Waterloo Region
District School Board

REQUEST FOR TENDER

24-7540-RFT

Pioneer Park Public School Interior Renovations

ISSUE DATE: MARCH 25, 2024

ELECTRONIC SUBMISSIONS will be received by the Bidding System no later than **2:00 p.m. local time, on APRIL 15, 2024.**

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: ward99 architects inc.

1.1.2 Structural: VX Engineering Inc.

1.1.3 Mechanical: Quasar Consulting Engineers Electrical: Quasar Consulting Engineers

DIVISION 00 – BIDDING AND CONTRACT DOCUMENTS

00 21 13 Instructions to Bidders

1. Designated Contact

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

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

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

2. Consultant (Applicable)

The Board has hired the following architect/consultant to assist in the preparation of this Tender: ward99 architects inc.

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

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

3. Blackout Period

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

4. Communication and Question Protocol

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

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

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

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

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

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

5. Doing Business with the Waterloo Region District School Board

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

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

Bid opportunities may be posted as Public or by Invitation only and are based on dollar thresholds outlined in WRDSB Administrative Procedure 4570 Procurement.

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

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

6. Anticipated Project Schedule

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

DESCRIPTION	DATE
Issue Date of Tender	March 25, 2024
Non-Mandatory Pre-Bid Site Examination	Date: April 4, 2024. Time: 10:00 am 55 Upper Canada Dr, Kitchener N2P 1G2 Main Entrance Vestibule
Deadline for Questions	April 8, 2024
Closing Date and Time	April 15, 2024, 2:00 pm local time
Anticipated Contract Start / Work begins	July 3, 2024
Substantial Completion Date	August 30, 2024
Ready for Takeover	August 30, 2024
Deemed Complete Date	September 13, 2024

7. Pre-Bid Site Examination

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

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

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

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

8. Secondary Site Examinations

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

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

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

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

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

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

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

9. Examination of Bid Documents and Work and Submitting Questions

i. Bidders are required to fully acquaint themselves with the Procurement documents; fully inform themselves of all conditions, limitations and requirements involved in the Procurement; and obtain all information that may be necessary to complete those requirements before submitting a Bid.

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

iii. In the event a Bidder discovers any errors, discrepancies, inconsistencies, or omissions or requires clarification within this Procurement, they are to submit their observations and/or questions through bids&tenders by clicking on the "Submit a Question" button found within the bid detail of the specified Procurement by the Deadline for Questions specified in this paragraph.

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

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

vi. Bidders are solely responsible for determining if they require additional information or if anything appears incorrect or incomplete. The onus is on the Bidder to contact the Designated Representative prior to the Deadline for

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

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

10. Electronic Bid Submission Only / Electronic Bidding System

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

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

i. In order to submit a bid, bidders must be registered with bids&tenders. The sole onus is on the bidder to have the most current correct information set-up in Bids and Tenders including but not limited to plan taker contact information, categories, and agency.

ii. All Bids shall be submitted through bids&tenders only. The onus is on the Bidder to ensure all requirements of the Bid Solicitations are submitted.

iii. If the bidder encounters technical issues, the onus is on the bidder to have this resolved prior to the closing date and time by contacting support@bidsandtenders.ca

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

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

vi. Bidders shall allow sufficient time to upload their Bid submission including all requirements as stated in this Procurement and to resolve any issues that may arise as Bid transmission can be delayed in an "internet traffic jam" due to file transfer size, transmission speed, and other electronic considerations

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

viii. The Owner reserves the right to accept or reject any or all provisional bid prices submitted, and such prices shall remain in effect for the duration of the Contract. Failure to submit provisional prices where required may result in the Bid being declared non-compliant.

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

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

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

xii. Upon submitting a Bid, the Bidding System will send a confirmation email to the Bidder advising that the Bid was submitted successfully. If a Bidder does not receive a confirmation email despite submitting a Bid, the Bidder should contact technical support of the service provider hosting the Bidding System via email: support@bidsandtenders.ca

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

xiv. If a Bid is a joint submission of two (2) or more firms, a single Bid is to be coordinated and submitted by the lead Bidder with the required information. If two or more parties submitted a joint response to this Bid Solicitation, they shall decide between them who is to be the Bidder, without any involvement of the Board.

xv. Your online Bid submission shall be taken as your statement that you understand the requirements and agree to comply with the requirements as well as terms and conditions stated in this Bid Solicitation document, including Board's Standard Terms and Conditions. Your Bid submission through the Bidding System confirms that you have checked and confirmed your pricing and by submitting the Bid online, you agree that you have not omitted any items from your Bid.

xvi. For construction projects with Bids above $200,000 the Successful Bidder will be required to execute a "Canadian Standard Form of Construction Contract to a Stipulated Sum" (CCDC 2 - 2020 including amendments thereto as set out in this Procurement.

11. Bid Prices

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

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

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

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

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

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

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

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

12. References (Not Applicable)

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

References must contain information about your clients including a complete organization name, contact person's names, title, telephone number and/or email address, details of the work provided, start and end dates of the work, and total cost of the work. Bidders cannot use references that pertain to another Vendor/Contractors' work.

The Board reserves the right to contact the clients noted to verify information provided

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

13. Addenda

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

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

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

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

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

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

Addenda cannot be acknowledged after the Closing Date and Time.

14. Edit and Withdrawal of Bid Submission

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

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

iii. The Bidder is solely responsible for ensuring that its re-submission is received prior to Closing Date and Time. The closing time shall be determined by the web clock within the Bidding System. After such time, requests to withdraw Bid will not be considered.

15. Irrevocable Period

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

16. Tie Bids

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

17. Bid Irregularities

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

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

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

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

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

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

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

18. Bid Review

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

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

iii. It is the Bidder's responsibility to satisfy the Board that they can comply with the requirements contained within this Bid Solicitation document and that they possess the necessary inventory, equipment, facilities, resources, and staff to perform the work specified in this Bid Solicitation document. Bidders may be required to submit evidence of above in a form acceptable to the Board. Substitution of materials, equipment, or methods different from that outlined in the terms of reference will not be accepted unless provided for within this Bid Solicitation document or with the written approval of the Board.

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

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

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

19. Post-Award Meeting

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

20. Intent to Award

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

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

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

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

iii. If Applicable, within **twenty-four (24) "workday" hours** of receiving a request or intent to award from the Board, the Bidder (the "Recommended Bidder") shall provide a list of all Subcontractors/Subconsultants that it proposes to use for all Work described in this Procurement including the Company Name, Sub Trade Category and if applicable, related Divisions.

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

a. Insurance certificate with coverage specified in the Bid Solicitation Document.
b. WSIB clearance certificate valid on date of award or an exemption letter (if applicable and requested).
c. Non-Disclosure Agreement (NDA) duly signed by the authorized signatory (to be renewed annually). The Board will provide this form.
d. Bonding Requirements, if applicable, as specified in the Bid Solicitation Document.
e. An executed Board issued Form of Agreement, if applicable, and duly signed by the authorized signatory.
f. Any other submittal specified in the Bid Solicitation Document or in the intent to award, as a requirement of award.
g. For construction projects above $200,000 the Successful Bidder will be required to execute a "Canadian Standard Form of Construction Contract to a Stipulated Sum" (CCDC 2 – 2020) including amendments thereto as set out in this Procurement.

v. The documents listed below will be incorporated as deemed necessary by the Board, into the Contract with the Bidder. If there is a discrepancy between the wording of one document and the wording of any other document that appears on the list, the wording of the document that first appears on the list shall take precedence:

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

21. Post Award

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

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

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

22. Award Notification

For procurements valued at $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.

END OF SECTION

00 21 14 – General Contractors and Subcontractors

1.0 General Contractor Roster List

1.1 Only invited prequalified General Contractors, as a result of the award of a competitive prequalification process, #23-7430-RFPQ, may submit a bid for this opportunity. Invitations are based on awarded Project Size Categories. Roster approved GCs can only bid on the projects size categories based on the award.

2.0 Subcontractors/Subconsultants

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

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

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

2.4. The Bidder (the "Recommended Bidder") shall provide a listing in a Board approved formatted list of Subcontractor/Subconsultant that it proposes to use for all Work described in this Procurement including the specification sections, as per the following:

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

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

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

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

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

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

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

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

END OF SECTION

00 21 15 – Scope of Work

The project scope of work includes but is not limited to the following:

1- The removal of two single-use staff washrooms to provide a recess for the parking of recycling bins in the school corridor.
2- Flooring replacement in two work rooms and the gymnasium, including the abatement of asbestos-containing vinyl composite flooring.
3- Provision for new coat racks and hooks.
4- Removal of an existing drinking fountain and replacement with a new drinking fountain/bottle filling station in a new recess off the existing school corridor.
5- The renovation to two existing gymnasium change rooms and associated showers and washrooms to provide for one (1) barrier-free washroom, one (1) single-use staff washroom, a Resource Room, a Custodian Storage room, Hockey Storage Room, a Sensory Room and Open Closet/Nutrition Room. The renovation includes demolition of existing masonry partitions, new masonry and drywall partitions, new flooring and ceiling assemblies and new millwork, appliances and equipment.

END OF SECTION

00 31 34 – Subsurface Investigation Report – Not Applicable

END OF SECTION

Appendix 00 31 34A – Soil Report; Not Applicable

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
Air Handler- ERV, Heat Pump, RTU
AC Split -Indoor/Outdoor Unit
Automatic Doors
Backflow Preventer
Boiler

Chiller
Cooling Tower
Elevator/Lift
Eyewash Station-location only
Fire Panel

Grease Trap
Gym Equipment
Hoods- Kitchen/Fume
Operable Partitions
Sprinkler System -area covered
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

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

b) Identified Price Form (Not Applicable)

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.

NOTE – Information below if for Reference purposes only. Bidders will complete all price bid forms electronically through bids&tenders. Do not complete or submit this sheet.

Reference/Information Only

Description	Lump Sum

00 56 13 – Definitions Stipulated Price

1.1. Definitions Declaration

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

.2 These Definitions are bound to the CCDC 2 Definitions and CCDC 2 General Conditions.

1.2. Supplementary Words and Terms to CCDC 2-2020

.1 The following words and terms are additional to the CCDC 2 Definitions.

.2 Addendum: A document that amends the Bid Documents during the Bidding Period and becomes part of the Contract Documents when a Contract is executed. (Plural: Addenda).

.3 Agreement: The signed and sealed legal instrument binding parties in a Contract, describing in strict terms their mutual arrangement, roles and responsibilities, commencement, and completion responsibilities.

.4 Alternative Price: The amount stipulated by a Bidder for an Alternative and stated as an addition, a deduction, or no change to the Bid Price.

.5 Authorities: Those having jurisdiction under law over Work or Parts thereof.

.6 Bid: To offer as a Bid stating for what price a Contractor will assume a Contract.

.7 Bid Documents: A set of documents consisting of the Instructions to Bidders, Bid Form, Contract Documents, and other information issued for the benefit of Bidders to prepare and submit a Bid.

.8 Bid Form: The specific and detailed form used to collect information about a Bid.

.9 Bidding: The process of preparing and submitting a Bid.

.10 Construction Documents: The Drawings and Project Manual. When combined with a Contract and Contract conditions, these documents form the Contract Documents.

.11 Contingency Allowance: An additional monetary amount added to a Project cost estimate and designated to cover unpredictable or unforeseen items of Work. The amount is usually based on some percentage of the estimated cost and expended and adjusted by Change Order. It is not intended to cover additions to the scope of Work.

.12 General Conditions: That part of the Contract Documents which sets forth many of the rights, responsibilities and relationships of the parties involved in a Contract.

.13 Exposed: Visible at completion of Work, in usable areas as well as interior of closets, cabinets, drawers, storage and service rooms, stairwells and exterior surfaces.

.14 Instructions To Bidders: Instructions contained in the Bid Documents to convey an Owner's expectations and criteria associated with submitting a Bid.

.15 Ready for Takeover: *Ready-for-Takeover* shall have been attained when the conditions set out in GC12.1, SC 55.1 , 12.1.1

.16 Section: A portion of a Project Specification covering one or more segments of the total Work or requirements. Sections are included in a Project manual as required to meet Project requirements.

.17 Standard: A document describing a grade or a level of quality, which has been established by a recognized agency or organization, utilizing an internal voting process.

.18 Separate Price: A separate price for work to be added to the base price if selected by the Owner. This price type is not a part of the base bid price.

.19 Stipulated Price: An amount set forth in a Stipulated Price Contract as the total payment for the performance of the Work. Sometimes referred to as a stipulated sum or a lump sum stipulated price.

.20 Tender: Refer to definition of Bid.

.21 Unit Price: The amount payable for a single unit of Work as stated in a Schedule of Prices.

.22 Install: To remove from site storage, move or transport to intended location, install in position, connect to utilities, repair site caused damage, and make ready for use.

.23 Supply: To acquire or purchase, ship or transport to the site, unload, remove packaging to permit inspection for damage, re-package, replace damaged items, and safely store on-site.

.24 Provide: To Supply and Install

.25 Wherever words 'approved', 'selected', 'satisfactory', 'directed', 'permitted', 'inspected', 'instructed', 'required', 'submit', 'ordered', 'reviewed', 'reported to', or similar words or phrases are used in Contract Documents, it shall be understood, unless context provides otherwise, that words 'by Consultant' or 'to Consultants' follow.

.26 Words 'by others' when used in Specifications or on Drawings shall not mean by someone other than Contractor. Only means by which something shown or specified shall be indicated as not being in Contract is by initials 'NIC' or words 'not in Contract', 'by Owner', or 'by Other Contractor'.

END OF SECTION

00 72 13 – Standard Terms and Conditions

1. Applicable Terms and Conditions

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

2. Bankruptcy

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

3. Basis of Award (Price factor)

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

4. Bonding Requirements

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

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

i. Bid Amount

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

ii. Bid Deposit Bond & Agreement to Bond

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

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

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

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

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

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

iii. Performance and Labour & Materials Bonds

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

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

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

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

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

5. Business Code of Conduct for Board Employees

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

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

6. Code of Conduct for Vendors/Contractors

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

i. **Courtesy and Respect**: all vendor/contractors and their employees must conduct themselves in a manner that is lawful, courteous, businesslike, and respectful of all students, staff, faculty, guests, or visitors.

ii. **Language and Behavior**: vendors/contractors and their employees cannot engage in behavior that is rude, threatening, or offensive. Use of profane or insulting language is prohibited. Harassment of any type, including sexual harassment is strictly prohibited. Abusive, derogatory, obscene or improper language, gestures, remarks, whistling, cat calls or other disrespectful behavior cannot be tolerated. Rough housing, fighting, fisticuffs, physical threats,

destruction of property, vandalism, littering, or physical abuse of anyone on WRDSB property are not permitted under any circumstance.

iii. **No Weapons, Alcohol, or Drugs**: The use, possession, distribution, or sale of any weapon, alcohol, illegal drug, or controlled dangerous substance by any contractor or contractor's employee is prohibited. Offenders will be removed from WRDSB property and/or reported to the local Police Department.

iv. **Smoking**: Contractors and their employees are not permitted to smoke on WRDSB property, in or near any buildings.

v. **Fraternization**: Vendor/Contractors and their employees may not fraternize or socialize with WRDSB students or employees.

vi. **Appearance**: Vendor/Contractors and their employees are required to wear appropriate work wear, hard hats and safety footwear, as the case may be, while on WRDSB property. Articles of clothing must be neat and tidy in appearance, and cannot display offensive or inappropriate language, symbols or graphics. WRDSB has the right to decide if such clothing is inappropriate.

vii. **Reporting**: The Vendor/Contractor is required to report any matter involving a violation of these rules of conduct, any matter involving health or safety, including any altercations, to WRDSB Facilities staff.

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

7. Compliance with Laws, Acts and Regulations

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

i. Broader Public Sector Accountability Act, 2010
ii. 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. Fighting Against Forced Labour and Child Labour in Supply Chains Act
xi. WRDBS Procurement Services Policies website
xii. WRDSB Policies and Procedures

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

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

The successful Bidder(s) will be required to comply with all applicable federal, provincial laws as well as Board policies in performing its obligations under the Contract including, without limitation, the Occupational Health and Safety Act, as amended, and the Workplace Safety and Insurance Act, 1997, as amended, and Accessibility for Ontarians With Disabilities Act, 2005, S.O. 2005, c.11, Accessibility Standards for Customer Services O. Reg. 429/07 requirements, under the Accessibility for Ontarians With Disabilities Act, 2005, as amended, or any successor legislation applicable, and to provide to the Board, upon request, periodic reports and evidences confirming such compliance.
By supplying the goods or equipment and/or providing services, the Vendor warrants that the goods or equipment supplied, and services provided to the Board conforms in all respects to the standards and codes set forth by federal and provincial agencies. Failure to comply with this condition will be considered a breach of this Contract.

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

8. Confidential Information and Municipal Freedom of Information and Protection of Privacy Act

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

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

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

9. Confirmation to Proceed

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

10. Conflict of Interest

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

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

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

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

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

A breach by the Vendor/Contractor, any of the Subcontractors, Suppliers or any of their respective advisors, partners, directors, officers, employees, agents, and volunteers shall entitle the Owner to terminate the Contract, in addition to any other rights and remedies that the Owner has in the Contract, in law, or in equity."

11. Construction Act Guidelines

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

12. Criminal Background Checks and Collection of Personal Information

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

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

An Offence Declaration on a Board-approved form for every employee of the Vendor/Contractor who may come in direct contact with Board staff and/or students on

a regular basis at any Board site prior to the occurrence and on or before September 1 each year thereafter may be required. Updated Offence Declarations may be required annually. The Board will determine in its sole discretion whether this is a requirement.

