation under all conditions.

.4 Wash fountains: operation of flow-actuating devices.

.5 Refrigerated water coolers: operation, temperature settings.

.4 Thermostatic controls.

.1 Verify temperature settings, operation of control, limit and safety controls.

.5 Floor and wall mounted fixtures: caulk to floor or wall using silicone caulking to make water tight, colour to match fixture.

.6 Counter mounted fixtures: lay fixtures into bead of caulking to ensure excess moisture does not reach the cut edge of the countertop. Clean excess caulking off outside the sink.

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 CAN/ULC-S702, Mineral Fiber Thermal Insulation for Buildings.

.3 ASTM C612, Mineral Fiber Block and Board Thermal Insulation.

.4 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 C 335, Test Method for Steady State Heat Transfer Properties of Pipe Insulation.

.2 ASTM C 449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.3 ASTM B 209M, Specification for Aluminum and Aluminum Alloy Sheet and Plate.

.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): National 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.

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 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.

.2 Insulation systems - insulation material, fasteners, jackets, and other accessories.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 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 C 335.

.3 Type C-1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma:

.1 Mineral fibre: to ASTM C553.

.2 Jacket: to CGSB 51-GP-52 Ma.

.3 Maximum "k" factor: to ASTM C553.

.4 Type C-2: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma:

.1 Mineral fibre: to ASTM C553.

.2 Jacket: to CGSB 51-GP-52 Ma.

.3 Maximum "k" factor: to ASTM C553.

.5 Manufacturers:

.1 All materials must be supplied by the same manufacturer.

.2 Acceptable Materials:

.1 Johns Manville

.2 Fibreglass Canada

.3 Knauf

.4 Manson

.5 Roxul

2.3 JACKETS

.1 Canvas:

.1 220 g/m² (0.0451 lb/ft²) cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.

.2 Lagging adhesive: Compatible with insulation.

2.4 ACCESSORIES

.1 Vapour retarder lap adhesive:

.1 Water based, fire retardant type, compatible with insulation.

.2 Indoor Vapour Retarder Finish:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C 449.

.4 ULC Listed Canvas Jacket:

.1 220 g/m² (0.0451 lb/ft²) 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 Duro Dyne 1A-22 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 TIAC National 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 thickness' conform to following table:

Application	Type	Thickness
Rectangular supply air ducts	C-1	25 mm (1")
Round supply air ducts	C-2	25 mm (1")
Supply, return and fan exhaust ducts exposed (visible) in space being served	none	
Outdoor air intake ductwork and plenums	C-1	50 mm (2")
Exhaust plenums dampers and louvres	C-1	25 mm (1")
Interior acoustically lined ducts	none	
Last 1.5m of Exhaust duct	C-1	25 mm (1")

.2 Exposed round ducts 600 mm (24") and larger, smaller sizes where subject to abuse:

.1 Use TIAC code C-1 insulation, scored to suit diameter of duct.

.3 Finishes: Conform to following table:

Application	Rectangular	Round
Indoor, concealed	none	none
Indoor, exposed	Canvas	Canvas

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 Canadian General Standards Board (CGSB)

.1 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 C 335, Test Method for Steady State Heat Transfer Properties of Pipe Insulation.

.2 ASTM C 921, Practice for Determining the Properties Jacketing Materials for Thermal Insulation.

.3 ASTM B 209M, Specification for Aluminum and Aluminum Alloy Sheet and Plate.

.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): National 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.

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 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.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 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 C 335.

.3 Type A-1: Rigid moulded mineral fibre with factory applied vapour retarder jacket.

.1 Mineral fibre: to ASTM C553.

.2 Jacket: to CGSB 51-GP-52 Ma.

.3 Maximum "k" factor: to ASTM C553.

.4 Type A-3: Flexible unicellular tubular elastomer.

.1 Insulation to ASTM C553 with vapour retarder jacket.

.2 Jacket: to CGSB 51-GP-52 Ma.

.3 Maximum “k” factor: to ASTM C553.

.4 To be certified by manufacturer to be free of potential stress corrosion cracking corrodants.

.5 Materials:

.1 All materials must be supplied by the same manufacturer.

.2 Acceptable Materials:
Fibreglass Canada
Knauf
Manson
Pittsburg Corning

2.3 INSULATION SECUREMENT

.1 Tape: Self-adhesive, aluminum, reinforced, 50 mm (2") wide minimum.

.2 Contact adhesive: Quick setting.

.3 Canvas adhesive: Washable.

2.4 CEMENT

.1 Thermal insulating and finishing cement:

.1 To ASTM C553.

.2 Hydraulic setting or Air drying on mineral wool, to ASTM C 449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.6 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 OUTDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m^2 (0.062 lb/ft^2).

2.8 JACKETS

.1 Polyvinyl Chloride (PVC):

.1 One-piece moulded type [and sheet] to CAN/CGSB-51.53 with pre-formed shapes as required.

.2 Colours: white.

.3 Minimum service temperatures: -20°C (-4°F).

.4 Maximum service temperature: 65°C (150°F).

.5 Moisture vapour transmission: 0.02 perm.

.6 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.

.2 Tacks.

.3 Pressure sensitive vinyl tape of matching colour.

.2 Aluminum:

.1 To ASTM B 209M.

.2 Thickness: 0.50 mm (26 gauge) sheet.

.3 Finish: Smooth.

.4 Joining: Longitudinal and circumferential slip joints with 50 mm (2") laps.

.5 Fittings: 0.50 mm (26 gauge) 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 (26 gauge) thick at 300 mm (12") spacing.

.7 Peel and stick jacket is not acceptable.

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 National 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").

3.3 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: At expansion joints, valves, primary flow measuring elements, flanges, and unions at equipment.

.2 Design: To permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

.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
Condensate	A-1	40 (1½")	40 (1½")	50 (2")	50 (2")	50 (2")
Hot Water Heating	A-1	40 (1½")	50 (2")	50 (2")	50 (2")	50 (2")
Refrigerant piping	A-3	25 (1")	25 (1")	25 (1")	25 (1")	25 (1")
Cooling Coil cond. Drain	A-1	25 (1")	25(1")	25 (1")	25 (1")	25 (1")

.5 Finishes: Conform to the following table:

Application	Piping	Valves & Fittings
Exposed indoors	PVC	PVC
Exposed in mech. rooms	PVC	PVC
Concealed indoors	N/A	PVC
Exterior refrigerant piping	Aluminum	Aluminum

.6 Connection: To appropriate TIAC code.

.7 Finish attachments: SS bands, @ 150 mm (6") oc. seals: closed.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 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 PIPE LINE STRAINER

.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.

.4 Blowdown connection: NPS 25 mm (1").

.5 Screen: stainless steel with 1.19 mm (50 mil) perforations.

.6 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 of each automatic control valve and as indicated.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 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.

.3 **ANSI/ASME B16.5, Pipe Flanges and Flanged Fittings: NPS½ through NPS24 Metric/Inch.**

.4 **ANSI/ASME B16.9, Factory-Made Wrought Steel Buttwelding Fittings.**

.5 **ANSI B18.2.1, Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series).**

.6 **ANSI/ASME B18.2.2, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).**

.7 **ANSI/AWWA C111/A21.11, Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.**

.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.

.6 **ASTM E202, Test Method for Ethylene Glycols and Propylene Glycols.**

.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 Pipe thread: taper.

.3 Bolts and nuts: to ANSI B18.2.1 and ANSI/ASME B18.2.2.

.4 **Roll grooved coupling gaskets: type EPDM.**

.5 **Roll grooved: standard coupling to CSA B242.**

.6 **Orifice flanges: slip-on raised face, 2100 kPa (300 psi).**

.4 Fittings

.1 Screwed fittings: malleable iron, to ANSI/ASME B16.3, Class 150.

.2 Pipe flanges and flanged fittings:

.1 Cast iron: to ANSI/ASME B16.1, Class 125.

.2 Steel: to ANSI/ASME B16.5.

.3 Butt-welding fittings: steel, to ANSI/ASME B16.9.

.4 Unions: malleable iron, to ASTM A47/A47M and ANSI/ASME B16.3.

2.2 VALVES

.1 Connections:

.1 NPS 32 mm (1 1/4") and smaller: screwed ends.

.2 Gate valves: Application: Isolating equipment, control valves, pipelines:

.1 NPS 50 mm (2") and under:

.1 Mechanical Rooms: Class 125, rising stem, solid wedge disc.

.2 Elsewhere: Class 125, non-rising stem, solid wedge disc.

.2 NPS 65 mm (2 1/2") and over:

.1 Mechanical Rooms:

.1 Rising stem, solid wedge disc, bronze trim.

.1 Operators: handwheel.

.2 Non-rising stem, solid wedge disc, bronze trim.

.1 Operators: handwheel.

.3 Globe valves: Application: Throttling, flow control, emergency bypass:

.1 NPS 32 mm (1 1/4") and under:

.1 With PFTE disc, as specified. Bronze.

.2 NPS 40 mm (1 1/2") and over:

.1 With solid bronze disc, bronze trim, cast iron body.

.4 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, with chain and cap.

.5 Swing check valves:

.1 NPS 32 mm (1 1/4") and under:

.1 Class 150, swing, with PFTE disc, as specified. Bronze. Jenkins 4475TJ.

.2 NPS 40 mm (1 1/2") and over:

.1 Flanged or Grooved ends, Bronze trim, Cast Iron: Gate, Globe, Check.

.6 Ball valves:

.1 NPS 80 mm (3") and under:

.1 Body and cap: cast high tensile bronze to ASTM B62.

.2 Pressure rating: Class 125, 860 kPa (125 psi) steam, WP = 1.4 MPa (203 psi) WOG.

.3 Connections:

.1 NPS 32 mm (1 1/4") and under screwed ends to ANSI B1.20.1 and with hex. shoulders.

.2 NPS 40 mm (1 1/2") 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.

.7 All valves shall be of commercial grade and of same manufacturer.

.8 Acceptable Manufacturers:

.1 Newman Hattersley Canada Ltd.

.2 Jenkins/Crane

.3 Milwaukee

.4 Toyo

.5 Kitz

2.3 BALANCING VALVES

.1 Size 15mm (1/2") to 32mm (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 materials:

.1 Bell & Gossett Circuit Setters

.2 Armstrong

.3 Taco

.4 Tour & Anderson

.5 Oventrop

2.4 AUTOMATIC AIR VENT

.1 Industrial float vent: cast iron body and NPS 15 mm (1/2") connection and rated at 860 kpa (125 psi) working pressure.

.2 Float: solid material suitable for 115°C (240°F) working temperature.

.3 Plastic vents are not acceptable.

.4 Acceptable materials:

.1 Maid-O-Mist No. 67

.2 Spirax Sarco

Part 3 Execution

3.1 PIPING INSTALLATION

.1 Installation shall be by a licensed pipe fitter.

.2 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.

.3 Install concealed pipes close to building structure to keep furring space to minimum. Install to conserve headroom and space. Run exposed piping parallel to walls. Group piping wherever practical.

.4 Slope piping in direction of drainage and for positive venting.

.5 Use eccentric reducers at pipe size change installed to provide positive drainage or positive venting.

.6 Provide clearance for installation of insulation and access for maintenance of equipment, valves and fittings.

.7 Ream pipes, clean scale and dirt, inside and outside, before and after assembly.

.8 Assemble piping using fittings manufactured to ANSI standards.

.9 Saddle type branch fittings may be used on mains if branch line is no larger than half the size of main. Hole saw or drill and ream main to maintain full inside diameter of branch line prior to welding saddle.

3.2 VALVE INSTALLATION

.1 Install rising stem valves in upright position with stem above horizontal.

.2 Install butterfly valves on chilled water and condenser water lines only.

.3 Install gate or ball valves at branch take-offs and to isolate each piece of equipment, and as indicated.

.4 Install globe valves for balancing and in by-pass around control valves as indicated.

.5 Provide silent check valves on discharge of pumps and in vertical pipes with downward flow and as indicated.

.6 Provide swing check valves in horizontal lines as indicated.

.7 Install chain operators on valves NPS 65 mm (2½") and over where installed more than 2400 mm (96") above floor in Boiler Rooms and Mechanical Equipment Rooms.

.8 Provide ball valves for glycol service.

3.3 AIR VENTS

.1 Install at high points of systems.

.2 Install ball valve on automatic air vent inlet.

.3 Extend vent lines in Mechanical Room with screwdriver stop at 1.8 m AFF.

3.4 CIRCUIT BALANCING VALVES

.1 Install flow measuring stations and flow balancing valves as indicated.

.1 On return side of all heating devices (convectors, panels, force flows, radiation, coils, etc.).

.2 On return side of all water or glycol cooling coils.

.3 On return side of all reverse return piping loops and/or branch circuits.

.2 Install to manufacturers requirements.

.3 Minimum valve size shall be one pipe size smaller than piping or 20 mm (¾"), whichever is larger.

.4 Refer to Testing Adjusting and Balancing Section for applicable procedures.

3.5 FILLING OF SYSTEM

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

.2 Co-ordinate filling of system with HVAC water treatment contractor.

3.6 TESTING

.1 Test system in accordance with Mechanical General Requirements Section.

.2 For glycol systems, retest with propylene glycol to ASTM E202, inhibited, for use in building system after cleaning. Repair any leaking joints, fittings or valves.

3.7 FLUSHING AND CLEANING

.1 Scope:

.1 Flush new piping only.

.2 Refer to Water Treatment Section

3.8 EXISTING SYSTEM DISPOSAL

.1 Disposal of existing system shall be to the requirements of the local and/or provincial regulations.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 American National Standards Institute (ANSI).

- .1 ANSI/ASME B16.1, Gray Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800.
- .2 ANSI/ASME B16.3, Malleable-Iron Threaded Fittings, Classes 150 and 300.
- .3 ANSI B18.2.1, Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series).
- .4 ANSI/ASME B18.2.2, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).
- .5 ANSI/AWWA C111/A21.11, Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.3 American Society for Testing and Materials (ASTM).

- .1 ASTM A47/A47M, Specification for Ferritic Malleable Iron Castings.
- .2 ASTM A53/A53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
- .3 ASTM A536, Specification for Ductile Iron Castings.
- .4 ASTM B61, Specification for Steam or Valve Bronze Castings.
- .5 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.
- .6 ASTM F-1476, Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

.4 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).

- .1 MSS-SP-67, Butterfly Valves.
- .2 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.
- .3 MSS-SP-71, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
- .4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.
- .5 MSS-SP-85, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with general requirements.

.2 Indicate on manufacturers' catalogue literature the following:

.1 Piping

.2 Valves

.3 Accessories

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

1.3 CLOSEOUT SUBMITTALS

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

1.4 APPLICATION

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

Part 2 Products

2.1 ACCEPTABLE MATERIALS

.1 Victaulic.

.2 No alternates.

2.2 PIPE

.1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:

.1 NPS 40 mm (1 ½") up to 150 mm (6"): Schedule 40.

.2 NPS 150 mm (6") 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").

2.3 PIPE JOINTS

.1 NPS 32 mm (1 ¼") and under: screw fittings with pulverized lead paste. Refer to 23 21 13 Hydronic Piping – Screwed, Welded.

.2 Rolled grooved with Grade E (EPDM) gaskets.

2.4 FITTINGS

.1 Grooved fittings: ASTM A536, Grade 65-45-12, ductile iron; ASTM A234, Grade WPB, wrought steel; or factory-fabricated from ASTM A53 steel pipe.

.2 Grooved joint couplings shall consist of two ductile iron housing segments, pressure responsive elastomer gasket, and ASTM A449 zinc-electroplated steel bolts and nuts. Couplings shall comply with ASTM F-1476, Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

.1 Rigid: Couplings shall be Victaulic Style 107N Installation-Ready with angled bolt pad design to provide system rigidity and support and hanging in accordance with ANSI B31.1 and B31.9. Couplings must be installed with Grade EHP (EPDM-HP) gaskets, rated for water service to 120°C (250°F).

.2 Flexible: Use in locations where vibration attenuation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors at equipment connections. Three couplings, for each connector, shall be placed in close proximity to the vibration source. Basis of Design: Victaulic Style 177 Installation-Ready, and Style 77.

.3 AGS series two-segment couplings with lead-in chamfer on housing key and wide-width FlushSeal gasket. Basis of Design: Victaulic Style W07 (rigid) and Style W77 (flexible).

.3 Flanges: Victaulic Style 741 / W741.

.4 Hole Cut Products and Branch Connections:

Victaulic Style 920 / 920N Mech. Tee
Victaulic Style 923 Vic-Let Outlet
Victaulic Style 924 Vic-O-Well Thermometer Outlet

2.5 VALVES

.1 Connections:

.1 **NPS 32 mm (1 ¼") and smaller: screwed ends.**

.2 **NPS 40 mm (1 1/2") and larger: rolled grooved ends.**

.2 Butterfly valves: Application: Isolating each cell or section of multiple component equipment and where indicated. Valve seat shall be pressure responsive in sizes through NPS 300 mm (12”). The stem shall be offset from the disc centerline to provide complete 360-degree circumferential seating.

.1 NPS 40 mm (1 ½") and over: Victaulic Vic 300 MasterSeal

.3 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, with chain and cap.

.4 Check valves:

.1 NPS 32 mm (1 ¼") and under:

.1 Class 150, swing, with PFTE disc, as specified.

Bronze. Jenkins 4475TJ.

.2 NPS 40 mm (1 ½") and over: Victaulic Style 716 Vic – check and AGS W715 for

.5 Ball valves:

.1 NPS 32 mm (1 ¼") and under:

.1 Body and cap: cast high tensile bronze to ASTM B62.

.2 Pressure rating: Class 125, 860 kPa (125 psi) steam, WP = 1.4 MPa (203 psi) WOG.

.3 Connections: Screwed ends to ANSI B1.20.1 and with hex. shoulders.

.4 Stem: stainless steel tamperproof ball drive.

.5 Stem packing nut: external to body.

.6 Ball and seat: replaceable stainless steel solid ball and teflon seats.

.7 Stem seal: TFE with external packing nut.

.8 Operator: removable lever handle.

.9 Extended handles on chilled water valves.

.10 Full port.

.11 Jenkins 201SJ.

.6 Strainers:

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

.2 Wye Strainer: NPS 50 mm (2") and over: Victaulic 732/W732 Wye Type Vic-Strainer.

2.6 BALANCING VALVES

.1 Size 15 mm (1/2") to 50mm (2"): DZR Brass (Ametal®) globe type or bronze body, brass ball, NPT connections and variable orifice. Victaulic Series 786 / 787.

.1 Victaulic Koil-Kits Series 799, 79V, 79A, and 79B may be used at coil connections. The kit shall include a Series 786/787/78K circuit balancing valve or series 76 (where automatic balancing valves are required), Series 78Y Strainer-Ball or Series 78T Union-Ball valve combination, Series 78U Union-Port fitting, and required coil hoses. A Style 793 and/or 794 and/or Pilot R differential pressure controller shall be provided as required. A meter shall be provided by the valve manufacturer that shall remain with the building owner after commissioning.

.2 Combination balancing and control valve: at mechanical contractor and control contractor agreement, combination balancing/control valves will be accepted: ½" – 2" Victaulic TC on/off, Victaulic Series TM Modulating. For sizes 2-1/2" – 6" Fusion C

.3 Pressure Independent balancing and control valve (PIBCV) to be provided where required: Victaulic Series TCP/7CP/Fusion P

.2 Size 65 mm (2 1/2") to larger: Victaulic Tour Anderson Series 788/789.

.3 Differential pressure readout ports with internal EPT inserts and check values, 6 mm (¼")NPT tapped drain/purge ports, memory stop and calibrated nameplate.

.4 Acceptable materials:

.1 Tour & Anderson

.2 No alternates.

2.7 AUTOMATIC AIR VENT

.1 Industrial float vent: cast iron body and NPS 15 mm (1/2") connection and rated at 860 kPa (125 psi) working pressure.

.2 Float: solid material suitable for 115°C (240°F) working temperature.

.3 Plastic vents are not acceptable.

.4 Acceptable materials:

.1 Maid-O-Mist No. 67

.2 Spirax Sarco

2.8 EXPANSION JOINTS AND FLEXIBLE CONNECTIONS

.1 Application: to suit motion.

.2 Minimum length in accordance with manufacturers recommendations to suit offset.

.3 Victaulic Style 150 Mover slip-type expansion joint or Style 155 Expansion Compensators. The expansion joint shall be installed with Style 07 Zero-Flex couplings.

Part 3 Execution

3.1 PIPING INSTALLATION

.1 Installation shall be by a licensed pipe fitter.

.2 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.

.3 Install concealed pipes close to building structure to keep furring space to minimum. Install to conserve headroom and space. Run exposed piping parallel to walls. Group piping wherever practical.

.4 Slope piping in direction of drainage and for positive venting.

.5 Use eccentric reducers at pipe size change installed to provide positive drainage or positive venting.

.6 Provide clearance for installation of insulation and access for maintenance of equipment, valves and fittings.

.7 Ream pipes, clean scale and dirt, inside and outside, before and after assembly.

.8 Assemble piping using fittings manufactured to ANSI standards.

.9 Saddle type branch fittings may be used on mains if branch line is no larger than half the size of main. Hole saw or drill and ream main to maintain full inside diameter of branch line prior to welding saddle.

.10 Grooved Joints: Install in accordance with the manufacturer's latest published installation instructions.

.1 Pipe ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to (and including) groove.

.2 Gasket shall be manufactured by the coupling manufacturer and verified as suitable for the intended service.

.3 A manufacturer's factory trained representative shall periodically visit the job site and review the installation for best practices. This shall be at the expense of the installing contractor. The installing Contractor shall correct any identified deficiencies.

.4 Victaulic product that has been examined and has not met the visual inspection criteria for proper installation must be corrected and re-examined by Inspection Services prior to the completion of the project. Any Victaulic product that has not been corrected or was not examined will not be considered as part of the successful completion of Inspection Services.

.5 Upon completion of the manufacturer's inspection of the installation and any identified corrections, the manufacturer will provide the owner or purchaser with a limited warranty on manufacturer's products.

3.2 PIPE END PREPARATION

.1 Refer to the latest Victaulic installation instructions.

.2 Outside diameter of grooved pipe shall not vary more than the tolerance approved. Any internal or external weld bead or seams in the groove area must be ground smooth and flush. The end of the pipe internally must be cleaned of any material that might interfere with or damage the internal roll.

.3 Pipe surface shall be free from indentations and projections from the end of the pipe to the groove, to provide a leak tight seat for the gasket. All loose paint, scale, dirt, chips, grease and rust must be removed. It is the recommendations of Victaulic that the pipe be square cut.

.4 Bottom of the groove must be free of loose dirt, chips, rust and scale that may interfere with proper coupling assembly.

.5 Groove dimensions shall conform to standard roll groove specifications as published by Victaulic.

.6 Pipe shall be grooved using Victaulic roll grooving system with track enhanced grooving rolls.

3.3 "ZERO-FLEX" COUPLING INSTALLATION

.1 Refer to the latest Victaulic installation instructions.

.2 Pipe must be free from indentation, projections, or roll marks on exterior from the end to the groove, to assure a leak tight seat for the gasket.

.3 Gasket supplied must be checked to be certain it is suited for intended service. Colour code identifies gasket grade. Apply a thin coat of Victaulic Lubricant to gasket lips and outside of gasket.

.4 Place gasket over pipe end, being sure lip does not overhang pipe end.

.5 Align and bring two pipe ends together and slide gasket into position centered between the grooves on each pipe. No portion of the gasket shall extend into the groove on either pipe.

.6 Loosely assemble all segments leaving one nut and bolt off to allow for "swing-over" feature.

.7 With one nut and one bolt removed, use "swing-over" feature to position housings over gasket and into position into the grooves on both pipes.

.8 Remaining bolt shall be inserted. Bolt track head must engage into housing recess.

.9 Nuts shall be tightened alternately and equally and must maintain metal-to-metal contact at the angle bolt-pads. Tighten securely to assure a rigid joint.

3.4 "REDUCING" COUPLING INSTALLATION

.1 Refer to the latest Victaulic installation instructions.

.2 Pipe must be free from indentation, projections, or roll marks on exterior from the end to the groove, to assure a leak tight seat for the gasket.

.3 Gasket supplied must be checked to be certain it is suited for intended service. Colour code identifies gasket grade. Gasket must be thoroughly lubricated.

.4 Place large opening of the gasket over the larger pipe ends until the Assembly Washer touches the pipe end.

.5 Align the pipe centerlines and insert the smaller pipe end in the gasket. Assembly washer provided by Victaulic shall be used.

.6 Coupling housings shall be positioned over the gasket into the groove on each pipe.

.7 Insert bolts and apply nuts.

.8 Nuts must be tightened alternately and equal until housing bolt pads are firmly together – metal-to-metal.

3.5 "OUTLET" COUPLING INSTALLATION

.1 Refer to the latest Victaulic installation instructions.

.2 Pipe must be free from indentation, projections, or roll marks on exterior from the end to the groove, to assure a leak tight seat for the gasket.

.3 Gasket supplied must be checked to be certain it is suited for intended service. Colour code identifies gasket grade. Gasket must be thoroughly lubricated.

.4 Gasket shall be placed on one pipe end so the lips on one side cover the area between the pipe end and the groove. The gasket must not overlap the groove. The pipe ends shall be d to touch the reinforcement ribs inside the gasket.

.5 Bring mating pipe or fitting into position and insert into gasket. The gasket shall not overlap the groove, but fully cover the pipe end.

.6 Housings shall be placed over the gasket and the housing keys must engage into the grooves. Ample lubricant shall be applied to the gasket outlet neck and the upper housing interior.

.7 Insert bolts and apply nuts.

.8 Nuts must be tightened alternately and equally until housing bolt pads are firmly together – metal-to-metal.

3.6 VICTAULIC "FLANGE ADAPTOR" INSTALLATION

.1 Refer to the latest Victaulic installation instructions.

.2 Pipe must be free from indentation, projections, or roll marks on exterior from the end to the groove, to assure a leak tight seat for the gasket.

.3 Gasket supplied must be checked to be certain it is suited for intended service. Colour code identifies gasket grade.

.4 Victaulic Flange adaptor shall be opened fully and hinged flange shall be placed around the grooved pipe end with the circular key section locating into the groove.

.5 Standard bolt shall inserted through the mating holes of the Vic-Flange adaptor to secure firmly in the groove.

.6 Gasket shall be fully lubricated and pressed into the cavity between the pipe O.D. and flange recess.

.7 Standard flange bolt shall be place in the hinge hole (opposite the lock bolt) and the bolt assembly shall be directed to mate with the adjoining flange. Remaining flange bolts shall be added and tightened evenly until faces contact firmly.

.8 Where Vic-Flange adaptors do not mate to a hard smooth surface, Victaulic Flange Washers must be used.

3.7 MECHANICAL-T OUTLET INSTALLATION

.1 Refer to the latest Victaulic installation instructions.

.2 Holes must be drilled.

.3 Gasket supplied must be checked to be certain it is suited for intended service. Colour code identifies gasket grade.

.4 In preparation for assembly, one nut and bolt shall be removed from the housing. The other nut and bolt shall be loosened until it is flush with the nut and bolt. Remove the tape and lift the gasket from the mechanical-T outlet.

.5 Victaulic lubricant shall be applied to all surfaces of the gasket and the gasket shall be properly repositioned into the housing using alignment tabs.

.6 When assembling the coupling, the lower housing shall be rotated 90 degrees away from the upper housing. Place the upper, or outlet section on to the face of the pipe in line with the outlet hole. The lower section shall then be rotated around the pipe to close the two halves. The locating collar must be in the outlet hole.

.7 Insert bolt and apply nut. Oval neck must engage in recess of the housing.

.8 Nuts shall be tightened alternately and equally until the housing is in complete surface contact in the gasket pocket area and the assembly is rigid.

.9 Where mechanical-T are used as transition pieces between two runs, they must be assembled onto the runs before the branch connections are made.

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

.1 Refer to the latest Victaulic installation instructions.

.2 Holes must be drilled.

.3 Do not use for branch piping connections where size may not be available. Use first available size and reducer.

.4 Gasket supplied must be checked to be certain it is suited for intended service. Colour code identifies gasket grade. Victaulic lubricant shall be applied to exposed gasket sealing lip.

.5 Vic-Let outlet toe shall align with pipe. Tilt toe into the hole and drop into the pipe. The Vic-Let outlet must be positioned with the heel inside the pipe.

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

3.9 ROUST-A-BOUT PLAIN END PIPE COUPLING INSTALLATION

.1 Refer to the latest Victaulic installation instructions.

.2 Pipe shall be marked as required.

.3 Gasket supplied must be checked to be certain it is suited for intended service. Colour code identifies gasket grade. Apply a thin coat of Victaulic Lubricant to gasket lips and outside of gasket.

.4 Place gasket over pipe end, being sure lip does not overhang pipe end.

.5 The pipe shall be butt and held in position while slide the gasket back into position. The gasket must be centered between the marks.

.6 Housings shall be placed over the gasket.

.7 Insert bolts and apply nuts.

.8 Nuts must be tightened alternately and equally to standard torque specifications as published by Victaulic. Segments must be assembled with equal gaps between the bolt pads.

3.10 VALVE INSTALLATION

.1 Install valves in upright position with stem above horizontal.

.2 Install butterfly valves on chilled water and condenser water lines only.

.3 Install butterfly or ball valves at branch take-offs and to isolate each piece of equipment, and as indicated.

.4 Install globe valves for balancing and in by-pass around control valves as indicated.

.5 Provide silent check valves on discharge of pumps and in vertical pipes with downward flow and as indicated.

.6 Provide swing check valves in horizontal lines as indicated.

.7 Install chain operators on valves NPS 65 mm (2 1/2") and over where installed more than 2400 mm (96") above floor in Boiler Rooms and Mechanical Equipment Rooms.

.8 Provide ball valves for glycol service.

3.11 AIR VENTS

.1 Install at high points of systems.

.2 Install isolating ball valve on automatic air vent inlet.

3.12 CIRCUIT BALANCING VALVES

.1 Install flow measuring stations and flow balancing valves as indicated.

.1 On return side of all heating devices (convectors, panels, force flows, radiation, coils, etc).

.2 On return side of all water or glycol cooling coils.

.3 On return side of all reverse return piping loops and/or branch circuits.

.2 Install to manufacturers requirements.

.3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

.4 Refer to Testing Adjusting and Balancing Section for applicable procedures.

3.13 FLUSHING AND CLEANING

.1 Coordinate flushing and cleaning of mechanical systems with HVAC water treatment contractor **and HVAC systems commissioning contractor.**

.2 Flush and clean **new** piping system in presence of Consultant.

.3 **Refer to Water Treatment Section.**

3.14 FILLING OF SYSTEM

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

3.15 TESTING

.1 Test system in accordance with Mechanical General Requirements Section.

.2 For glycol systems, retest with propylene glycol to ASTM E202, inhibited, for use in building system after cleaning. Repair any leaking joints, fittings or valves.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 ANSI/ASME B16.22, Wrought Copper Alloy and Copper Alloy Solder - Joint Pressure Fittings: Classes 150, 300, 600, 900, 1500, and 2500.

.3 ANSI/ASME B16.24, Cast Copper Pipe Flanges and Flanged Fittings.

.4 ANSI/ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.

.5 ANSI/ASME B31.5, Refrigeration Piping and Heating Transfer Components.

.6 ASTM A307, Specification for Carbon Steel Bolts and Studs, 413.5 mPa (60,000 psi) Tensile Strength.

.7 ASTM B280, Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.8 CSA B52, Mechanical Refrigeration Code.

.9 EPS 1/RA/2, Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

Part 2 Products

2.1 TUBING

.1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.

.1 Hard copper: to ASTM B280, type ACR-B.

2.2 FITTINGS

.1 Service: design pressure 2070 kPa (300 psi) and temperature 121°C (250°F).

.2 Brazed:

.1 Fittings: wrought copper to ANSI/ASME B16.22.

.2 Joints: silver solder, 45% Ag-15% Cu or copper-phosphorous, 95% Cu-5%P and non-corrosive flux.

.3 Flanged:

.1 Bronze or brass, to ANSI/ASME B16.24, Class 150 and Class 300.

.2 Gaskets: suitable for service.

.3 Bolts, nuts and washers: to ASTM A307, heavy series.

.4 Flared:

.1 Bronze or brass, for refrigeration, to ANSI/ASME 16.26.

2.3 PIPE SLEEVES

.1 Hard copper or steel, sized to provide 6 mm (1/4") clearance all around between sleeve and uninsulated pipe or between sleeve and insulation.

2.4 VALVES

.1 22 mm (7/8") and under: Class 500, 3.5 MPa (500 psi), globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moisture proof seal for below freezing applications, brazed connections.

.2 Over 22 mm (7/8"): Class 375, 2.5 MPa (375 psi), globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and bonnet, moisture proof seal for below freezing applications, brazed connections.

2.5 FILTER-DRIER

.1 On lines 20 mm (3/4") outside diameter and larger, filter-drier shall be replaceable core type with Schraeder type valve.

.2 On lines smaller than 20 mm (3/4") outside diameter, filter-drier shall be sealed type using flared copper fittings.

.3 Size shall be full line size.

.4 Approved manufacturers:

.1 Mueller

.2 Parker

.3 Sporlan

.4 Virginia

2.6 SIGHT GLASS

.1 Combination moisture and liquid indicator with protection cap.

.2 Sight glass shall be full line size.

.3 Sight glass connections shall be solid copper or brass, no copper-coated steel sight glasses allowed.

.4 Approved manufacturers:

.1 Mueller

.2 Henry

.3 Parker

.4 Superior

2.7 SUCTION LINE TRAP

.1 Manufactured standard one-piece traps.

2.8 EXPANSION VALVES

.1 For pressure type distributors, externally equalized with stainless steel diaphragm, and same refrigerant in thermostatic elements as in system.

.2 Size valves to provide full rated capacity of cooling coil served. Co-ordinate selection with evaporator coil and condensing unit.

.3 Approved manufacturers:

.1 Henry

.2 Mueller

.3 Parker

.4 Sporlan

2.9 FLEXIBLE CONNECTORS

.1 Designed for refrigerant service with bronze seamless corrugated hose and bronze braiding.

.2 Approved manufacturers:

Anaconda “Vibration Eliminators” by Anamet

Vibration Absorber Model VAF by Packless Industries

Vibration Absorbers by Superior Valve Co

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 PIPING SUPPORT ASSEMBLY

.1 All channel members shall be fabricated from structural grade steel conforming to one of the following ASTM specifications: A1011/A1011M, A653/A653M.

.2 All fittings shall be fabricated from steel conforming to one of the following ASTM specifications: A575, A36/A36M or A635/A635M.

.3 Electro galvanized cush clamps with shoulder bolt and molded thermoplastic cushion, size to suit pipe.

.4 Acceptable materials:

.1 Unistrut

.2 Or equal

Part 3 Execution

3.1 GENERAL

.1 Hard copper to be used. Throughout the project, the use of annealed copper shall not be used without approval of the consultant.

.2 Install in accordance with CSA B52, EPS 1/RA/2 and ANSI/ASME B31.5.

.3 Connect to equipment with isolating valves and unions.

.4 Provide space for servicing, disassemble, and removal of equipment and components all as recommended by manufacturer.

.5 Protect all openings in piping against entry of foreign material.

.6 Provide all necessary equipment including thermal expansion valve, sight glass, solenoid valve, filter dryer, etc., for a complete installed system. Pipe system as per manufacturer's recommendation and requirements.

.7 Provide number of refrigerant circuits and appropriate corresponding piping as per manufacturer's recommendations and requirements.

3.2 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.

3.3 PIPING INSTALLATION

.1 General:

- .1 Hard drawn copper tubing: do not bend. Minimize use of fittings.
- .2 Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.
- .3 Provide trap at base of risers greater than 2.4m (8') high and at each 7.6m (25'-0") thereafter.
- .4 Provide inverted deep trap at top of each riser.
- .5 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.

3.4 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.

3.5 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.

3.6 INSTRUCTIONS

.1 Post instructions in frame with glass cover in accordance with Operation and Maintenance Manual Section and CSA B52.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Plumbing Specialties and Accessories.

.2 Hydronic Systems – Steel.

1.2 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 American Society of Mechanical Engineers (ASME).

.3 ANSI/ASME Boiler and Pressure Vessel Code, Section VI.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with general requirements.

1.4 CLOSEOUT SUBMITTALS

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

.2 Include following:

.1 Log sheets as recommended by manufacturer.

.2 Test reports.

Part 2 Products

2.1 MANUFACTURER

.1 Equipment, chemicals, service by one supplier.

.2 Acceptable manufacturer:

.1 Aquarian Chemicals (905-825-3711) No alternates.

2.2 WATER TREATMENT FOR HYDRONIC SYSTEMS

.1 Hot water heating system: Reuse existing system.

.2 Micron filter for each pot feeder:

.1 Six (6) sets of filter cartridges for each type, size of micron filter.

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 WATER TREATMENT SERVICES

.1 After entire new and existing system is cleaned as specified elsewhere, provide monthly water treatment monitoring and consulting services for period of one year after system start-up. Provide written report to consultant after each visit. Service to include:

.1 Initial water analysis and treatment recommendations.

.2 System start-up assistance.

.3 On site system testing and recording of treated hydronic system.

.4 Operating staff training.

.5 Visit plant every 7 days during first month of operation and as required until system stabilizes, and advise consultant in writing on treatment system performance.

.6 Provide monthly visits with reports after system has stabilized to the satisfaction of the owner.

.7 Provide necessary monthly recording charts and log sheets for one year operation.

.8 Provide necessary laboratory and technical assistance.

.9 Instructions and advice to operating staff to be clear, concise and in writing.

3.3 START-UP

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

3.4 SYSTEM COMMISSIONING AND TRAINING

.1 Commissioning and training shall be provided by installing water treatment sub-contractor and water treatment supplier.

.2 Timing:

.1 After start-up deficiencies rectified.

.2 After start-up and before TAB of connected systems.

.3 Pre-commissioning Inspections:

.1 Verify:

.1 Presence of test equipment, reagents, chemicals, details of specific tests to be performed, operating instructions.

.2 Suitability of log book.

.3 Currency and accuracy of initial water analysis.

.4 Required quality of treated water.

.4 Commissioning procedures - applicable to all Water Treatment Systems:

.1 Establish, adjust as necessary and record all automatic controls and chemical feed rates.

.2 Monitor performance continuously during commissioning of all connected systems and until acceptance of project.

.3 Establish test intervals, regeneration intervals.

.4 Record on approved report forms all commissioning procedures, test procedures, dates, times, quantities of chemicals added, raw water analysis, treated water analysis, test results, instrument readings, adjustments made, results obtained.

.5 Establish, monitor and adjust automatic controls and chemical feed rates as necessary.

.6 Visit project at monthly intervals after commissioning is satisfactorily completed to verify that performance remains as set during commissioning (more often as required until system stabilizes at required level of performance).

.7 Advise Engineer in writing on all matters regarding installed water treatment systems.

.5 Commissioning procedures - Closed Circuit Hydronic Systems:

.1 Analyse water in system.

.2 Based upon an assumed rate of loss approved by Engineer, establish rate of chemical feed.

.3 Record types, quantities of chemicals applied.

.4 Provide written verification of glycol solution concentration.

.6 Training:

.1 Commission systems, perform tests in presence of, and using assistance of, assigned O&M personnel.

.2 Train O&M personnel in softener regeneration procedures.

.7 Certificates:

.1 Upon completion, furnish certificates confirming satisfactory installation and performance.

.8 Commissioning Reports:

.1 To include system schematics, test results, test certificates, raw and treated water analyses, design criteria, all other data required by Consultant.

.9 Commissioning activities during Warranty Period:

.1 Check out water treatment systems on regular basis and submit written report to Consultant.

3.5 CLEANING OF MECHANICAL SYSTEM

.1 Coordinate cleaning of mechanical systems with mechanical contractor.

.2 Provide copy of recommended cleaning procedures and chemicals for approval by Consultant.

.3 Procedure:

.1 Flushing and cleaning should only take place after successful piping pressure testing.

.2 Terminal device (reheat coils, heat pumps, perimeter radiation, 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 Consultant.**

.8 **Flush after pressure test for a minimum of 4 hrs.**

.9 **Fill system with solution of water and non-foaming, phosphate-free detergent 3% solution by weight. Circulate for minimum of 8 hrs.**

.10 **Thoroughly flush all new mechanical systems and equipment with approved cleaning chemicals designed to remove deposition from construction such as pipe dope, oils, loose mill scale and other extraneous materials. Chemicals to inhibit corrosion of various system materials and be safe to handle and use.**

.11 **During circulation of cleaning solution, periodically examine and clean filters and screens and monitor changes in pressure drop across equipment.**

.12 **Refill system with clean water. Circulate for at least 2 hours. Clean out strainer screens/baskets regularly. Then drain.**

.13 **Drainage to include drain valves, dirt pockets, strainers, every low point in system.**

.14 **Drain and flush systems until alkalinity of rinse water is equal to make-up water. Refill with clean water treated to prevent scale and corrosion during system operation.**

.15 **Re-install strainer screens/baskets only after obtaining Consultant's approval and approval from HVAC water treatment contractor and board chemical treatment technician.**

.16 **Repeat system drain and flush as often as necessary to have a clean system.**

.17 **Disposal of cleaning solutions to be approved by authority having jurisdiction.**

.18 **Isolate new piping system from existing system as required for system cleaning**

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

.3 SMACNA HVAC Duct Leakage Test Manual.

.4 ASTM A480/A480M, Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

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

.6 ANSI/NFPA 90A, Installation of Air Conditioning and Ventilating Systems.

.7 ANSI/NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section general requirements.

.2 Indicate following:

- .1 Sealants
- .2 Tape
- .3 Proprietary Joints
- .4 Fittings

1.3 CERTIFICATION OF RATINGS

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 DUCTWORK

.1 Galvanized Steel:

- .1 Galvanized steel with Z90 designation zinc coating lock forming quality: to ASTM A653/A653M.

.2 Thickness:

Size Type	Class A Gauge	Class B Gauge	Class C Gauge
Square and Rectangular			
Up to 600 mm (24”)	22	24	24
625 mm to 1000 mm (25” to 40”)	20	22	24
1025 mm to 1800 mm (41” to 72”)	18	20	22
1825 mm to 2400 mm (73” to 96")	16	18	20
2450 mm and over (97")	16	16	16
Round and Oval			
Up to 300 mm (12”)	24	24	24
325 mm to 600 mm (13” to 24”)	22	24	24
625 mm to 900 mm (25" to 36")	20	22	24
925 mm to 1200 mm (37” to 48”)	18	20	22
1225 mm (49”) and over	18	18	20

.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 materials:

.1 Ductmate Canada Ltd.

.2 Nexus, Exanno Corp.

.3 WDCI

.4 Ducts 1200 mm (48") and larger, Ductmate/35, Nexus, or WDCI (heavy) (SMACNA “J” Type connection). Weld all corners.

.1 Acceptable materials:

.1 Ductmate Canada Ltd.

.2 Nexus, Exanno Corp.

.3 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
2500 (10")	A
1500 (6")	A
1000 (4")	A
750 (3")	A
500 (2")	B
250 (1")	B
125 (0.5")	C

.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).

.1 Acceptable materials:

.1 Duro Dyne S-2

.2 Foster

2.6 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm (2") wide.

.1 Acceptable material:

.1 Duro Dyne FT-2

2.7 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Duct Leakage Test Manual.

2.8 FIRESTOPPING

.1 40 mm x 40 mm x 3 mm (1½" x 1½" x 16ga) retaining angles all around duct, on both sides of fire separation.

.2 Firestopping material and installation must not distort duct.

.3 All ductwork passing through partition walls shall be firestopped.

2.9 HANGERS AND SUPPORTS

.1 Band hangers: use on round and oval ducts only up to 500 mm (20") diameter, of same material as duct but next sheet metal thickness heavier than duct.

.2 Trapeze hangers: ducts over 500 mm (20") diameter or longest side, to ASHRAE and SMACNA.

.3 Hangers: galvanized steel angle with black steel rods to ASHRAE and SMACNA following table:

Duct Size mm (")	Angle Size mm (")	Rod Size mm (")
up to 750 (30)	25 x 25 x 3 (1 x 1 x 1/8)	6 (1/4)
>750 to 1050 (>30 to 42)	40 x 40 x 3 (1½ x 1½ x 1/8)	6 (1/4)
>1050 to 1500 (>42 to 60)	40 x 40 x 3 (1½ x 1½ x 1/8)	10 (3/8)
>1500 to 2100 (>60 x 84)	50 x 50 x 3 (2 x 2 x 1/8)	10 (3/8
>2100 to 2400 (>84 x 96)	50 x 50 x 5 (2 x 2 x 1/8)	10 (3/8)
>2400 (96) and over	50 x 50 x 6 (2 x 2 x ¼)	10 (3/8)

.4 Upper hanger attachments:

.1 For concrete: manufactured concrete inserts.

.1 Acceptable material:

.1 Myatt fig. 485

.2 For steel joist: manufactured joist clamp or steel plate washer.

.1 Acceptable material:

.1 Grinnell fig. 61 or 60

.3 For steel beams: manufactured beam clamps:

.1 Acceptable material:

.1 Grinnell Fig. 60

Part 3 Execution

3.1 GENERAL

.1 The following systems shall conform to these requirements:

System	Class	Material
HVAC Supply and Return	B	Galvanized steel
General Exhaust	B	Galvanized steel
Ventilation Plenum	B	Galvanized steel
Exhaust Plenum	B	Galvanized steel
Individual Exhaust	C	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 CLUTCHER CABLE HANGER

.1 Do not install in corrosive environments such as pools, aquariums or spas.

.2 Utilize the standard loop hanging style. (limited to 450mm (18”) diameter)

.3 Contractor is responsible to calculate required clutcher and cable weight rating based on manufacturer selection guidelines. Minimum weight rating of system components shall be 250 lbs.

.4 Maximum Hanger Spacing: 3000 mm (120”)

.5 Provide additional rigid supports as required if lateral movement in the ductwork occurs.

3.4 SEALING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturers recommendations.

3.5 LEAKAGE TESTS

.1 Co-ordinate leakage testing with TAB contractor. TAB contractor will be responsible for all duct testing.

.2 Duct to be tested in accordance with SMACNA HVAC Duct Leakage Test Manual.

.3 Leakage tests to be done in sections.

.4 Trial leakage tests to be performed as instructed to demonstrate workmanship.

.5 Install no additional ductwork until trial test has been passed.

.6 Test section to be minimum of 15 m (50'-0") long with not less 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).

3.6 CLEANING

.1 Keep ducts clear from dust and debris

.2 Keep duct liner clean from dust, debris, and moisture.

.3 At completion of project vacuum ducts if dirt or dust is present.

.4 Where new systems connect into existing systems the existing systems shall be cleaned and vacuumed prior to reconnection.

.5 Ensure all systems are clean prior to start up.

3.7 INSTALLATION REQUIREMENTS

.1 All ductwork is to be protected from the weather and precipitation. The top and sides of all ductwork are to be completely covered with 6mil poly to the satisfaction of the consultant. Maintain protection of the ductwork until the building is made watertight and hollow cores drained. Tape all joints.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

.3 ANSI/NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.

.4 ANSI/NFPA 96, Ventilation Control and Fire Protection of Commercial Cooking Operations.

.5 CSA B228.1, Pipes, Ducts and Fittings for Residential Type Air Conditioning.

1.2 PRODUCT DATA

.1 Submit product data in accordance with general requirements.

.2 Indicate the following:

.1 Flexible connections.

.2 Duct access doors.

.3 Turning vanes.

.4 Instrument test ports.

1.3 CERTIFICATION OF RATINGS

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 GENERAL

.1 Manufacture in accordance with CSA B228.1.

2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame with fabric clenched by means of double locked seams.

.2 Material:

.1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at -40°C (-40°F) to plus 90°C (194°F), density of 1.3 kg/m.

2.3 ACCESS DOORS IN DUCTS

.1 Non-insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm (25 gauge) thick complete with sheet metal angle frame.

.2 Insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm (24 gauge) thick complete with sheet metal angle frame and 25 mm (1") thick rigid glass fibre insulation.

.3 Gaskets: neoprene

.4 Hardware:

.1 Up to 300 mm (12"): 2 sash locks

.2 301 mm to 450 mm (13" to 18"): 4 sash locks Complete with safety chain.

.3 451 mm to 1000 mm (19" to 40"): piano hinge and minimum 2 sash locks.

.4 Doors over 1000 mm (40"): piano hinge and 2 handles operable from both sides.

.5 Hold open devices.

.5 Acceptable materials:
Nailor
E. H. Price
Titus

2.4 INSTRUMENT TEST PORTS

.1 1.6 mm (16 gauge) thick steel zinc plated after manufacture.

.2 Cam lock handles with neoprene expansion plug and handle chain.

.3 28 mm (1 1/8") minimum inside diameter. Length to suit insulation thickness.

.4 Neoprene mounting gasket.

.5 Acceptable material:
Duro Dyne IP1 or IP2
Duct mate

Part 3 Execution

3.1 INSTALLATION

.1 Flexible connections:

.1 Install in following locations:

.1 Inlets and outlets to supply air units and fans. (Unless internally isolated)

.2 Inlets and outlets of exhaust and return air fans.

.3 As indicated.

.2 Length of connection: 100 mm (4").

.3 Minimum distance between metal parts when system in operation: 75 mm (3").

.4 Install in accordance with recommendations of SMACNA.

.5 When fan is running:

.1 Ducting on each side of flexible connection to be in alignment.

.2 Ensure slack material in flexible connection.

.2 Access doors and viewing panels:

.1 Size:

.1 600 mm x 600 mm (24" x 24") for person size entry.

.2 600 mm x 1000 mm (24" x 40") for servicing entry.

.3 300 mm x 300 mm (12" x 12") for viewing.

.4 As indicated.

.2 Location:

.1 At fire and smoke dampers.

.2 At control dampers.

.3 At devices requiring maintenance.

.4 At locations required by code.

.5 At inlet and outlet of reheat coils.

.6 Elsewhere as indicated.

.7 Inlet and outlet of duct mounted coils.

.3 Instrument test ports.

.1 General:

.1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.2 Locate to permit easy manipulation of instruments

.3 Install insulation port extensions as required.

.4 Locations.

.1 For traverse readings:

.1 At ducted inlets to roof and wall exhausters.

.2 At inlets and outlets of other fan systems.

.3 At main and sub-main ducts.

.4 And as indicated.

.2 For temperature readings:

.1 At outside air intakes.

.2 In mixed air applications in locations as approved by Consultant.

.3 At inlet and outlet of coils.

.4 Downstream of junctions of two converging air streams of different temperatures.

.5 And as indicated.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

1.2 PRODUCT DATA

.1 Submit product data in accordance with general requirements

.2 Indicate the following: performance data.

Part 2 Products

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 SINGLE BLADE DAMPERS

.1 Of same material as duct, but one sheet metal thickness heavier. V-groove stiffened, minimum 1.6 mm (16 gauge).

.2 Size and configuration to recommendations of SMACNA, except maximum height 100 mm (4").

.3 Shaft extension to accommodate insulation thickness and locking quadrant.

.4 Inside and outside nylon end bearings.

.5 Channel frame of same material as adjacent duct, complete with angle stop.

2.3 MULTI-BLADED DAMPERS

.1 Factory manufactured of material compatible with duct.

.2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.

.3 Maximum blade height:

.1 50 mm (2") up to 375 mm (15") high duct.

.2 100 mm (4") max 400 mm (16") high duct and over.

.4 Bearings: self-lubricating nylon.

.5 Linkage: shaft extension with locking quadrant.

.6 Channel frame of same material as adjacent duct, complete with angle stop.

.7 Shaft extension to accommodate insulation thickness and locking quadrants.