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

13. Damage Responsibility of Contractor/Vendor

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

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

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

14. Damage Reporting

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

It is understood that all damage caused by workers engaged in the work under these specifications will be repaired by the Vendor/Contractor and at the Vendor/Contractor's

sole expense. Damaged turf areas will be levelled and seeded, all horticultural planting damaged beyond repair will be replaced and any damage to structures, utilities, signs, light fixtures, landscape furniture, irrigation systems etc. will be repaired or replaced. Repair work will be carried out by skilled workers acceptable to the Board representative. All repairs and replacements will be approved by a Board representative prior to final payment.

15. Debriefing Requests

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

16. Default

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

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

17. Delay Claims

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

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

18. Designated Substances

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

are present, produced, processed, used, handled or stored and at which a worker is likely to be exposed to the designated substance.

I. Asbestos

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

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

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

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

II. Lead

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

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

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

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

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

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

III. Mercury

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

IV. Silica

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

All work involving the demolition silica-containing materials shall follow the procedures outlined in the MOL "Silica on Construction Projects" guideline. Type 1

operations may be necessary based on the type of work conducted and the Vendor/Contractor shall implement dust suppression methods and protect workers.

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

19. Dispute Resolution

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

20. Electrical Safety Requirements

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

21. Emergency and Maintenance

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

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

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

22. Equivalent or Brand Name

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

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

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

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

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

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

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

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

23. Evidence of Quality

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

24. Force Majeure

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

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

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

25. Hot Work Procedure

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

i. Whenever possible, complete Hot Work in a welding shop or out of doors at the school.
ii. Flammable liquids, dust lint and oily deposits to be removed from within 50-ft (15m) of Work. Remove other combustibles where possible. Otherwise protect with fire-resistive tarpaulins or metal shields.
iii. Explosive atmosphere in area eliminated. Floors swept clean. Combustible floors wet down, covered with damp sand or fire-resistive tarpaulins.
iv. All wall and floor openings covered. Fire-resistive tarpaulins suspended beneath Work.
v. For on-site Work (indoor and out of doors), advise the Head Custodian, Principal, Consultant (if assigned) and Project Coordinator/Lead prior to Work being performed, and of related dangers.
vi. Where the Fire Alarm system is required to be set to stand-by to discourage false alarms from smoke detectors provide a firewatch throughout the building or structure being worked on. NEVER put the fire alarm system in stand-by mode when the building is occupied by staff or students.
vii. In the event of a fire as a result of the Hot Work, notify the fire department immediately. Report incident to the head custodian, the Consultant, if assigned, and Project Coordinator immediately, whether extinguished or not. Provide a fire incident report to the Board.
viii. Barriers must be set up to protect staff and students (i.e. pylons, shields, and caution tape) from exposure to arc flash and smoke migration.
ix. Have all necessary doors, windows and/or drapes closed. Confer with the Head Custodian to shut down all fan systems in the area to reduce or eliminate smoke distribution.
x. Provide and keep fire extinguishers handy and in good Working condition. Temporarily cover all smoke detectors in the area during time of Work.
xi. Provide a fire watch/spot check for several hours after Work is completed. Uncover smoke detectors.
xii. On new construction, the requirements of the Hot Wok permit may be waived, until such time as either Substantial Completion or Occupancy is granted, whichever comes first.
xiii. On additions to existing buildings, the requirements for Hot Work permits shall remain in place.

25.1 Hot Work Permit

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

ii. The contractor must obtain Hot Work Permits from the School Board's representative prior to the start of work.
iii. The contractor must complete the form as required and must keep the form on site.
iv. Return each completed form to the School Board's representative on the date of expiration.
v. The most current version of the Permit and its requirements shall be used for the purposes of the Work.

26. Incurred Costs

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

27. Indemnification

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

28. Insurance Provisions

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

i. **General Liability Insurance:** The Vendor/Contractor shall maintain liability insurance acceptable to the Board throughout the term of this Agreement from the date of commencement of work until one (1) year from the date of substantial performance of work. Liability coverage shall be provided for completed operations hazards from the date of substantial performance of the work, as set out in the certificate of

substantial performance of work, on an ongoing basis for a period of 6 years following substantial performance of work. Coverage shall consist of a comprehensive policy of public liability and property damage insurance, with all applicable coverage extensions/ endorsements, in an amount of not less than $10,000,000 per occurrence. Such insurance shall name the **Waterloo Region District School Board** and any other person or party identified in the contract documents, as an **additional insured** with a cross liability endorsement and severability of interests' provision. The policy SIR/deductible shall not exceed $100,000 per claim and if the policy has an aggregate limit, the amount of the aggregate shall be double the required per occurrence limit. A combination of primary coverage plus umbrella or excess liability insurance may be used.

ii. **Owned and Non-Owned Automobile Liability Insurance:** The Vendor/Contractor shall maintain liability insurance on all Owned, Non-Owned and Leased Automobiles used in the performance of this work to a limit of $2,000,000 per occurrence throughout the term of this Agreement from the date of commencement of work and until one (1) year after the date of substantial performance of work.

iii. **Broad Form Contractor's Equipment Insurance**: The General Contractor shall provide and maintain during the term of the Agreement, coverage for construction machinery and equipment used by the Contractor for the performance of the work. Such insurance shall be in a form acceptable to the Board and shall not allow subrogation claims by the Insurer against the Board.

iv. **If applicable**, the General Contractor shall provide and maintain during the term of the Agreement an **All Risk Installation Floater Insurance** policy covering the installation of any machinery and equipment associated with the construction project. Coverage shall be in an amount equal to the value of the machinery and/or equipment and shall include coverage while it is in transit to, while stored at a temporary location, and awaiting installation at the work site.

v. **If applicable**, the General Contractor shall **ensure** its professional consultants, architects, landscape architects, planners, and engineers providing a professional service in connection with the contract, maintain until three (3) years after the Agreement, **Professional Liability Insurance** to a limit not less than $1,000,000 per claim providing coverage for acts, errors and omissions arising from their professional services performed under this Agreement. The policy SIR/deductible shall not exceed $100,000 per claim and if the policy has an aggregate limit, the amount of the aggregate shall be double the required per claim limit. Certificates evidencing such coverage shall be supplied to the Board prior to the completion of the project and in accordance with the provisions stated above.

vi. **If applicable, (i.e., for projects with environmental liability concerns)** the General Contractor shall take out and keep in force **Contractor's Pollution Liability** (CPL) coverage to ensure that its work does not exacerbate any pre-existing environmental condition during construction. Coverage shall be in an amount of not less than $2,000,000 per claim or per occurrence, or such greater amount as the Board may from time to time require, naming the Board as an additional insured, whose coverage shall be maintained in force for 1 year following the termination of the Contract. The policy SIR/deductible shall not exceed $100,000 per claim and if the policy has an aggregate limit, the amount of the aggregate shall be double the required per occurrence limit.

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

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

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

viii. **Third Party Claims Process:**

a. The Board's claims process for Third Party claims is to refer the claimant directly to the Vendor/Contractor and to leave the resolution of the claim with the Vendor/Contractor. This applies regardless of whether or not it is an insured loss.

b. As the Board has a responsibility to the taxpayers, we must ensure that claimants are dealt with in a fair and efficient manner. Claims reported to the Vendor/Contractor, either directly by a third party or through the Board shall be promptly investigated by the Vendor/Contractor. The Vendor/Contractor shall contact the third party claimant within 48 hours of receipt of notice of a claim. The Vendor/Contractor shall initiate an

investigation of the claim immediately upon notice, and advise the third party claimant in writing, with a copy to the Board, of its position regarding the claim within 21 calendar days of the notice. The Vendor/Contractor shall include in its response the reasons for its position.

c. Should this position not resolve the claim and be accepted by the third party claimant, the Vendor/Contractor shall immediately report the claim to its Insurer for further review. (Insurer for this purpose is defined as either the Claims Department of the Vendor/Contractor's Insurance Company or the Claims Administrator at the Vendor/Contractor's Insurance Broker.) The Vendor/Contractor's Insurer upon receipt of this claim shall advise the third party claimant by letter, with a copy to the Board, that it is now investigating the claim. When a final position on the claim has been determined, the Vendor/Contractor's Insurer shall advise the third party claimant by letter, with a copy to the Board. Failure to follow this procedure shall permit the Board to investigate and resolve any such claims.

d. Nothing herein shall limit the right of the Board to investigate and resolve any such claims notwithstanding the response of the Vendor/Contractor and/or its Insurer and to seek indemnification from the Vendor/Contractor or to exercise any other rights under the Contract.

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

29. Invoice Requirements, Proper Invoice and Payment Terms

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

29.1 In advance of invoicing, upon request, contracted Vendors will provide:

i. necessary company information to set up a WRDSB account and
ii. banking information if they wish to receive payment by Electronic Funds Transfer (EFT).

29.2 Requests to change company information, such as a name change due to a merger or acquisition, must be submitted in writing accompanied with a legal document/letter signed by a lawyer on the law firm's letterhead.

29.3 Invoices, not subject to the Construction Act, must contain the following information, where applicable, in order to be deemed complete:

i. Purchase Order Number
ii. Work Order Number
iii. Invoice Date

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

29.4 Construction Act – Proper Invoice

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

i. the Vendor/Contractor's name, address, telephone number and mailing address.
ii. the date of the Proper Invoice and the period during which the services or materials for which payment is being applied for were supplied.
iii. information identifying the authority, whether in the contract or otherwise, under which the services or materials were supplied.
iv. a description, including quantity where appropriate, of the services or materials that were supplied during the payment period.
v. the amount payable for the services or materials that were supplied during the payment period, with a clear identification of the portions of the amount that are holdbacks, and HST.
vi. the name, title, telephone number and mailing address of the person to whom payment is to be sent.
vii. the payment terms as specified by the Board in the Contract.
viii. the invoice number and if applicable, the revision number.
ix. the Vendor/Contractor's HST number.
x. invoices and time sheets from all subtrades whose work is included in the Proper Invoice, if required in the Contract.
xi. backup documentation to support any cash allowances and extra work claimed in the Proper Invoice.
xii. a schedule of values indicating:

a. for lump sum contracts, the percentage of work completed per division with each division further subdivided to show the percentage of work completed for each subtrade,
b. for unit price contracts, the tender quantity, unit of measure, previous quantity, current quantity, to-date quantity,
c. an updated list of change orders, showing the percentage of work completed under each change order, and
d. an updated cash allowance list, showing the percentage of work completed in respect of each cash allowance, if required by the Contract.

xiii. a Statutory Declaration where required by the Contract attesting to the truth of the statements made therein.

29.5 Payment Terms

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

30. Licenses and Permits

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

31. Locates, if applicable

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

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

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

32. Materials - Specifications

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

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

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

34. Mathematical Errors (Unit Prices Prevail)

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

35. No Branding

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

36. No Collusion

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

37. No Lobbying

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

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

38. No Smoking and Scent-Free Environment

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

39. Non-Assignment

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

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

40. Non-Disclosure Agreement (NDA)

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

41. Ownership of Work

For the purposes of this paragraph:

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

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

" Personnel " means employees, representatives, agents and subcontractors.

The Bidder and the Board acknowledge and agree that the development of the Deliverables and the provision of the Work may result in the creation or development of new intellectual property and may contain or utilize the existing intellectual property of the Bidder or of third parties. Accordingly, the Bidder and the Board agree as follows.

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

Personnel to cooperate fully at all times, with respect to signing such documents and doing such acts and other things reasonably requested by the Board to confirm the transfer of ownership rights in the Deliverables.

42. Patent, Copyright and Other Proprietary Rights

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

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

43. Performance

i. Where the Vendor/Contractor is in default in carrying out any of its obligations under the contract, the Board may issue a verbal warning outlining the deficiency in supply or other aspects of performance and requiring the Vendor/Contractor to correct those deficiencies within such period of time as stated.
ii. If the deficiency is not corrected within the time specified, or there is a further instance of deficient performance, the Board may issue a written notice to the Vendor/Contractor, identifying the deficiency in performance and setting a final date or time period for its correction.
iii. If corrective steps are not taken by the final date or within that time, the Board may terminate the Contract and take corrective action.
iv. Termination of any Contract can be immediate depending on the severity of the default.
v. The Vendor/Contractor shall have no right to perform the services contemplated under this agreement beyond the time when such services become unsatisfactory to the Board; and in the event that Vendor/Contractor shall be discharged before all the services contemplated hereunder have been completed, or the services are for any reason terminated, stopped or discontinued because of the inability of the Vendor/Contractor to serve under this agreement they shall be paid only for that portion of the Work which shall have been satisfactorily completed at the time of termination.
vi. Where deemed appropriate, a performance evaluation shall be completed by the Board. The evaluation report shall be reviewed with Procurement Services, and a copy of the completed evaluation forwarded to the Vendor for their records. Dependent on the evaluation scoring, the Board may request a corrective action plan

and/or project size/value may be affected on future bid opportunities for your company.

44. Permits and Licenses

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

45. Proceedings Against the Board

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

46. Protection of Board Assets

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

47. Public Health Safety Protocol

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

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

48. Records, Inspection, Audits

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

49. Reserved Rights of the Board

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

i. Reject any Bid received from a Bidder which is party to any potential, current, past or existing suits, actions, and litigation proceedings, arbitrations, alternative dispute resolutions, investigations, Bidder performance evaluations that are below expectations, or claims by or against or otherwise involving either of the Board and the Bidder.
ii. waive formalities and accept Bids which substantially comply with the requirements of this tender.
iii. accept any Bid in whole or in part.
iv. accept, reject, or cancel any or all Supplementary pricing.
v. discuss with any Bidders different or additional terms to those contemplated in this Bid Solicitation Document or in any Bid submission.
vi. make public the names of any or all Bidders.
vii. accept or reject equivalent or alternative brand names.
viii. check references other than those provided by any Bidder.
ix. reject any, or any part of, any or all Bids, or cancel the bidding process at any stage and/or issue a new Bid call for the same or similar deliverables.
x. disqualify any Bidder:
    a. whose Bid contains misrepresentations or any other, inaccurate, or misleading information, or any qualifications within its Bid,
    b. who has engaged in conduct prohibited by the Bid Solicitation Document,
    c. with inadequate credentials or due to unsatisfactory past performance,
xi. reject Bid(s) from Bidder who has engaged in lobbying or has contravened any of the terms of the Bid Solicitation Document.
xii. reject a Bid based on:
    a. information provided by references or credit check or other due diligence efforts,
    b. the information provided by a Bidder pursuant to the Board exercising its clarification rights under the procurement process, or
    c. other relevant information that arises during the procurement process.
xiii. choose to reject a Bid if only a single Bid is received and cancel the bidding process or enter into direct negotiations with the sole Bidder.
xiv. accept a Bid other than the lowest or highest scoring and/or to not accept any Bid for any reason whatsoever.
xv. award the contract as split-order, lump sum or individual-item basis, or such combination as shall best serve the interests of the Board
xvi. negotiate in circumstances permitted for in the Bid document or by relevant policies, or directives, and include additional terms and conditions during the process of negotiations.
xvii. no longer consider a Bidder if a satisfactory outcome is not reached as part of

negotiation, as determined by the Board in their sole discretion and move to the next highest ranked Bid in such event.

xviii. select a Bidder other than the Bidder whose Bid reflects the lowest cost to the Board and/or award the Contract to any Bidder.

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

xx. not award the Contract if the costs of completing the Work exceed budget funding; or

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

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

50. Responsibilities of the Vendor

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

The Vendor shall:

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

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

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

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

v. submit to Finance – Accounts Payable, an invoice for payment at the completion of the Work, unless otherwise stated. All applicable taxes including HST are to be itemized separately on invoices. Include the purchase order number on each invoice; and

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

51. Site and Work Examination

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

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

iii. Before submitting a Bid, each Bidder shall:

a. carefully examine this entire Bid Solicitation Document to determine the extent of the Work, and various provisions including the maps, drawings, reports and specifications.

b. immediately report all discrepancies between the various documents and site conditions.

c. provide subcontractors, sub-consultants, and suppliers to whom the Bidder intends to sublet a portion or portions of the Work with complete information as to the requirements of the Work. This is to include maps, drawings, reports, specifications, and all requirements of the Bid Solicitation Document including any addenda.

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

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

vi. Any soils investigation, environmental, geotechnical or other reports prepared or obtained with respect to the Place of the Work (collectively the “Reports”) are available from the Consultant. Where the Work involves existing buildings, structures, facilities, plant or equipment, any reports, data or as-built drawings concerning such buildings, structures, facilities, plant or equipment (collectively the “Data”) are available from the Consultant. The Reports should not be considered a representation of the site conditions of the entire Place of the Work, and the Reports and Data are provided for general information and guidance purposes only. Neither the Owner nor the Consultant guarantees the accuracy or completeness of the Reports or the Data, nor does either assume any responsibility for any interpretations or conclusions that bidders may make or draw from the Reports or the Data.

vii. Each Bidder is solely responsible, at its own cost and expense, to carry out its own independent research and due diligence, or to perform any other investigations considered necessary by the Bidder to satisfy itself as to all existing conditions. The

Bidders' obligations set out in this paragraph apply irrespective of any Reports, Data or any information contained in the Bid Documents.