.8 Acceptable materials:

.1 Duro Dyne

.2 E.H. Price

.3 Nailor

.4 T.A. Morrison

.5 Tamco

.6 Ruskin

.7 Ventex/Alumavent

.8 United Enertech

2.4 LOCKING QUADRANTS

.1 6 mm (1/4") dial regulator with square bearing shaft.

.1 18 gauge oval frame, cadmium plated, clearly shows damper position.

.2 18 gauge formed handle for easy adjustment.

.3 Bolt and wing nut lock damper securely.

.4 Offset mounting holes avoid interference with damper movement and mechanical fastening to duct.

.2 9 mm (3/8") and larger: clamp quadrant with square bearing shaft.

.1 Accommodates and securely locks square rod, bearing fitting and adaptor pins.

.2 Heavily ribbed 16 gauge steel frame, 3 mm (1/8") thick formed steel handle, cadmium-plated.

.3 By tightening nut, bearing is securely locked in handle, preventing slippage and rattle.

.4 Neoprene and steel washer assembly seals bearing opening to eliminate air-leakage.

.5 Screw holes for mechanically fastening to ductwork.

.3 High pressure system locking quadrant:

.1 Airtight, rattle-proof regulator, designed for ZERO leakage at high pressure. Use for applications up to 500°F constant temperature.

.2 Handle design for easy recognition of damper position.

.3 Heavy-gauge, zinc-plated steel, 2 high temperature rubber seals and washers, end bearing support, and 2 end bearings. Pressure loss and damper rattle in ductwork has been a constant annoyance for as long as HVAC ductwork has been installed. Now, a truly air-tight, rattle-proof regulator is available. The SPEC-SEAL regulator utilizes a special high-temperature rubber seal to eliminate leakage and rattle even at many times the pressure found in high pressure.

.4 Soft, comfortable grip handle with a highly-visible, plastic cover which indicates the damper position.

.5 Handle to accommodate 9 mm (3/8") or 12 mm (1/2") to match damper shaft size, square and round bearing shafts.

.4 Acceptable manufacturers:
Duro Dyne
Ductmate

Part 3 Execution

3.1 INSTALLATION

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 For supply, return and exhaust systems, locate balancing dampers in each branch duct.

.1 Single blade dampers up to 200 mm (8").

.2 Multi-blade dampers over 200 mm (8").

.4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.5 All dampers to be vibration free.

.6 Leave all dampers in open position for T.A.B.

.7 Fasten locking quadrants to ductwork and shaft.

.8 Place locking quadrants on standoffs where ductwork insulated.

.9 Lock down quadrant arm in the open position.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 ANSI/NFPA 90A, Installation of Air Conditioning and Ventilating Systems.

.3 CAN/ULC-S112, Standard Method of Fire Test of Fire Damper Assemblies.

.4 CAN/ULC-S112.1, Standard Method of Fire Test of Ceiling Firestop Flap Assemblies.

.5 ULC-S505, Fusible Links for Fire Protection Service.

1.2 PRODUCT DATA

.1 Submit product data in accordance with general requirements.

.2 Indicate the following:

.1 Fire dampers.

.2 Operators.

.3 Firestop flaps.

.4 Fusible links.

1.3 MAINTENANCE DATA

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

1.4 MAINTENANCE MATERIALS

.1 Provide following:

.1 6 fusible links of each type.

1.5 CERTIFICATION OF RATINGS

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 FIRE DAMPERS (STATIC)

.1 Fire dampers: arrangement as indicated, listed and bear label of ULC, meet requirements of provincial fire authority and authorities having jurisdiction. Fire damper assemblies to be fire tested in accordance with CAN/ULC-S112.

.2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.

.3 Top hinged: offset single damper, round or square; multi-blade hinged or interlocking type; guillotine type; sized to maintain full duct cross section.

.4 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.

.5 40 mm x 40 mm x 3 mm (1½" x 1½" x 16ga) retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.

.6 Acceptable materials:

.1 Ruskin
.2 Nailor
.3 E.H. Price
.4 T.A. Morrison
.5 Tamco
.6 Ventex/Alumavent
.7 United Enertech
.8 Safeair-Dowco (stainless steel)
.9 Greenheck

2.2 FIRE DAMPERS (DYNAMIC)

.1 Multi blade or roll type, fire damper suitable for HVAC system velocities up to 2000 fpm (610 m/mm), dual direction air flow, max 4" wg pressure.

.2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.

.3 Top hinged: offset single damper, round or square; multi-blade hinged or interlocking type; guillotine type; sized to maintain full duct cross section.

.4 Stainless closure spring to positively close damper upon fusible link release, for horizontal or vertical orientations.

.5 Linkage concealed in frame.

.6 40 mm x 40 mm x 3 mm (1½" x 1½" x 16ga) retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.

.7 Fire damper assemblies and type to meet requirements of provincial fire authority and authority having jurisdiction.

.8 Acceptable materials:

.1 Ruskin

.2 Nailor

.3 E.H. Price

.4 T.A. Morrison

.5 Tamco

.6 Greenheck

.7 Ventex/Alumavent

2.3 FIRE STOP FLAPS

.1 To be ULC listed and labelled and fire tested in accordance with CAN/ULC-S112.1.

.2 Construct of minimum 1.5 mm (16 gauge) thick sheet steel with 1.5 mm (16 gauge) thick non-asbestos ULC listed insulation and corrosion-resistant pins and hinges.

.3 Flaps to be held open with fusible link conforming to ULC-S505 and close at 74°C (165°F).

Part 3 Execution

3.1 INSTALLATION

.1 Provide where indicated and at all fire rated partitions indicated, on architectural drawing.

.2 Install in accordance with ANSI/NFPA 90A and in accordance with conditions of ULC listing.

.3 Maintain integrity of fire separation.

.4 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.

.5 Install access door adjacent to each damper.

.6 Coordinate with installer of firestopping.

.7 Static fire dampers: Only on transfer air ducts where ductwork is not connected to a fan/blower.

.8 Dynamic fire dampers: In all duct work where air is moved by a fan/blower.

END OF SECTION

Part 1 General

1.1 CODES AND STANDARDS

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 ANSI/NFPA 90A, Installation of Air Conditioning and Ventilating Systems.

.3 CAN/ULC-S112, Standard Method of Fire Test of Fire Damper Assemblies.

.4 CAN/ULC-S112.1, Standard Method of Fire Test of Ceiling Firestop Flap Assemblies.

.5 ULC-S505, Fusible Links for Fire Protection Service.

.6 CAN/ULC-S524, Installation of Fire Alarm Systems

.7 CAN/ULC-S1001.11, Integrated Systems Testing of Fire Protection and Life Safety Systems.

1.2 PRODUCT DATA

.1 Submit product data in accordance with general requirements indicating the following:

- .1 Damper type
- .2 Operators
- .3 Fusible links
- .4 Smoke detectors
- .5 Power requirements
- .6 Size, orientation, construction

1.3 MAINTENANCE DATA

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

1.4 MAINTENANCE MATERIALS

.1 Provide following:

- .1 6 fusible links of each type.

1.5 CERTIFICATION OF RATINGS

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 SMOKE DAMPERS

.1 Provide a complete system, consisting of the damper, damper actuator, smoke detector with duct sample tube, sleeve and all other components necessary for a complete and operable system. The assembly shall be factory assembled as a single unit. Field assembly shall be permitted at contractor discretion provided all listings are maintained and the installation follows all manufacturer installation guidelines.

.2 Damper

- .1 Damper shall be ULC listed and labelled
- .2 Both damper and damper actuator to be ULC listed and labelled.
- .3 Normally closed smoke/seal: folding blade type. Blade edge seals of flexible stainless steel shall provide required constant sealing pressure. Stainless steel negator springs with locking devices shall ensure positive closure for units.
- .4 Damper shall have Class I leakage rating.
- .5 Suitable for horizontal or vertical installations.

.3 Actuator

- .1 Actuator shall be ULC listed and labelled
- .2 Motorized actuator: 2-position, spring return, normally open with power on. When power is interrupted damper shall close automatically. Upon return of power, damper shall automatically reset open. Actuators are to be located outside of airstream, unless otherwise specified or shown on drawings.
- .3 Exterior visualization of damper position.
- .4 Damper actuator end switches for monitoring damper position by the BAS.

.4 Factory sleeve.

- .1 Type and style: matching application.

.5 Operating Temperature: 0° Celsius to 99° Celsius ambient temperature rating for 300 fpm to 4000 fpm air velocity.

.6 Smoke Detector:

- .1 ULC approved photoelectric duct smoke detector;
- .2 operates from 100 to 4000 ft/min air velocity, -4 to 158°F temperature, and 0 to 95% non-condensing humidity;
- .3 test/reset button with LED display;
- .4 The detector housing shall be ULC listed specifically for use in air handling systems; capable of local testing via magnetic switch and test button; duct mounted smoke detector with sampling tube, housing.

.5 The detector shall incorporate separate 2.0A 30VDC Alarm and Supervisory contacts. Alarm contacts shall be normally open (N.O.) in which closed contacts will indicate an alarm condition to the fire alarm panel. Supervisory contacts shall be normally closed (N.C.) in which open contacts will indicate a trouble condition to the fire alarm panel.

.7 Damper assembly to operate at 120V with single point power connection.

.8 Large damper sizes can be provided in multiple sections. Field assembly is acceptable following manufacturer's installation guidelines.

.9 Size: as indicated on drawings.

.10 Acceptable materials:
E H Price
NCA Ltd.
Nailor Industries Inc.
Ruskin
Alumavent
United Enertech
Safeair-Dowco (stainless steel)

2.2 COMBINATION FIRE AND SMOKE DAMPERS

.1 Provide a complete system, consisting of the damper, damper actuator, smoke detector with duct sampling tube, sleeve and all other components necessary for a complete and operable system. The assembly shall be factory assembled as a single unit. Field assembly shall be permitted at contractor discretion provided all listings are maintained and the installation follows all manufacturer installation guidelines.

.2 Damper

.1 Damper shall be ULC listed and labelled

.2 Both damper and damper actuator to be ULC listed and labelled.

.3 Normally closed smoke/seal: folding blade type. Blade edge seals of flexible stainless steel shall provide required constant sealing pressure. Stainless steel negator springs with locking devices shall ensure positive closure for units.

.4 Damper shall have Class I leakage rating.

.5 Suitable for horizontal or vertical installations.

.3 Actuator/Link

.1 Actuator shall be ULC listed and labelled

.2 Motorized actuator: 2-position, spring return, normally open with power on. When power is interrupted damper shall close automatically. Upon return of power, damper shall automatically reset open. Actuators are to be located outside of airstream, unless otherwise specified or shown on drawings.

.3 Exterior visualization of damper position.

.4 Damper actuator end switches for monitoring damper position by the BAS.

.5 Combined actuator: electrical control system actuated from smoke sensor or smoke detection system and from fusible link.

.6 Fusible link, or electric re-settable link (ERL).

.7 Electric fire sensor capable of remote openable control is to be provided in place of fusible link where specifically indicated in project documents.

.8 Where ERL or electric fire sensor is used in place of fusible link, this device shall fail closed upon power failure.

.4 Factory sleeve.

.1 Type and style: matching application.

.5 Operating Temperature: 0° Celsius to 99° Celsius ambient temperature rating for 300 fpm to 4000 fpm air velocity.

.6 Smoke Detector:

.1 ULC approved photoelectric duct smoke detector;

.2 operates from 100 to 4000 ft/min air velocity, -4 to 158°F temperature, and 0 to 95% non-condensing humidity;

.3 test/reset button with LED display;

.4 The detector housing shall be ULC listed specifically for use in air handling systems; capable of local testing via magnetic switch and test button; duct mounted smoke detector with sampling tube, housing

.5 6. The detector shall incorporate separate 2.0A 30VDC Alarm and Supervisory contacts. Alarm contacts shall be normally open (N.O.) in which closed contacts will indicate an alarm condition to the fire alarm panel. Supervisory contacts shall be normally closed (N.C.) in which open contacts will indicate a trouble condition to the fire alarm panel.

.7 Damper assembly to operate at 120V with single point power connection.

.8 Large damper sizes can be provided in multiple sections. Field assembly is acceptable following manufacturer's installation guidelines.

.9 Fire rating to match wall assembly i.e. 1 hour/1 ½ hour/2 hour/ 3 hour.

.10 Size: as indicated on drawings.

.11 Acceptable materials:
E H Price
NCA Ltd.
Nailor Industries Inc.
Ruskin
Alumavent
United Enertech
Safeair-Dowco (stainless steel)

2.3 NUMBER OF AIR TYPE SMOKE DETECTORS

.1 Where air velocities are greater than 1.5 m/s (300 feet per second), one air duct type detector shall be installed for every 1.5 meters square (16 square feet) of cross-sectional duct area.

.2 Where air velocities are less than 1.5 m/s (300 feet per second), one duct type smoke detector shall be installed for every 0.5 meters square (5.3 square feet) or cross-sectional duct area.

2.4 PRESSURE RELIEF DOORS

.1 Frames shall be Z-shape, 12 gage (2.8) galvanized steel.

.2 Door shall be 12 gage (2.8) galvanized steel, hinged on one side.

.3 Seal shall be around the door perimeter allowing no more than 7 cfm/ft2 at 1.0 inch w.g..

.4 Door shall include stainless steel springs to close door upon pressure relief and system shutdown.

.5 All release mechanisms, springs and parts shall be completely out of airstream.

.6 Pressure relief settings available from 2” (0.5 kPa) to 10” (2.49 kPA) increments of 1” w.g. (0.25 kPa). Supplier shall examine plans to provide appropriate pressure relief based on associated air handling system.

.7 Pressure relief mechanism shall be factory calibrated in an AMCA Registered Laboratory.

.8 Pressure Relief Doors shall be provided as indicated in the execution section.

Part 3 Execution

3.1 INSTALLATION

.1 Provide smoke dampers where indicated and at all duct penetrations through smoke barrier partitions indicated on architectural drawings.

.2 Provide combination fire and smoke dampers where indicated and at all duct penetrations through fire rated smoke barrier partitions indicated on architectural drawings. To provide separated fire dampers and smoke dampers, obtain approval from the consultant for the alternate arrangement.

.3 Provide pressure relief doors (both positive and negative as applicable) as follows:

.1 For all systems with a combination fire smoke or smoke damper in the duct main of the system when:

.1 The system operates at static pressure of 1.0 inches w.g. or higher; and

.2 More than 50% of the system airflow passes through the combination fire/smoke or smoke damper.

.2 Where/as indicated on the plans.

.4 Install in accordance with ANSI/NFPA 90A, in accordance with conditions of ULC listing and manufacturer's recommendation.

.5 Maintain integrity of smoke separation and fire rating.

.6 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.

.7 Install access door adjacent to each damper and smoke detector.

.8 Front grille access for through wall dampers that terminate in a grille is acceptable.

.9 Provide proper firestopping and duct seal to fire barrier wall.

.10 Confirm proper operation and test sheets.

.11 Should contractor provide separated devices mount smoke detector downstream of damper and within 1.5 m (5 ft) of damper.

.12 Ensure access doors/panels, fusible links, damper actuators and sensors are easily observed and accessible.

3.2 WIRING

.1 All fire alarm wiring shall be 1 hour rated and in conduit or as per electrical fire alarm wiring requirement.

3.3 DAMPER POSITION MONITORING

.1 In all cases the BAS contractor shall monitor the damper actuator end switches i.e. "closed position and open position".

3.4 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

3.5 INTEGRATED LIFE SAFETY SYSTEMS TESTING

.1 Prior to the building Integrated Life Safety Systems Testing the mechanical contractor shall commission/verify the operation of all installed smoke dampers.

.2 Participate in the Integrated Life Safety Systems Testing to confirm proper operation of all operating smoke dampers and associated Life Safety Systems (i.e. fire alarm).

.3 This contractor shall work with the Integrated Life Safety Contractor and reset all systems back into proper operation.

.4 Include all costs associated with participation Integrated Life Safety System Testing in the tender value.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This section applies to operating dampers not specified in Controls Section.

1.2 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

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

1.3 PRODUCT DATA

.1 Submit product data in accordance with general requirements.

.2 Indicate the following:

.1 Performance data.

1.4 MAINTENANCE DATA

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

1.5 CERTIFICATION OF RATINGS

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency.

Part 2 Products

2.1 MOTORIZED DAMPERS

.1 Opposed blade type.

.2 Extruded aluminum, interlocking blades, complete with extruded vinyl seals, spring stainless steel side seals, extruded aluminum frame.

.3 Pressure fit self-lubricated bronze bearings.

.4 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.

.5 Operator: Refer to BAS Section.

.6 Performance:

.1 Leakage: in closed position to be less than 2% of rated air flow at 250 Pa (1" w.c.) differential across damper.

.2 Pressure drop: at full open position to be less than 10 Pa (0.04" w.c.) differential across damper.

.7 Insulated aluminum dampers:

.1 Frames: insulated with extruded polystyrene foam with R factor of 5.0.

.2 Blades: constructed from aluminum extrusions with internal hollows insulated with polyurethane or polystyrene foam, R factor of 5.0.

.3 Use on services to the exterior.

.8 Acceptable materials:
Honeywell
Johnson
T. A. Morrison
E.H. Price
Tamco
Ruskin
Nailor
Henderson Industrial
Ventex/Alumavent

2.2 BACK DRAFT DAMPERS

.1 Automatic gravity operated, multi leaf, aluminum construction with nylon bearings, centre pivoted or counterweighted, as indicated.

.2 Acceptable materials:

T.A. Morrison
Tamco Series 7000
Ruskin
Nailor
E.H. Price
Henderson Industrial
Ventex/Alumavent

Part 3 Execution

3.1 INSTALLATION

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.

.3 Seal multiple damper modules with silicon sealant.

.4 Install access door adjacent to each damper. See Duct Accessories Section.

.5 Insulated dampers on all outside air intake and exhaust damper.

.6 Non-insulated dampers on all interior motorized dampers not exposed to outside air.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 All codes, standards, etc. as referenced shall be the latest edition.

.2 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 Acceptable materials:

.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

.7 Provide factory mounted speed control for all direct drive motors.

2.2 CEILING DISCHARGE FANS

.1 Centrifugal direct drive, with plug in type electric motor suitable for ceiling installation, zinc coated rectangular metal housing.

.2 Sizes and capacity: as indicated.

.3 Toggle switch operated complete with integral electrical outlet box with plug-in type receptacle.

.4 Side duct outlet with integral backdraft damper, size as indicated.

.5 Wall cap complete with spring loaded backdraft damper with neoprene gasket.

.6 Silver anodized aluminum grille paint finish.

2.3 EXISTING EXHAUST AIR FANS

.1 Refurbish existing exhaust air fans as follows:

.1 Vacuum entire unit interior.
.2 Lubricate all bearings.
.3 Replace fan belt(s).
.4 Rebalance to capacity indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's instructions.

.2 Provide flexible duct connection at roofline.

.3 Provide backdraft damper at building exterior penetration.

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

.1 Submit product data in accordance with general requirements.

.2 Indicate the following:

- .1 Capacity.
- .2 Throw and terminal velocity.
- .3 Noise criteria.
- .4 Pressure drop.
- .5 Neck velocity.

1.2 MAINTENANCE MATERIALS

.1 Include:

- .1 Keys for volume control adjustment.
- .2 Keys for air flow pattern adjustment.

1.3 MANUFACTURED ITEMS

.1 Grilles, registers and diffusers of same generic type to be product of one manufacturer.

1.4 CERTIFICATION OF RATINGS

.1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 GENERAL

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.

.2 Frames:

- .1 Full perimeter gaskets.
- .2 Plaster frames where set into plaster or gypsum board and as specified.
- .3 Concealed fasteners.

.3 Concealed operators.

.4 Colour and Finish: standard as directed by Consultant.

.5 Acceptable materials:

.1 E.H. Price
.2 Nailor
.3 Krueger
.4 Titus
.5 Carnes
.6 Seiho
.7 Metalaire

2.2 SUPPLY GRILLES AND REGISTERS

.1 General: with opposed blade dampers as indicated, concealed manual operator and gaskets.

.2 For type, size, and capacity: Refer to drawing schedule.

2.3 RETURN AND EXHAUST GRILLES

.1 General: with opposed blade dampers as indicated, concealed manual operator and gaskets **and fire stop flap where indicated**.

.2 For type, size, and capacity: Refer to drawing schedule.

2.4 DIFFUSERS

.1 General: volume control dampers with flow straightening devices and blank-off quadrants, as indicated and gaskets **and fire stop flap and fire blanket where indicated**.

.2 For type, size, and capacity: Refer to drawing schedule.

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 GOOSENECK HOODS

.1 Thickness: to ASHRAE and SMACNA.

.2 Fabrication: to ASHRAE and SMACNA.

.3 Joints: to ASHRAE and SMACNA and or proprietary manufactured duct joint.

.1 Acceptable material:
Ductmate Canada
Exanno Nexus

.4 Supports: as indicated.

.5 Complete with integral birdscreen of 2.7 mm (12 gauge) diameter aluminum wire. Use 15 mm (1/2") mesh on exhaust 20 mm (3/4") mesh on intake.

.6 Vertical or Horizontal backdraft dampers as required.

.7 Prefabricated roof curb through roof complete with insulation and counter flashing.

2.2 BRICK VENTS (FLANGE FRAME)

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: extruded aluminum alloy 6063-T5.

.3 Blade: stormproof pattern.

.4 Perimeter flange frame, head, sill and jamb: 40 mm (1½") deep one piece extruded aluminum, minimum 3 mm (1/8") thick with approved caulking slot, integral to unit.

.5 Fastenings: stainless steel (Society of Automotive Engineers) SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.

.6 Screen: 15 mm (1/2") exhaust 20 mm (3/4") exhaust mesh, 2 mm (5/64") diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.

.7 Finish: Kynar 500

Colour: to Consultant's approval.

.8 Options:

.1 Straight duct extension.

.2 Perimeter flange frame.

.9 Acceptable materials:

Greenheck Model BVF
Construction Specialties
E.H. Price
Krueger
Ruskin
Ventmaster
Ventex
Nailor

2.3 THIN LINE FIXED LOUVRES – ALUMINUM

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: extruded aluminum alloy 6063-T5.

.3 Blade: stormproof pattern with centre watershed in blade, reinforcing bosses and maximum blade length of 1500 mm (60").

.4 Perimeter flange frame, head, sill and jamb: 50 mm (2") deep one piece extruded aluminum, minimum 3 mm (1/8") thick with approved caulking slot, integral to unit

.5 Fastenings: stainless steel (Society of Automotive Engineers) SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.

.6 Screen: 20 mm (3/4"), 2 mm (5/64") diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.

.7 Finish: Kynar 500
Colour: to Consultants approval.

.8 Acceptable materials:
Greenheck ESJ-150
Construction Specialties
E.H. Price
Krueger
Ruskin
Ventmaster

Nailor
Ventex

Part 3 Execution

3.1 INSTALLATION

.1 In accordance with manufacturers and SMACNA recommendations.

.2 Reinforce and brace air vents, intakes and goosenecks as indicated.

.3 Anchor securely into opening.

.4 Seal with caulking all around to ensure weather tightness.

END OF SECTION

Part 1 General

1.1 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.

1.4 WARRANTY

.1 Contractor hereby warrants refrigeration compressors for 5 years.

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

.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.

.2 Unit control circuit shall contain a 24-v transformer for unit control.

.9 Capacity: As indicated.

.10 Provide the following:

.1 Hail Guard Package.

.2 Winter Start Package.

.11 Acceptable materials:

.1 As indicated.

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 As indicated.

2.4 REFRIGERANT

.1 Holding charge of refrigerant applied at factory.

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.

.5 Provide closed cell Armaflex insulation complete with two (2) coats of UV protectant in lieu of aluminum jacketing.

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.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS

.1 Submit shop drawings in accordance with general requirements.

.2 Indicate:

.1 Equipment, capacity, piping, and connections.

.2 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, sizes and location of mounting bolt holes.

.3 Special enclosures.

.3 Primer coat to be off white.

.4 All hydronic heating shall be by a single manufacturer.

1.2 MAINTENANCE DATA

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

Part 2 Products

2.1 DAMPERS

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

2.2 CAPACITY

.1 As indicated.

2.3 FINNED TUBE RADIATION

.1 Heating elements: NPS 32 mm (1 1/4") seamless copper tubing, 1.2 mm (18 gauge) minimum wall thickness, mechanically expanded into flanged collars of evenly spaced aluminum fins, 100 mm x 100 mm (4" x 4") nominal, 164 fins per meter (50 fins/ft) suitable for sweat fittings.

.2 Element hangers: cradle type providing unrestricted longitudinal movement on enclosure brackets. Space brackets 900 mm (36") centres maximum.

.3 Standard enclosures: 1.6 mm (16 gauge) thick steel complete with stamped grille, components for wall-to-wall or complete with die formed end caps having no knock-outs, with inside corners, outside corners, as indicated. Provide full length channel and sealer strip at top of wall edge. Joints and filler pieces to be flush with cabinet. Support rigidly top and bottom, on wall mounted brackets. Joints and filler pieces to be clear of grilles located to provide easy access to valves and vents. Provide access doors for valves. Finish cabinet with factory applied baked primer coat. Enclosure height and style as indicated.

.4 Special enclosures: as indicated.

.5 Dimensions for enclosures: measure site conditions. Do not scale from drawing.

.6 Provide for noiseless expansion of all components.

.7 Expansion compensators: Flexonics at each section by mechanical contractor as specified elsewhere.

.8 Acceptable materials:

.1 As indicated.

2.4 FREE STANDING FINNED TUBE RADIATION

.1 Copper-aluminum element shall be NPS 32 (1¼") nominal I.D. seamless copper with 4" x 4" (102 mm x 102 mm) aluminum fin. Fins to be stamped for rigidity and have integral collars to provide even spacing of 50 fins/foot (164 fins/m) and maximum heat transfer. Tube ends suitable for seat connecting. Heavy gauge element hangers shall be provided for mounting on the enclosure bracket and shall consist of galvanized rigid steel hanger with peg board style mounting hook and nylon roller bearing to allow for free expansion. Element hanger shall swing from mounting hole for free expansion of element. Centre on minimum 4 ft. (1.2 m).

.2 Element: cradle type providing unrestricted longitudinal movement on enclosure brackets. Space brackets 900 mm (36") centers maximum.

.3 Pedestal legs will mount solidly on the floor. The legs will have an adjustable bracket to accommodate floor level variation. Element hangers will mount on the vertical member of the enclosure bracket at desired height. The front panel will mount into the back panel integral joggle strip. The bottom of the panel is retained by the spring clip. Enclosure is 18 gauge cold rolled steel with a factory baked-on white primer finish, with stamped top grille and open bottom.

.4 Corners: Corners are one piece and cover the back panel as well as the front panel. Gently spread the corner apart and place over the enclosure. Bend tabs at bottom in front and back securing it to the enclosure.

.5 Laps: Used where the enclosure is wall to wall. Laps are one piece and cover back panel as well as the front panel. Gently spread the lap apart and place over the enclosure. Bend tabs at bottom in front and in back securing it to the enclosure.

.6 End caps: Complete the enclosure installation by installing end caps where required.

.7 Dimensions for enclosures: Measure site conditions. Do not scale from drawing. Provide wall to wall installation.

.8 Provide for noiseless expansion of all components.

.9 Expansion compensators: Flexonics at each section by mechanical contractor as specified elsewhere.

.10 Acceptable materials:

.1 As indicated.

2.5 CABINET UNIT HEATERS

.1 Cabinet: surface or recessed installation as indicated, 1.6 mm (16 gauge) thick steel with rounded exposed corners and edges, removable panels, glass fiber insulation and integral air outlet and inlet.

.2 Finish: As indicated.

.3 Coils: aluminum fins mechanically bonded to copper tubes. Hydrostatically tested to 1 MPa (145 psi).

.4 Fans: centrifugal double width wheels, statically and dynamically balanced, direct driven, sleeve bearings, resilient mounted.

.5 Motor: multi-speed, tapped wound permanent split capacitor type with sleeve bearings, built-in thermal overload protection and resilient rubber isolation mounting.

.6 Filters: removable permanent washable type.

.7 Capacity and orientation as indicated.

.8 Control:

.1 3 speed switch with integral overloads in cabinet.

.2 Low limit aquastat strapped on to hot water heating supply set to prevent fan operating below 27°C (81°F).

.3 Control thermostat: electric, rated to suit cabinet heater, with setpoint locking device and concealed adjustment.

.1 Remote thermostat and guard by BAS contractor.

.9 Acceptable materials:

.1 As indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's instructions.

.2 Install in accordance with piping layout and reviewed shop drawings.

.3 Provide for pipe movement during normal operation.

.4 Maintain sufficient clearance to permit performance of service maintenance.

.5 Check final location with Consultant if different from that indicated prior to installation. Should deviations beyond allowable clearances arise, request and follow Consultant's directive.

.6 Valves

.1 Install valves with stems upright or horizontal unless approved otherwise.

.2 Install isolating gate valves on inlet and balancing valves on outlet of each unit.

.7 Venting:

.1 Install screwdriver vent on cabinet convector, terminating flush with surface of cabinet.

.2 Install standard air vent with cock on continuous finned tube radiation.

.8 Clean finned tubes and comb straight.

.9 Install flexible expansion compensators as indicated.

.10 Mount wall mounted radiation at 200 mm (8") above finish floor unless otherwise indicated.

.11 On units fed from below floor provide factory manufactured piping shrouds on the exposed piping between base of the radiation cabinet and finished floor. Shroud shall be manufactured by the radiation manufacturer. Shroud shall match finish of the radiation cabinet.

.12 On fan forced units set discharge patterns and fan speeds to suit requirements prior to acceptance.

.13 Provide new filter media.

END OF SECTION

Part 1 General

1.1 GENERAL NOTE

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

1.2 RELATED WORK SPECIFIED ELSEWHERE

.1 Plumbing & Drainage

Ventilation & Air Conditioning
Testing & Balancing
Electrical

.2 Supply all necessary efforts to provide the project DDC Lon Works system as specified.

1.3 DESCRIPTION OF SYSTEM

.1 Provide a new DCC control system for the packaged rooftop HVAC units, ERVs, exhaust fans, radiation, boiler plant, and other equipment indicated. Furnish and install all components, devices and control wiring for a fully integrated Energy Management and Environmental Control System incorporating Direct Digital Control (DDC), and equipment monitoring. The system shall control and monitor all air handling units, exhaust fans, and other equipment as specified in this section.

.2 The DDC System shall include the new DDC System to the latest Board standards. All controller Chipsets to latest release versions.

.3 The work shall include but is not limited to the following:

.1 New DDC control system.

.2 A local stand alone programmable building automation control (BAS) system for each system as indicated.

.3 Monitoring of outdoor climate conditions.

.4 Split A/C unit control.

.5 Exhaust fan control.

.6 Interior Corridor lighting.

.7 Radiation heating control.

.8 Force flow unit control.

.9 Building low temperature alarm (all spaces with sensor).

.10 Fire alarm.

.11 All dampers, operators, etc, required under this contract.

.12 All electric wiring, switches, relays, etc., for a complete operating system.

.13 All wiring incidental to controls system.

.14 System and equipment trending and scheduling.

.15 System training.

.4 All the necessary controls, motors, control wiring, conduit, control panels, instrumentation, computer software, and network access units, for the specified system shall be provided under this section. The installed system shall incorporate electronic and digital control devices to perform the control sequences and programs outlined herein. Specific control sequence requirements are as detailed in subsequent sections of this specification and on the drawings.

.5 All electrical wiring, mechanical installations, and control sequences shall comply with local and provincial electrical and mechanical codes.

.6 It is the responsibility of the BAS contractor to provide dedicated 120 V power for the automation system from a spare breaker in the nearest electrical panel. Obtain all necessary ESA permits, inspections, and approvals for all power related work.

.7 Testing, debugging, confirmation of total system operation and owner training on the complete operation of the system and the computer software shall also be provided in this section.

1.4 SCOPE OF WORK

.1 The contractor shall supply, install, test, and commission a complete microprocessor based programmable HVAC control system including all system components as described further. The system shall include the necessary engineering, supervision, and programming for a completely operational system. Submit complete As-built information describing the operation/programming and installation/wiring of the new DDC system.

.2 Install new software in the existing custodial PC located on site.

.3 Install new software in the existing PC located at the Board maintenance office on Dutton Drive in Waterloo, Ontario.

1.5 ASSOCIATED WORK SPECIFIED IN OTHER SECTIONS

.1 The contractor shall coordinate the installation of devices furnished in this section with the installing contractor by trade jurisdiction.

.2 Sheet Metal/Ventilating Contractor

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

.3 Electrical Contractor

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

1.6 MANUFACTURER

.1 Bids for the BAS contract will only be accepted from the following vendors/installers:

.1 Energy Controls and Mechanical Services Inc.
565 Trillium Drive, Unit 6
Kitchener, Ontario
N2R 1J4
Tel: (519) 893-2638

.2 All control equipment and materials shall be new and of the manufacturer's latest standard design that complies with the specification requirements.

1.7 SYSTEM ACCEPTANCE

.1 System commissioning and interface to facilities management network shall be performed by the Building Automation contractor.

.2 On project completion, the contractor shall issue a report to the consultant stating that the system is complete, that all hardware and software functions have been verified and that the system is operating in accordance with the specifications. A demonstration of complete system operation shall be made to the owner's authorised representative.

.3 Upon successful completion of the system demonstration, the owner's representative shall be requested to approve, in writing, the satisfactory operation of the DDC System, interface devices and accessories.

.4 The consultant shall verify through the owner's representatives that the entire system is complete and operating to the satisfaction of the owner before final acceptance is approved.

1.8 MAINTENANCE DATA AND SERVICE

.1 Provide maintenance data for controls and instrumentation for incorporation into maintenance manual.

.2 After acceptance, seasonally check and readjust control systems for change over. Make 2 site trips. Notify Engineer of scheduled dates. Carry out any preventive maintenance required including parts and labour. Report to Engineer, in writing, results or resettings made.

.3 Provide as-built information in accordance with Section 15010, requirement.

1.9 WARRANTY

.1 The Control Contractor shall guarantee the control system as specified to be free from defects in workmanship and material under normal use and service for a period of 12 months. Items found defective shall be replaced free of charge for a period of 12 months following written acceptance of the completed project contract by the Owner.

.2 Custom hardware and materials specific to this control system shall be similarly guaranteed for a period of 24 months.

.3 Service conducted on the system during the period of warranty shall be performed by the Contractor on-site. Any component serviced off-site shall be temporarily replaced with an identical device at no additional expense.

.4 Equipment guaranteed for a longer period by the OEM shall be replaced by the Contractor until the manufacturer's limit, on a labour only basis.

.5 Provide telephone support for the duration of the guarantee period accordingly. Submit a written procedure for the reporting of system malfunction by the Owner for required Contractor service. Provide telephone numbers, hour of use, and a 24/7 emergency response number for support.

1.10 SUBMITTALS

.1 Prior to the installation of any equipment, the contractor shall provide the engineer with six (6) copies of shop drawings and specifications for all devices and equipment used for the complete system installation.

.2 Upon completion of the installation and prior to acceptance and owner training, the contractor shall furnish the engineer with three (3) copies of installation and operation manuals for the complete system. Each manual shall include:

.1 "As Built" drawings, including plan layout, conduit runs, interconnection between devices, and panel wiring diagrams as finally installed.

.2 A complete application description, address location, sequence of operation and I/O summary for each controller installed in the system.

.3 System Architecture Schematics: Provide a complete drawing(s) which details all components of the monitoring and control system. Identify the individual type of controllers, communication buses and speeds, power sizes and distribution, etc. by location and name. Field devices need not be shown.

.4 Equipment Description: Provide technical specifications of all additional project equipment used in the system, including all field devices. Include manufacturer, model number, power requirements, accuracy, etc. Identify the information by point labels. Technical specifications will be presented in OEM Adobe “PDF” formats only.

.5 Provide a DDC system generated points list describing the type, function, and label of all control points for cross reference with specification points list and/or sequence of operation.

.6 Provide an Operator's Manual consisting of instructions, program listings and control sequences for the control system. Provide specific instructions, which explain the remote access procedure, all default and programmed DDC system and OWS software passwords, and supervisory control operation.

.7 Provide an OEM CD-ROM containing all product line documentation, manuals, release notes, controller firmware files, etc. Provide internet access to an OEM website which provides current file access to the items on the CD-ROM.

.8 Backup diskettes of all final data files, programs and computer software for the system, as accepted by the owner, for reloading into the site computer in the event of a system catastrophe or site computer memory failure. The contractor shall also keep one copy of backup diskettes for the system archived in a software storage vault at their business location.

.9 Shop drawings shall be approved before any materials are delivered or installed at the project site.

1.11 TESTING AND BALANCING

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

Part 2 Products

2.1 MONITORING AND CONTROL SYSTEM (MCS)

.1 The MCS as specified shall include all necessary hardware, software programming, engineering, installation, calibration, sensors, controlling devices and wiring to provide a complete and functional DDC HVAC system.

.2 The MCS shall be a real-time based, multi-user, multi-tasking, computerized control system incorporating distributed direct digital control processing formats as specified. Mechanical and single loop digital controllers (SLDC) are prohibited.

.3 The MCS controllers shall consist of stand-alone, non-application specific (ASC) , microprocessor based panels which communicate on industry standard communications buses to central/remote display terminals. Provide a functional peer-peer "ECHELON" communications network at each site. Provide software and hardware as required to complete an Ethernet TCP/IP, PTP(RS232), and MS/TP(RS485) network protocol for the DDC system in "Echelon", ISO Standard. The operator's WorkStation software, DDC hardware control panels and products, shall communicate using the protocols and LAN/WAN IP standards as defined by the current ANSI/ASHRAE Echelon standard governed by SSPC 135 (www.Echelon.org).

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

.4 The individual MCS controllers will be able to initiate all alarm reporting and selective data uploading to central/remote display terminals via LAN/WAN connections based on TCP/IP standards.

.5 A fail-safe control mode shall allow equipment to be protected if any controller is disabled or malfunctions.

2.2 CONTROLLERS

.1 The Direct Digital Control (DDC) panels shall have UPS backup and shall consist of the following:

.1 Each DDC controller shall utilize its own microprocessor and must be capable of stand-alone direct digital operation to perform custom program control, monitoring, alarm reporting, trending, and fail safe control. Application specific controllers will not be accepted.

.2 Memory protection for a minimum of 24 hours by zero maintenance capacitor backup shall be provided after a loss of primary power for each DDC controller. This protection shall at a minimum include continuous real-time clock operation and automatic system restart upon power return. Outputs shall have the option of being set to “staggered start” upon power reset.

2.3 DDC SOFTWARE

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

The ECHELON protocol shall communicate all system data via the Ethernet LAN/WAN. DDC communications networks across routers between DDC panels via Echelon/IP shall be provided and demonstrated.

.2 Provide both a menu tree and command prompt type of operator's control software to include complete input/output data base entry, custom application programming, alarm definitions, data trending, report summaries, as a minimum.

The menu tree shall be custom programmed in order to restrict user configured control options based on a minimum of four levels of defined password protection.

.3 The default units of measurement shall be Metric SI, Imperial units are base optional.

.4 The control software concept shall be based on everything is a "point". Any input, output, controller, schedule, calendar, trend, alarm, program, controller or system option is a point that can be addressed. All points can be shared within common control applications, transferred over control networks, modified, printed, saved or deleted as required through operator terminals and in control programs.

.5 Universal Inputs/outputs. All universal point types shall be software configured by selecting sensor options in database creation and modification templates. All changes shall be possible while the system is on-line and operational. The configuration shall be done in a form so that the user is never required to be knowledgeable about the programming itself, only the system and applications.

.6 All numerical point values shall be displayed in integer format or floating point between -3.4*10 ^ 38 to 3.4*10 ^ 38, i.e. .00000123, 7.879E-12, 100. Selected engineering units shall accompany point values.

.7 All points can be printed in an "all-points" log or in selected groups (inputs, outputs, variables, etc.) by the user using "Wild-Card" conventions.

.8 All points will be programmed to alarm based on user defined input ranges for both digital change of state and analog point values.

.9 Provide the following control routines:

- Start/Stop by Schedule, Duty cycle, Optimization, Level, Electrical demand.
- Process Loop Control - P, PI, PID.
- Economizer Control of Free Outdoor Air Cooling.
- Boiler Plant Optimization. Adaptive Hot Water Reset.
- Equipment Trend Log, Run-Time Monitoring.
- Unitary Equipment Programs.

Custom control programs developed shall be added to the library of software routines.

.10 Provide the following Operators:

- Logical "NOT", "AND", "OR", "XOR". Minimum of three Expressions.
- Value Power "^". (i.e.. 2^3 = 8)
- Addition "+", Subtraction "-".
- Multiplication "*", Division "/".
- Integer of a Division "\", Remainder of Division "MOD".
- Less Than "<", Greater Than ">".
- Less Than or Equal "<=", Greater Than or Equal ">=".
- Equal "=", Not Equal "<>".

.11 Provide a DDC based custom control strategy programming language based on a high level "Control" type code such as Basic. Assembler type or proprietary based programming languages will not be accepted. All programs shall use embedded comment statements to describe control sequences within the software program.

All of the above functions must be accomplished via DDC software.

Editing Features

.1 Provide full screen editor to enable editing of the program source code down to character by character changes.

.2 Provide the capability in the editor of accepting programs from ASCII files that have been created on other text editors and word processors.

.3 If a point name is changed, all occurrences of that will point will automatically be changed, regardless of where the occurrence exists.

.4 Provide cutting and pasting functions within editor, such that sections of the code from one program can be easily cut and pasted into a different code on residing in another controller.

.5 Provide debug utility, which will indicate line of code containing structural or syntax error.

.6 If coding contains line number reference, provide automatic renumbering feature to sequentially renumber lines.

.7 Provide the capability to automatically view value and/or status of points used within the code without exiting editor.

.8 Provide at least TEN (10) unique local variables that can be declared for each individual code.

.12 Control software "Firmware" shall be the most recent version available and shall be upgraded with new versions, which become available within the warranty period.

2.4 LOCAL DISPLAY TERMINAL SOFTWARE

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

.2 Software versions shall operate under the latest version of all the Microsoft Windows operating systems. The software versions shall be Windows compliant and permit multitasking operation. The software shall permit multiple "windows" to be simultaneously open for the DDC system, desktop, and other third party programs, i.e. "Netscape", “Microsoft Word” etc.

.3 Provide multiple-level system access protection on any DDC port to allow restricted control of system operations according to user capability. Provide six levels minimum for 32 system users.

.4 Control sequences are to be created in high-level code.

System alarms shall indicate the specific graphic for display in response to alarm recognition.
System points on all graphic displays shall include custom text files for on-line review by operators to describe specifics about the point.
The graphic displays shall use any type of DDC system point in quantities limited only by the usable display area of the monitor.
All DDC points shall be referenced in OEM/Echelon point ID format. Control points from other control systems shall be displayed directly in the graphics software application stipulated.
Explanation, creation, modification, programming of graphics shall be detailed in OEM manuals and in electronic "PDF" format.
Displays should permit:
- At least 30-local/network points minimum per page.
- Automatic updating every 10 seconds minimum.
- Alarm display and control conditions.
- Simple means of color printing.

Provide a display for:
- Main summary page. c/w project title, OAT conditions, other.
- Energy Data.

.5 The system shall trend and display either numerically or graphically any digital and analog system point with a value. Data files in standard formats for direct use with third-party spreadsheet software (Microsoft Excel) shall be included. Automatic upload of trend data by the system shall be included. The trend features including elapsed time period between logging, value accuracy, number of points, and engineering units shall be programmable. The DDC programs shall control the start/stop, snapshot, and reset of analog and digital trends.

A minimum of four points can be trended in one database.

.6 The system alarms shall be directed to the Remote Central Display Terminal for hard disk type record purposes. The alarm format shall be in ASCII format sent by Ethernet LAN/WAN and e-mail compatible formats. Alarm report printouts shall be obtained by request of a system operator.

2.5 MOTORIZED CONTROL DAMPERS

.1 Control dampers shall be opposed blade type. Size as indicated on drawings.

.2 Damper frames shall be 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 1/8 in. extruded aluminum.

.4 Damper shaft bearings shall be as recommended by manufacturer for application, oil impregnated sintered bronze or better.

.5 All blade edges and top and bottom of the frame shall be provided with replaceable butyl rubber or neoprene seals. Side seals shall be spring-loaded stainless steel. The blade seals shall provide for a maximum leakage rate of 50 L/s m2 (10 cfm per ft2) at 1000 Pa (4 in. w.g.) differential pressure. Provide air foil blades suitable for a wide-open face velocity of 7.5 m/s (1500 fpm).

.6 Exterior dampers shall have insulated blades and insulated frame.

.7 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.

.8 Modulating dampers shall provide a linear flow characteristic where possible.

.9 Dampers shall have exposed linkages.

.10 Acceptable Manufacturers.

.1 Tamco
.2 Nailor
.3 Greenheck
.4 Johnson Controls
.5 Ruskin
.6 Alumavent

2.6 CONTROL VALVES

.1 Control valves shall be two-way for two-position or modulating service as shown.

.2 Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:

.3 Water Valves:

.4 Two-way: 150% of total system (pump) head.

.5 Water Valves:

.6 Body and trim style and materials shall be in accordance with manufacturer's recommendations for design conditions and service shown, with equal percentage ports for modulating service.

.7 Sizing Criteria:

.8 Two-position service: Line size.

.9 Two-way modulating service: Pressure drop shall be equal to 50% of the pressure difference between supply and return mains, or 5 psi, whichever is greater but not less than one trade size of supply pipe.

.10 Valves 1/2 in. through 2 in. shall be bronze body or cast brass ANSI Class 250, spring-loaded, PTFE packing, quick opening for two-position service. Two-way valves to have replaceable composition disc or stainless steel ball.

.11 Valves 2 1/2 in. and larger shall be cast iron ANSI Class 125 with guided plug and PTFE packing.

.12 Water valves shall fail normally open or closed as follows:

.13 Water zone valves remain in set position.

.14 Heating coils in air handlers-normally open.

.15 Other applications-as scheduled or as required by sequences of operation.

.16 Valve Actuators: all valve actuators for modulating control shall be 0-10Vdc or 4-20 mA analogue signal.

.17 Acceptable Manufacturers:

.1 Neptronic

.2 Belimo

.3 Tour & Anderson

2.7 NON-DDC TEMPERATURE DEVICES

.1 Low-limit thermostats. Low-limit airstream thermostats shall be UL listed, vapor pressure type, with an element of 6 m (20 ft) minimum length. Element shall respond to the lowest temperature sensed by any 30 cm (1 ft) section. The low-limit thermostat shall be automatic reset only.

.2 Acceptable Manufacturers

.1 Siemens
.2 Honeywell
.3 Johnson Controls
.4 ACI
.5 Greystone

2.8 DDC THERMOSTATS

.1 DDC Temperature Thermostat

.2 Digital room sensors shall have LCD display, day / night override button, and setpoint slide adjustment to ±5°C adjustment and override options. The setpoint slide adjustment can be software limited by the automation system to limit the amount of room adjustment.

.1 Temperature monitoring range +20/120°F (13° to 49°C)

.2 Output signal Changing resistance

.3 Accuracy at Calibration point ±0.5°F (+/- 0.3°C)

.4 Set Point and Display Range 55° to 95° F (13° to 35°C)

.3 Provide guards on thermostat in common areas.

.4 In corridors, washrooms, and gymnasiums provide stainless steel plate type sensors (push button override and LCD display not required).

.5 Do not provide LCD display.

.6 Acceptable Manufacturers

.7 Devices must be the same as the control manufacturers product.

.1 As per approved control system contractor and manufacturer list.

2.9 TEMPERATURE SENSORS

.1 Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor.

.2 Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 1.5m (5ft) in length per 1 m2 (10 ft2)of duct cross section.

.3 Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed. The well must withstand the flow velocities in the pipe.

.4 Space sensors shall be equipped with set point adjustment, override switch, display, and/or communication port as shown.

.5 Provide matched temperature sensors for differential temperature measurement.

.6 Outdoor sensors shall have gasket cover connection and thermal radiation cover to protect the sensor from weather conditions.

.7 Acceptable Manufacturers

.1 Siemens
.2 Honeywell
.3 Johnson Controls
.4 ACI
.5 Greystone

2.10 HUMIDITY SENSORS

.1 Duct and room sensors shall have a sensing range of 20% to 80%.

.2 Duct sensors shall be provided with a sampling chamber.

.3 Outdoor air humidity sensors shall have a sensing range of 20% to 95% RH. They shall be suitable for ambient conditions of-400C to 750C (-400F to 1700F).

.4 Humidity sensor’s drift shall not exceed 1 % of full scale per year.

.5 Acceptable Manufacturers

.1 Siemens
.2 Honeywell
.3 Johnson Controls
.4 ACI
.5 Greystone

2.11 FLOW SWITCHES

.1 Flow-proving switches shall be either paddle or differential pressure type, as shown.

.2 Paddle type switches (water service only) shall be UL listed, SPDT snap-acting with pilot duty rating (125 VA minimum) and shall have adjustable sensitivity with NEMA I enclosure unless otherwise specified.

.3 Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application or as specified.

.4 Acceptable Manufacturers

.1 Siemens
.2 Honeywell
.3 Johnson Controls
.4 ACI
.5 Greystone

2.12 $C0_2$ DETECTOR

.1 Non-Dispersion-infrared (NDIR) technology used to measure CO2 levels.

.2 Provides output signal proportional to CO2 level.

.3 Outputs shall be configured using optional software package to provide advanced control strategies using CO2.

.4 Wall mounting or duct mounting, depending on application.

.5 Gold-plated sensor to provide long-term calibration stability.

.6 Ambient Operating Range: +32°F to +122°F (0°C to +50°C).

.7 Relative Humidity (non-condensing) range: 0 to 95 percent.

.8 Communications interface: Serial UART port connection via four-wire cable and optional software package.

.9 Power supply: 15-29 V (ac/dc), 50/60 Hz (Class 2).

.10 Analog output ratings: 0 to 10 Vdc.

.11 Acceptable Manufacturers

.1 Siemens
.2 Honeywell
.3 Johnson Controls
.4 ACI
.5 Greystone

2.13 SENSORS AND CONTROL DEVICES

.1 A general guideline requires all new only devices to be supplied/installed as specified. Sensors must provide responses, which deliver accurate, reliable control of HVAC equipment.

.2 Sensors and control devices are to be industry standard products that can be purchased by the Owner from the manufacturer.

.3 Temperature Sensors.

.1 10 k NTC @ 25 degC Thermistor. Encapsulated to protect against moisture and permit an acceptable TC for the application.
Acceptable products:
All DDC based temperature sensors as supplied by:

.1 MAMAC

.2 Greystone.

.3 Enercorp.

.2 Each sensor shall be provided with a custom label which indicates the model, manufacturer, specifications, and DDC point I.D.

.3 Duct mounted sensors shall be S.S. probe type or flex averaging element type as specified. Probe sensors are suitable in duct under 1.5 square meter cross sectional area. Averaging elements/probes are suitable for any duct as preferred.

.4 Space sensors shall be provided with ventilating conductive protective covers, mounted an approved distance from the floor level. Provide space sensors as specified. Stainless Steel (S.S.) plate sensors are specified for use in all rooms. Submit samples to Owner for final approval with shop drawings.

.5 Liquid immersion sensors shall be spring loaded tip sensitive devices mounted in existing or new brass wells rated for the working temperature and pressure of the fluid.

.6 Outdoor air sensor shall be weather proof and properly shielded from direct solar radiation. The probe shall be externally mounted on the building skin and properly sealed to eliminate the effect of internal air temperatures.

.4 Current Sensing Status Switch. On/Off.