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

52. Site Existing Services, if applicable

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

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

53. Site Inspection and Control

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

54. Site Investigation

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

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

55. Site Safety and Clean Up

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

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

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

56. Site Traffic/Pedestrian Safety

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

57. Site Use and Traffic Control

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

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

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

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

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

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

58. Suspension of Bidders

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

59. Sustainable Purchasing

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

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

60. Termination

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

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

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

61. Termination for Convenience

The Board may terminate the Contract, in whole or in part, whenever the Board determine that such termination is in the best interests of the Board without showing cause, upon providing written notice to the Vendor/Contractor. The Board shall pay all reasonable costs incurred by the Vendor/Contract up to the date of termination considering the Work performed and/or services were provided in accordance with the Contract and to the complete satisfaction of the Board. Payment shall be in accordance with prices as per Contract. However, in no event shall the Vendor/Contractor be paid an

amount, which exceeds the Total Bid Price. The Vendor/Contractor will not be reimbursed for any profits which may have been anticipated but which have not been earned up to the date of termination.

62. Termination for Lack of Funding

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

63. Tools and Equipment

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

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

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

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

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

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

64. Usage Reports

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

65. Variation of Bid Prices

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

66. Volume and Exclusivity

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

67. Waiver

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

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

68. Warranty and Maintenance

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

warranty period.

69. Work Continuity

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

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

70. Work Requirements

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

71. Workplace Safety Insurance Board (WSIB) Certificate

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

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

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

END OF SECTION

00 73 00 "The Supplementary Conditions"

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

(the "Supplementary Conditions")

AGREEMENT, DEFINITIONS, AND

GENERAL CONDITIONS

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

AGREEMENT BETWEEN OWNER AND CONTRACTOR

ARTICLE A-1 – THE WORK

SC17.1	A-1.3	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 30th day of August in the year 2024. .2 (if applicable) *Occupancy* by the 30th day of August in the year 2024, and .3 *Ready-for-Takeover* by the 30th day of August in the year 2024."

SC1.1		

ARTICLE A-3 – CONTRACT DOCUMENTS

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

ARTICLE A-4 – CONTRACT PRICE

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

ARTICLE A-5 – PAYMENT

SC4.1	A-5.1	Delete Article A- 5.1 in its entirety including all subparagraphs and replace it with the following:

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

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

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

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

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

SC6.1	Article A-10	Add the following new Article A-10 as follows: **"ARTICLE A-10 TIME OF THE ESSENCE** 10.1 It is agreed that one of the reasons the *Contractor* was selected by the *Owner* for this *Contract* is the *Contractor's* representation and covenant that it will attain *Substantial Performance, Occupancy (*if applicable), and *Ready-for-Takeover* within the *Contract Time* stated in Article A-1 of this *Contract*. 10.2 The *Contractor* acknowledges and agrees that it is responsible to marshal its resources and those of its *Subcontractors and Suppliers* in a manner which will permit timely attainment of *Substantial Performance, Occupancy (*if applicable), and *Ready-for-Takeover*. The *Contractor* agrees that time is of the essence of this *Contract*." 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 delete the words "under paragraphs 13.2.1 or 13.2.3" and replace them with "under paragraph 13.2.1" -and- change both instances of the words "the party" to "the *Contractor*". Change the word "claim" to "Claim" in all instances in the paragraph.

***NEW* PART 14 OTHER PROVISIONS**

SC58.1	14.1	Add new PART 14 – OTHER PROVISIONS as follows: "**PART 14 OTHER PROVISIONS** **GC 14.1 OWNERSHIP OF MATERIALS** 14.1.1 Unless otherwise specified, all materials existing at the *Place of the Work* at the time of execution of the *Contract* shall remain the property of the *Owner*. All *Work* and *Products* delivered to the *Place of the Work* by the *Contractor* shall be the property of the *Owner.* The *Contractor* shall remove all surplus or rejected materials as its property when notified in writing to do so by the *Consultant*."
	14.2	Add new GC 14.2 – CONSTRUCTION LIENS as follows: **"GC 14.2 LIENS** 14.2.1 Notwithstanding any other provision in the *Contract*, the *Consultant* shall not be obligated to issue a certificate, and the *Owner* shall not be obligated to make payment, subject to the *Owner*'s requirement to issue a *Notice of Non-Payment* (Form 1.1) to the *Contractor*, if at the time such certificate or payment was otherwise due: .1 a claim for lien has been registered against the *Project* lands by a *Subcontractor* or a *Supplier* that has not been vacated or discharged by the *Contractor* in accordance with the requirements of this *Contract*, or .2 if the *Owner* or a mortgagee of the *Project* lands has received a written notice of a lien that has not been resolved by the *Contractor* through the posting of security or otherwise. 14.2.2 In the event a construction lien arising from the performance of the *Work* is registered or preserved against the *Project* lands by a *Subcontractor* or a *Supplier*, or a written notice of a lien is given or a construction lien action is commenced against the *Owner* by a *Subcontractor* or a *Supplier*, then the *Contractor* shall, at its own expense: .1 within 10 calendar days of registration of the construction lien, vacate or discharge the lien from title to the premises (i.e. the *Place of the Work*). If the lien is merely vacated, the *Contractor* shall, if requested, undertake the *Owner*'s defence of any

		subsequent action commenced in respect of the lien, at the *Contractor*'s sole expense; .2 within 10 calendar days of receiving notice of a written notice of a lien, post security with the Ontario Superior Court of Justice so that the written notice of a lien no longer binds the parties upon whom it was served; and .3 satisfy all judgments and pay all costs arising from such construction liens and actions and fully indemnify the *Owner* against all costs and expenses arising from same, including legal costs on a full indemnity basis. 14.2.3 In the event that the *Contractor* fails or refuses to comply with its obligations pursuant to paragraph 14.2.2, the *Owner* shall, at its option, be entitled to take all steps necessary to address any such construction liens including, without limitation and in addition to the *Owner's* rights under paragraph 13.2.4, the posting of security with the Ontario Superior Court of Justice to vacate the claim for lien from title to the *Project* lands, and in so doing will be entitled to a full indemnity from the *Contractor* for all legal fees, security, disbursements and other costs incurred and will be entitled to deduct same from amounts otherwise owing to the *Contractor*. 14.2.4 In the event that any *Subcontractor* or *Supplier* registers any claim for lien with respect to all or part of the *Place of Work*, the *Owner* shall have the right to withhold, in addition to the statutory holdback, the full amount of said claim for lien plus either: (a) $250,000 if the claim for lien is in excess of $1,000,000 or (b) 25% of the value of the claim for lien and to bring a motion to vacate the registration of said claim for lien and any associated certificate of action in respect of that lien, in accordance with Section 44 of the *Act*, by paying into court as security the amount withheld. 14.2.5 Nothing in this GC 14.2 serves to preclude the *Contractor* from preserving and perfecting its lien in the event of non-payment by the *Owner*."

APPENDIX 1
to the Supplementary Conditions

Project-specific requirements for a "*Proper Invoice*"

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

.1 the written bill or request for payment must be in writing;

.2 the *Contractor*'s name and current address;

.3 the *Contractor*'s HST registration number;

.4 the date the application for payment was prepared by the *Contractor*;

.5 the period of time in which the services or materials were supplied to the *Owner*;

.6 the purchase order number provided by the *Owner*;

.7 reference to the provisions of the *Contract* under which payment is being sought (e.g. GC 5.3 –PAYMENTS for progress payments, GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK GC 5.5 – FINAL PAYMENT for final payment, etc.);

.8 a description, including quantities where appropriate, of the services or materials, or a portion thereof, that were supplied and form the basis of the *Contractor's* request for payment;

.9 the amount the *Contractor* is requesting to be paid by the *Owner*, set out in a statement based on the schedule of values approved under GC 5.2.4, separating out any statutory or other holdbacks, set-offs and HST;

.10 a sworn Statutory Declaration in the form CCDC 9A-2018, only for second and subsequent progress payments;

.11 a current Workplace Safety Insurance Board clearance certificate;

.12 a pre-approved schedule of values, supplied by the *Contractor*, for Divisions 1 through 14 of the *Specifications* (or equivalent Construction Specifications Institute Masterformat) of the *Work*, aggregating the total amount of the *Contract Price*, including all supporting invoicing;

.13 a separate pre-approved schedule of values, supplied by each *Subcontractor*, for each of Division 15, 16, and 17 of the *Specifications* (or equivalent Construction Specifications Institute Masterformat) of the *Work*, aggregating the total amount of the *Contract Price*, including all supporting invoicing;

.14 invoices and other supporting documentation for all claims against the cash allowance;

.15 a current, acceptable, and up to date *Construction Schedule Update*;

.16 if requested by the *Owner*, a current and valid certificate(s) of insurance as required under GC 11.1 – INSURANCE;

.17 the name, title, telephone number and mailing address of the person at the place of business of the *Contractor* to whom payment is to be directed;

.18 a current, up to date, and approved *Shop Drawing* log;

.19 in the case of the *Contractor's* application for final payment, in addition to the foregoing requirements (as applicable):

(a) any *Close-Out Documentation*, together with complete and final as-built drawings;

(b) the *Contractor's* written request for release of the deficiency holdback, including a statement that no written notices of lien have been received by it;

(c) the *Contractor's* written certification that there are no outstanding claims, pending claims or future claims from the *Contractor* or their *Subcontractors* or *Suppliers*; and

(d) sufficient evidence of the *Contractor's* compliance with GC 3.11.

END OF AMENDMENTS TO CCDC 2 - 2020

DIVISION 01 - GENERAL REQUIREMENTS

01 14 00 – Work Restrictions

1.0 GENERAL

1.1. SECTION INCLUDES

.1 Connecting to existing services

.2 Special scheduling requirements

1.2. RELATED SECTIONS

.1 Section 01 53 00 - Temporary Construction.

.2 Section 01 33 00 - Submittal Procedures.

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

1.3. EXISTING SERVICES

.1 Notify Owner and Consultant and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Consultant and Owner forty-eight (48) hours of notice for necessary interruption of mechanical or electrical service throughout the course of work.

.1 Keep duration of interruptions minimum.

.2 Perform interruptions after normal working hours of occupants, preferably on weekends.

.2 Provide for vehicular, pedestrian and personnel traffic.

.3 Construct barriers in accordance with Section 01 53 00.

1.2. AFTER HOURS WORK

.1 Schedule Work with school staff through the Board's contact so as to limit disruption to school operations. Include for any overtime, to ensure orderly and continuous progression of Work and operation of school.

.2 Direct calls from Contractors to Board staff to adjust alarms and to arrange for access will not be accepted. All correspondence must be through the Project Manager.

.3 Arrange 48 hours in advance with the Board to obtain an access card and adjust security alarms for after hours Work.

.4 Bidders are cautioned that the Board will be compensated by the Contractor for false alarms. Any costs associated with each false alarm will be levied against the Contractor for false fire alarm activation or security alarm activation. These costs may include, but are not limited to:
   .1 Fines or penalties imposed by the local Fire Services,
   .2 Fines or penalties imposed by the local Police Services,
   .3 Overtime costs borne by the Board.

.5 Contractors are responsible for ensuring doors and windows are secured prior to leaving school.

.6 Unless specifically stated otherwise school activities take precedence over Contractor's activities.

1.3. SPECIAL REQUIREMENTS

.1 Schedule and perform work in occupied areas to the Board Representative's approval.

.2 Schedule and perform noise generating work to the Board Representative's approval.

.3 Submit schedule of special requirements or disruptions in accordance with Section 01 33 00.

.4 All Contractor personnel are restricted to the job site and necessary access routes. No personnel shall visit other areas or buildings without specific authorization.

END OF SECTION

01 19 00 – Specifications and Documents

1.0 GENERAL

1.1. RELATED DOCUMENTS

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

1.2. WORDS AND TERMS

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

1.3. COMPLEMENTARY DOCUMENTS

.1 Generally, drawings indicate graphically, the dimensions and location of components and equipment. Specifications indicate specific components, assemblies, and identify quality.

.2 Drawings, specifications, diagrams and schedules are complementary, each to the other, and what is required by one, to be binding as if required by all.

.3 Should any conflict or discrepancy appear between documents, which leaves doubt as to the intent or meaning, apply the Precedence of Documents article below or obtain guidance or direction from Consultant.

.4 Examine all discipline drawings, specifications, schedules, diagrams and related Work to ensure that Work can be satisfactorily executed.

.5 All specification sections of the Project Manual and Drawings are affected by requirements of Division 01 sections.

1.4. PRECEDENCE OF DOCUMENTS

.1 In the event of conflict within and between the Contract Documents, the order of priority within specifications and drawings for this project are - from highest to lowest:

- .1 the Agreement and Definitions between the Owner and the Construction
- .2 the Defined Terms, Definitions;
- .3 Supplementary Conditions;
- .4 the General Conditions;
- .5 Sections of Division 01 of the specifications;
- .6 Technical specifications Sections of Divisions 02 through 49 of the specifications.

.7 Schedules and Keynotes:
  .1 Material and finishing schedules within the specifications, then;
  .2 Material and finishing schedules on drawings, then;
  .3 Keynotes and definitions thereto, then;

.8 Drawings:
  .1 Drawings of larger scale shall govern over those of smaller scale of the same date, then;
  .2 Dimensions shown on drawings shall govern over dimensions scaled from drawings, then;
  .3 Location of utility outlets indicated on architectural detail drawings takes precedence over positions or mounting heights located on mechanical or electrical Drawings.

.9 Later dated documents shall govern over earlier documents of the same type.

1.5. SPECIFICATION GRAMMAR

.1 Specifications are written in the imperative command mode, in an abbreviated form.

.2 Imperative language of the technical sections is always directed to the Contractor identified as a primary constructor, as sole executor of the Contract, unless specifically noted otherwise.
  .1 This form of imperative command mode statement requires the primary constructor to perform such action or Work.
  .2 Perform all requirements of the Contract Documents whether stated imperatively or otherwise.

.3 Division of the Work among subcontractors, suppliers, or others is solely the prime contractor's responsibility. The Consultant(s) and specification authors assume no responsibility to function or act as an arbiter to establish subcontract scope or limits between sections or divisions of Work.

END OF SECTION

01 21 00 – Allowances

1.0 GENERAL

1.1. RELATED SECTIONS

.1 Section 01 45 00 – Quality Control.

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

1.2. GENERAL

.1 Allowances included herein are for items of Work which could not be fully quantified prior to Bidding.

.2 Expend each allowance as directed by the Consultant. Work covered by allowances shall be performed for such amounts and by such persons as directed by Consultant.

.3 Funds will be expended by means of Cash Allowance allocations and contingency allowance allocations.

.4 Progress payments for Work and Products authorized under allowances will be made in accordance with the payment terms set out in the Conditions of the Contract.

.5 The Contractor shall bid the work involved and submit the Bids received to the Consultant and the Board, for approval

.6 The Contractor shall submit 3 bids unless directed by the Board.

1.3. CASH ALLOWANCES

.1 Cash allowances, cover the net cost to the Contractor of services, products, construction machinery and equipment, freight, handling, unloading, storage, installation where indicated, and other authorized expenses incurred in performing the Work. Cash allowances shall not be included by a subcontractor in the amount for their subcontract work.

.2 Supply only allowances shall include:

- .1 Net cost of Products.
- .2 Delivery to Site.
- .3 Applicable taxes and duties, excluding HST.

.3 Supply and install allowances shall include:

- .1 Net cost of Products.
- .2 Delivery to Site.
- .3 Unloading, storing, handling or products on site.

.4 Installation, finishing and commissioning of products.

.5 Applicable taxes and duties, excluding HST.

.4 Inspection and testing allowances shall include:

.1 Net cost of inspection and testing services.

.2 Applicable taxes and duties, excluding HST.

.5 Other costs related to work covered by cash allowances are not covered by the allowance, but shall be included in the Contract Price.

.6 Where costs under a cash allowance exceed the amount of the allowance, the Contractor will be compensated for any excess incurred and substantiated plus an allowance for overhead and profit as set out in the Contract Documents.

.7 Progress payments on accounts of work authorized under cash allowances shall be included in the monthly certificate for payment.

.8 Submit, before application for final payment, copies of all invoices and statements from suppliers and subcontractors for work which has been paid from cash allowances.

1.4. ALLOWANCES SCHEDULE

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

1	Designated Substance Removal. (Additional removal not already identified in the ACM Summary report)	$5,000
2	Independent Testing & Inspection (As directed by the Consultant)	$3,000
3	Data cabling installation and network equipment (Including terminations) not described in the Contract Documents including all cabling.	$3,000
4	Metal Shelving Units and Metal Bin and Cart Storage Units	$5,000
5	Access Control & Intrusion Detection Systems (security systems) (Where not otherwise identified in the Contract Documents and including all cabling)	$3,000
6	Appliances (washer/dryer unit and refrigerator etc.) and equipment and accessories (storage bins and totes/carts).	$5,000

11	Public Address (PA) systems. (Including all cabling and hardware)	$4,000
	Total of All Allowances:	**$28,000.00**

END OF SECTION

01 31 00 – Project Managing And Coordination

1.0 GENERAL

1.1. RELATED SECTIONS

.1 Section 01 32 00 - Construction Progress Documentation.

.2 Section 01 33 00 - Submittal Procedures.

.3 Section 01 53 00 – Temporary Construction Facilities

.4 Section 01 61 00 – Product Requirements

.5 Section 01 78 10 – Closeout Submittals and Requirements

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

1.2. PROJECT COORDINATION

.1 Perform coordination of progress schedules, submittals, use of site, temporary utilities, construction facilities and construction Work, with progress of Work of other contractors, under instructions of the Consultant.