.1 Current sensing relays shall be solid state, two wire, now powered devices.
Acceptable products:
Greystone CS-GNC
Hawkeye model H-800 N.O. contact @ 0.5-200 A as supplied by:
Veris Industries, www.veris.com

.5 Air Pressure Switches. On/Off.

.1 Switches shall be field adjustable over the operating pressure range and provide snap-acting Form C contacts.

.6 Control Relays.

.1 Control relay contacts shall be rated for 150% of the loading application, Form C double pole contacts. The relay shall provide a minimum one million operations and contain coil transient suppression devices and DDC output LED pilot. All relays shall be mounted on a separate relay base.
Acceptable products:
.1 FEME. Model Series M15. Pilot.
.2 Omron. HP rated, starter rated.

.7 Solid State Relays. SSR

.1 SSR with opto-electronic coupler for 3-32 V d.c. turn on/off input control shall be provided. Relays shall be rated for the application and mounted on a properly sized heat sink in order to regulate relay temperatures below 25 °C continuously.
Acceptable products:
.1 Crydom.

.8 0-135 Ohm Transducer.

.1 Transducer shall be solid state, no motorized POT, with a minimum 8bit/256
.2 step resolution. Long life-cycle relays shall be integrated to provide the resistive control.
.3 The device shall permit fail-safe operation to manual 0-135 set point control.
.4 Provide 24 VAC power.
Acceptable products:
.1 Delta
.2 MAMAC
.3 Greystone.

2.14 ELECTRIC AND MECHANICAL DEVICES

.1 All electric switch devices shall be selected for the applied load and UL listed and labeled for the application and environment to which they are applied. Miscellaneous, electric, and mechanical devices shall include:

.1 Provide any automatic control dampers not specified to be integral with other equipment. Frames shall not be less than 2.5 mm (13 gauge) galvanized steel. Blades shall not be over 200 mm (8") wide nor less than 1.6 mm (16 gauge) galvanized steel roll formed. Bearings shall be oilite, ball-bearing or nylon with steel shafts. Side seals shall be stainless steel of the tight-seal spring type. Dampers and seals shall be suitable for temperature ranges of –40°C to 93°C (-40°F to 200°F).

.1 All proportional control dampers shall be opposed or parallel blade type as hereinafter specified and all two-position dampers shall be parallel blade types.

.2 Dampers shall be sized to meet flow requirements of the application. The sheet metal contractor shall furnish and install baffles to fit the damper to duct size. Baffles shall not exceed 150 mm (6").

.3 Dampers shall be minimum leakage type to conserve energy and the temperature control manufacturer shall submit leakage data for all control dampers with the temperature control submittal. Maximum leakage for dampers in excess of sixteen inches square shall be 152 l/s/m^2 (30 cfm/ft^2) at static pressure of 25 mm (1") of w.c.

.4 Where ultra-low leakage dampers are specified the blade edges shall be fitted with replaceable, snap-on, inflatable seals to limit damper leakage to 2.8 l/s/m^2 (6 cfm/ft^2) for dampers in excess of sixteen inches square at 25 mm (1") of w.c.

.2 All automatically controlled devices, unless specified otherwise elsewhere, shall be provided with actuators sized to operate their appropriate loads with sufficient reserve power to provide smooth modulating action or two-position action and tight close-off.

Acceptable material:
Belimo

Part 3 Execution

3.1 GENERAL

.1 The DDC controls project shall be performed in accordance with the general conditions of the contract. The contractor shall conduct all on-site work in conjunction with building operating staff to streamline the new system startup.

.2 The summary of input/output channels describe the DDC system points. It is the responsibility of the Contractor to ensure compatibility of the mechanical systems, devices, and actuators with the DDC system.

.3 All digital output control points located in unconditioned spaces shall be relocated to an accessible ventilated indoor location. All control devices, DDC panels, other shall be located inside the conditioned space of the building envelope.

.4 All DDC system equipment will become the property of the Owner.

3.2 LABELLING

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

3.3 COMMISSIONING - DDC SYSTEMS

.1 Check the installation of each sensor, actuator, and controlled device.

.2 Verify and record in as built OEM drawings the wiring of each I/O sensor and device as installed.

.3 Calibrate each sensor as required.

.4 Manually operate each output for every system with a portable Display Terminal supplied by the contractor for commissioning.

.5 Tune each control loop and print the response of trends for hard copy record. Identify correct PID parameters on all print outs.

.6 Verify all start/stop operations, e.g. "schedule control", "Optimized control", "unoccupied mode" setback.

.7 Verify all custom control programs and alarm functions.

.8 Perform end-to-end checks from an operator terminal to all sensors and actuators to verify system communications and control via LAN/WAN.

.9 Verify all Echelon communications as specified and submit all point naming and identification values accordingly.

3.4 INSTALLATION

.1 Install systems and related controls in accordance with approved shop drawings and manufacturer's recommendations using factory-trained journeymen certified by the Province of Ontario.

.2 Locate thermostat, room sensors, etc., location as shown or as required.

.3 Secure approval for damper motor locations and supports. Submit detail of damper motor location and support for approval.

.4 Provide dampers, for installation by the sheet metal contractor on new and or existing dampers.

3.5 POINT DESCRIPTORS

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

3.6 SYSTEM OPERATION

.1 General

Where Optimum Start Stop (OSS) is specified, equipment shall start-up based on global outdoor temperature, space temperature, and system response to assure that comfort conditions are reached at scheduled occupancy time (occupancy schedules are defined under time programs), and operate in both heating and cooling cycles. In all cases, the optimum start program shall operate fully stand-alone in the local GPC.
OSS shall include a Night Cycle program applying to (heating cycle only) (both heating and cooling cycle) with the outdoor air dampers closed. The space temperature shall be used to determine the “fan on” and/or “supply heat” command to maintain a low limit of *50-55* degrees for the heating cycle and the “fan on” and “supply cooling” command to maintain 82 degrees for the cooling cycle.

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

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

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

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

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

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

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

.3 Application Requirements

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

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

.3 Sensors
Select duct insertion sensors to suit the application. For large ducts, use sensors with longer probe lengths. For heating and cooling coil freeze protection, use a long capillary type sensor. For mixed air and coil discharge temperature sensing, use averaging capillary type sensors.

.4 Valves
Ensure that actuators meet all the job requirements (i.e., control signal, close off, action, etc.). Control valves shall be selected to suit both the medium and the specified configuration (i.e., Straight-thru, 3-way, screwed, flanged, etc.).

.5 Damper Actuators

The total number of actuators may vary depending on the damper size. Consult the actuator's application literature to determine sizing requirements and use no less than 30% of the minimum number of actuators recommended.

.4 Design Requirements

.1 Safeties: Smoke detector or high temperature interlocks will be hard-wired to the supply fan starter. These points will be assigned addresses in the DDC controller for alarm annunciation purposes only. AHU's with flows greater than 15,000 CFM will require a smoke detector or high temperature detector in the supply and return air ducts.

.2 Schedules: Time schedules will default to 6AM to 6PM, Monday through Friday.

.3 Actuators: Actuator output points will display as follows:

.1 0% = 2-way valve, closed.
.2 0% = 3-way valve, closed to the coil.
.3 0% = Mixed air dampers, full return air position.
.4 100% = 2-way valve, open.
.5 100% = 3-way valve, open to the coil.
.6 100% = Mixed air dampers, full fresh air.
.7 These requirements shall be the case no matter how the actuator is sequenced or whether it is a reverse or direct acting valve.

.4 Valves: Heating and cooling coil valves shall fail open to the coil. Mixed air dampers shall fail to the full return air position.

.5 Outdoor Sensors: Outdoor air temperatures and humidities (where applicable) are assumed to be Global points transferred to DDC controllers. If the BMCS system lacks global point capability, global points shall be replaced by hardware points connected to specific controllers; the I/O capacity of the controller being used must be checked to make sure the added points will fit in the controller and upgraded in point capacity if necessary.

3.7 SEQUENCES OF OPERATION

.1 <u>SEQUENCE OF CONTROL</u>

.1 General

.1 The control programs shall be modular and structured in order to provide specific control operation of all HVAC components indicated.

.2 All control programs shall provide a minimum of 20% spare memory for expansion.

.3 Each control program shall contain "REM" statements which explain the program operation.

.4 Each control program shall open with a list of the I/O points used and controlled in the program.

.2 DDC Sensors and Devices - are listed in the Points Summary that is part of this specification. Provide 5% spare I/O capacity.

Implement the following control program concepts in full, or partial as required, to provide complete HVAC equipment control. The programs shall perform all control strategies on the basis of protecting equipment operation, saving operational energy costs, and indicating alarm conditions.

Programs which increase the system energy consumption or cause equipment failures will be refused and resolved by the contractor accordingly at not additional cost to the Board.

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

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

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

.5 System Architecture: The control sequences will be performed by DDC controllers arranged as indicated in the following architecture diagram:

.2 HEATING CONTROL (MISCELLANEOUS WASHROOMS and SPACES WITH HEAT ONLY)

.1 Provide individual DDC space control (with TCV's) of miscellaneous rad heaters, convectors, unit heater, force flows complete with night setback program.

.3 ELEVATOR MACHINE ROOM/ELECTRICAL ROOM

.1 BAS will engage the exhaust fan on rise in room temperature past setpoint.

.2 Monitor fan status.

.4 CABINET HEATERS (VESTIBULES)

.1 Provide BAS control of heaters.

.2 Lock out heating when outdoor air is above 5°C.

.3 When outdoor air is above 0°C and below 5°C cycle fan and open/close control valve to maintain setpoint of 15°C.

.4 When outdoor air is below 0°C open control valve and cycle fan to maintain 18°C.

.5 Include system operation on graphic package.

.5 BUILDING LOW TEMPERATURE

.1 All space sensors shall be capable of indicating building low temperature. Alarm building low temperatures at OWS.

3.8 ELECTRICAL

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

.2 Arrange for all the necessary inspections and approvals of built-up and modified control systems and relay panels by governing authorities. All electrical equipment, material, and its installation shall conform to the current requirements of the following authorities:

.1 C.S.A

.2 Ontario Hydro Safety Authority

.3 O.B.C. Building Codes / Fire Codes.

.3 All wiring shall conform to governing codes and shall be inspected by request of the contractor for approval. The contractor shall obtain and purchase all necessary permits as required.

.4 Wiring: All electric wiring in connection with this project shall be furnished and installed under this section.

.1 The Contractor shall be aware that cables carrying high currents run through ceiling and wall cavities. Signal interference or sensor inaccuracy or failure caused by existing cable runs shall be the responsibility of the Contractor and shall be covered under the warranty. The Contractor shall select sensors and use shielded cable or transmitters as necessary to prevent electrical interference with the control system operation.

.2 The Contractor shall coordinate fully the interconnection of factory assembled portions of system controls, field installed control systems and the electrical power system to provide a complete working installation.

.3 Power for control equipment shall not be taken from equipment motor leads. Power shall be from circuits dedicated for controls only.

.4 Transformers shall be sized for 150% of engineered capacity.

.5 All wires are to be numbered using wire labels at each end. These labels shall correspond to wire identification on the shop drawings and "as-built" drawings.

.5 Electrical Isolation of I/O Points: To prevent serious damage to the field panels from surges, or RFI electrically induced spikes, protection in the following form shall be provided, as a minimum:

.1 Digital outputs singularly or collectively shall be galvanically isolated from the main panel processor.

.2 Analog outputs shall be galvanically isolated from each other and the main panel processor.

.3 Digital inputs shall be galvanically isolated from the main panel processor.

.6 Panel Documentation: Mount an input/output layout sheet within each controller field panel. This sheet shall include the name of the points connected to each controller channel.

.7 Conduits and Wiremold: All exposed wiring, whether for power, sensors, actuators, or data communications, shall be in metallic conduit or wiremold in all finished areas. This includes all wiring runs in and around rooftop HVAC units. All conduits shall have a minimum inside diameter of 13mm.

.1 All conduits shall be installed out of the way in traffic areas, and parallel to the lines of the building. Flexible conduit may be used only in areas of vibration or expansion joints. All conduits shall be supported at least every 4 feet. Supports shall be located at each connector end of each conduit. High and low voltage wire shall not be run in the same conduit. Only wires of similar purpose shall be run in the same conduit; i.e. sensor or control, power, and communication wire shall be in separate conduit.

.2 The Contractor may use existing unused conduit from equipment that is no longer in service, if the opportunity arises during construction.

.3 Wiremold shall be a specified in Division 16. Colour shall be selected by the owner.

.8 Pull Boxes and Junction Boxes: Pull boxes shall be located at a minimum spacing of 30m. The contractor is responsible for getting approvals from the Owner for locating pull boxes. Pull boxes shall comply with the Canadian Electrical Code. All boxes shall be clearly marked as part of the automated control system.

.9 Enclosures: All enclosures shall be mounted such that the doors can open fully without interference with new or existing equipment. Except where expressly permitted in writing by the Owner or Engineer, enclosures shall be mounted in easily accessible locations where a technician can clearly see and easily access all components inside without a stool or ladder.

.10 Power Protection: During the warranty period, the Contractor shall be responsible for parts and labour to repair or replace any system equipment damaged by power quality problems (spikes, sags, waveform anomalies, etc.). with that in mind, the Contractor shall provide appropriate power protection.

.11 All wiring shall conform to governing codes and shall be inspected by request of the contractor for approval. The contractor shall obtain and purchase all necessary permits as required.

.12 It is the responsibility of this contractor to provide dedicated 120 V, power from the spare breaker for the automation system from the nearest electrical panel.

3.9 CONTROL SYSTEM SOFTWARE

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

.2 Shop Drawings: The Contractor shall provide to the Engineer complete schematic drawings for the entire control system for approval before work shall begin. This submittal shall be provided under this Division and include all control components purchased and installed for the project. Manufacturer's control terminals shall be indicated at each end of each wire. Upon completion of his work the controls contractor shall provide three sets of maintenance and operation manuals for distribution to the owner. Control wiring diagrams shall show all temperature controls, start/stop arrangement for each piece of equipment, equipment interlocks and any special connection information required for properly controlling the mechanical equipment.

.3 Manuals: The Contractor shall provide three copies of the manual for the operator terminal software. The Contractor shall also provide three copies of all manuals used by the programmer(s) in setting up the system. This includes general programming manuals and any equipment-specific programming manuals for hardware used on the project.

.4 Training: The Contractor shall provide four one-half day training sessions on-site and as soon as possible after system start up. The person providing the training shall be someone involved with the programming and completely familiar with the job. Exact training dates and times shall be arranged with the Owner.

.5 Start Up of Control Systems: Once the Contractor has completed all installation and programming, he will arrange to demonstrate the system operation to the Engineer and Owner. If there are any deficiencies at this point, they will be documented by the Engineer. That documentation will be sent to the Contractor, and the Contractor will proceed to rectify the deficiencies as quickly as possible. The Contractor will then arrange a second demonstration.

.1 This process will be repeated, if necessary, until the Owner, Contractor, and Engineer all agree that the system meets this specification fully and there are no more deficiencies requiring correction.

.2 When the Owner and Engineer have agreed that all deficiencies have been corrected, the Contractor shall:

.1 Submit three (3) printed copies of the “As Built Drawings”.

.3 At the completion of the startup, the Contractor shall submit to the Engineer a letter stating that he has made final calibrations and adjustments to the system and stating that the Owner's operating personnel have been instructed in its use or that instruction periods have been scheduled.

.4 The contractor shall work in conjunction with the owners' commissioning agent after start up is complete until the entire system is commissioned and accepted by the owner.

3.10 See the graphical sequence of operations attached to the end of this specification for equipment and systems.

END OF SECTION

Division 26 Common Requirements for Electrical

Division 28 Electronic Safety and Security

END OF SECTION

Part 1 General

1.1 GENERAL INSTRUCTIONS

.1 Comply with the General Conditions, Supplementary Conditions, and all of General Requirements, Mechanical and Electrical Divisions.

1.2 CASH ALLOWANCES (HST EXCLUDED)

.1 Refer to Division 1 specification for cash allowances.

1.3 FEES

.1 The contractor is to determine general inspection fees with Electrical Safety Authority and include as part of tender.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This Section covers items common to Electrical Divisions.

.2 This section supplements requirements of Division 1.

.3 Furnish labour, materials, and equipment necessary for completion of work as described in contract documents.

1.2 INTENT

.1 Mention herein or indication on Drawings of articles, materials, operations, or methods requires: supply of each item mentioned or indicated, of quality, or subject to qualifications noted; installation according to conditions stated: and, performance of each operation prescribed with furnishing of necessary labour, equipment, and incidentals for electrical work.

.2 Where used, words “Section” and “Division” shall also include other Subcontractors engaged on site to perform work to make building and site complete in all respects.

.3 Where used, word “supply” shall mean furnishing to site in location required or directed complete with accessory parts.

.4 Where used, word “install” shall mean secured in place and connected up for operation as noted or directed.

.5 Where used, word “provide” shall mean supply and install as each is described above.

1.3 TENDERS

.1 Submit tender based on specified described equipment or Alternates listed.

.2 State in Tender, names of all Subcontractors proposed for work under this Division.

1.4 LIABILITY INSURANCE

.1 This contractor must maintain and produce at the request of the consultant proof of proper insurance to fully protect the Owner, the Consultant and the Contractor from any and all claims due to accidents, misfortunes, acts of God, etc.

1.5 DRAWINGS

.1 Electrical Drawings do not show structural and related details. Take information involving accurate measurement of building from building drawings, or at building. Make, without additional charge, any necessary changes or additions to runs of conduits and ducts to accommodate structural conditions. Location of conduits and other equipment may be altered by the Consultant without extra charge provided change is made before installation and does not necessitate major additional material.

.2 As work progresses and before installing fixtures and other fittings and equipment which may interfere with interior treatment and use of building, provide detail drawings or obtain directions for exact location of such equipment and fitments.

.3 Electrical drawings are diagrammatic. Where required work is not shown or only shown diagrammatically, install same at maximum height in space to conserve head room (minimum 2200 mm (88") clear) and interfere as little as possible with free use of space through which they can pass. Conceal wiring, conduits and ducts in furred spaces, ceilings and walls unless specifically shown otherwise. Install work close to structure so furring will be small as practical.

.4 Before commencing work, check and verify all sizes, locations, grades, elevations, levels and dimensions to ensure proper and correct installation. Verify existing/municipal services.

.5 Locate all electrical equipment in such a manner as to facilitate easy and safe access to and maintenance and replacement of any part.

.6 In every place where there is indicated space reserved for future or other equipment, leave such space clear, and install services so that necessary installation and connections can be made for any such apparatus. Obtain instructions whenever necessary for this purpose.

.7 Relocate equipment and/or material installed but not co-ordinated with work of other Sections as directed, without extra charge.

.8 Where drawings are done in metric and product not available in metric, the corresponding imperial trade size shall be utilized.

1.6 INTERFERENCE AND CO-ORDINATION DRAWINGS

.1 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the constructed spaces provided.

.2 Prepare drawings to indicate co-ordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus, and connections are co-ordinated.

.3 Ensure that clearances required by jurisdictional authorities and clearances for proper maintenance are indicated on drawings.

.4 Upon consultant’s request submit copies of interference drawings to the consultant.

1.7 QUALITY ASSURANCE

.1 The installations of the division must conform to the latest edition of the Electrical Safety Code as well as its supplemental bulletins and instructions. Provide materials and labour necessary to comply with rules, regulations, and ordinances.

.2 Complete underground systems in accordance with CSA C22.3 No. 7-94 except where specified otherwise.

.3 Abbreviations for electrical terms: to CSA Z85-1983.

.4 In case of differences between building codes, provincial laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Consultant in writing of such differences.

1.8 ALTERNATES AND SUBSTITUTIONS

.1 Throughout these sections are lists of “Alternate Equipment” manufacturers acceptable to Consultant if their product meets characteristics of specified described equipment.

.2 Each bidder may elect to use “Alternate Equipment” from lists of Alternates where listed. Include for any additional costs to suit Alternated used. Prices are not required in Tender for Alternates listed.

.3 It is responsibility of this Division to ensure “Alternate Equipment” fits space allocated and gives performance specified. If an “Alternate Equipment” unit is proposed and does not fit space allotted nor equal specified product in Consultant’s opinion, supply of specified described equipment will be required without change in Contract amount. Only manufacturers listed will be accepted for their product listing. All other manufacturers shall be quoted as substitution stating conditions and credit amount.

.4 If item of material specified is unobtainable, state in Tender proposed substitute and amount added or deducted for its use. Extra monies will not be paid for substitutions after Contract has been awarded.

1.9 EXAMINATION

.1 Site Inspection

.1 Examine premises to understand conditions, which may affect performance of work of this Division before submitting proposals for this work.

.2 No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

.2 Drawings:

.1 Electrical Drawings show general arrangement of fixtures, power devices, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.

.2 Consider Architectural, Mechanical, and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Electrical Drawings.

.3 Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories, which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.

.3 Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.

1.10 SEQUENCING AND SCHEDULING

.1 It is understood that while Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for installation of systems according to the true intent and meaning of Contract Documents. Anything not clear or in conflict will be explained by making application to Consultant. Should conditions arise where certain changes would be advisable, secure Consultant's approval of these changes before proceeding with work.

.2 Coordinate work of various trades in installing interrelated work. Before installation of electrical items, make proper provision to avoid interferences in a manner approved by Consultant. Changes required in work specified in these sections caused by neglect to do so shall be made at no cost to Owner.

.3 Arrange fixtures, conduit, ducts, and equipment to permit ready access to junction boxes, starters, motors, control components, and to clear openings of doors and access panels.

.4 Furnish and install inserts and supports required by these sections unless otherwise noted. Furnish sleeves, inserts, supports, and equipment that are an integral part of other Divisions of the Work to Sections involved in sufficient time to be built into construction as the Work proceeds. Locate these items and see that they are properly installed. Expense resulting from improper location or installation of items above shall be borne by the electrical trade.

.5 Adjust locations of ducts, conduits, equipment, fixtures, etc, to accommodate work from interferences anticipated and encountered. Determine exact route and location of each conduit and duct prior to installation.

.1 Make offsets, transitions, and changes in direction of ducts, and electrical raceways as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.

.2 Supply and install pull boxes, etc, as required to effect these offsets, transitions, and changes in direction.

1.11 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 Miscellaneous distribution equipment

.5 Branch conduits

.6 Branch wiring

.7 Lighting fixtures (interior)

.8 Emergency lighting

.9 Wiring for mechanical equipment

.10 Commissioning and Integrated System Testing

.11 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.

1.12 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 30 days after award of Contract.

.2 Provide a complete list of shop drawings to be submitted prior to first submission.

.3 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.

.4 If material or equipment is not as specified or submittal is not complete, it will be rejected by Consultant.

.5 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.

.6 **Submit all shop drawings for the project as a package. Partial submittals will not be accepted**.

.7 Catalog data or shop drawings for equipment, which are noted as being reviewed by Consultant or his Engineer shall not supersede Contract Documents.

.8 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.

.9 Check work described by catalog data with Contract Documents for deviations and errors.

.10 Shop drawings and product data shall show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances. e.g. access door swing spaces.

.11 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.

.12 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.

.13 Once these shop drawings are returned "reviewed" or "reviewed as noted" fabrication, production, and installation may commence. **NOTE: If a shop drawing is returned "reviewed as noted" this Contractor must provide written indication that the comments have been complied with.**

A partial list of shop drawings includes:

.1 Fire alarm system
.2 Luminaires
.3 Emergency fixtures
.4 Firestopping materials
.5 Hand dryers
.6 Wiring devices
.7 Lighting controls & occupancy sensors
.8 Integrated Life Safety System Testing Plan (ITP)

.2 Submissions shall be submitted electronically as per the following directions:

.1 Electronic Submissions:

.1 Electronically submitted shop drawings shall be prepared as follows:

.1 Use latest software to generate PDF files of submission sheets.

.2 Scanned legible PDF sheets are acceptable. Image files are not acceptable.

.3 PDF format shall be of sufficient resolution to clearly show the finest detail.

.4 PDF page size shall be standardized for printing to letter size (8.5"x11"), portrait with no additional formatting required by the consultant. Submissions requiring larger detail sheets shall not exceed 11"x17".

.5 Submissions shall contain multiple files according to section names as they appear in Specification.

.6 File names shall include consultant project number and description of shop drawing section submitted.

.7 Each submission shall contain an index sheet listing the products submitted, indexed in the same order as they appear in the Specification. Include associated PDF file name for each section.

.8 On the shop drawing use an "electronic mark" to indicate what is being provided.

.9 **Each file shall bear an electronic representation of the "company stamp" of the contractor. If not stamped the file submission will not be reviewed.**

.2 Email submissions shall include subject line to clearly identify the consultants' project number and the description of the shop drawings submitted.

.3 Electronic attachments via email shall not exceed 10MB. For submissions larger than 10MB, multiple email messages shall be used. Denote related email messages by indicating “1 of 2” and “2 of 2” in email subject line for the case of two messages.

.4 Electronic attachments via web links (URL) shall directly reference PDF files. Provide necessary access credentials within link or as username/password clearly identified within body of email message.

.5 On site provide one copy of the “reviewed” shop drawings in a binder as noted above.

.6 Contractor to print copies of “reviewed” shop drawings and compile into maintenance manuals in accordance with requirements detailed in this section.

1.13 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.

1.14 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.

1.15 PERMITS, FEES AND INSPECTION

.1 The contractor is required to include in his tender all required inspection costs by the Electrical Safety Authority. Permit application is the responsibility of the contractor.

.2 Reproduce drawings and specifications required by Electrical Safety Authority at no cost.

.3 Notify Consultant of changes required by Electrical Safety Authority prior to making changes.

.4 Furnish Certificates of Acceptance to Engineer from Electrical Safety Authority and other authorities having jurisdiction upon completion of work.

.5 This contractor must furnish any certificates required to indicate that the work completed conforms with laws and regulations of authorities having jurisdiction.

1.16 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.

1.17 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.

1.18 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint indoor switchgear and distribution enclosures light grey.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks, fastenings, and conduits etc. to prevent rusting.