.2 The Contractor shall have total control of the Work and shall effectively direct and supervise the Work so as to ensure conformity with the Contract Documents and within the Contract Time.

.3 The Contractor shall be solely responsible for the construction means, methods, sequences, and procedures and for coordinating parts of the Work under the contract.

.4 Coordinate progress of the Work, progress schedules, submittals, use of site, temporary utilities, construction facilities, safety regulations and fire protection, as per authorities having jurisdiction codes.

.5 The Consultant has the authority to stop the Work:

.1 whenever they observe or are made aware of unsafe conditions.

.2 whenever it is deemed necessary to protect the interests of the Board,

.3 whenever materials or workmanship are in contravention to the Contract Documents.

1.3. SITE SUPERVISOR AND PROJECT MANAGER

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

.2 Performance of the Contractors Project Manager and Site Supervisor

.1 If the Board and or the Consultant become concerned with any of: Site Safety, Project Schedule, or general compliance with the tender documents due to the performance of the Site Supervisor or Project Manager, the Consultant and or the Board will identify the concerns in writing to the Contractor.

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

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

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

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

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

1.4. PERMITS

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

1.5. CONSTRUCTION DOCUMENTS

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

1.6. PRE-CONSTRUCTION MEETING

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

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

1.7. ON-SITE DOCUMENTS

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

- .1 Complete set of Contract drawings.
- .2 Specifications.
- .3 All Addenda.

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

1.8. SCHEDULES

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

1.9. CONSTRUCTION PROGRESS MEETINGS

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

.3 Contractor, major subcontractors and consultants involved in Work are to be in attendance.

.4 Post and forward copies of progress schedules for advice of Subcontractors, Owner and Consultant.

.5 Notify parties minimum five (5) days prior to meetings.

.6 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within two (2) days after meeting.

.7 Agenda to include following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems which impede construction schedule.

.5 Review of off-site fabrication delivery schedules.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule.

.8 Progress schedule, during succeeding work period.

.9 Review submittal schedules: expedite as required.

.10 Maintenance of quality standards.

.11 Review proposed changes for effect on construction schedule and on completion date.

.12 Review site security issues.

.13 Other business.

.8 Schedule additional meetings, to expedite progress, should work require it.

.9 Keep Owner and Consultant informed of progress, of delays and potential delays during all stages of Work. Do everything possible to meet progress schedule

.10 Schedule and administer pre-installation meetings when specified in sections and when required to coordinate related or affected Work.

1.10. SUBMITTALS

.1 Prepare and issue submittals to Consultant for review.

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

.3 Submit requests for payment for review, and for transmittal to Consultant.

.4 Submit requests for interpretation of Contract Documents, and obtain instructions through Consultant.

.5 Process substitutions through Consultant.

.6 Process change orders through Consultant.

.7 Deliver closeout submittals for review and preliminary inspections, for transmittal to Consultant.

1.11. RECORD (AS-BUILT) DOCUMENTS AND SAMPLES

.1 Procedures for record as-built documents and samples as specified in Section 01 78 10.

.2 Keep as-built documents and samples available for inspection by the Consultant.

1.12. CLOSEOUT PROCEDURES

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

.2 Notify Consultant and Board when Work is considered ready for Substantial Performance.

.3 Accompany Consultant and Board on preliminary inspection to determine items listed for completion or correction.

.4 Comply with Consultant's instructions for correction of items of Work listed in executed certificate of Substantial Performance.

.5 Notify Consultant of instructions for completion of items of Work determined in Consultant's final inspection.

END OF SECTION

01 32 00 – Construction Progress Documentation

1.0 GENERAL

1.1. RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

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

1.2. SCHEDULES

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

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

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

.4 Submit schedules as follows:

.1 Submittal Schedule for Shop Drawings and Product Data.

.2 Submittal Schedule for Samples.

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

.4 Product Delivery Schedule.

.5 Cash Allowance Schedule for acquiring Products and Installation.

.6 Shutdown or closure activity.

1.3. CONSTRUCTION PROGRESS SCHEDULING

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

.2 Schedule Format.

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

.2 Split horizontally for projected and actual performance.

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

.3 Schedule Submission.

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

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

.3 Resubmit finalized schedule within five (5) days after return of review copy.

.4 Submit revised progress schedule with each application for payment.

.5 Distribute copies of revised schedule to:

.1 Job site office.

.2 Subcontractors.

.3 Other concerned parties.

.6 Instruct Consultant to report to Contractor within ten (10) days, any problems anticipated by timetable shown in schedule.

.4 Submit revised schedules with Application for Payment, identifying changes since previous version.

.5 Select either of the following paragraphs to identify the type and format of schedule required.

.6 Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.

.7 Indicate estimated percentage of completion for each item of Work at each submission.

.8 Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by Allowances.

.9 Include dates for commencement and completion of each major element of construction:

.1 Site clearing.

.2 Site utilities.

.3 Foundation Work.

.4 Structural framing.

.5 Subcontractor Work.

.6 Equipment Installations.

.7 Finishes.

.10 Indicate projected percentage of completion of each item as of first day of month.

.11 Indicate progress of each activity to date of submission schedule.

.12 Indicate changes occurring since previous submission of schedule:

.1 Major changes in scope.

.2 Activities modified since previous submission.

.3 Revised projections of progress and completion.

.4 Other identifiable changes.

.13 Provide a written report to define:

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

1.4. PROGRESS PHOTOGRAPHS

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

1.5. SHOP DRAWING SUBMITTAL SCHEDULE

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

END OF SECTION

01 33 00 – Submittal Procedures

1.0 GENERAL

1.1 RELATED SECTIONS

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

1.1 ADMINISTRATIVE

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

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

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "Shop Drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 The term "design team" means Consultant and Sub-consultants whether Sub-consultants are employees of Consultant or not, and includes structural, mechanical, electrical, etc.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow fourteen (14) days for Consultant's review of each submission.

.5 Adjustments made on Shop Drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.

.6 Make changes in Shop Drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of any revisions other than those requested.

.7 Accompany submissions with transmittal letter, containing:

- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.8 Submissions shall include:

- .1 Date and revision dates.

.2 Project title and number.

.3 Name and address of:

.1 Subcontractor.

.2 Supplier.

.3 Manufacturer.

.4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.

.5 Details of appropriate portions of Work as applicable:

.1 Fabrication.

.2 Layout, showing dimensions, including identified field dimensions, and clearances.

.3 Setting or erection details.

.4 Capacities.

.5 Performance characteristics.

.6 Standards.

.7 Operating weight.

.8 Wiring diagrams.

.9 Single line and schematic diagrams.

.10 Relationship to other parts of the Work.

.9 After Consultant's review, distribute copies.

.10 Submit Shop Drawings in Pdf. format for each requirement requested in specification Sections and as consultant may reasonably request.

.11 Submit product data sheets or brochures in Pdf. format for requirements requested in specification sections and as requested by Consultant where Shop Drawings will not be prepared due to standardized manufacture of product.

.12 Delete information not applicable to project.

.13 Supplement standard information to provide details applicable to project.

.14 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, the drawings will be stamped as reviewed or reviewed as modified and will be returned. At this point fabrication and installation of Work may proceed. If Shop Drawings are rejected, noted copy will be returned and re-submission of corrected Shop Drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.15 Signed drawings shall be returned to and retained by Contractor who is then responsible for distribution of copies of corrected shop drawing to appropriate

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

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

1.3 SAMPLES

.1 Submit for review to the Consultant three (3) samples as requested in respective specification Sections.

.2 Submit samples with identifying labels bearing material or component description, manufacturer's name and brand name, Contractor's name, project name, location in which material or component is to be used, and date.

.3 Deliver samples prepay any shipping charges involved for delivering samples to destination point and returning to point of origin if required.

.4 Provide samples of special products, assemblies, or components when so specified.

.5 No work requiring a sample submission shall commence until submission has received Consultant's final review.

.6 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.7 Where colour, pattern or texture is criterion, submit full range of samples.

.8 Adjustments made on samples by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.

.9 Make changes in samples which Consultant may require, consistent with Contract Documents.

.10 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 MOCK-UP

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

1.5 ` CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, and prior to commencing the work submit the performance bond and the labour and materials payment bond as described in the bid documents.

.2 Submit transcription of certified true copies of insurance immediately after award of Contract.

.3 A current WSIB clearance certificate

.4 The bidder's health and safety policy for the project.

.5 A copy of the notice of project issued by the ministry of labour for the project

.6 Building materials, components and elements specified without the use of trade or proprietary names shall meet requirements specified. If requested by Consultant, submit evidence of meeting requirements specified. Evidence shall consist of certification based on tests carried out by an independent testing agency. Certification based on previous tests for same materials, components or elements is acceptable. Certification shall be in form of written test reports prepared by testing agency.

END OF SECTION

01 35 17 – Fire Safety Procedures

1.0 GENERAL

1.1. RELATED SECTIONS

.1 Section 01 14 00 – Work Restrictions.

.2 Section 01 31 00 - Project Managing and Coordination.

.3 Section 01 33 00 - Submittal Procedures.

.4 Section 01 35 23 – Health and Safety

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

.6 Appendix 01 35 17A Contractor Hot Work Permit

1.2. FIRE SAFETY PLAN

.1 Contractors and their personnel will be familiar with this section and its requirements.

.2 The contractor must take all necessary precautions during the carrying out of the work to prevent the possibility of fire occurring.

1.3. FIRE PROTECTION

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

.2 The contractor will, at all times, when welding, brazing and performing any operation with an open flame, combustible adhesives or flammable solvents keep a portable, operable fire extinguisher within 3 meters of the operation.

1.4. HOT WORK

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

.1 Whenever possible, complete Hot Work in a welding shop or out of doors at the school.

.2 Flammable liquids, dust lint and oily deposits to be removed from within 50-ft (15m) of Work. Remove other combustibles where possible. Otherwise protect with fire-resistive tarpaulins or metal shields.

.3 Explosive atmosphere in area eliminated. Floors swept clean. Combustible floors wet down, covered with damp sand or fire-resistive tarpaulins.

.4 All wall and floor openings covered. Fire-resistive tarpaulins suspended beneath Work.

.5 For on-site Work (indoor and out of doors), advise the Head Custodian, Principal, Consultant (if assigned) and Project Coordinator prior to Work being performed, and of related dangers.

.6 Where the Fire Alarm system is required to be set to stand-by to discourage false alarms from smoke detectors provide a firewatch throughout the building or structure being worked on. NEVER put the fire alarm system in stand-by mode when the building is occupied by staff or students.

.7 In the event of a fire as a result of the Hot Work, notify the fire department immediately. Report incident to the head custodian, the Consultant, if assigned, and Project Coordinator immediately, whether extinguished or not. Provide a fire incident report to the Board.

.8 Barriers must be set up to protect staff and students (i.e. pylons, shields, and caution tape) from exposure to arc flash and smoke migration.

.9 Have all necessary doors, windows and/or drapes closed. Confer with the Head Custodian to shut down all fan systems in the area to reduce or eliminate smoke distribution.

.10 Provide and keep fire extinguishers handy and in good Working condition. Temporarily cover all smoke detectors in the area during time of Work.

.11 Provide a fire watch/spot check for several hours after Work is completed. Uncover smoke detectors.

.12 On new construction, the requirements of the Hot 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 4200 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

Pioneer Park Public School

2020 Asbestos Audit Update Report

Project Location:
55 Upper Canada Drive, Kitchener, ON

Prepared for:
Waterloo Region District School Board
51 Ardelt Avenue, Kitchener, ON

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

September 1, 2020

MTE File No.: C34532-919

Engineers, Scientists, Surveyors.

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

September 1, 2020

MTE File No.: C34532-919

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

RE: 2020 Asbestos Audit Update – Pioneer Park Public School
55 Upper Canada Drive, Kitchener, Ontario

1.0 Introduction

MTE Consultants Inc. (MTE) was authorized by the Waterloo Region District School Board (WRDSB) to conduct the 2020 Asbestos Audit Update for the subject building.

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

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

2.0 Scope of Work

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

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

3.0 Methodology and Assessment Criteria

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

- The following rooms:
    - WRDSB Room 1052, 1053 – No Key Access – Hydro One electrical
- 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 August 25, 2020. The 1-storey school was constructed in 1977 with an addition in 2012. The inspection did not include areas of post 1990 construction or renovation (where all building finishes have been removed and replaced), as applicable.

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

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

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

4.1 Analytical Results

During this inspection, a total of 15 building material samples that are suspect ACM were collected with a total of 15 analyses being performed. Equal to or greater than 0.5%, asbestos by dry weight, the laboratory method detection limit (MDL), classifies the material as ACM according to O. Reg. 278/05. Samples collected were submitted for analysis to Paracel Laboratories Ltd. (Paracel), in Mississauga, Ontario. Paracel is certified under the National Voluntary Laboratory Accreditation Program to perform asbestos analysis of bulk samples by PLM. Laboratory analysis was conducted in accordance with the United States Environmental Protection Agency, Test Method EPA/600-R-93/116: Method for the Determination of Asbestos in Bulk Building Materials, June, 1993 by Polarized Light Microscopy as prescribed by O. Reg. 278/05.

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

4.2 Removed ACM

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

WRDSB Room 1050.

- 3 insulated pipe fittings.

WRDSB Room 1002, 1003.

- 12”x12” vinyl floor tiles.

4.3 Discovery of Additional ACM

No additional ACM or suspect ACM was identified.

4.4 Damaged ACM

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

5.0 Recommendations

5.1 Remedial

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

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

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

5.2 Long Term Management

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

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

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

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

6.0 Limitations

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

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

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

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

All of which is respectfully submitted,

MTE Consultants Inc.

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Appendix A

Asbestos Management Database

School Name	Legend:	Notes:
Pioneer Park Public School	**HM -** Homogenous Material - homogeneous with previously sampled material **SL** - Sample Location - Material Sampled **VC** - Visually Confirmed - Material not sampled, deemed ACM **NF** - Non-Friable **F**- Friable	**All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.**
Date Built:		**Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.**
Original: 1977		
Addition(s): 2012		

WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
Structure/Additions										
	Original Building	Structure	Concrete	Concrete	-	Non ACM	-	-	-	-
	Original Building	Façade	Brick Veneer	Brick and Mortar	-	Non ACM	-	-	-	-
	Original Building	Façade	Concrete	Concrete	-	Non ACM	-	-	-	-
	Original Building	Not Inspected	Not Inspected	Roofing Materials	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
	Original Building	Deck	Metal Pan	-	-	Non ACM	-	-	-	-
	Original Building	Soffits	Texture Coat	-	-	Non ACM	SL	S15ABC	27-Jan-10	ND
	Original Building	Window	Exterior Frame	Brown Sealant	-	Non ACM	SL	S01ABC	25-Aug-20	ND
	Original Building	Door	Interior Frame	White Sealant	-	Non ACM	SL	S02ABC	25-Aug-20	ND
	Original Building	Door	Interior Frame	Black Sealant	-	Non ACM	SL	S03ABC	25-Aug-20	ND
	Original Building	Door	Exterior Pane	Grey Sealant	-	Non ACM	SL	S04ABC	25-Aug-20	ND
	Original Building	Door	Exterior Pane	Brown Sealant	-	Non ACM	SL	S05ABC	25-Aug-20	ND
	Original Building	Floor	Mastic	Black Mastic	-	Non ACM	HM	S14ABC	27-Jan-10	ND
Level 1										
1	Classroom A1	Floor	Vinyl Floor Tile 12"x 12"	Beige Oatmeal	-	Non ACM	HM	S06	27-Jan-10	ND
1	Classroom A1	Wall	Concrete	-	-	Non ACM	-	-	-	-
1	Classroom A1	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
2	Classroom A2	Floor	Vinyl Floor Tile 12"x 12"	Beige Oatmeal	-	Non ACM	HM	S06	27-Jan-10	ND
2	Classroom A2	Wall	Concrete	-	-	Non ACM	-	-	-	-
2	Classroom A2	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
2A	Storage	Floor	Vinyl Floor Tile 12"x 12"	White with Grey & Black	-	Non ACM	HM	S01	27-Jan-10	ND
2A	Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
2A	Storage	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
2A	Storage	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
3	Classroom A3	Floor	Vinyl Floor Tile 12"x 12"	Beige Oatmeal	-	Non ACM	HM	S06	27-Jan-10	ND
3	Classroom A3	Wall	Concrete	-	-	Non ACM	-	-	-	-
3	Classroom A3	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
4	Classroom A4	Floor	Vinyl Floor Tile 12"x 12"	Beige Oatmeal	-	Non ACM	SL	S06abc	27-Jan-10	ND
4	Classroom A4	Wall	Drywall	No Drywall Joint Compound	-	Non ACM	-	-	-	-
4	Classroom A4	Wall	Concrete	-	-	Non ACM	-	-	-	-
4	Classroom A4	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
5	Classroom A5	Floor	Vinyl Floor Tile 12"x 12"	Beige Oatmeal	-	Non ACM	HM	S06	27-Jan-10	ND
5	Classroom A5	Wall	Drywall	No Drywall Joint Compound	-	Non ACM	-	-	-	-
5	Classroom A5	Wall	Concrete	-	-	Non ACM	-	-	-	-
5	Classroom A5	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
6	Classroom A6	Floor	Vinyl Floor Tile 12"x 12"	Beige Oatmeal	-	Non ACM	HM	S06	27-Jan-10	ND
6	Classroom A6	Wall	Drywall	No Drywall Joint Compound	-	Non ACM	-	-	-	-
6	Classroom A6	Wall	Concrete	-	-	Non ACM	-	-	-	-