1.19 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.2 Nameplates:

.1 Lamicoid 3 mm (1/8") thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

NAMEPLATE SIZES

Size 1	9 mm x 50 mm (3/8" x 2")	1 line	3 mm (1/8") high letters
Size 2	12 mm x 70 mm (1/2" x 2 1/2")	1 line	5 mm (3/16”) high letters
Size 3	12 mm x 70 mm (1/2" x 2 1/2")	2 lines	3 mm (1/8") high letters
Size 4	20 mm x 90 mm (3/4" x 3 1/2")	1 line	9 mm (3/8") high letters
Size 5	20 mm x 90 mm (3/4" x 3 1/2")	2 lines	5 mm (3/16") high letters
Size 6	25 mm x 100 mm (1" x 4")	1 line	12 mm (1/2") high letters
Size 7	25 mm x 100 mm (1" x 4")	2 lines	6 mm (1/4”) high letters

.3 Wording on nameplates labels to be approved by Consultant prior to manufacture.

.4 Allow for average of twenty-five (25) letters per nameplate.

.5 Identification to be English.

.6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.7 Nameplates for disconnects, starters and contactors must indicate equipment being controlled and voltage.

1.20 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.

1.21 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
Fire alarm	red
Emergency lighting	pink

.4 This contractor must paint all system junction boxes and covers in conformance with the above schedule.

1.22 PROTECTION OF OPENINGS

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

1.23 WIRING TERMINATIONS

.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.24 MANUFACTURERS AND CSA LABELS

.1 All labels must be visible and legible after equipment is installed.

1.25 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").

1.26 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.

1.27 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 Emergency call switches and/or pushbuttons: 900 mm (36").

1.28 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.

1.29 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.

1.30 FIELD QUALITY CONTROL

.1 Conduct and pay for following tests:

.1 Power distribution system including phasing, voltage, grounding, and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Lighting and its control.

.4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.5 Systems: fire alarm system, 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 Check resistance to ground before energizing.

.4 Carry out tests in presence of Consultant.

.5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.6 Submit test results for Consultant's review.

1.31 GUARANTEE AND WARRANTY

.1 At the substantial completion stage 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 substantial completion will be corrected at the contractors expense.

.2 If the electrical sub-contractor’s office is 50 kilometers (30 miles) or more from the project site, the sub-contractor is to provide a service/warranty work agreement for warranty period with a local electrical sub-contractor approved by Consultant. Include copy of service/warranty agreement in warranty section of operation and maintenance manual.

.3 Warranty period shall start from date of substantial completion.

.4 Refer to individual specification sections for information on any special manufacturer’s equipment warranties.

1.32 SYSTEM START UP

.1 Provide consultant with written notice verifying all equipment operation and installation is complete prior to scheduled start-up period.

.2 Start up shall be in presence of the following: owner or representative, contractor, and manufacturer's representative. Each person shall witness and sign off each piece of equipment. Consultant's attendance will be determined by consultant.

.3 Arrange with all parties and provide 72 hours notice for start up procedure.

.4 Simulate system start up and shut down and verify operation of each piece of equipment.

.5 These tests are to demonstrate that the systems and equipment installed are operational as specified.

.6 The contractor must describe during the start up session the required maintenance for each piece of equipment according to the manufacturer.

.7 The contractor must provide all necessary tools (including a digital multimeter) to successfully complete the start up procedure.

1.33 OPERATION AND MAINTENANCE MANUAL

.1 Provide operation and maintenance data for incorporation into manual as specified in other Sections of this Division.

.2 Operation and maintenance manual to be approved by, and final copies deposited with, Consultant before final inspection. Make changes as requested and re-submit as directed by Consultant.

.3 Submit one manual for approval. Two manuals will be required at project completion. Each of which shall be in a three ring binder (minimum 50 mm (2") ring) labelled:

.1 Operation and Maintenance Manual.

.2 Project Name.

.3 Location.

.4 Submit copies of all noted maintenance manuals section files in pdf format on USB stick for approval. Approved maintenance manuals files on USB stick will be required at project completion.

.5 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 Two year warranty letter for all parts, equipment and workmanship.

.5 List of manufacturers, spare parts list and source.

.6 Copy of typewritten schedules for all new and renovated panels.

.7 Receipt of spare fuses from owner's representative.

.8 Final certificate from the Electrical Safety Authority.

.9 Final Fire alarm verification certificate including field technician device sheets.

.10 Certificate of exit/emergency lighting testing as per the specification.

.11 Copy of electrical shop drawings which have been stamped and reviewed by Consultant.

.12 Electrical As-built drawings including contractor company's as built stamp.

.13 Any special warranties on equipment required (i.e. LED lighting, digital lighting control).

.14 Certificate of completion from all associated sub-contractors.

.15 System commissioning certificate and report.

.6 Upon acceptance of Operation and Maintenance Manual by the consultant, a pdf file of the entire manual is to be provided on a USB stick. Only one USB stick is to be provided containing both the approved manuals and as-built drawings.

1.34 AS-BUILT DRAWINGS

.1 Site records:

.1 Contractor shall provide 2 sets of reproducible electrical drawings. Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include field and contract changes to electrical systems.

.2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection at all times.

.2 As-built drawings:

.1 Identify each drawing in lower right hand corner in letters at least 3 mm (1/8") high as follows: - "AS-BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW ELECTRICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).

.2 Submit hard copy to Consultant for approval. When returned, make corrections (if any) as directed.

.3 Once approved, submit completed reproducible paper as-built drawings as well as a scanned pdf file copy on USB stick with Operating and Maintenance Manuals.

1.35 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Manufacturers or their representatives are to provide demonstrations and instructions.

.3 Use operation and maintenance manual, As-built drawings, audio visual aids, etc. as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

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

1.36 SUBSTANTIAL PERFORMANCE

.1 Complete the following to the satisfaction of the consultant prior to submission of substantial performance.

.1 As-built Drawings.

.2 Maintenance Manuals.

.3 System Start up.

.4 Instructions to Owners.

.5 Final Certificates (Electrical Safety Authority, Fire Alarm, Emergency Lighting, Integrated Life Safety Systems Commissioning).

1.37 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.

1.38 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.

1.39 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.

1.40 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.

1.41 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 The firestopping materials are not to shrink, slump or sag and be free of asbestos, halogens and volatile solvents.

.6 Firestopping materials are to consist of a component sealant applied with a conventional caulking gun and trowel.

.7 Firestop materials are to be capable of receiving finish materials in those areas, which are exposed and scheduled to receive finishes.

.8 Firestopping shall be inspected and approved by local authority prior to concealment or enclosure.

.9 Install material and components in accordance with ULC certification, manufacturers instructions and local authority.

.10 Submit product literature and installation material on firestopping in shop drawing and product data manual.

.11 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.

.12 Ensure firestop manufacturer representative performs on site inspections and certifies installation. Submit inspection reports/certification at time of substantial completion.

1.42 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.

1.43 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.

1.44 DELIVERY STORAGE & HANDLING

.1 Follow Manufacturer's directions in delivery, storage, and protection, of equipment and materials.

.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.

1.45 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 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.

1.46 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.

1.47 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.

1.48 ASBESTOS

.1 If asbestos is suspected or identified cease all work in the immediate area in accordance with OHSA and notify consultant.

.2 Each contractor and on site employee of the contractor shall have “asbestos awareness training”.

.3 The Contractor shall ensure that employees who may come into contact with asbestos due to the nature of the work that they perform, have received training that enables them to recognize asbestos and that enables them to react in accordance with the Occupational Health and Safety Act and regulations thereto should contact with asbestos occur during the course of their work.

.4 It is the responsibility of the contractor to review the asbestos book in the building prior to starting any work.

.5 Existing occupied buildings (depending upon their age) may contain asbestos in thermal insulating materials and some manufactured products, such as vinyl asbestos floor tile. Any insulating materials, on pipes, fittings, boilers, tanks, ductwork, etc. may contain asbestos and shall not be disturbed.

.6 **A survey of each building documenting the location and condition of asbestos-containing materials is available for your mandatory review prior to commencing any work on premises.**

1.49 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.

1.50 OWNER SUPPLIED EQUIPMENT

.1 Connect to equipment supplied by the owner and make operable.

1.51 ENCLOSURES

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

1.52 EXISTING CONCRETE SLAB X-RAY/SCANNING

.1 This contractor shall retain the services of a qualified company to provide and X-Ray and/or scan of the existing buried services in walls and/or floors prior to starting any work in the affected area.

.2 Failure to locate existing piping, conduit, rebar etc., shall not relieve this contractor of repair of same prior to installing his service.

.3 This contractor shall be responsible for all repairs and/or replacement of existing services caused by cutting the existing concrete slabs and/or walls.

END OF SECTION

Part 1 General

1.1 INTENT

.1 Life safety and fire protection systems are to be installed to comply with the provisions of the current Ontario Building and Fire Codes. As a result, testing of these integrated systems must be performed as a whole to ensure the proper operation and inter-relationship between systems (functional testing).

.2 The testing is to provide functional verification and documented confirmation that these building systems satisfy the intent of the Building Code.

.3 These systems as applicable to any given project include but are not limited to fire alarm, elevator recalls, smoke dampers, and emergency lighting.

1.2 GENERAL

.1 This testing process is the responsibility of the Integrated Testing Firm as a sub-contractor to the electrical trade. Electrical trade to include all costs associated with the Integrated Testing Coordinator in contract.

.2 This process must be co-ordinated with suppliers and sub-contractors associated with these systems (mechanical and/or electrical).

.3 This process must be co-ordinated with the project construction schedule and be completed, including all associated documentation, prior to the consultant's certification of the project for occupancy.

.4 All applicable contractors, sub-contractors, and suppliers are to include all required costs in their respective tender costs.

.5 All work is to be performed in accordance with CAN/ULC S1001-2011. Special consideration is to be given to the Sample Integrated Testing Plan (ITP), the review of life safety system design documents, and the provision of test plans and reports.

.6 The work to be performed by this contractor is also described in CAN/ULC S1001-2011.

.7 Refer to CAN/ULC S1001-11 Rev1-2019 Informative Annex (C) for Sample Integrated Testing Plan (ITP).

1.3 QUALITY ASSURANCE

.1 The following criteria must be met in order to be considered an acceptable Integrated Testing Coordinator for this project:

.1 Manufacturers: Firms regularly engaged in functional testing and implementation of life safety and fire protection systems for not less than five years.

.2 Qualifications: Firms with at least five years of successful experience in facility construction, inspection, acceptance testing or commissioning as it relates to fire protection and life safety and equipment similar to that required for this project.

.3 The Contractor shall be an established commissioning contractor that has had and currently maintains a locally run and operated business for at least five years.

.4 The Contractor shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the systems.

.2 For bidder information only, experienced Life Safety Systems Testing Firms include these listed below or local branches of the companies noted in the vicinity of this project:

.1 Georgian Bay Fire and Safety Ltd.
1700 20th Street East
Owen Sound, Ontario

.2 Vintage Fire and Life Safety Ltd.
25 Coverdale Cres.
Kitchener, Ontario N2M 4X1

.3 Troy Life and Fire Safety
805 Boxwood Dr., Unit #201
Cambridge, Ontario N3E 1A4

.4 Control Tech Systems
31 Regal Road
Guelph, Ontario N1K 1B6

.5 Lonergan Engineering
4 Industrial Parkway South
Aurora, Ontario L4G 3W1

NOTE: This agent must be a third party firm NOT associated with this project in any way and be under contract with the electrical sub-contractor not the fire alarm supplier.

.3 Other firms to these listed above, who feel they are capable, must submit in writing, to the Consultant's office confirmation of the items listed in the criteria above, a minimum of one week prior to tender close in order to be considered as a bidder.

1.4 GENERAL REQUIREMENTS

.1 The Commissioning Process shall generally encompass and co-ordinate the following key areas:

.1 Integrated systems testing planning.

.2 Integrated systems testing implementation (functional testing).

.3 Integrated systems testing documentation

1.5 RESPONSIBILITIES

.1 General Contractor:

.1 The general contractor shall verify completeness of the building envelope, perimeter and interior items which affect proper operation of the noted systems.

.2 The general contractor will assure participation and co-operation of Sub-Contractors and Specialty Contractors (mechanical, electrical, building management, etc.) under the General Contractor's jurisdiction as required for the commissioning process.

.2 Mechanical Contractor:

.1 Verify Functional performance of associated mechanical systems for compliance with design intent as specified in the appropriate Specification sections.

.2 Provide the documentation with standard Functional performance reports on completion of the testing.

.3 Verify submissions for system operation and maintenance manuals, as-built documents, spare parts listing, special tools listing, and other items as may be specified.

.3 Electrical Contractor:

.1 The Integrated Life Safety Systems Testing Coordinator (ITC) is being retained by the electrical contractor, however; this contractor's work to satisfy the ITC requirements shall be included in the tender price.

.2 Verify Functional performance of electrical systems for compliance with design intent as specified in the appropriate Specification sections.

.3 Provide the documentation with standard Functional performance reports on completion of the testing.

.4 Verify submissions for electrical system operation and maintenance manuals, as-built documents, spare parts listing, special tools listing, and other items as may be specified.

.5 As a minimum this contractor must include for:

.1 Providing the ITC with documentation of design and shop drawings.

.2 Provide documents for sequence of operation and maintenance of system.

.3 Testing of all components and accessories to confirm Alarm/Supervisory/Trouble at the fire panel.

.4 Testing and operation of any generator (s) as applicable to the project.

.5 Other items that may be requested by the ITC.

.6 Re-commissioning of any items that may have failed.

.7 Re-setting of the system to proper operation after tests are completed.

.8 Provide documentation of compliance with OBC 3.2.7.3 'Emergency Lighting'.

.9 Provide written confirmation that life safety systems are installed in accordance with applicable codes and standards, as well as the scope of the project engineering documents.

.4 Equipment Manufacturers:

.1 The equipment manufacturers shall be responsible for providing labour, material, equipment, etc., required within the scope of the respective equipment to facilitate the commissioning process.

.2 The equipment manufacturers will perform Pre-Functional and Functional Performance Tests required by the commissioning process.

.5 Design Engineer:

.1 The design engineer shall review and provide written confirmation of acceptance of the Integrated Testing Pan (ITP).

.2 The design engineer shall observe Functional Performance Testing, at his discretion.

.3 The design engineer shall provide technical capabilities for resolution of deficiencies, where required.

.4 The design engineer shall provide necessary information to assist Integrated Test Coordinator including written confirmation of life safety systems installation in accordance with project engineering documents and are ready for integrated testing.

Part 2 Commissioning Process

2.1 OPERATIONS AND MAINTENANCE MANUALS

.1 Furnish Final, reviewed Operation and Maintenance Manuals to the Consultant fourteen (14) days prior to scheduled Functional Performance Tests.

2.2 FUNCTIONAL PERFORMANCE TEST

.1 The contractor shall be responsible for the Functional Performance Tests. These tests ensure that all equipment and systems are installed in accordance with the Specifications, Drawings and manufacturers' requirements.

.2 The contractor shall be responsible for co-ordinating schedule for Functional tests of various equipment and systems.

.3 In the Functional Test, all noted systems and sub-systems shall be checked for the following:

.1 Verify that each element has been properly installed, properly identified, and that all connections have been made correctly.

.2 Verify that tests, meter readings, and specific mechanical/electrical performance characteristics agree with those required by equipment or system manufacturer.

.3 Re-commission any item(s) that may have failed.

.4 Notify the consultant in writing, at least fourteen (14) days prior to the date of Functional Performance Testing. Schedule the Functional performance tests over a period of consecutive business days.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA C22.2 No.0.3-92, Test Methods for Electrical Wires and Cables.

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 ARMOURED CABLES

.1 Conductors: insulated, copper minimum size as indicated above.

.2 Type: AC90 (minimum size 12 AWG).

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Connectors must be suitable for installed environment and approved for use with armoured cable.

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring from source to load through raceways as specified.

.2 Provide separate neutral conductors for all lighting circuits and circuits originating from surge protected panels. Size raceways accordingly.

3.2 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

.2 Terminate cables in accordance with Wire and Box Connectors - 0 - 1000 V Section.

.3 These cables are to be installed in concealed locations only. These concealed locations are considered to be stud walls and "drops" to stud walls, lighting fixtures, and ceiling mounted devices.

.4 These "drops' shall not be permitted to exceed 2.4 m (8'-0"). To limit these "drops" to lengths noted above provide additional branch wiring in conduit.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data for cabinets in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 MATERIALS

.1 Junction and pull boxes must conform to CSA C22.2 No. 40 (latest edition)

2.2 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm (1") minimum extension all around, for flush-mounted pull and junction boxes.

Part 3 Execution

3.1 JUNCTION AND PULL BOXES INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Install junction and pull boxes so as not to exceed 30 m (100') of conduit run between pull boxes and in conformance with the Electrical Safety Code.

3.2 IDENTIFICATION

.1 Provide equipment identification in accordance with General Electrical Requirements Section.

.2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Outlet boxes, conduit boxes, and fittings must conform to CSA C22.2 No. 18 (latest edition).

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm (4") square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 mm x 50 mm x 64 mm (3" x 2" x 2½") or as indicated. 102 mm (4") square outlet boxes when more than one conduit enters one side with extension and plaster rings as required. Iberville 1104 Series.

.2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit **in utility rooms**, minimum size 102 mm x 57 mm x 38 mm (4" x 2¼" x 1½"). Iberville 1110 Series.

.3 102 mm (4") square or octagonal outlet boxes for lighting fixture outlets.

.4 102 mm (4") square outlet boxes with extension and plaster rings for flush mounting devices in finished tile walls.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

.1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 CONDUIT BOXES

.1 Cast FS or FD 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.**

2.6 FITTINGS- GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 32 mm (1- 1/4") and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm (1/4") of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

.5 Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA C22.2 No.65-1956(R1965) Wire Connectors.

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as indicated.

.2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Clamps or connectors for armoured cable, 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.56-1977(R1977), Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .3 CSA C22.2 No.83-M1985(R1992), Electrical Metallic Tubing.

Part 2 Products

2.1 CONDUITS

.1 Epoxy coated conduit: to CSA C22.2 No.45, with zinc coating and corrosion resistant epoxy finish inside and outside.

.2 Electrical metallic tubing (EMT) with couplings: to CSA C22.2 No.83.

.3 Flexible metal conduit: to CSA C22.2 No.56, aluminum and liquid-tight flexible metal.

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 Coating: same as conduit.

.5 Factory "ells" where 90° bends are required for 27 mm (1") and larger conduits.

.6 Where bushings are noted to be provided they must be “screwed” type fastened to a conduit connector. Push-fit or glued in place bushings will NOT be accepted.

2.4 FISH CORD

.1 Nylon twine.

Part 3 Execution

3.1 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical/ electrical service rooms and in unfinished areas. Where devices are to be installed on existing walls in finished area, which cannot be "fished", install feeds in a surface metal raceway equal to Wiremold V700 series. Co-ordinate surface installations with consultant prior to rough-in.

.3 Use electrical metallic tubing (EMT) for all branch circuits unless specified otherwise.

.4 Use flexible metal conduit for connection to motors in dry areas, connection to recessed fixtures without a prewired outlet box, connection to surface or recessed fixtures, work in movable metal partitions.

.5 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations and for connections to kitchen equipment.

.6 Conduits terminating at electrical equipment in sprinklered areas are to be provided with insulated compression style connectors equal to Thomas & Betts Cat. #TC8XXSC or approved equal.

.7 **Minimum conduit size for branch circuits shall be 21 mm (3/4").** Single drops from ceiling mounted junction boxes down to a light switch or duplex receptacle may be reduced to 16 mm (½").

.8 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.9 Mechanically bend steel conduit over 27 mm (1") diameter.

.10 Install fish cord in empty conduits.

.11 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.12 Dry conduits out before installing wire.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m (5') clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended or surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm (3") parallel to steam or hot water lines with minimum of 25 mm (1") at crossovers.

.7 Do not fasten surface conduit to roof deck. Provide standoffs or supports as manufactured by Caddy or use unistrut trapeze fastened to structure.

3.3 CONCEALED CONDUITS

.1 Do not install horizontal runs in masonry walls.

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 Hand dryers.
- .2 Telecommunication network system rough-in.
- .3 Occupancy sensors.

Part 2 Products

2.1 HAND DRYERS

.1 Hand dryers where noted on the drawings are to be supplied and installed by this Division with the following features:

- .1 Surface mounting.
- .2 Fixed nozzle.
- .3 Brushed stainless steel finish with automatic activation.
- .4 Rating of 1450W at 120V.
- .5 Comac Cat. #SW-100220004

2.2 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.

2.3 OCCUPANCY SENSORS

.1 Where noted on the drawings, the wall mounted switch style occupancy sensor shall be a dual technology switch with either single or double relay (circuit) as noted on the drawings. Colour to suit architect.

Note: For dual relay switches, program the sensor for 15 minute off delay, enabled walk-thru, audible alert enabled, relay 1 on mode: auto on, relay 2 on mode: manual on.

.1 Single relay (circuit): Wattstopper Cat. #DW-100

.2 Dual relay (circuit): Wattstopper Cat. #DW-200

.3 Approved equal:

.1 Hubbell.

.2 Leviton.

.3 Sensor switch.

.4 Cooper Controls (Greengate).

.2 Provide other occupancy sensors to suit the detail on the drawings.

.3 All sensors shall be set to 5 minutes “delay to off” unless otherwise directed.

Part 3 Execution

3.1 HAND DRYERS

.1 Install and connect hand dryers in conformance with manufacturer’s recommendations.

.2 Hand dryers are to be mounted at a height to suit age of expected users’. Unless otherwise noted confirm height with manufacturer, owner, Architect, and/or consultant prior to rough in.

.3 Once installed this contractor is to caulk the joint between dryer and wall surface with a bead of clear silicone.

3.2 TELECOMMUNICATION NETWORK SYSTEM ROUGH-IN

.1 Conduits terminated into ceiling spaces must be within 3m (10') of zone conduits (if applicable).

.2 Outlets are to be installed complete with 25 mm (1") conduit to corridor ceiling space or nearest zone conduit (if applicable).

.3 Provide insulated bushings on all conduits terminated in ceiling space.

.4 A 25mm (1") conduit is to be installed from elevator machine room to voice service backboard.

3.3 OCCUPANCY SENSORS

.1 Install power packs in accessible maintenance areas.

.2 Provide access doors if power packs are installed above drywall ceilings.

.3 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.

.4 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.

.5 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.

.6 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.

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.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 SWITCHES

.1 General purpose AC switches must conform to CSA C22.2 No. 111 (latest edition).

.2 15 or 20 A, 120 V, single pole, three-way, four-way, keyed, or motor rated switches complete with pilot light.

.3 Manually-operated general purpose ac switches with following features:

- .1 Terminal holes approved for No. 10 AWG wire.
- .2 Silver alloy contacts.
- .3 Urea or melamine molding for parts subject to carbon tracking.
- .4 Suitable for back and side wiring.
- .5 Toggle style (Rocker style) (architect to select colour).

.4 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.

.5 Switches of one manufacturer throughout project.

.6 Acceptable materials:

single pole: Hubbell Cat # HBL1201 Series

.7 Acceptable alternate manufacturers include:

- .1 Pass & Seymour
- .2 Leviton.

2.2 RECEPTACLES

.1 Receptacles, plugs, and other similar wiring devices must conform to CSA 22.2 No 42 (latest edition).

.2 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, with following features (20A where noted):

.1 Urea molded housing (Colour by architect).

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and rivetted grounding contacts.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

.5 Acceptable materials:

Tamper resistant receptacle	Hubbell Cat # BR15TR
Tamper resistant T-slot receptacle	Hubbell Cat. #BR20TR
Tamper resistant ground fault protected receptacle	Hubbell Cat. #GFTR15
Tamper resistant ground fault protected T-slot receptacle	Hubbell Cat. #GFTR20 complete with Decora style coverplate to suit specification below

.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.

Part 3 Execution

3.1 INSTALLATION

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Mount toggle switches at height specified in Electrical General Requirements Section or as indicated.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height specified in Electrical General Requirements Section or as indicated.

.3 Where split receptacle has one portion switched mount vertically and switch upper portion.

.3 Cover plates:

.1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.2 Install suitable common cover plates where wiring devices are grouped.

.3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No.248.12/94, Low Voltage Fuses Part 12: Class R (Bi-National Standard with, UL 248-12 (1st Edition).

.2 CSA C22.2 No. 106-M92 (latest edition).

1.2 MAINTENANCE MATERIAL

.1 Three spare fuses of each type and size installed.

1.3 DELIVERY AND STORAGE

.1 Ship fuses in original containers.

.2 Store fuses in original containers in moisture free location.

Part 2 Products

2.1 FUSES GENERAL

.1 Fuses: product of one manufacturer for entire project.

.2 Fuses specified below must conform to CSA C22.2 No. 106 (latest edition). Fuses conforming to standard C22.2 No. 106-1953 will be rejected.

.3 Fuses must provide a fully co-ordinated system for both overload and fault conditions.

2.2 FUSE TYPES

.1 Class J fuses (formerly HRCI- J).

.1 Time delay, capable of carrying 500% of its rated current for 10 s minimum.

.2 Fast acting as noted.

.2 Class R fuses (formerly HRCI- R). For UL Class RK1 fuses, peak let-through current and I^2t values not to exceed limits of UL 198E-1982, table 10.2.

2.3 ACCEPTABLE PRODUCTS

.1 Motor Protection:

1-600 A: Mersen Type AJT

.2 Other acceptable manufacturers:

.1 GEC

.2 Little Fuse

Part 3 Execution

3.1 INSTALLATION

.1 Install fuses in mounting devices immediately before energizing circuit.

.2 Ensure correct fuses fitted to physically matched mounting devices.

.1 Install Class R rejection clips for HRCI-R fuses.

.3 Ensure correct fuses fitted to assigned electrical circuit.

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.

.10 Disconnects feeding elevator controllers must be equipped with two auxiliary contacts approved by the elevator supplier.

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 Connect auxiliary contacts to elevator controller using conduit, wire and route approved by the elevator supplier.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE C62.41- 1991, Recommended Practices for Surge Voltages in Low-Voltage AC Power Circuits.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM F1137- 88 (1993), Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.3 United States of America, Federal Communications Commission (FCC)

.1 FCC (CFR47) EM and RF Interference Suppression.

.4 IESNA LM-79-08, IES Electrical Method for the Electrical and Photometric Measurements of Solid State Lighting Products.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings in accordance with Electrical General Requirements Section for all light fixtures supplied under this contract.

.2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Consultant.

.3 Photometric data to include: VCP Table spacing criterion.

1.3 SCOPE

.1 This contractor is responsible to supply and install all lighting fixtures as scheduled and/or indicated including lamp and those accessories required for a complete lighting system. This contractor must coordinate lighting installations with all other Divisions of this project.

.2 All fixtures must be CSA approved or approved at this contractor's expense by the Special Inspection Division of the Electrical Safety Authority.

1.4 GUARANTEE

.1 Guarantees for materials replacement shall be as follows from date of substantial completion.

.1 LED fixtures, and driver: 5 years.

.2 The labour required to replace these ballasts, lamps or drivers must be included in the above guarantee, however only for the extent of the contract guarantee and warranty period as noted in Electrical General Requirements.

Part 2 Products

2.1 FIXTURE CONSTRUCTION

.1 Fixtures must be constructed of 20 gauge (minimum) cold rolled steel. All metal edges require smooth finish.

.2 Light leaks must be prevented by providing gasketting, stops, and barriers.

.3 Fixtures must be finished in high reflective baked white enamel. This surface must have a reflectance of not less than 85%.

2.2 FIXTURE LENS

.1 Unless otherwise noted fixture lenses shall be as follows:

.1 Lens thickness: 3.2 mm (1/8")

.2 Material: injection moulded clear prismatic virgin acrylic

.3 Frame: hinged, latched, steel.

2.3 LED FIXTURES

.1 Fixture LED's must be tested in conformance with IESNA LM80 standard.

.2 LED's must be selected using a binning algorithm to ensure colour and lumen output of a given fixture are consistent, as well as meet or surpass ANSI C78.377 specification for the rated lifetime of the fixture. Colour accuracy between products must be within a 2-step MacAdam ellipse.

.3 Luminaires must be tested to IESNA LM79 by an independent approved laboratory.

.4 Luminaires must be tested prior to shipping.

.5 Luminaires must be ULC certified and approved for use in Canada.

.6 Fixtures must maintain a minimum of 90% of their initial light output for 60,000 hours. Submit test results upon request.

.7 Lumen values indicated for fixtures in the project documents are to be considered as "absolute" or "delivered" values.

.8 Other than for specialty fixtures, and unless otherwise indicated, the maximum driver current is to be 750 mA.

2.4 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.

2.5 EMERGENCY LIGHTING UNITS (self contained)

.1 Emergency lighting units must conform to CSA C22.2 No 141 (latest edition).

.2 Supply voltage: as noted on drawings.

.3 Battery: sealed, maintenance free, 10 year life.

Note: Battery units must be capable of supplying the wattage indicated for a minimum of 90 minutes or as specified.

.4 Charger: solid state, multi rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.

.5 Solid state transfer circuit. EM backup AC fail operation.

.6 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.

.7 Signal lights: “AC Power ON” condition and “charging” condition.

.8 Lamp type: integral high output LED, 100,000 hours at L70.

.9 Ceiling mount brackets and recessed mounting kit as required to suit installation.

.10 Auxiliary equipment:

.1 Test switch.

2.6 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 900mm (36") intervals along length of drop. Final appearance must be neat and professional.

.6 Install exit lighting units with illuminated faces and chevrons/arrows indicating path(s) of exit as indicated. Unless otherwise noted install exit fixtures at 2400 mm (8' 0") above finished floor.

.7 Install emergency lighting units and associated remote mounted fixtures as indicated.

.8 Direct “heads” on units and remote mounted fixtures to illuminate path(s) of exit.

.9 Install emergency lighting units and remote fixtures at 300mm (12") below finished ceiling, unless indicated otherwise.

.10 Provide a 15 A 120 V duplex receptacle (connected to circuit indicated) adjacent to unit.

.11 **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.**

.12 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.

3.3 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.4 DELIVERIES

.1 Fixtures are to be completely assembled at the manufacturer's plant and delivered to the project site in original unitized containers. Ensure that a dry, protected and secure space is available for proper storage before scheduling delivery of fixtures.

3.5 TESTING/CERTIFICATION

.1 At the completion of the project and in the presence of the consultant, test all exit and emergency fixtures. On company letterhead, the contractor is to prepare a chart indicating:

.1 project
.2 date
.3 equipment type
.4 certification of correct connection
.5 certification of correct operation
.6 duration of test in minutes (minimum 30)
.7 actual period of testing (time of day)

.2 **Provide "Integrated Testing" of this life safety system in conformance with the noted specification section. Include all associated costs in tender.**

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.

1.5 LIGHTING CONTROL APPLICATIONS

.1 Provide a minimum application of intended lighting control functions as detailed on design drawings and specified herein. Control functions shall include the following:

.1 Space Control Requirements – Provide occupancy/vacancy sensors with Manual-ON functionality in all spaces except toilet rooms, storerooms, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling- or corner-mounted sensors.

.2 Bi-Level Lighting – Provide single zone, multi-level controls in any enclosed office, conference room, meeting room, and training room in all enclosed spaces except where variable dimming or multi-zone switching is used.

.3 Daylit Areas – All luminaries closest to the daylight source, and zoned separately from other fixtures in the space, shall be controlled separately from luminaires outside of daylit zones. Multiple-leveled switched daylight harvesting controls may be utilized for areas marked on drawings.

1.6 WARRANTY

.1 Provide a five-year complete manufacturer's warranty on all products to be free of manufacturers' defects.

.2 The labour required to replace these products must be included in the above warranty, however only for the extent of the contract guarantee and warranty period as noted in Electrical General Requirements.

1.7 QUALITY ASSURANCE

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

Part 2 Products

2.1 MANUFACTURERS

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

.1 Cooper Controls (Greengate).

.2 Acuity Controls (nlight).

.2 Substitutions:

.1 All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 7 working days prior to the bid date and must be made available to all bidders.

.2 By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring.

2.2 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR SYSTEM

.1 Wall or ceiling mounted (to suit installation) passive infrared (PIR), ultrasonic or dual technology digital (passive infrared and ultrasonic) occupancy sensor. Furnish the Company's system which accommodates the square-foot coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors and accessories which suit the lighting and electrical system parameters.

.2 Digital Occupancy Sensors shall provide calibration and electronic documentation for the following features:

.1 Digital calibration and pushbutton programming for the following variables:

.1 Sensitivity – 0-100% in 10% increments

.2 Time delay – 1-30 minutes in 1 minute increments

.3 Test mode – Five second time delay

.4 Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.

.5 Walk-through mode

.6 Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.

.2 Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.

.3 Device Status LEDs including:

.1 PIR Detection

.2 Ultrasonic detection

.3 Configuration mode

.4 Load binding

.4 Manual override of controlled loads.

.5 One or two RJ-45 port(s) for connection to DLM local network.

.3 Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

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

2.3 DIGITAL WALL SWITCHES

.1 Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5, and 8 button configuration; colour per architect, compatible with wall plates with decorator opening. Wall switches shall include the following features:

.1 Two-way infrared (IR) transceiver for use with personal and configuration remote controls.

.2 Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.

.2 Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.

.3 The following switch attributes may be changed or selected using a wireless configuration tool:

.1 Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).

.2 Individual button function may be configured to Toggle, On only or Off only.

.3 Individual scenes may be locked to prevent unauthorized change.

.4 Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.

.4 Two RJ-45 ports for connection to DLM local network.

.5 Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.

.6 WattStopper product numbers: LMSW-101, LMSW-102, LMSW-103, LMSW-104, LMSW-105, LMSW-108, LMDM-101.

2.4 DIGITAL POWER PACKS (ROOM CONTROLLERS)

.1 Room Controllers automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room Controllers shall be provided to match the room lighting load and control requirements. The controllers will be simple to install and will not have, dip switches, potentiometers or require special configuration. The control units will include the following features:

- .1 Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.
- .2 Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.
- .3 Device Status LEDs to indicate:
  - .1 Data transmission
  - .2 Device has power
  - .3 Status for each load
  - .4 Configuration status
- .4 Quick installation features including:
  - .1 Standard junction box mounting
- .5 Plenum rated
- .6 Manual override and LED indication for each load
- .7 120 VAC, 60 Hz operation.
- .8 Zero cross circuitry for each load.

.2 On/Off Room Controllers shall include:

- .1 One or multiple relay configuration to suit control details
- .2 Efficient 150 mA switching power supply
- .3 Sufficient sensor connection points to suit indicated function without the requirement for additional hardware
- .4 Discrete model listed for connection to receptacles, for schedule-based control of plug loads within the space.
  - .1 One relay configuration only.
  - .2 Automatic-ON/OFF configuration.
  - .3 Optional Network Bridge for BACnet MS/TP communications
- .5 Three RJ-45 DLM local network ports.
- .6 WattStopper product numbers: LMRC-101, LMRC-102, LMPL-101, LMPL-201.

.3 On/Off Room/Dimming enhanced Room Controllers shall include:

- .1 One or multiple relay configuration to suit control details.
- .2 Efficient 250 mA switching power supply.
- .3 One 0-10 volt analog output per relay for control of compatible ballasts and LED drivers.

.4 The following dimming attributes may be changed or selected using a wireless configuration tool:

.1 Establish preset level for each load from 0-100%.

.2 Set high and low trim for each load.

.3 Set lamp burn in time for each load up to 100 hours.

.5 Four RJ-45 DLM local network ports.

.6 Optional Network Bridge for BACnet MS/TP communications.

.7 WattStopper product numbers: LMRC-211, 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 It shall be the contractor's responsibility to locate and aim sensors in the correct location required for complete and proper coverage within the range of coverage as per the manufacturer's recommendations. The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective rooms.

.6 Provide written or computer-generated documentation on the commissioning of the system including room by room description including:

.1 Sensor parameters, time delays, sensitivities, and daylighting setpoints.

.2 Sequence of operation, (e.g. manual ON, Auto OFF. etc.)

.3 Load Parameters (e.g. blink warning, etc.)

.7 Re-commissioning – After 30 days from occupancy re-calibrate all sensor time delays and sensitivities to meet the Owner's Project Requirements. Provide a detailed report to the Architect / Owner of re-commissioning activity.

3.2 FACTORY COMMISSIONING

.1 Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.

.2 The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the system startup and adjustment date.

.3 Upon completion of the system commissioning the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

.4 Factory commissioning shall include functional testing and documentation of the control system conforming to the “Functional Testing” requirements included in the current ASHRAE standard. This cost shall be included in the Tender Price.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CAN/ULC-S524 (latest edition), Installation of Fire Alarm Systems.

.2 ULC-S525 (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-S536 (latest edition), Inspection and Testing of Fire Alarm Systems.

.9 CAN/ULC-S537 (latest edition), Verification of Fire Alarm Systems.

.10 OBC-2012, Ontario Building Code.

1.2 DESCRIPTION OF SYSTEM

.1 System includes:

.1 Control panel to carry out fire alarm and protection functions including receiving alarm signals, initiating general alarm, supervising system continuously, actuating zone annunciators, and initiating trouble signals.

.2 Trouble signal devices.

.3 Power supply facilities.

.4 Addressable manual alarm stations.

.5 Addressable and conventional automatic alarm initiating devices.

.6 Audible and visual signal devices.

.7 End-of-line devices.

.8 Annunciators.

.9 Ancillary devices.

.10 Interface and zone modules.

.11 Remote trouble indicator.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

.1 This system is subject to review by local building department officials, local fire department officials. **Therefore, submission of verification certificate and field technician device verification sheets is required prior to inspection by these officials. Schedule accordingly.**

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Electrical General Requirements Section.

.2 Include:

.1 Layout of equipment.

.2 Zoning.

.3 Complete wiring diagram.

1.5 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for Fire Alarm System for incorporation into manual specified in Electrical General Requirements Section.

.2 Include:

.1 Operation and maintenance instructions for complete fire alarm system to permit effective operation and maintenance.

.2 Technical data - illustrated parts lists with parts catalogue numbers.

.3 Copy of approved shop drawings.

.4 List of recommended spare parts for system.

1.6 MAINTENANCE MATERIALS

.1 Include:

.1 10% spare glass rods for total number of manual pull box stations if applicable.

1.7 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.

1.8 QUALITY ASSURANCE

.1 Each and all items of the fire alarm system shall be listed as the products of a single manufacturer under the appropriate category by the Underwriter's Laboratories of Canada and shall bear the "U.L.C." label.

.2 Each and all items of the fire alarm system shall be covered by a one year parts and labour warranty covering defects resulting from faulty workmanship and materials. The warranty shall be deemed to begin on the date the system is accepted by the Project Manager on issuance of the substantial performance certificate for the project.

.3 All control equipment must have Transient Protection Devices to comply with U.L.C. requirements.

Part 2 Products

2.1 GENERAL

.1 The fire alarm system shall be a hybrid conventional/addressable, single stage, zoned, non-coded, indicating, fully integrated fire alarm.

.2 The fire alarm control panel shall allow for loading or editing of special instructions and operating sequences as required. The system shall be capable of on site programming to accommodate expansion, and changes required by local codes. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.

.3 The ability to selectively program input/output control functions based on ANDing, ORing, NOTing, Timing and Special Coded Operations is also to be incorporated in the resident software programming of the system.

.4 The system shall have the ability to manually disable and enable any device/circuit individually for maintenance or testing purposes.

.5 It shall be possible to reprogram selected or all smoke detector initiating zones for alarm verification.

.6 It shall be possible to program an adjustable time delay circuit for each waterflow initiating circuit to prevent false alarms that may be caused by erroneous pressure surges in the sprinkler system.

.7 All on site programming changes to the fire alarm system shall be password protected.

.8 Wiring to any remote annunciator shall be supervised for open and ground conditions. A separate annunciator trouble indicator must be provided at the control panel, which shall illuminate and an audible trouble signal shall sound at the control panel upon the detection of an open or ground condition.

.9 All Control Panels and Remote Annunciator Cabinets are to be properly grounded to building ground. Conduit ground will not be acceptable. The green coloured grounding loop shall be a minimum #14 AWG insulated copper conductor run in conduit. The ground loop shall be connected to building water supply to the line side of the water meter. Ground wire must not be run in the same conduit as the Fire Alarm wiring.

2.2 POWER REQUIREMENTS

.1 The control panels shall receive 120 VAC power via a dedicated overcurrent protected circuit. The incoming power to the system shall be supervised so that any power failure must be audibly and visually indicated at the control panel and the remote annunciator. A green `Power On' LED shall be displayed continuously while incoming power is present.

.2 Control Panel output power supply shall have the following operating characteristics:

.1 Rated for five Amps continuous duty

.2 24 VDC filtered and regulated

.3 Power limited with a range of 20.4 VDC to 32 VDC.

.4 Automatic "Brownout" transfer to standby batteries when supply voltage falls to 102 VAC

.3 The system shall be provided with sufficient standby capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of twenty-four hours with two hours of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic.

.4 The system batteries shall be supervised so that a low battery condition or disconnection of the batteries shall be audibly and visually annunciated at the control panel.

.5 Battery charger shall have the following operating characteristics:

.1 Ability to charge a range up to 33 AH to 70% of their capacity within 12 hours.

.2 Compatible with either lead acid or nicad batteries.

.6 All circuits requiring system operating power shall be individually fused at the control panel.

.7 The system shall be modular in design to allow future expansion with a minimum of hardware additions and system interruptions.

2.3 FIRE ALARM CONTROL PANEL

.1 The fire alarm control panel construction shall be modular in design with solid state microprocessor based electronics. An 80 character Liquid Crystal Display shall indicate alarms, supervisory service conditions and any troubles. The panel shall include but not be limited to the following:

.1 80 character LCD display

.2 Local Energy, Shunt Master Box, or Reverse Polarity Remote Station Connection

.3 Form C Trouble Contact

.4 Earth Ground Supervision Circuit

.5 Basic 8 A power supply

.6 Automatic Battery Charger

.7 Standby Batteries

.8 Resident non-volatile programmable operating system memory for all operating requirements.

.9 Five Programmable Multi-Function keys with status LED's

.10 Red Alarm LED and Acknowledge Button

.11 Yellow Supervisory Service LED and Acknowledge Button

.12 Yellow Trouble LED and Acknowledge Button

.13 Green Power on LED

.14 Alarm/Signal Silence Button

.15 System Reset Button

.16 Operator Interface Keypad for Manual Control and System Information Access

.17 Addressable Interface Control Card

.18 Supervised Annunciator Circuit

.2 The control Panel shall be capable of chronologically logging and storing 300 events in an alarm log and 300 events in a trouble log. The historical logs shall be stored in the CPU's memory and shall be protected by a lithium battery that is supervised for a low battery condition. Each recorded event shall include the time and date of that event's occurrence. The alarm log file must be separate from the trouble log file. It shall be possible for the user to generate a report of both logs upon request.

.3 All auxiliary manual controls shall be supervised so that all switches must be returned to the normal automatic position to clear system trouble.

.4 Signal Circuits shall be independently supervised and fused such that a fault on one circuit shall not affect the operation of any of the other circuits. All signal circuits shall be configured as follows:

.1 Class “B” wiring, current limited.

.2 Rated at two Amps of continuous power.

.3 Capable of powering polarised 24 VDC audible and visual signalling appliances.

.5 Provide dry contact auxiliary control circuits as follows:

.1 Central Station alarm output.

.2 Central Station trouble output.

.3 SPDT Form C relays fused at 2 A @ 24 VDC.

.6 System Expansion Modules connected by ribbon cables shall be supervised for module placement. Should a module become disconnected the system trouble indicator must illuminate and audible trouble signal must sound.

.7 The Fire Alarm Control Panel shall be capable of supporting RS-232-C I/O ports. CPU data output to the I/O ports shall be in a parallel ASCII format at field adjustable baud rates of 220, 300, 1200, 2400 and 4800.

.8 A walk test feature must be provided.

.9 All system controls shall be housed in a surface wall mounted steel cabinets. Finish shall be according to the manufacturer's standards.

.10 All modules shall be secured behind hinged locked door with a full viewing tempered plastic window. The hinged locked doors shall give access to all the operating controls but shall not expose live connections.

.11 All internal wiring, control circuits, connections and terminals shall only be accessible behind a removable metal retainer plate.

.12 All Cabinets are to be properly grounded to building ground. Conduit ground will not be acceptable.

.13 The system must provide communication with addressable initiating devices. All of these devices will be annunciated on the control panel's main LCD display. Annunciation shall include the following conditions for each point:

.1 40 Character Zone/Device Location

.2 Type of Device

.3 Detector Status (Normal/Alarm/Trouble)

.4 Device Missing/Failed

.14 The communication format must be a completely digital poll/response protocol to allow tapping of the circuit wiring. A high degree of communication reliability must be obtained by using parity data bit error checking routines for address codes and check sum routines for the data transmission portion of the protocol.

.15 Each addressable device must be uniquely identified by an address code entered on each device base at time of installation. The use of jumpers to set address will not be acceptable due to the potential of vibration and poor contact.

.16 It shall be possible for the owner's representative to change a smoke detector without any special tools or programming.

.17 The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions. Systems, which cannot support 100% of their point capacity in alarm simultaneously, cannot assure appropriate system response and are not acceptable.

.18 **The appropriate quantity of isolator modules shall be installed so that a wiring fault (short, open or ground) within one floor area shall not prevent the normal operation of other addressable devices on other floor areas.**

.19 The system shall maintain the sensitivity level set, for each sensor, over time by automatically compensating for environmental factors such as dust and dirt accumulations in a smoke sensor's chamber. The smoke sensor shall be a smoke density measuring device having no self-contained set-point. **The control panel shall determine the alarm decision for each sensor.**

.20 The system shall automatically indicate when an individual sensor needs cleaning. When a sensor's average value reaches a predetermined value a `Dirty Sensor' trouble condition shall be audibly and visually indicated at the control panel for the individual sensor.

.21 All data transmissions, **including the analogue value**, between the smoke sensors and the control panel shall be digitally transmitted and incorporate parity and checksum digital data checks of each transmission.

.22 An operator from the control panel, having a proper access level, shall have the ability to:

.1 Manually access and print the following information for each sensor in a report format that can be easily understood by the user:

.1 Primary Status

.2 Device Type

.3 Present Average Value

.4 Present Sensitivity Selected

.5 Highest Peak Detection Values

.6 Sensor Chamber Status (Normal, Almost Dirty, Dirty, Excessively Dirty)

.2 Manually control the following of each sensor:

.1 Clear Peak Detection Values

.2 Enable or Disable the Point

.3 Clear Verification Tally

.4 Control a Sensor's Relay Driver Output

.23 It shall be possible to program the control panel to **automatically** change the sensitivity settings of each sensor based on **time-of-day** and **day-of-week**.

2.4 CONVENTIONAL MANUAL ALARM STATIONS

.1 Manual alarm stations: pull lever, style, wall mounted semi-flush type, non-coded single pole normally open contact for single stage, English signage.

2.5 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.

2.6 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.

2.7 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.

2.8 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.

2.9 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.

2.10 CONVENTIONAL AUTOMATIC ALARM INITIATING DEVICES

.1 Thermal fire detectors: fixed temperature, non-restorable, rated 57°C (135ºF) or 88°C (194ºF) as indicated.

.2 Smoke detector: ceiling mounted, photo electric type, visual alarm indicator, complete with relay base where noted.

2.11 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 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 Any surface mounted signal devices must be provided with suitable backboxes supplied by the manufacturer.

.2 Provide synchronization modules to suit signal devices (if required by manufacturer).

2.12 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.

2.13 INTELLIGENT MODULES – GENERAL OPERATION

.1 The modules shall have a minimum of 2 diagnostic LED's 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.

2.14 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:	114.3mm (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.

2.15 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.

2.16 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.

2.17 SYSTEM WIRING

.1 The system wiring must be FSA rated in conformance with the Electrical Safety Code to suit the type of installation.

.2 Wiring shall be minimum #18 AWG twisted shielded pair in conduit. “Securex 2” armoured cable will be permitted to be used for “drops” to devices on accessible ceilings.

.3 As indicated on system riser diagram initiating device wiring shall be run in a loop with a home run from the last device to the control panel (Class ‘A’ configuration).Wiring from the “loop” module to conventional devices must be supervised, run in conduit, and conform to the standards of the Electrical Safety Code.

.4 Signal wiring is to be cross connected in a class ‘B’ configuration.

.5 Install isolator modules and end of line resistors in service rooms no higher than 2.4 M AFF. Provide location of these devices at the time of shop drawing submission.

.6 **These are the basic wiring requirements for system operation. Prior to tender close manufacturer and contractor are to confirm all necessary wiring specifications and requirements.**

2.18 APPROVED EQUIPMENT

DEVICE	**EDWARDS**
Control Panel	
	EST 4 or 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
Monitor Module	SIGA-CT Series
Control Module	SIGA-CR
Isolator Module	SIGA-IM

Conventional and Auxiliary Devices

Manual Alarm Stations	270 Series
Thermal Detectors	280-PL Series
150 mm (6”) Bells	439D Series or MB Series
Strobe	G1R-VM

Part 3 Execution

3.1 INSTALLATION

.1 The entire system shall be installed in accordance with CAN/ULC-S524 (latest edition) and approved manufacturers manuals and wiring diagrams. The contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation, All wiring shall be of the type recommended by the Electrical Safety Code, approved by local authorities having jurisdiction for the purpose, and shall be installed in dedicated conduit throughout.

.2 Install main control panel and connect to ac power supply.

.3 Locate and install manual alarm stations and connect to alarm circuit wiring.

.4 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.

.5 Connect alarm circuits to main control panel.

.6 Locate and install signal devices and connect to signalling circuits.

.7 Connect signalling circuits to main control panel.

.8 Install end-of-line devices at end of applicable alarm and signalling circuits.

.9 Elevator controllers are to be connected with 4 #14 conductors in conduit from fire alarm control panel to signal elevator recall in the event of a general alarm.

.10 **Connect smoke damper integral detector outputs to monitor modules for alarm condition and for monitoring of AC power to smoke damper as trouble condition at fire alarm panel based on module address.**

3.2 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.

3.3 ACCEPTABLE INSTALLER

.1 The fire alarm / life safety system specified herein shall be installed by an Authorized Electrical Contractor who is CFAA certified.

3.4 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.

3.5 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.

3.6 SYSTEM TEST

.1 Perform tests in accordance with General Electrical Requirements Section and CAN/ULC-S537-(latest edition) Standard for the Verification of Fire Alarm Systems.

.2 Fire alarm system:

.1 Test each device and alarm circuit to ensure noted devices transmit alarm to control panel and actuate general alarm and ancillary devices.

.2 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.

.3 Class B circuits

.1 Test each conductor on all circuits for capability of providing alarm signal on line side of single open-circuit fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

.3 The control panel shall continuously perform as automatic self-test routine on each sensor, which will functionally check the sensor electronics and ensure the accuracy of the valves being transmitted to the control panel.

.4 Automatic testing will occur at a rate of one sensor every four minutes.

.5 The sensor's average analogue value is the average of the last 2000 recorded analogue entries of its chamber.

.6 Any sensor that fails this test shall indicate a '**SELF-TEST ABNORMAL'** trouble condition with the sensor's address at the control panel.

.7 The system shall automatically indicate when an individual sensor needs cleaning. When the sensor's average value reaches a predetermined value, a **'DIRTY SENSOR'** trouble condition shall be audibly and visually indicated at the local control panel for that sensor. IF a **'DIRTY SENSOR'** indication is left unattended and its average value increases to a second predetermined value, an **'EXCESSIVELY DIRTY SENSOR'** trouble condition shall be indicated at the local control panel for that sensor. To prevent false alarms, these **'DIRTY'** conditions shall in no way decrease the amount of smoke obscuration necessary to generate an alarm condition.