School Name	Legend:	Notes:
Pioneer Park Public School	**HM -** Homogenous Material - homogeneous with previously sampled material **SL** - Sample Location - Material Sampled **VC** - Visually Confirmed - Material not sampled, deemed ACM **NF** - Non-Friable **F**- Friable	**All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.**
Date Built:		**Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.**
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WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
6	Classroom A6	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
7	Kindergarten B1	Floor	Vinyl Sheet Floor	Faux Wood (2017)	-	Non ACM	-	-	-	-
7	Kindergarten B1	Wall	Concrete	-	-	Non ACM	-	-	-	-
7	Kindergarten B1	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
7A	Kindergarten B1	Floor	Vinyl Sheet Floor	Faux Wood (2017)	-	Non ACM	-	-	-	-
7A	Kindergarten B1	Wall	Concrete	-	-	Non ACM	-	-	-	-
7A	Kindergarten B1	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
7B	Kindergarten Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
7B	Kindergarten Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
7B	Kindergarten Washroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
7B	Kindergarten Washroom	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
8	Special Education	Floor	Vinyl Floor Tile 12"x 12"	Beige Oatmeal	-	Non ACM	HM	S06	27-Jan-10	ND
8	Special Education	Wall	Drywall	New (2017)	-	Non ACM	-	-	-	-
8	Special Education	Wall	Concrete	-	-	Non ACM	-	-	-	-
8	Special Education	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
9	Classroom B3	Floor	Vinyl Floor Tile 12"x 12"	White with Grey & Black	-	Non ACM	HM	S01	27-Jan-10	ND
9	Classroom B3	Wall	Concrete	-	-	Non ACM	-	-	-	-
9	Classroom B3	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
10	Kindergarten B4	Floor	Vinyl Sheet Floor	Faux Wood (2017)	-	Non ACM	-	-	-	-
10	Kindergarten B4	Wall	Concrete	-	-	Non ACM	-	-	-	-
10	Kindergarten B4	Wall	Drywall	Drywall Joint Compound	-	Non ACM	SL	S12a	27-Jan-10	ND
10	Kindergarten B4	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
10A	Kindergarten B4	Floor	Vinyl Sheet Floor	Faux Wood (2017)	-	Non ACM	-	-	-	-
10A	Kindergarten B4	Wall	Concrete	-	-	Non ACM	-	-	-	-
10A	Kindergarten B4	Wall	Drywall	Drywall Joint Compound	-	Non ACM	SL	S12a	27-Jan-10	ND
10A	Kindergarten B4	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
12	Classroom C1	Floor	Vinyl Floor Tile 12"x 12"	White with Grey & Black	-	Non ACM	HM	S01	27-Jan-10	ND
12	Classroom C1	Wall	Concrete	-	-	Non ACM	-	-	-	-
12	Classroom C1	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
13	Classroom C2	Floor	Vinyl Floor Tile 12"x 12"	Beige Oatmeal	-	Non ACM	HM	S06	27-Jan-10	ND
13	Classroom C2	Wall	Concrete	-	-	Non ACM	-	-	-	-
13	Classroom C2	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
14	Classroom C3	Floor	Vinyl Floor Tile 12"x 12"	Beige Oatmeal	-	Non ACM	HM	S06	27-Jan-10	ND
14	Classroom C3	Wall	Concrete	-	-	Non ACM	-	-	-	-
14	Classroom C3	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
101	General Office	Floor	Vinyl Floor Tile 12"x 12"	White with Grey & Black	-	Non ACM	HM	S01	27-Jan-10	ND
101	General Office	Wall	Concrete	-	-	Non ACM	-	-	-	-
101	General Office	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
101	General Office	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
102	Health Room	Floor	Vinyl Sheet Flooring	New (2017)	-	Non ACM	-	-	-	-
102	Health Room	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
102	Health Room	Wall	Concrete	-	-	Non ACM	-	-	-	-

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WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
102	Health Room	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
102	Health Room	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S03abc	27-Jan-10	Trace Chrysotile; Trace Amosite
103	Washroom	Floor	Vinyl Sheet Floor	-	-	-	-	-	-	Non ACM
103	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
103	Washroom	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
103	Washroom	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
104	General Office	Floor	Carpet	-	-	Non ACM	-	-	-	-
104	General Office	Wall	Concrete	-	-	Non ACM	-	-	-	-
104	General Office	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S03abc	27-Jan-10	Trace Chrysotile; Trace Amosite
105	Principal's Office	Floor	Carpet	-	-	Non ACM	-	-	-	-
105	Principal's Office	Wall	Concrete	-	-	Non ACM	-	-	-	-
105	Principal's Office	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
105	Principal's Office	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
106	Resource Room	Floor	Carpet	-	-	Non ACM	-	-	-	-
106	Resource Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
106	Resource Room	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
106	Resource Room	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
107	Resource Room	Floor	Carpet	-	-	Non ACM	-	-	-	-
107	Resource Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
107	Resource Room	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
107	Resource Room	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
108	Kiln Room	Floor	Concrete	-	-	Non ACM	-	-	-	-
108	Kiln Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
108	Kiln Room	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
109	Staff Lounge	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck (2017)	-	Non ACM	-	-	-	-
109	Staff Lounge	Wall	Concrete	-	-	Non ACM	-	-	-	-
109	Staff Lounge	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
109	Staff Lounge	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
110	Staff Kitchen	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck (2017)	-	Non ACM	-	-	-	-
110	Staff Kitchen	Wall	Concrete	-	-	Non ACM	-	-	-	-
110	Staff Kitchen	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
110	Staff Kitchen	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
111	Work Room	Floor	Vinyl Floor Tile 12"x 12"	White with Grey & Black	-	Non ACM	HM	S01	27-Jan-10	ND
111	Work Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
111	Work Room	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
112	Work Room	Floor	Vinyl Floor Tile 12"x 12"	Tan with Brown and Tan Spots	-	Non ACM	SL	S07abc	27-Jan-10	ND
112	Work Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
112	Work Room	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
113	Work Room	Floor	Vinyl Floor Tile 12"x 12"	White with Grey & Black	-	Non ACM	HM	S01	27-Jan-10	ND
113	Work Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
113	Work Room	Wall	Drywall	-	-	Non ACM	-	-	-	-
113	Work Room	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite

School Name	Legend:	Notes:
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WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
114	Work Room	Floor	Vinyl Floor Tile 12"x 12"	Tan with Brown and Tan Spots	-	Non ACM	HM	S07	27-Jan-10	ND
114	Work Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
114	Work Room	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
115	Seminar Room 3	Floor	Vinyl Floor Tile 12"x 12"	Beige Oatmeal	-	Non ACM	HM	S06	27-Jan-10	ND
115	Seminar Room 3	Wall	Concrete	-	-	Non ACM	-	-	-	-
115	Seminar Room 3	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
116	Library Resource Centre	Floor	Vinyl Floor Tile 12"x 12"	Beige Oatmeal	-	Non ACM	HM	S06	27-Jan-10	ND
116	Library Resource Centre	Floor	Carpet	-	-	Non ACM	-	-	-	-
116	Library Resource Centre	Wall	Concrete	-	-	Non ACM	-	-	-	-
116	Library Resource Centre	Ceiling	Ceiling Tile 2' x 2'	-	-	Non ACM	-	-	-	-
117	Seminar Room 2	Floor	Carpet	-	-	Non ACM	-	-	-	-
117	Seminar Room 2	Wall	Concrete	-	-	Non ACM	-	-	-	-
117	Seminar Room 2	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
117	Seminar Room 2	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
118	Seminar Room 1	Floor	Carpet	-	-	Non ACM	-	-	-	-
118	Seminar Room 1	Wall	Concrete	-	-	Non ACM	-	-	-	-
118	Seminar Room 1	Wall	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
118	Seminar Room 1	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
119	Library Office	Floor	Vinyl Floor Tile 12"x 12"	Beige Oatmeal	-	Non ACM	HM	S06	27-Jan-10	ND
119	Library Office	Wall	Concrete	-	-	Non ACM	-	-	-	-
119	Library Office	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
120	Library Storage	Floor	Vinyl Floor Tile 12"x 12"	Beige Oatmeal	-	Non ACM	HM	S06	27-Jan-10	ND
120	Library Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
120	Library Storage	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
121	Custodial Room	Floor	Vinyl Floor Tile 12"x 12"	Beige with Tan Streaks	NF	ACM	HM	S09abc	27-Jan-10	1.5% Chrysotile
121	Custodial Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
121	Custodial Room	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
121	Custodial Room	Piping	Pipe	Transite	NF	ACM	VC	-	-	-
122	Washroom	Floor	Vinyl Floor Tile 12"x 12"	Brown Oatmeal	-	Non ACM	SL	S10abc	27-Jan-10	ND
122	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
122	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S05	27-Jan-10	ND
123	Washroom	Floor	Vinyl Floor Tile 12"x 12"	Brown Oatmeal	-	Non ACM	SL	S10abc	27-Jan-10	ND
123	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
123	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S05	27-Jan-10	ND
124	Storage Room A7	Floor	Vinyl Floor Tile 12"x 12"	Beige with Tan Streaks	NF	ACM	SL	S09abc	27-Jan-10	1.5% Chrysotile
124	Storage Room A7	Wall	Concrete	-	-	Non ACM	-	-	-	-
124	Storage Room A7	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
124	Storage Room A7	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
125	Instructor's Room	Floor	carpet on Concrete	-	-	Non ACM	-	-	-	-
125	Instructor's Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
125	Instructor's Room	Ceiling	Ceiling Tile 2' x 4'	New	-	Non ACM	-	-	-	-
126	Girls Changeroom	Floor	Concrete	-	-	Non ACM	-	-	-	-

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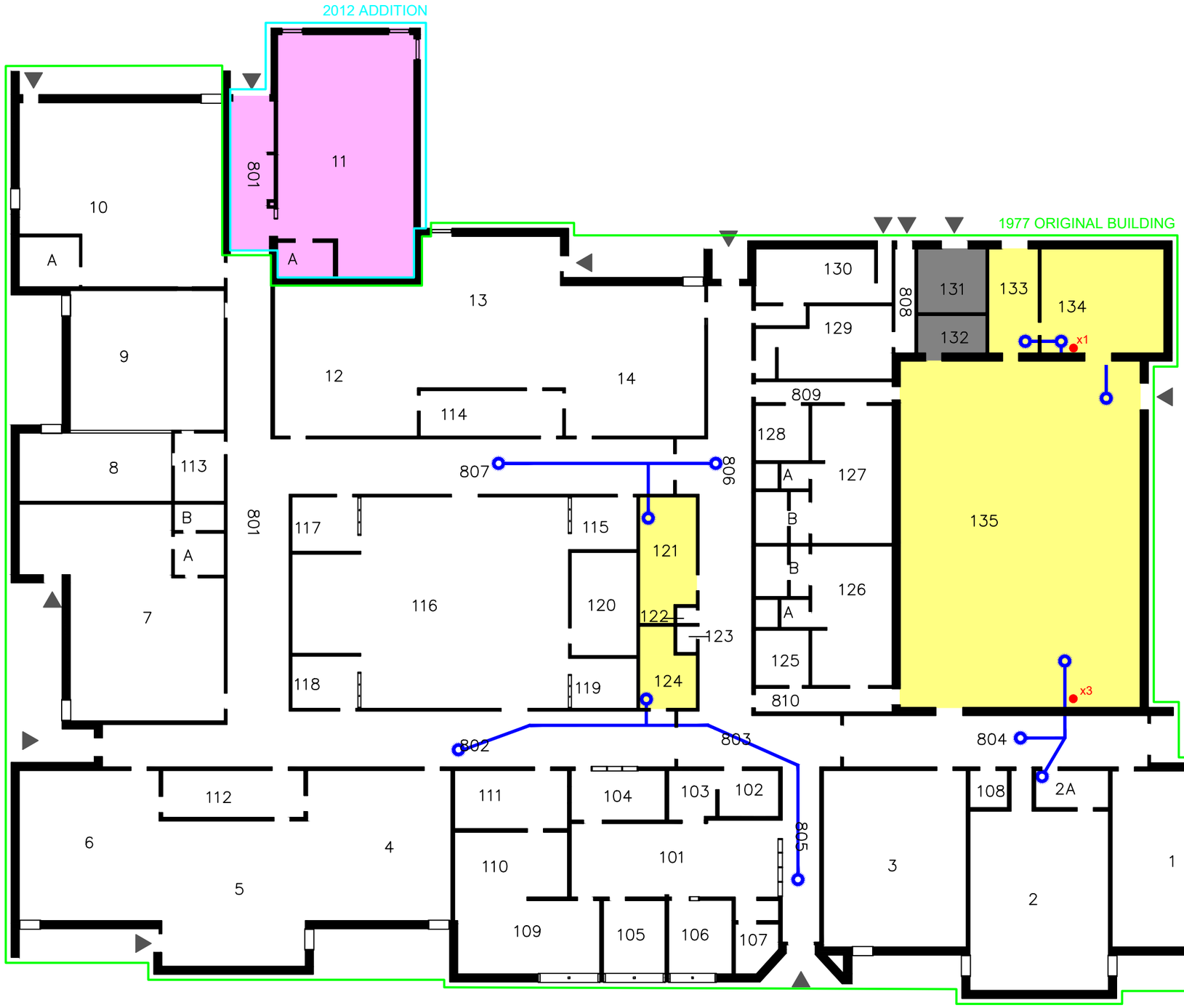
126	Girls Changeroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
126	Girls Changeroom	Ceiling	Ceiling Tile 2' x 4'	New	-	Non ACM	-	-	-	-
126A	Girls Washroom	Floor	Concrete	-	-	Non ACM	-	-	-	-
126A	Girls Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
126A	Girls Washroom	Ceiling	Ceiling Tile 2' x 4'	New	-	Non ACM	-	-	-	-
126B	Girls Washroom	Floor	Concrete	-	-	Non ACM	-	-	-	-
126B	Girls Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
126B	Girls Washroom	Ceiling	Ceiling Tile 2' x 4'	New	-	Non ACM	-	-	-	-
127	Boys Changeroom	Floor	Concrete	-	-	Non ACM	-	-	-	-
127	Boys Changeroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
127	Boys Changeroom	Ceiling	Ceiling Tile 2' x 4'	New	-	Non ACM	-	-	-	-
127A	Boys Washroom	Floor	Concrete	-	-	Non ACM	-	-	-	-
127A	Boys Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
127A	Boys Washroom	Ceiling	Ceiling Tile 2' x 4'	New	-	Non ACM	-	-	-	-
127B	Boys Washroom	Floor	Concrete	-	-	Non ACM	-	-	-	-
127B	Boys Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
127B	Boys Washroom	Ceiling	Ceiling Tile 2' x 4'	New	-	Non ACM	-	-	-	-
128	Instructor's Room	Floor	Concrete	-	-	Non ACM	-	-	-	-
128	Instructor's Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
128	Instructor's Room	Ceiling	Ceiling Tile 2' x 4'	New	-	Non ACM	-	-	-	-
129	Girls Washroom	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
129	Girls Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
129	Girls Washroom	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
130	Boys Washroom	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
130	Boys Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
130	Boys Washroom	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
131	Transformer Room	No Access								
132	Electrical Room	No Access								
133	Exterior Storage	Floor	Vinyl Floor Tile 12"x 12"	Tan with Brown and Tan Streaks	NF	ACM	HM	S14	27-Jan-10	0.75% Chrysotile
133	Exterior Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
133	Exterior Storage	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
133	Exterior Storage	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
134	Interior Storage	Floor	Vinyl Floor Tile 12"x 12"	Tan with Brown and Tan Streaks	NF	ACM	HM	S14	27-Jan-10	0.75% Chrysotile
134	Interior Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
134	Interior Storage	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
134	Interior Storage	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1990 Pinchin	1990	75% Chrysotile
134	Interior Storage	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
135	Gymnasium	Floor	Vinyl Floor Tile 12"x 12"	Tan with Brown and Tan Streaks	NF	ACM	SL	S14abc	27-Jan-10	0.75% Chrysotile
135	Gymnasium	Wall	Concrete	-	-	Non ACM	-	-	-	-
135	Gymnasium	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	1990 Pinchin	1990	75% Chrysotile
135	Gymnasium	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
135	Gymnasium	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-

School Name	Legend:	Notes:
Pioneer Park Public School	**HM -** Homogenous Material - homogeneous with previously sampled material **SL** - Sample Location - Material Sampled **VC** - Visually Confirmed - Material not sampled, deemed ACM **NF** - Non-Friable **F**- Friable	**All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.**
Date Built:		**Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.**
Original: 1977		
Addition(s): 2012		

WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
801	Corridor	Floor	Vinyl Sheet Floor	Grey With White Fleck (2017)	-	Non ACM	-	-	-	-
801	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
801	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
801	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S05	27-Jan-10	ND
801	Corridor	Ceiling	Texture Coat	-	-	Non ACM	SL	S13abc	27-Jan-10	ND
802	Corridor	Floor	Vinyl Sheet Floor	Grey With White Fleck (2017)	-	Non ACM	-	-	-	-
802	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
802	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S05abc	27-Jan-10	ND
802	Corridor	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
804	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
804	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
804	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
804	Corridor	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
805	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
805	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
805	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
805	Corridor	Ceiling	Texture Coat	-	-	Non ACM	HM	S13	27-Jan-10	ND
805	Corridor	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
806	Corridor	Floor	Vinyl Floor Tile 12"x 12"	Brown with Black and White Spots	-	Non ACM	HM	S04	27-Jan-10	ND
806	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
806	Corridor	Wall	Drywall	Drywall Joint Compound	-	Non ACM	SL	S12bc	27-Jan-10	ND
806	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S05	27-Jan-10	ND
806	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S03	27-Jan-10	Trace Chrysotile; Trace Amosite
806	Corridor	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
807	Corridor	Floor	Vinyl Sheet Floor	Grey With White Fleck (2017)	-	Non ACM	-	-	-	-
807	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
807	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S05	27-Jan-10	ND
807	Corridor	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
808	Girls Washroom	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
808	Girls Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
808	Girls Washroom	Ceiling	Drywall	Drywall Joint Compound	-	Non ACM	HM	S12	27-Jan-10	ND
809	Boys Changeroom	Floor	Concrete	-	-	Non ACM	-	-	-	-
809	Boys Changeroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
809	Boys Changeroom	Ceiling	Ceiling Tile 2' x 4'	New	-	Non ACM	-	-	-	-
810	Girls Changeroom	Floor	Concrete	-	-	Non ACM	-	-	-	-
810	Girls Changeroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
810	Girls Changeroom	Ceiling	Ceiling Tile 2' x 4'	New	-	Non ACM	-	-	-	-
Summary of Potential ACM Hidden or Not Assessed										
		Throughout Building	Not Inspected	Not Inspected	Wall Cavity Insulation					
		Throughout Building	Not Inspected	Not Inspected	Door Core Insulation					

Appendix B

Figures



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 2012 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
Ph. (519) 743-6500 www.mte85.com

CLIENT
WATERLOO REGION DISTRICT SCHOOL BOARD

PROJECT
2020 ASBESTOS AUDIT UPDATE

DRAWING
PIONEER PARK PUBLIC SCHOOL

LEVEL ONE

Project Manager: P. Semeniuk	Date: October 2020
Design By: WRDSB	Project No.: 34532-919
Drawn By: S-P. Lemieux	Drawing No.: 1.0
Scale: N.T.S.	

Appendix C

Tables

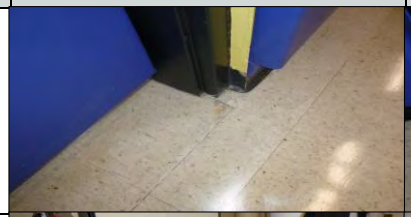
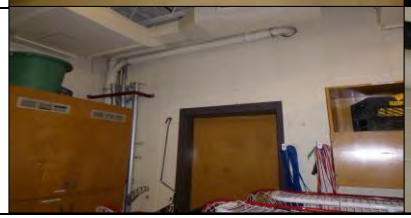
TABLE 1 - INTERNAL ABATEMENT MANAGEMENT							
Pioneer Park Public School							
Material	**WRDSB Fixed Reference Number**	**MTE Functional Space Number**	**Material Description**	**Approximate Quantity**	**Photograph - Context**	**Photograph - Detail**	**Required Action**
Asbestos Non-Friable	135	1050 (Along Exterior Wall and All Doorways)	12" x 12" Tan with Brown and Tan Streaks Floor Tile	>1 m²			Monitor Annually and Prioritize Removal in accordance with O. Reg. 278/05 as a Type 1 Operation, as Feasible
Asbestos Non-Friable	121	1025	12" x 12" Beige with Tan Streaks Floor Tile	2 Tiles			Monitor Annually
Asbestos Non-Friable	134	1055	Asbestos Cement (Transite) Pipe	2 Couplings			Monitor Annually
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

Pioneer Park Public School

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

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

TABLE 3: BULK ASBESTOS SAMPLING SUMMARY					
Sample #	**Location**	**Material Description**	**Asbestos Content (%)**	**Fibre Type**	**Is Material ACM**
2009 Asbestos Audit Update					
32523-PPPS-S01a	1001	12"x12" Floor Tile	ND	-	No
32523-PPPS-S01b	1001	12"x12" Floor Tile	ND	-	No
32523-PPPS-S01c	1001	12"x12" Floor Tile	ND	-	No
32523-PPPS-S02a	**1002**	**12"x12" Floor Tile**	**1.2**	**Chrysotile**	**Yes**
32523-PPPS-S02b	**1002**	**12"x12" Floor Tile**	**NA**	**Chrysotile**	**Yes**
32523-PPPS-S02c	**1002**	**12"x12" Floor Tile**	**NA**	**Chrysotile**	**Yes**
32523-PPPS-S03a	1001	2'x4' Ceiling Tile	<0.25	Chrysotile	No
			<0.25	Amosite	No
32523-PPPS-S03b	1001	2'x4' Ceiling Tile	<0.25	Chrysotile	No
			<0.25	Amosite	No
32523-PPPS-S03c	1001	2'x4' Ceiling Tile	<0.25	Chrysotile	No
			<0.25	Amosite	No
32523-PPPS-S04a	1015	12"x12" Floor Tile	ND	-	No
32523-PPPS-S04b	1015	12"x12" Floor Tile	ND	-	No
32523-PPPS-S04c	1015	12"x12" Floor Tile	ND	-	No
32523-PPPS-S05a	1015	2'x4' Ceiling Tile	ND	-	No
32523-PPPS-S05b	1015	2'x4' Ceiling Tile	ND	-	No
32523-PPPS-S05c	1015	2'x4' Ceiling Tile	ND	-	No
32523-PPPS-S06a	1011	12"x12" Floor Tile	ND	-	No
32523-PPPS-S06b	1011	12"x12" Floor Tile	ND	-	No
32523-PPPS-S06c	1011	12"x12" Floor Tile	ND	-	No
32523-PPPS-S07a	1014	12"x12" Floor Tile	ND	-	No
32523-PPPS-S07b	1014	12"x12" Floor Tile	ND	-	No
32523-PPPS-S07c	1014	12"x12" Floor Tile	ND	-	No
32523-PPPS-S08a	**1016**	**Texture Coat on Drywall**	**0.75**	**Chrysotile**	**Yes**
32523-PPPS-S08b	**1016**	**Texture Coat on Drywall**	**NA**	**Chrysotile**	**Yes**
32523-PPPS-S08c	**1016**	**Texture Coat on Drywall**	**NA**	**Chrysotile**	**Yes**
32523-PPPS-S09a	**1022**	**12"x12" Floor Tile**	**Tile - 1.5**	**Chrysotile**	**Yes**
			Mastic - ND	-	No
32523-PPPS-S09b	**1022**	**12"x12" Floor Tile**	**Tile - NA**	**Chrysotile**	**Yes**
			Mastic - ND	-	No
32523-PPPS-S09c	**1022**	**12"x12" Floor Tile**	**Tile - NA**	**Chrysotile**	**Yes**
			Mastic - ND	-	No
32523-PPPS-S10a	1023	12"x12" Floor Tile	ND	-	No
32523-PPPS-S10b	1023	12"x12" Floor Tile	ND	-	No
32523-PPPS-S10c	1023	12"x12" Floor Tile	ND	-	No
32523-PPPS-S11a	1028	12"x12" Floor Tile	ND	-	No
32523-PPPS-S11b	1028	12"x12" Floor Tile	ND	-	No
32523-PPPS-S11c	1028	12"x12" Floor Tile	ND	-	No
32523-PPPS-S12a	1034	Drywall Joint Compound	ND	-	No
32523-PPPS-S12b	1039	Drywall Joint Compound	ND	-	No
32523-PPPS-S12c	1039	Drywall Joint Compound	ND	-	No
32523-PPPS-S13a	1027	Plaster	ND	-	No
32523-PPPS-S13b	1027	Plaster	ND	-	No
32523-PPPS-S13c	1027	Plaster	ND	-	No
32523-PPPS-S14a	**1050**	**12"x12" Floor Tile**	**Tile - 0.75**	**Chrysotile**	**Yes**
			Mastic - ND	-	No
			Leveling Compound - ND	-	No
32523-PPPS-S14b	**1050**	**12"x12" Floor Tile**	**Tile - 0.75**	**Chrysotile**	**Yes**
			Mastic - ND	-	No
			Leveling Compound - ND	-	No
32523-PPPS-S14c	**1050**	**12"x12" Floor Tile**	**Tile - 0.75**	**Chrysotile**	**Yes**
			Mastic - ND	-	No

TABLE 3: BULK ASBESTOS SAMPLING SUMMARY					
Sample #	**Location**	**Material Description**	**Asbestos Content (%)**	**Fibre Type**	**Is Material ACM**
			Leveling Compound - ND	-	No
32523-PPPS-S15a	Exterior	Plaster	ND	-	No
32523-PPPS-S15b	Exterior	Plaster	ND	-	No
32523-PPPS-S15c	Exterior	Plaster	ND	-	No
2020 Asbestos Audit Update					
S01A	Original	Exterior Window Sealant - Brown	ND	-	No
S01B	Original	Exterior Window Sealant - Brown	ND	-	No
S01C	Original	Exterior Window Sealant - Brown	ND	-	No
S02A	Original	Interior Door Sealant - White	ND	-	No
S02B	Original	Interior Door Sealant - White	ND	-	No
S02C	Original	Interior Door Sealant - White	ND	-	No
S03A	Original	Interior Door Sealant - Black	ND	-	No
S03B	Original	Interior Door Sealant - Black	ND	-	No
S03C	Original	Interior Door Sealant - Black	ND	-	No
S04A	Room 1039 (Original)	Exterior Door Sealant - Grey - Pane	ND	-	No
S04B	Room 1039 (Original)	Exterior Door Sealant - Grey - Pane	ND	-	No
S04C	Room 1039 (Original)	Exterior Door Sealant - Grey - Pane	ND	-	No
S05A	Room 1039 (Original)	Exterior Door Sealant - Brown - Door	ND	-	No
S05B	Room 1039 (Original)	Exterior Door Sealant - Brown - Door	ND	-	No
S05C	Room 1039 (Original)	Exterior Door Sealant - Brown - Door	ND	-	No

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

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

Appendix 01 35 43B– Lead Report

Waterloo Region
District School Board

51 Ardelt Avenue, Kitchener, ON N2C 2R5
Tel: 519-570-0003, Fax: 519 576-0478
FACILITY SERVICES

February 9, 2024

RE: Paint and Coatings bulk Sampling – Letter of Findings
Pioneer Park Public School, 55 Upper Canada Drive, Kitchener, Ontario
Project-Specific Work Area – Fixed Reference Nos. 125, 126, 126A/B, 127, 127A/B, 128, 809, and 810

1. INTRODUCTION

Paint and coatings samples were collected for lead content analysis within Pioneer Park Public School, specifically, Fixed Reference Nos. 125, 126, 126A/B, 127, 127A/B, 128, 809, and 810. The samples were collected from surfaces within the project-specific location and submitted to ALS Environmental for the determination of lead content.

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

2. METHODOLOGY

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

The number of paint chip samples retrieved for analysis was based on surface colours observed. Samples were not retrieved from paint finishes with limited application. All paint chip samples were retrieved by scraping the paint down to the base material substrate to ensure collection of all layers of paint. Additional care was taken to avoid collection of the underlying substrate to reduce analytical substrate matrix interference.

Upon completion of our assessment, one paint chip sample was submitted to ALS Environmental for the determination of lead content. Analysis was conducted by the laboratory following the EPA Method 6010. The result of analysis was reported by the laboratory in micrograms per gram (µg/g).

3. RESULTS

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

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

Sample No.	Location	Surface	Paint Colour	Condition	Lead Conc. (µg/g)	EACC Classification
Sa101	Fixed Reference No. 127	Throughout	Yellow	Good	12	'*De Minimis*' Level of Lead

Note: 1 mg/kg = 1 µg/g

4. CONCLUSIONS

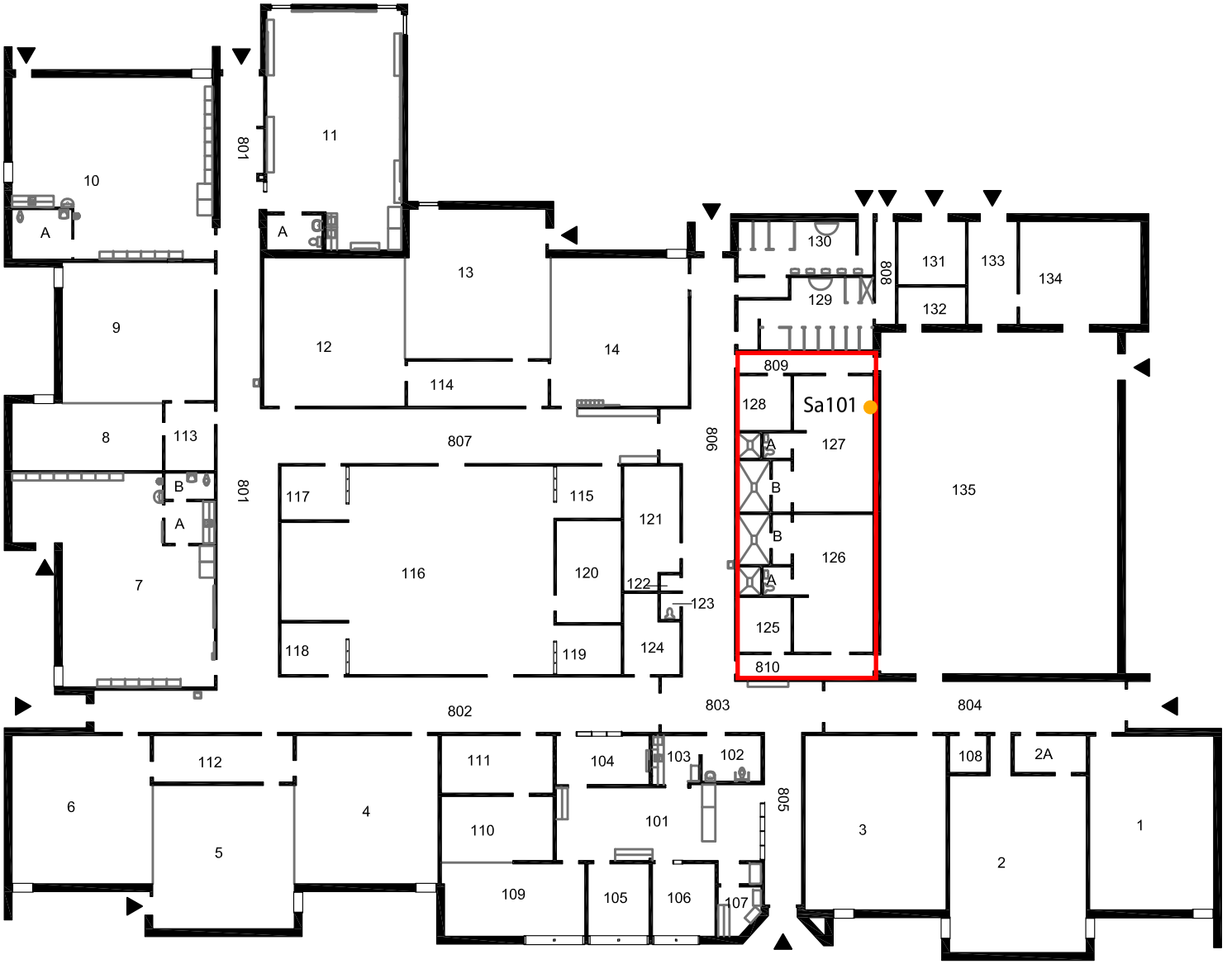
'*De* Minimis' Level of Lead in Paint

Paint sample, Sa101, collected from the painted wall surfaces observed throughout Fixed Reference No. 127, which is representative of painted wall surfaces of the entire work area, was determined to have lead contents below 1,000 µg/g Lead by Weight, which is considered a "*de minimis*" level of lead in paint as per the October 2014 Environmental Abatement Council of Canada (EACC) publication, "Lead Guideline for Construction, Renovation, Maintenance or Repair" (herein after referred to as the "EACC Lead Guideline").

Prepared by:

Jeff Cull
Environmental Officer
jeff_cull@wrdsb.ca

Appendix A
Extent of Assessment Area & Paint Sample Locations



Assessment Area

Sample Location

WATERLOO REGION DISTRICT SCHOOL BOARD			
PROJECT:	PIONEER PARK PUBLIC SCHOOL - KITCHENER		
TITLE:	FLOOR PLAN - FIXED REFERENCE ROOM NUMBERS		
Date: MAY 2019	Drawn by: ADO	Appr.: .	
Prev. Rev: SEPT 2017 SKA	Scale: 1" = 30'-0"	Dwg.No: 2 OF 2	

Appendix B
Laboratory Certificate of Analysis

ALS Canada Ltd.

right solutions. right partner.

CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WT2402528**	Page	: 1 of 3
Client	: **Waterloo Region District School Board**	Laboratory	: ALS Environmental - Waterloo
Contact	: Jeff Cull	Account Manager	: Candice Hunter
Address	: 51 Ardelt Avenue Kitchener ON Canada N2C 2E1	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 502 8343	Telephone	: +1 519 886 6910
Project	: PIONEER PARK P.S. RENO 2024	Date Samples Received	: 05-Feb-2024 11:30
PO	: ----	Date Analysis Commenced	: 06-Feb-2024
C-O-C number	: ----	Issue Date	: 06-Feb-2024 17:26
Sampler	: Jeff Cull		
Site	: ----		
Quote number	: Non - Regulated Standing SOA		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Nik Perkio	Inorganics Analyst	Metals, Waterloo, Ontario

General Comments

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

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*

>: greater than.
<: less than.
Red shading is applied where the result or the LOR is greater than the Guideline Upper Limit (or lower than the Guideline Lower Limit, if applicable).
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit .

Workorder Comments

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

Analytical Results

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

	Client sample ID	SA 101/FR#127					
	Sampling date/time	02-Feb-2024 00:00					
Analyte	*Method/Lab*	*LOR*	*Unit*	WT2402528-001	--	--	--	--	--	--
Metals										
Lead	E494.Pb/WT	5.0	mg/kg	12.0	--	--	--	--	--	--

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

Please refer to the Accreditation section for an explanation of analyte accreditations.

No Breaches Found

Key:

Appendix C
Site Photographs

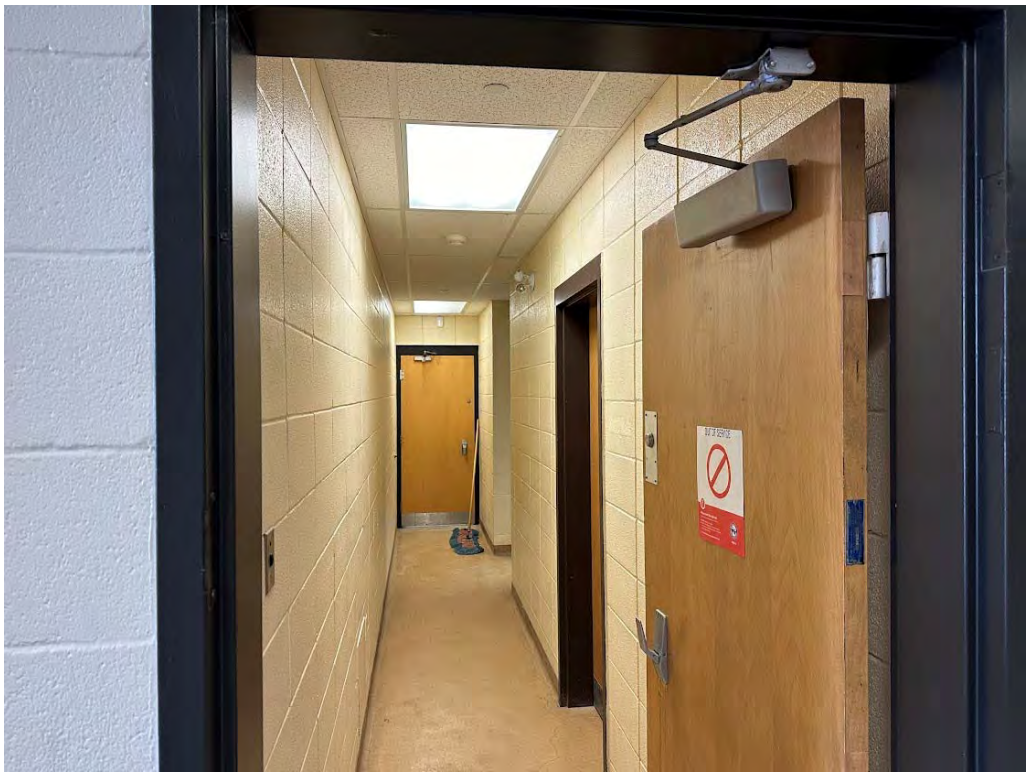


Photo 1: Painted wall surface, representative of Sa101 and the entire work area, Fixed Reference No. 809.

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

PART 1 – GENERAL

1.1 GENERAL

.1 Test methods used to determine fire hazard classification and fire endurance rating shall be as required by Ontario Building Code.

.2 Upon request, furnish the Consultant with evidence of compliance to fire protection requirements as noted in documents or specified codes, etc.

.3 Materials and components used to construct fire rated assemblies and materials requiring fire hazard classification shall be listed and labelled, or otherwise approved, by fire rating authority. Labelled materials and their packaging shall bear fire rating authorities label showing product classification.

.4 Note: The existing school building is sprinklered. Existing corridor walls provide for an existing 0 hour fire separation. The new Custodian's Storage Room provides for a fire separation with a 1 hour fire resistance-rating. Fire separations must be maintained at existing corridor walls in the proposed renovation areas. Provide continuous fire-sealant at all mechanical piping and electrical piping conduits penetrating fire separations.

.5 Construct fire rated assemblies in accordance with applicable fire test report information issued by fire rating authority. Deviation from fire test report will not be allowed.

.6 Construct fire rated assemblies as continuous, uninterrupted elements except for permitted openings. Extend fire rated walls and partitions from floor to underside of structural deck above.

.7 Materials which have a fire hazard classification shall be applied or installed in accordance with fire rating authority's printed instructions.

.8 Provide firestopping as specified in Section 07 84 00.

.1 Firestopping shall be a tested system consisting of non-combustible materials, smoke sealant, and means of support, used to fill gaps between fire-rated separations or between fire separations and other assemblies, and used around items that penetrate a fire separation.

.2 Fill and patch voids and gaps around openings and penetrations in and at perimeter of assemblies so as to maintain continuity and to produce a fire resistant, smoke tight seal, acceptable to jurisdictional authorities.

.9 Provide fire blocks to compartmentalize concealed spaces as required by the OBC.

.1 Fire block means a material, component or system that restricts the spread of fire within a concealed space or from a concealed space to an adjacent space.
.2 Fire blocks are also referred to as fire stops in the OBC.

.10 The Contractor shall ensure that all fire safety features called for in the Contract Documents are supplied and installed to meet fire safety standards established by those authorities having jurisdiction. The Contractor shall ensure that the work of Subcontractors is properly coordinated to achieve the intent of this Specification.

.11 Nothing contained in the Drawings or Specifications shall be construed as to be in conflict with any law, by-law, or regulations of municipal, provincial, or other authorities having jurisdiction. Work shall be performed in conformity with all such laws, by-laws, and regulations.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED WORK

.1	Temporary Utilities	Section 01 51 00
.2	Execution and Cutting and Patching	Section 01 73 30

1.2 REFERENCES

.1 Conform to all laws, By-Laws and regulations of the authorities having jurisdiction and, in particular, the Ontario Occupational Health and Safety Act; The Environmental Protection Act; The Ontario Building Code, Ontario Regulation 332/12; The Ontario Fire Code; The National Building Code, 2010; and the National Fire Code.

.2 CSA S350-M, code of practice for safety in demolition of structures.

.3 Ontario regulations under the Environmental Protection Act:

- .1 O.Reg. 102/94 Waste Audits and Waste Reduction Work Plans
- .2 O.Reg. 103/94 Industrial, Commercial and Institutional Source Separation Programs
- .3 O.Reg. 347/90 General - Waste Management; refer to "Definitions"

.4 Ontario regulations under the Occupational Health and Safety Act:

- .1 O.Reg. 213/91 Construction Projects
- .2 All regulations regarding “Designated Substances”
- .3 O.Reg. 860/90 Workplace Hazardous Materials Information System (WHMIS)

.5 Conform to “Guidelines for Maintaining Fire Safety During Construction in Existing Buildings”, provided by the Office of the Ontario Fire Marshal.

.6 RFCI Recommended Work Practices for Removal of Resilient Floor Coverings

1.3 EXAMINATION OF EXISTING SITE AND STRUCTURE

.1 Examine the existing site and building before tendering to be familiar with the detailed extent of demolition, dismantling, relocation and reassembly required.

.2 Examine the drawings and include all costs associated with the demolition work, including after-hours work and remobilization costs. Coordinate all work with the Owner to ensure that the site and building can remain operational, in use and occupied during construction.

.3 No allowance will be made for failure to obtain complete information prior to close of tenders.

1.4 SUMMARY OF WORK

.1 Carry out all alteration and demolition work required to accommodate new work indicated on drawings. Make good any damage caused by alterations required.

.2 Remove HVAC equipment, electrical fixtures and all other items so noted on drawings as required for the renovation, unless otherwise noted.

.3 Unless noted otherwise, building materials resulting from demolition under this contract shall become the property of the Contractor, and shall be removed by the Contractor.

.4 Supply and install temporary dust proof membranes at junctions with work area, at all adjoining doorways and corridor walls between the existing building areas and the proposed building areas to be renovated. Dust proof membranes shall be minimum thickness of 10 MIL polyethene sheet. Sheets are to be overlapped a minimum of 300mm and taped at complete perimeter of openings and provided at a height from top of finished floor to underside of ceiling and or exposed roof deck. At doorways where access is required, provide double layer of membranes with zippers to accommodate access.

.5 Dust proof membranes shall be erected outside of building operating hours and shall remain in place until the work is fully commissioned and accepted by the Owner. Membranes shall be removed, reconfigured and relocated as required to maintain the security of the site and the existing building and ensure that construction noise and dust does not penetrate into the existing building and disturb building occupants.

1.5 SCHEDULE OF WORK

.1 Safety and required exiting from the existing building must be maintained at all times, particularly during operating hours and scheduled events. Work must be suspended if the Owner advises that noise and/or dust is interfering with the building operation.

.2 When the building is occupied by students and staff, work which will generate excessive noise, dust or vibration must be undertaken outside of the building's hours of operation, during the times when the building is normally occupied. Confirm the building hours of operation with the Owner.

.3 Dust proof partitions must be installed prior to any work being undertaken.

.4 Refer to drawings for the complete scope of work. Confirm any required construction phasing sequences with the Owner and the Consultant prior to commencing the work.

1.6 PROTECTION

.1 Protect adjacent properties against damage which might occur from falling debris or other cause. Make good damage to adjacent public or private properties resulting from Work of this Contract.

.2 Protect existing building from damage and contamination during demolition activities. All openings must be made weatherproof. Provide temporary barriers, dust control

measures, security controls, supports, and such additional protection as may be required by specific demolition work.

.3 Prevent movement, settlement, and damage to existing building to remain, including services, paving, landscaped areas to remain, and adjacent structures. Provide temporary supports, including shoring and bracing, as required. All shoring must be designed by a professional engineer licensed in the Province of Ontario.

.4 Employ licensed rodent and vermin exterminators to destroy all discovered vermin and rodents.

.5 Remove contaminated and dangerous material from the site and dispose of safely and legally. Meet all M.O.E. requirements.

.6 Take precautions to guard against movement or settlement of adjacent land, existing building, and remaining services and utilities. Provide and place bracing or other means of support.

.7 Take precaution against contamination of air and adjacent properties.

1.7 MAINTAINING FIRE SAFETY IN EXISTING BUILDING

.1 Maintain all required exiting for safe operations within the existing building. Where an exit is closed off due to construction activities, provide alternate exit acceptable to both the Consultant and to Authorities Having Jurisdiction. Any temporary exits must be clearly identified with appropriate signage.

.2 Maintain access roadways for fire department vehicles, acceptable to the fire department. Access must be approved prior to commencement of construction activities.

.3 Store all combustible materials in accordance with the Fire Code and the Occupational Health and Safety Act. Do not store combustible materials within the existing building or against the building. All combustibles shall be stored in a manner which minimizes risks to building and occupants.

.4 Maintain dust proof membranes and protection at openings, as specified above, with fire separation ratings as required by Authorities Having Jurisdiction.

.5 Maintain fire alarm system in operating condition in existing building. Notify the fire department and Owner of any temporary shutdowns of service and provide alternative measures during such periods of time.

.6 Coordinate with Owner and Authorities Having Jurisdiction for all changes to fire emergency procedures as may be required during construction.

1.8 SERVICES

.1 Seal and cap mechanical and electrical services in order to facilitate removals indicated on drawings. Mark location and type of service of all capped services at the site. Submit record drawing showing locations and dimensions of all capped services.

PART 2 – PRODUCTS

2.1 Not Used

PART 3 – EXECUTION

3.1 GENERAL

.1 Remove and dispose of any fixtures, fittings and equipment remaining in the work area, which are not shown to be relocated or reused in the completed project.

.2 Protect all items indicated to be removed and later reinstalled. These items shall be removed prior to demolition work wherever possible. It will be the responsibility of the Contractor to repair or replace any such items damaged by careless handling.

.3 Refer also to demolition and alteration notes on drawings.

3.2 DEMOLITION

.1 Demolish any masonry walls in small sections. Do not permit masonry to fall in mass.

.2 Remove and carefully lower wood or steel framing as applicable.

.3 Remove interior masonry walls, partitions, ceilings, bulkheads, as indicated on drawings, and as required to accommodate new construction.

.4 Remove glass, metals and combustible materials from walls being demolished.

.5 Remove all items not indicated or noted to remain or be re-used.

.6 Remove mechanical and electrical equipment and piping indicated to abandoned. Refer to mechanical and electrical demolition drawings. Temporarily uninstall portions of the existing rainwater pipe as required to complete the work. Reinstall existing rainwater pipe once new work is complete. Provide temporary measures to accommodate rainwater drainage. Disconnect and remove existing power and data receptacles located in the area of the unit ventilator and associated millwork assemblies in each classroom.

.7 Any items noted to be re-used or re-located are to be removed carefully, cleaned, packaged appropriately, and handed over to Contractor.

.8 Upon discovery of mold or moldy materials remove and dispose of these separately.

.9 If any materials suspected to contain asbestos and other designated substances are encountered, do not disturb these materials. Inform the Consultant of the location and extent of suspect material. Do not resume work in this area until it has been cleared by an Abatement Consultant. Abatement of known asbestos containing materials as described in the Asbestos Audit Report is included in the Contractor's base cost. The

Contractor is required to become familiar and understand the description of asbestos containing materials described in the Asbestos Audit Report.

.10 At the end of each day's work, leave work in a safe condition so that no part of the remaining structure is in danger of collapse.

.11 Do not burn any refuse or debris at the site.

.12 Complete scanning and x-rays of any and all walls and floors, as required to complete the work and carry all required procedures as part of the base bid price.

3.3 NEW OPENINGS IN EXISTING WALLS

.1 Where new openings are shown to be cut into existing walls, break open the wall to the sizes required, provide new lintels over the opening, and patch all adjacent materials. Temporary shoring of existing wall assemblies is the responsibility of the Contractor, as required to safely complete the work.

.2 Refer to the Asbestos Audit Report, included in the Project Manual, to confirm where wall finishes contain asbestos. Some existing partitions may contain asbestos and are required to be partially abated to complete the work. Abatement of asbestos containing materials, as required to complete the work, is to be carried by the Contractor in their base bid price.

3.4 REMOVAL OF EXISTING FLOOR FINISHES

.1 Existing floor finishes shall be removed and old adhesive removed from the existing concrete slab by scraping or solvent, in accordance with Health & Safety requirements. Grind existing concrete floors as required to make concrete slabs smooth, flush and good prior to the installation of new flooring materials. Flooring mastics and some floor tiles contain asbestos, as described in the Asbestos Audit included in the Project Manual. Abatement of asbestos containing materials, as required to complete the work, is to be carried by the Contractor in their base bid price.

.2 Existing concrete floors shall be prepared according to manufacturer’s instructions for new adhesive applied finishes where new flooring finishes are indicated on the drawings.

3.5 REMOVAL OF CEILINGS AND ROOF ASSEMBLIES

.1 Remove existing ceilings and bulkheads in areas where new ceilings and bulkheads are indicated, and as shown on drawings.

.2 Ceilings to be demolished shall be removed complete with all finishes, framing, suspension system, trim, fasteners, and accessories.

.3 Where ceilings are to be removed to accommodate work, and later reinstalled, carefully disassemble ceilings to the extent required. Clean all components, wrap for protection, clearly label package contents, and store in a safe location until they are to be reinstalled.

.4 Where ceilings are to remain after adjacent walls or bulkheads are demolished, remove ceiling components as required to complete demolition work. Coordinate with forces doing new ceiling work, to confirm what components are to be retained for reuse. Cut ceiling tiles may not be used; new full or appropriately cut tiles will be required.

.5 Where ceiling mounted equipment is indicated to be removed and reused, or where it must be temporarily removed to accommodate the Work, it is to be carefully removed, cleaned, wrapped, labelled as to contents, and stored in a safe location, ready for reinstallation.

.6 Penetrations are required in the existing roof assemblies. Roofing materials are assumed to contain asbestos. Abatement of asbestos containing materials is to be completed as required to complete the work and is carried by the Contractor in their base bid price.

3.6 MECHANICAL AND ELECTRICAL WORK

.1 Mechanical and Electrical services must be temporarily capped or terminated to permit renovation in existing areas to proceed.

.2 Refer to mechanical and electrical drawings for the extent of removals, relocations, and alterations required.

.3 Ceiling mounted mechanical and electrical equipment which is to be removed and reused is to be carefully removed and stored as specified above.

.4 Cutting of holes up to 100mm in size in the existing structure and surfaces required by the mechanical and electrical trades shall be by those Subcontractors. Cutting and patching of openings greater than 100mm in size shall be by the Contractor in co-ordination with those trades. PATCHING OF ALL HOLES IN EXPOSED FINISHED SURFACES SHALL BE BY THE CONTRACTOR. Mechanical and Electrical trades shall do their own coring of existing slabs as required.

3.7 COMPLETION OF WORK

.1 Remove all surplus materials, equipment and rubbish from the site.

.2 Leave site in condition to meet approval of the Consultant.

.3 On completion of Demolition work, thoroughly clean all existing surfaces to remain, including ceiling space. No debris or dirt shall remain to be enclosed by new construction.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

.1 All reinforcement for cast-in-place concrete.
.2 Supply of reinforcing bars for masonry.

1.2 RELATED WORK

.1 Concrete Formwork, Section 03 10 00.
.2 Cast in Place Concrete, Section 03 30 00.
.3 Precast Structural Concrete, Section 03 41 00.
.4 Masonry, Division 4.