.8 An operator having a proper access level, shall have the capability to manually access the following information from the control panel:

.1 Primary Status

.2 Device Type

.3 Present Average Value

.4 Present Sensitivity Selected*

.5 Highest Peak Detection Values (HVP)*

.6 Sensor Range (Normal, Dirty, Excessively Dirty)

* Values shall be in 'percent of smoke obscuration' format so that no interpretation is required by the operator.

.9 **Provide "Integrated Testing" of this life safety system in conformance with the noted specification section. Include all associated costs in tender.**

3.7 AUDIBILITY TESTING

.1 Audibility Testing:

.1 The contractor is to coordinate an audibility test prior to occupancy of the facility. The test is to be performed by the representatives of the fire alarm manufacturer in the presence of the consultant. The test report is to be in chart form indicating:

.1 Project

.2 Date of test

.3 Room name and number

.4 Ambient dB level

.5 Alarm dB level

.6 Name of testing technician

.2 The test results are to be submitted to the consultant for review prior to issuing to owner's representatives and/or authorities having jurisdiction.

END OF SECTION

Waterloo Region District School Board

DESIGN BRIEF FOR EXTERIOR WINDOWS, ENTRANCE & CURTAIN WALL SYSTEMS

For:

Waterloo Region District School Board

Prepared:

March 2015

Δ Updated as notes by WRDSB October 19, 2015

TABLE OF CONTENTS

This Design Brief is to provide the design consultant a parameter for the design for the building envelop closures and access points.

Table of Content..... 2

1 Design Parameters

Design parameters are to meet the latest Ontario Building Code Compendium SB-10 prescriptive method for Energy Conservation for all building envelope and access point closures and shall follow the WRDSB requirements outlined in this document.
An Energy Assessment Analysis for retrofit projects may be required at the request of the WRDSB.

a) Maximum Ratio Glazing vs. Building Envelope

- Overall building vertical fenestration-to-wall-ratio (FWR) shall not exceed 25%. The method of calculating the FWR shall match that required for demonstrating compliance with OBC energy provisions. Areas of vertical fenestration ratio exceeding the 25% requires WRDSB approval at the design stage.
- Exterior spandrel glazing area ratio shall not exceed 7.5% of the overall building vertical surface area. (All exterior spandrel glazing within a glazing system shall have an insulated back pan.)
- Vision glass area in teaching spaces should be targeted at10% of the floor area of the room. Vision glass area for Child Care rooms shall be a minimum of 10% of the floor area of the room.

b) Skylights

- The use of skylights is not permitted in new construction by the WRDSB. Clerestory fenestration is an acceptable option in lieu of skylights.

2 Framing

Exterior Fenestration:

- Thermally broken extruded aluminum framing.
- Non-thermally broken hollow metal framing kept to a minimum and shall be used at exterior entrances for the following spaces: Shipping & Receiving, Storage Room, Utility Room. The non-thermally broken hollow metal frames shall be filled solid with spray foam insulation.
- Locate thermal break of the aluminum framing in line with the exterior building envelope insulation space to obtain maximum thermal resistance at the transition.
- Suggested classroom window sill heights: 800mm A.F.F. to allow millwork positioning below the window sill at ground floor levels and 1000mm A.F.F. at upper floors.
  Suggested kindergarten window sill height: 400mm A.F.F.
  Where snow build-up may occur at exterior wall locations where there is typically no snow removal carried out, a minimum 400mm sill height above finished grade shall be provided.

2 Framing (cont'd.)

Δ *Window sills – prefinished extruded aluminum, as shown on drawings, colour and finish to match exterior finish of window frames.* ***Site-fabricated bend aluminum plates/sheet sills are not acceptable.***

1. *Drip deflectors (end dams, rounded cap) at all ends*
2. *Joint covers where sills are not continuous lengths, and at mitres*
3. *Align intermediate joints with mullions*

4. *Round off all protruding edges and corners*
5. *Precast concrete window sills preferred, if possible*

- All fenestration above roof levels shall have a minimum sill height of 500mm above the finished roof below.
- All spandrel glazing shall have sealed insulated metal back pans to maximize insulation value. (Minimum R value of the insulated back pan shall be R-14 or the full depth of the back frame in which the spandrel panel is installed in, but in no case less than R-14)
- All framing shall be secured with stainless steel fasteners and sealed to the building envelop opening perimeters to form a continuous barrier.
- All exterior doors aluminum entrance doors shall be thermally broken door frames.

3 Glazing

a) Glazing Types and Locations

The following glazing types shall be provided at the following locations:

- Exterior entrance doors and sidelight glazing, Sliding doors, Exterior ground floor glazing, Exterior glazing above ground floor :
  Outer Light Glass: 6mm (1/4") Tempered Glass
  Inner Light Glass: 6mm (1/4") Tempered Glass
- Exterior and interior glazing not protected by a guard and below guard height adjacent to a minimum 600mm grade differential: Glazing shall be designed to withstand the loads on guards as per Division B, Section 4 and SB-13 of the O.B.C.
- Interior doors and sidelight glazing: 6mm tempered clear vision glass
- Fire rated glazing: 5mm (3/16") minimum thick Firelite safety premium grade (impact resistant) glass, conforming to CAN/CGSB - 12.11-M90, ASTM E2010, CAN 4 S-104 and CAN 4 S-106 and thickness required by manufacturer for fire rating required in the assembly in which the glazing is installed.
- No Georgian Wire Glazing shall be used for interior/exterior glazing applications.
- Insulating units conforming to CAN/CGSB - 12.8 - M90 and
  - IGUs shall be double-glazed.
  - IGUs shall include an argon-filled inter-pane gap (minimum 90% argon). The gap thickness shall be approximately 12.7 mm (0.50 inches).
  - IGUs shall include low-e coating on surface #2. (low-e on surface 3 for tinted glazing)
  - Center-of-glass U-value shall not exceed 1.53 W/m2/°C (0.27 btu/hr/ft2/°F) (NFRC or CSA rating).
  - Center-of-glass SHGC shall not exceed 0.40 (NFRC or CSA rating).
  - Center-of-glass VT (visible transmittance) shall not be less than 0.60 (NFRC or CSA rating).

The low-e coating products listed below are examples of products that will typically meet all the above requirements for U-value, SHGC, and VT (when used in an IGU with argon fill).

- PPG Solarban 60
- Guardian Sunguard SuperNeutral 68
- Cardinal LoE²-270

3 Glazing

a) Glazing types and Locations (cont'd.)

- Glass tinting is recommended for all new facilities & all wholesale glass replacement projects. Glass tinting for partial re-glazing projects to be reviewed with School Board project coordinator.

- Spandrel Glass Panels: 6mm (1/4") tempered glass with opaci-coat back . (Spandrel glazing requires a sealed insulated metal back pan with min R-14 insulating value)
- Translucent Insulated Glazing Units :
  Acid-etched application on glass surface 3
  Glass Outer Lite – 6mm tempered glass
  Inner Lite – 6mm clear tempered glass
  Acid-etched texture & tinting, if required, to be confirmed to maximize natural light transmission.
- Consult the WRDSB to identify areas where high impact glazing may be required i.e. near play areas, sport areas or known high vandalized areas. Suggest 10mm (3/8") thick tempered exterior or interior glazing pane. Thick glazing pane to be installed on the side of direction of impact.

b) Maximum Glazing Panels

It is recommended that the maximum glazing panel sizes shall be kept within the following limits:

- For all types of glass 1220 x 2440mm (48"x96") – The dimension in only one direction may exceed 1220mm (48")

4 Operable Windows

- Operable Windows: Recommended for all teaching spaces, meeting rooms, administration/staff areas or where constant supervision is available. The operable vent area shall be a min. of 1% of the floor area in which the vent is located.
- Operable Window Type: Slider windows preferred in buildings without air conditioning.
  Slider window operation shall be located within 1200mm (4'-0") above the finished floor. Provide slider stop on operable windows located on upper floor levels to prevent opening the vent more than 100mm (4").

4 Operable Windows (cont'd.)

- Alternate Operable Window Type: Awning window type (top hinged, out swinging) preferred in buildings with air conditioning.

All out swinging operators shall be minimum 2100mm (6'-11") above exterior grade with crank operation at maximum1200mm above finished floor or have a maximum outswing operation of 100mm (4") with the vent projection not extending beyond the exterior window sill projection, whichever is less.

- Insect screens on all operable windows.

5 Hardware

- All hardware to be supplied under Hardware Allowance.
- Exterior doors with continuous weather stripping and maximum 12.7mm (1/2") high thresholds.
- Exterior doors: Roton concealed leaf geared hinges.
- Interior doors: stainless steel ball bearing hinges.
- Locking and security to be coordinated with School Board hardware expert.
- All entrance hardware operators shall be compatible with accessibility devices and security operation.

6 Blinds

- All teaching and administration spaces to receive manual rolling blinds at all exterior windows.
- Automatic operated rolling blinds to be provided at all high ceiling spaces exceeding 3000mm (10'-0").
- Rolling blinds to be 1% open weave flame retardant fabric for teaching spaces and libraries and 3% for administration areas.

Δ *Cassette design shall be a one piece aluminum extruded box closed on all four sides, top, back, sides and bottom return. Cassette sections to be square profile. Cassette section with internal groove to accommodate a self-cleaning brush to insure fabric maintenance as well as a gap brush on top back side of cassette to provide for a light seal.*

Δ *Finish clear anodized aluminum or custom painted in colour section by Consultant.*

Δ *Operating chain (manual shades)shall be no. 10 qualified heavy duty stainless steel bead chain 90 lb. load test formed in a continuous loop with stops at highest and lowest positions to prevent over winding and unrolling.*

7 Installation, Inspection & Testing

- Installation shall be in accordance with ASTM E2112 – "Standard Practice for Installation of Exterior Windows, Doors & Skylights"
- The cost of inspection and testing will be paid out of an allowance specified.
- Inspection and Testing Companies for trades will be selected from competitive bids obtained by the General Contractor for review and recommendation.
- Provide full size mock-up of typical window installation within wall opening at start of construction for review and approval.
- Provide inspection and testing reports prepared by independent Inspection and Testing Agency of the building envelope components (air-barrier, insulation,

flashing, transition membranes, etc.) tied to the fenestration including a blower door test in accordance with ASTM E783 – "Standard Test Method for Filed Measurement of Air Leakage Through Installed Exterior Windows and Doors" Suggested intervals of inspection at following stages of installation:

- Air/vapour barrier window perimeter installation.
- Window frame installation.
- Window perimeter seal to wall installation.
- Glass installation.

- Provide thermography testing of all fenestration during the first heating season after Substantial Completion.

8 Maintenance

- All maintenance within the warranty period, pertaining to the operation of the components specified, shall be included in the tender amount.
- Maintenance and Operation Manuals shall be submitted for the components supplied and installed to the School Board upon completion of the project.

9 Warranty

The following warranties are to be provided and shall include labour and materials:

- Aluminum Windows, Entrance Framing & Doors 5 years
- Glazing 10 years

∆ *10 LIST OF APPROVED VENDORS*

Acceptable Manufacturers

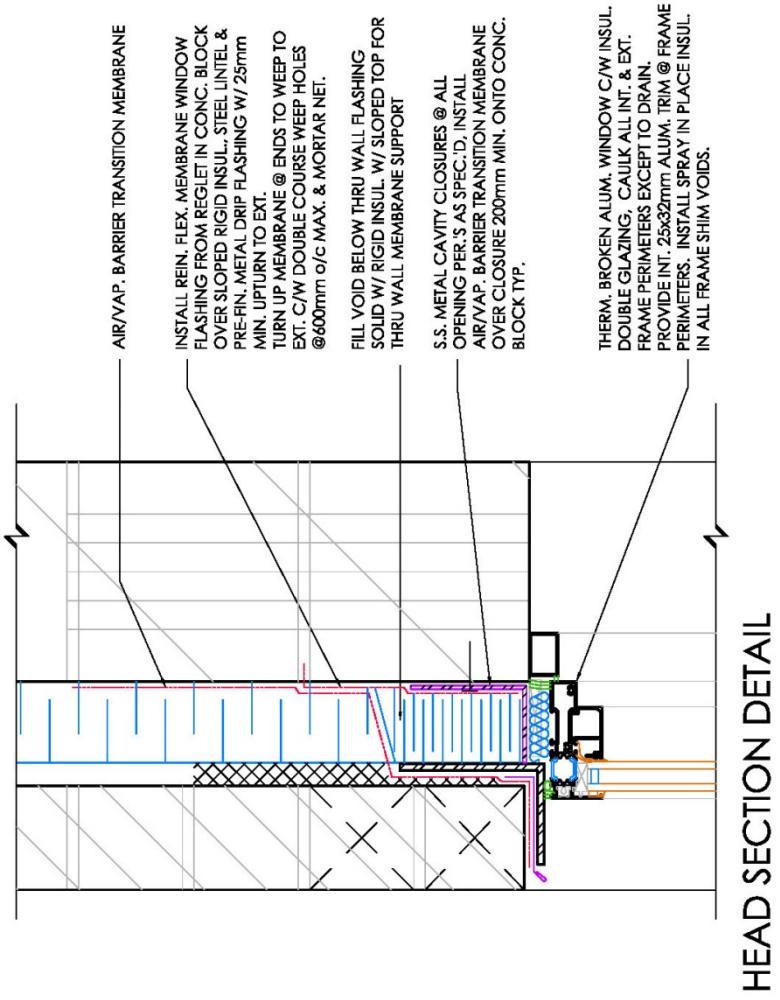
- *Kawneer Company Inc*
- *Alumicor Ltd.*
- *Sherwood Windows Group*
- *Aerloc Industries Ltd.*

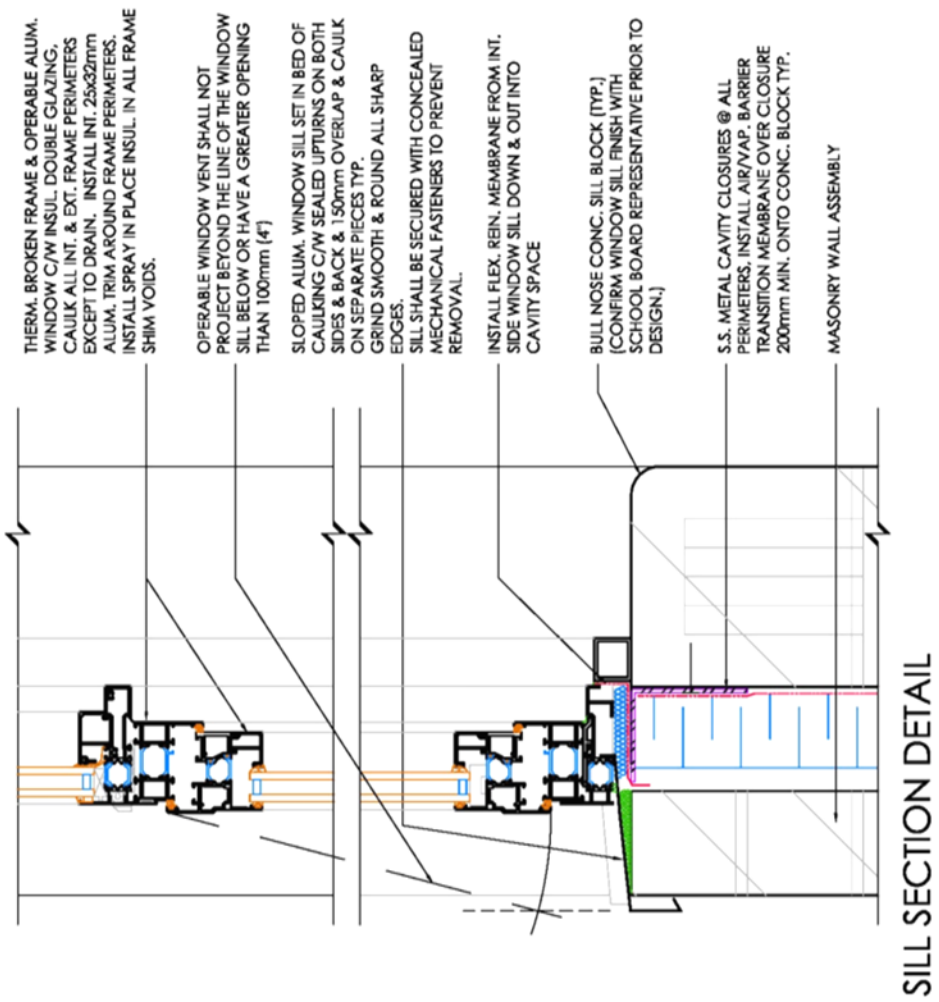
Installers

- *See record of vendor list from purchasing*

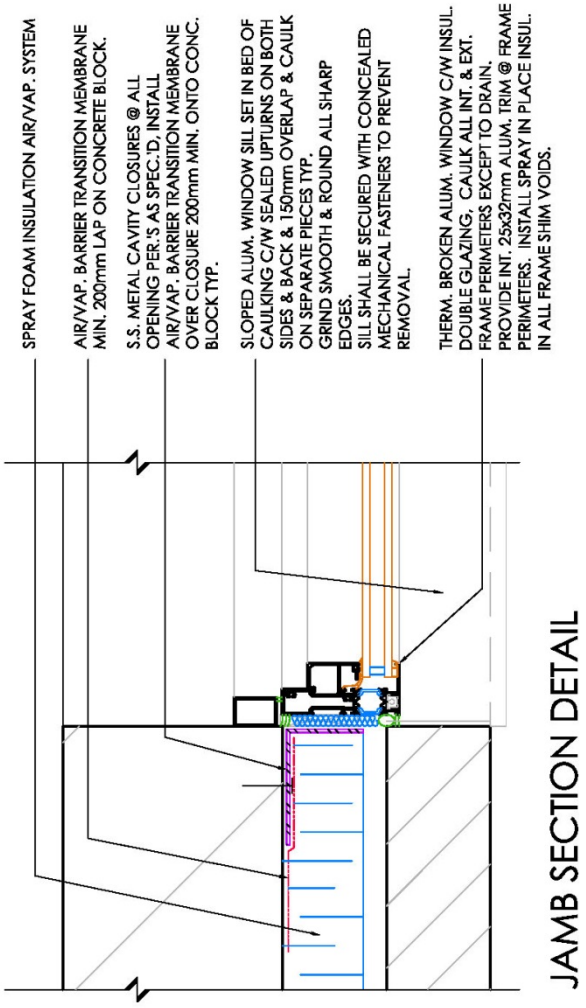
Not to be modified without approval from Board

11. Typical Opening Details

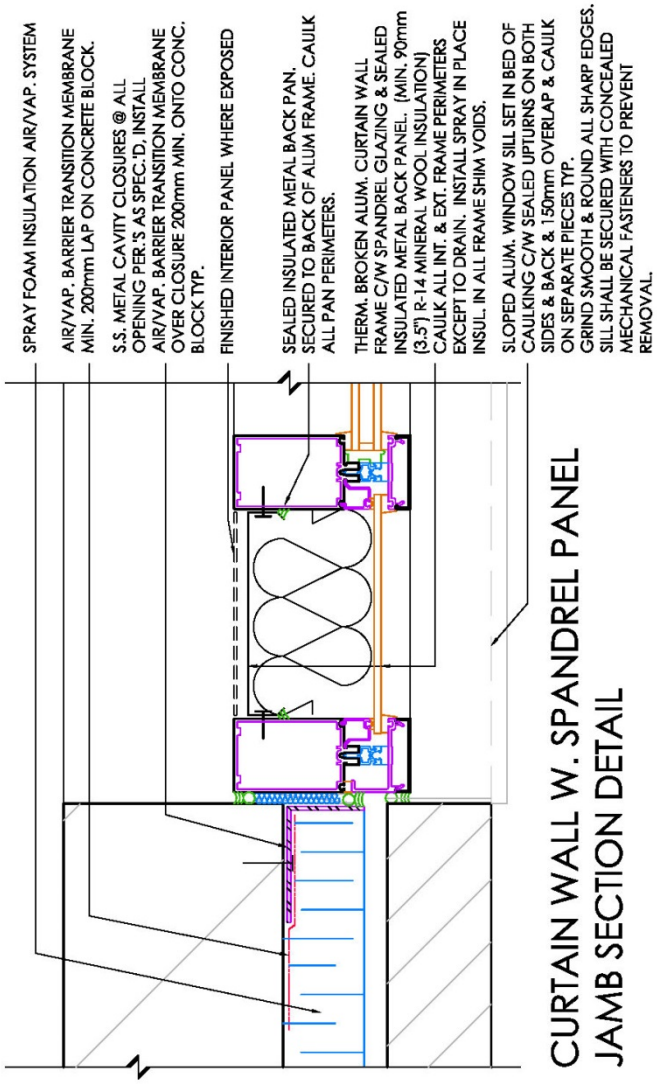




SILL SECTION DETAIL



JAMB SECTION DETAIL



CURTAIN WALL W. SPANDREL PANEL
JAMB SECTION DETAIL

23-7367-RFT - King Edward Public School Accessibility Upgrade including Elevator and Washrooms

Opening Date: April 5, 2023 4:27 PM

Closing Date: April 21, 2023 2:00 PM

Schedule of Prices

* Denotes a "**MANDATORY**" field

Do not enter $0.00 dollars unless you are providing the line item at zero dollars to the Board.

BID PRICE FORM

The amounts stipulated on the Bid Price Form are intended to cover the cost of the complete Work as described in this Procurement and must remain fixed and firm for the term of the Contract unless otherwise specified in this Procurement.

All prices shall be in Canadian Funds, Free On Board (FOB) Destination, and Freight Prepaid (Board locations). and shall be exclusive of Harmonized Sales Tax (HST) but shall include all materials, labour, equipment, disbursements, expenses, insurance, bonding, customs charges, freight, shipping and handling costs, travel costs and all other charges of every kind attributable to the Work and Services provided.

Refer to Tender Document, Section 00 21 12 Instructions to Bidders for complete details

Description	Bid Price *	
23-7367-RFT King Edward Public School Accessibility Upgrade including Elevator and Washrooms, as per scope of work		*
Subtotal:		

Summary Table

Bid Form	Amount
BID PRICE FORM	
HST (13%)	$ 0.00
Total Contract Amount:	

Bid Questions

In the near future, the Board will require General Contractors to have their IHSA - Certificate of Recognition (COR®). Although not mandatory now, the Board requests bidders to respond to the question below with a YES or NO.

Does your company have a current IHSA - Certificate of Recognition (COR®)? - YES or NO

Specifications

Bidder's Contact Information

A Site Supervisor and Project Manager, assigned to manage and supervise the Work, must be named in this form. Personnel will be subject to approval by the Board and cannot be changed without prior written approval from the Board.

A dedicated Site Supervisor is required full-time for this project. If your company is awarded more than one project/contract, a different Site Supervisor is required for each project.

Note: resumes are required to be uploaded in the document section

Title	Name *	E-mail *	Cell Phone Number *	
Project Manager				*
Site Supervisor				*

Documents

It is your responsibility to ensure the uploaded file(s) is/are not defective or corrupted and are able to be opened and viewed by the Owner. If the attached file(s) cannot be opened or viewed, your Bid Submission may be rejected.

Upload a resume for each person named in the Specification section.

Reminder: If your company is awarded more than one project/contract, a different Site Supervisor is required for each project.

- Project Manager - Resume * (mandatory)
- Site Supervisor - Resume * (mandatory)

BONDING UPLOAD SECTION

Refer to the Bonding Requirements Section of the Terms and Conditions.

Bonding is required if the project is equal to or greater than $200,000.00. Note: The Bidding System has flagged these fields as mandatory. If your bid is less than $200,000.00, please upload a pdf document stating: Not Applicable.

Bidders shall upload their electronically verifiable and enforceable (e-Bond) format for Bid Deposit Bond and Agreement to Bond separately in this section. If both Bonds are in the same file, please upload it in both fields.

The date on Bonds must be the Closing Date

Tender # and Project Title must be included on Bonds.

- Bid Bond * (mandatory)
- Agreement to Bond * (mandatory)

Addenda, Terms and Conditions

I/We have read and understand this Bid Solicitation document, and agree to perform the Work required in accordance with this Bid

Solicitation document, including all addenda, at the price(s) detailed in the Bid.

I/We confirm that:

1. The person named in this Bid is authorized to sign and electronically submit this Bid through the Bidding System.

2. I/We meet all mandatory requirements of the Bid Solicitation document.

3. The bid will remain open for a specified acceptance period after the Closing Time. The Board may, at any time within this period, accept the Bid whether or not any other Bid has previously been accepted.

4. All prices provided in the Bid will remain fixed and firm for the duration of the term of the agreement, unless specified otherwise.

5. All prices provided in my/our Bid are in Canadian funds and include all charges of every kind attributable to the Work. Harmonized Sales Tax will be extra and not shown, unless specified otherwise.

6. To the best of my/our knowledge and belief:

a) the information provided in the Bid is correct; and

b) the Bid is made without any comparison of figures or arrangement with any other individual, corporation or person submitting a Bid for the same Work and is in all respects fair and without collusion or fraud.

7. I/We comply with the all applicable Board policies, provincial, and federal laws, and are aware of the Board's "Principles of Business Conduct" and will comply.

8. I/We agree and understand that the recommendation to award the Work may be subject to the approval from the Board as well as availability of funds.

9. I/We agree to be bound by the terms and conditions of the Bid Solicitation document and submit this Bid on behalf of the Bidder.

☐ I have the authority to bind the Bidder.

The Bidder/Proponent is to declare any actual, potential or perceived conflict of interest that could arise from submitting the Bid/Proposal.

Do you have a potential conflict of interest?

○ **Yes** ○ **No**

The Bidder acknowledges and agrees that the addendum/addenda below form part of the Bid Solicitation Document.

Please check the box in the column "**I have reviewed this addendum"** below to acknowledge each of the addenda.

File Name	I have reviewed the below addendum and attachments (if applicable)	Pages
There have not been any addenda issued for this bid.		