1.3 REFERENCES

.1 Reinforcing Steel Manual of Standard Practice published by the Reinforcing Steel Institute of Canada.
.2 ACI SP-66, ACI Detailing Manual published by the American Concrete Institute.
.3 CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
.4 CSA-A23.3, Design of Concrete Structures.
.5 ASTM A82, Standard Specification for Steel Wire, Plain, for concrete reinforcement.
.6 ASTM A185, Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
.7 CSA G30.18, Billet-Steel Bars for Concrete Reinforcement.
.8 CAN/CSA G40.21, Structural Quality Steels.
.9 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
.10 ASTM D3963/D3963M, Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.

1.4 SOURCE QUALITY CONTROL

.1 Upon request, provide the Consultant with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis.
.2 Upon request, inform the Consultant of proposed source of material to be supplied.
.3 Upon request, provide the Consultant with a copy of plant certificate by the Concrete Reinforcing Steel Institute for epoxy coating of reinforcement.
.4 Upon request, provide the Consultant with a copy of manufacturer’s instructions for patching factory applied epoxy coating.
.5 Use welding firm certified by the Canadian Welding Bureau under the requirements of CSA W186.

1.5 SHOP DRAWINGS

.1 Submit shop drawings including placing of reinforcement in accordance with Section 01 33 00 - Submittals. This applies to all reinforcement including reinforcing bars for masonry to be installed by the Masonry Trade.

.2 Submit to the Consultant for review before the start of Work, 4 white prints of shop drawings. Leave room on drawings for the stamps of the Consultant and the Structural Engineer. Check and sign before submission. Only 2 copies will be returned to General Contractor.

.3 Allow a minimum of 10 working days for review of each submission of shop drawings in the Structural Engineer's office. Shop drawings received after noon will be date-stamped as received the following working day.

.4 If required, CAD diskettes of the Structural Drawings are available "as-is", and at cost, for use in the preparation of shop drawings provided that the title blocks are removed and provided that the Owner and the Owner's Consultants are not held responsible for any errors or omissions on the drawings. These CAD drawings are not to be scaled.

.5 Submit plans, elevations, sections, and bar lists necessary to show reinforcing and to facilitate review and placing. Show location of construction joints and detail reinforcement at joints. Dimension strips for flat slabs and flat plates. Draw elevations of walls including reinforced masonry walls. Show concrete cover on the diagrams. Draw to scale not smaller than 1:50.

.6 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and splices with identifying code marks to permit correct placement without reference to Structural Drawings.

.7 Conform to CSA A23.1 and the Reinforcing Steel Manual of Standard Practice, unless the Contract Documents contain a more stringent requirement, in which case the latter shall govern. Provide accessories as required by the Standard. Conform to ACI, SP-66 Detailing Manual whenever a detail condition is not covered by any of the above, but is covered by the ACI Manual.

.8 Design and detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated. Provide standard hooks at ends of hooked bars.

.9 Do not release for fabrication reinforcing bars whose length may be affected by field conditions, such as the final elevation of footings, until the governing field dimensions have been ascertained.

.10 Review of shop drawings by the Consultant is on a sampling basis for general conformity with contract documents. It is not a detailed check and must not be construed as relieving the Contractor of responsibility for making the work accurate and in conformity with the Contract Documents.

.11 Design for which the Contractor is responsible under the contract will not be reviewed. Work done prior to the receipt of the reviewed shop drawings will be at the risk of the Contractor. Review comments are not authorization for changes to the contract price.

.12 After review, drawings will be returned to the Contractor stamped to show one of the following:

.1		Reviewed -	Released for fabrication.
.2		Noted -	Released for fabrication after revisions noted are made. Submit revised drawing for Consultant's records.
.3	Resubmit -		Correct and resubmit for review.

Conform to the requirements of each authority that has reviewed the drawings.

.13 Keep on site at all times a set of reviewed shop drawings and use only these drawings and the Structural Drawings to place reinforcing steel. Neatly mark on the Structural Drawings changes issued during the course of construction.

1.6 TOLERANCES

.1 Conform to CSA A23.1.

.2 Cover to be not less than required for fire rating.

1.7 **SUBSTITUTES**

.1 Substitute different size bars only if permitted in writing by the Consultant.

1.8 **ALLOWANCE**

.1 Include an allowance of five tonnes of additional reinforcing bars in the Contract. Allowance to include all costs including supply, detailing, fabricating and placement of rebars. Provide detailed records of use. Provide credit for unused portion based on unit prices.

PART 2 - MATERIALS

2.1 MATERIALS

.1 Reinforcing steel: billet steel, grade 400 MPa, deformed bars to CSA-G30.18, unless otherwise indicated.
.2 Weldable reinforcing steel: weldable steel, grade 400MPa, deformed bars to CSA G30.18. Required only where welding is indicated.
.3 Cold-drawn annealed steel wire ties: to CSA G30.3.
.4 Welded wire fabric: to CSA G30.5. Provide in flat sheets only.
.5 Epoxy coated reinforcement: Apply fusion bonded epoxy coating conforming to the requirements of ASTM D3963/D3963M. Provide colour which contrasts sharply with reinforcing steel and rust colours. Brown is not acceptable. All bars must be supplied by plants certified by the Concrete Reinforcing Steel Institute for epoxy coated steel. Certified plants include:
.1 Harris Rebar - Stoney Creek, Ontario
.2 Teme Rebar Concepts - Fruitland, Ontario
Provide patching material for areas where the epoxy coated is damaged or omitted in accordance with the coating manufacturer’s written instructions using material supplied by the manufacturer.
.6 Bar supports and side form spacers: to CSA-A23.1. For exposed concrete surfaces and for floor and roof slabs with directly applied ceiling finish: use either plastic bar supports or plastic tipped bar supports for at least the bottom 25mm; use plastic side form spacers; and use plastic with colour to match concrete. For epoxy coated reinforcement, use plastic bar supports, epoxy coated support bars and plastic coated tie wires.
.7 Epoxy coating of existing reinforcement: Amerlock 400 High-Solids Epoxy by Amercoat Canada Inc. or an equivalent material acceptable to the Consultant. Provide colour which contrasts sharply with steel and rust colours.

2.2 **FABRICATION**

.1 Fabricate reinforcing steel in accordance with CSA-A23.1, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
.2 Obtain Consultant's approval for locations of reinforcement splices other than shown on placing drawings.
.3 Where indicated, weld reinforcement in accordance with CSA-W186. Use weldable reinforcing steel.
.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar lists.

PART 3 - EXECUTION

3.1 PLACING REINFORCEMENT

.1 Handle epoxy coated bars in accordance with CSA S413.
.2 Place reinforcing steel in accordance with CSA-A23.1.
.3 Concrete cover to be not less than required for fire rating.
.4 Use only reviewed shop drawings and the Structural Drawings for placing of reinforcement. Report discrepancies to the Consultant before proceeding.
.5 Before placing, remove all loose scale, dirt, oil or other coatings, which would reduce bond.
.6 Turn the ends of tie wire towards the interior of the concrete.
.7 Use bar supports for beams and slabs. Use precast concrete chairs where supports rest on the ground. Where welded wire fabric is used in slabs-on- grade, place precast concrete chairs at 600 mm on centre each way. Use side form spacers for walls and columns.
.8 No splicing of reinforcement is permitted other than shown on the Structural Drawings.
.9 Do not cut reinforcement without written approval of Consultant.
.10 Ensure concrete cover to reinforcement is maintained during concrete pour.

3.2 FIELD BENDING

.1 Do not field bend reinforcement except where indicated or authorized by the Consultant. Do not field bend epoxy coated reinforcement.
.2 When field bending is authorized, bend without heat, applying a slow and steady pressure. Replace bars, which develop cracks or splits.

3.3 FIELD WELDING

.1 Do not field weld reinforcement except where indicated or authorized by the Consultant. Do not weld epoxy coated reinforcement.
.2 Conform to CSA A23.1 and CSA W186.

3.4 PATCHING FACTORY APPLIED EPOXY COATING

.1 If factory applied epoxy coating is damaged or omitted, patch in accordance with coating manufacturer's written instructions using material supplied by manufacturer.

3.5 REVIEW OF CONSTRUCTION

.1 Provide the Consultant with a minimum of 24 hrs notice of intended concrete pours to allow review of reinforcement.
.2 Review of construction by Consultant is to ascertain general conformity with contract documents. It does not relieve the Contractor of his contractual responsibilities. The review is based on representative samples of the work and does not relieve the Contractor from carrying out his own quality control and making the work in conformity with the drawings and specifications.
.3 Reviews are undertaken so that the Owner may be informed in writing as to the quality of the Contractor's performance and for the protection of the Owner.
.4 The Contractor will receive copies of the construction review reports and the results of material tests. He will thereby be informed of any defects or deficiencies found.
.5 Bring to the attention of the Consultant, any defects or deficiencies in the Work, which may occur during construction together with a proposal for remedy. The Consultant will decide what corrective action may be taken and will issue the necessary instructions.

3.6 REINFORCED MASONRY

.1 Supply reinforcing bars required for the construction of masonry lintels, beams, walls, columns and piers. Provide shop drawings. Note that Structural Drawings do not show all openings. Refer to lintel notes on structural drawings.

3.7 **PITS, CURBS, BASES**

.1 Construct all concrete sumps, pits, trenches, curbs and machinery bases forming part of floor construction that are required within the building by other trades.

.2 Unless otherwise shown on drawings, reinforce curbs with 10M @ 400 dowels plus 2 - 10M continuous horizontal.

.3 Unless otherwise shown on drawings, reinforce bases with 10M at 300 each way placed 50 mm below top of concrete.

END OF SECTION

PART 1 – GENERAL

1.1 WORK INCLUDED

.1 All cast-in-place concrete including supply, placing, finishing and curing.
.2 Installing embedment.
.3 Grouting under base plates and bearing plates.
.4 Installing shelf angles/plates and wall plates that bear on or are attached to concrete.

1.2 RELATED WORK

.1	Concrete Formwork	Section 03 10 00
.2	Concrete Reinforcement	Section 03 20 00
.3	Precast Structural Concrete	Section 03 41 00
.4	Structural Steel	Section 05 12 10

1.3 REFERENCES

.1 ASTM C260, Standard Specification for Air-Entraining Admixtures to Concrete.
.2 ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
.3 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.
.4 ASTM D1751, Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
.5 CSA A5, Portland cement.
.6 CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
.7 CSA-A23.2, Methods of Test and Standard Practices for Concrete.
.8 CAN/CSA A3000, Cementitious Materials for Use in Concrete.
.9 CAN/CSA S448.1, Repair of Reinforced Concrete in Buildings.
.10 CSA A283, Qualification Code for Concrete Testing Laboratories.

1.4 QUALITY ASSURANCE

.1 Concrete supplier to have a valid “Certificate of Ready Mixed Concrete Production Facilities” as issued by the Ready Mixed Concrete Association of Ontario.

1.5 PROJECT RECORDS

.1 Batch Logs: Concrete supplier to keep record of each batch delivered to site.

.2 Concrete Delivery Slips: Keep all concrete delivery slips (“driver’s tickets”) on site until building is completed. Record on delivery slip where concrete was placed including time and date.

.3 Record Drawings: Record on a set of Structural Drawings extent of each pour including pour date and falsework removal date. Also record all changes to that shown on drawings including footing elevations.

.4 Keep project records up to date and make available to Consultant at all times.

1.6 SUBMITTALS

.1 Submit to the Consultant for review before the start of Work, 4 white prints of shop drawings. Leave room on drawings for the stamps of the Consultant and the Structural Engineer. Check and sign before submission. Only 2 copies will be returned to General Contractor.

.2 Minimum 2 weeks prior to starting concrete work, submit certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1.

.3 Minimum 2 weeks prior to starting concrete work, submit all concrete mix designs, including pump mixes, and indicate where each concrete mix is to be used. Where Class C1, C2 or F1 mix designs are required, submit test data to confirm that air-void system conforms to CSA A23.1 for each mix design.

.4 Minimum 2 weeks prior to starting concrete work, submit a written confirmation that all admixtures used in concrete will not have any adverse impact on the long term durability and performance of concrete, or any other materials embedded or in contact with concrete. Also provide a written statement that any admixtures used in concrete will not have any adverse effect on human health and the environment.

.5 Minimum submission requirements for each concrete mix design shall include the following:
- .1 minimum specified compressive strength at 28 days.
- .2 maximum aggregate size
- .3 aggregate type (if not normal density)
- .4 alkali-aggregate resistance
- .5 concrete density range, wet and dry (if not normal density)
- .6 CSA exposure class
- .7 cement type (if not type 10)
- .8 maximum water/cement ratio
- .9 plastic air content range air-void system test data
- .10 assumed method of placement of concrete
- .11 slump range
- .12 percentage and type of any supplementary cementing materials
- .13 admixtures (type and name only)
- .14 certificate of compatibility between admixtures unless all admixtures are supplied by same manufacturer

.6 Minimum 2 weeks prior to starting concrete work, submit proposed quality control procedures for Consultant's approval for following items:
- .1 Finishing, curing and protection

.2 Hot weather concreting
.3 Cold weather concreting

.7 Minimum 4 weeks prior to placing any slabs-on-grade, submit drawings showing proposed locations of construction joints and control joints in slabs-on-grade.

PART 2 – MATERIAL

2.1 CONCRETE MIX MATERIALS

.1 Portland cement: to CSA-A5.

.2 Cementitious hydraulic slag: to CSA-A363

.3 Fly ash: to CSA-A23.5, Type CI

.4 Water: to CAN/CSA-A23.1

.5 to CSA-A23.1. Coarse aggregates to be crushed stone or gravel which is suitable for type N concrete as defined by Supplementary Guidelines to OBC 2012, SG-2, . Do not use recycled concrete as aggregate.

.6 To ensure compatibility, all admixtures to be supplied by a single manufacturer or certificate of compatibility to be provided with mix design.

.7 Air entraining admixture: to ASTM C260.

.8 Chemical admixtures: to ASTM C494. Do not use admixtures containing chlorides.

.9 Corrosion inhibiting admixture: Containing calcium nitrite:
.1 DCI by W.R. Grace (use DCI-S with ambient temperatures above 20°C)
.2 Rheocrete CNI by Master Builders (add set retarder with ambient temperatures above 20°C).

.10 Shrinkage reducing admixture: Eclipse Floor for non-air entrained concrete and Eclipse Plus for air entrained concrete by W.R. Grace. Confirm compatibility with superplasticizer if being used.

.11 Plastic fiber additive: fibrillated polypropylene fibers at least 19mm in length:
.1 Fibremesh by Master Builders
.2 ConLoc Fibres by Pro Technologies
.3 Fiberforce by Ampro
.4 Promesh by Canada Cordage

2.2 OTHER MASTERIALS

.1 Grout: Premixed, non-metallic, non-shrink:
.1 Euco NS Grout by Eulicd Admixture Canada
.2 Masterflow 713 by Chemrex (M.B.T.)

.3 V-3 Grout by W.R. Meadows of Canada
.4 Sikagrout 212 by Sika Canada
.5 M-Bed Standard by Sika Canada
.6 CPD Non-Shrink Grout by CPD

.2 Dry pack grout: Use 1:2 mix of Portland cement and concrete sand. Add sufficient water for the mixture to retain its shape when made into a ball by hand. When thickness of grout exceeds 50mm, use 1:1½:2 mix of Portland cement, concrete sand and 10mm pea gravel instead. Compressive strength at 28 days to be 30 MPa.

.3 Liquid curing/sealing compound: to ASTM C309 Type 1, Class B, water based acrylic, compatible with surface hardener where hardener is used:
Sealtight CS 309 by W.R. Meadows of Canada. Apply two (2) coats where exposed concrete floor is called for in Room Finishing Schedule. Apply first coat as soon as concrete sets - Apply second coat just prior to occupancy by Owner.

.4 Premoulded joint fillers: Bituminous impregnated fibre board: to ASTM D1751.

.5 Evaporation reducer: Confilm by Chemrex (M.B.T.).

.6 Bonding agent: synthetic latex:
.1 Surfacrete Concentrate by Sika Canada
.2 Intralok by W.R. Meadows of Canada
.3 Acryl-Set by Chemrex (M.B.T.)
.4 CPD Concentrated Latex Adhesive by CPD

.7 Drilled concrete expansion anchors:
.1 Kwik-Bolt by Hilti
.2 Wedge Anchor by Ucan Fastening Products

.8 Drilled concrete adhesive anchors:
.1 HVA Adhesive Anchor by Hilti
.2 ADH Adhesive Anchor by Ucan Fastening Products

.9 Epoxy for bonding anchors and dowels into predrilled holes in concrete:
.1 HIT -HY-150 by Hilti
.2 Epcon Ceramic 6 by ITW Construction Products
.3 Flo-Rok FR1-22 & FR3-22 by Ucan Fastening Products

.10 Non-slip nosing insert for concrete stairs: Fine aluminum oxide strips, 6mm (¼") wide x 10mm (d") deep.

.11 Vapour barrier for slab on grade:
.1 Refer to DIV.7

.12 Rigid insulation: Extruded polystyrene boards:
.1 Styrofoam SM by Dow Chemical
.2 Styrofoam HI-100 by Dow Chemical

.13 Control joint filler: semi-rigid filler to protect against slab edge breakdown:
.1 For sawcuts and joints in interior slabs:
.1 Rezi-Weld Flex by W. R. Meadows

.2 Loadflex by Sika Canada

.2 For sawcuts and joints in exterior slabs:

.1 Sikaflex 2C NS/SL by Sika Canada

.14 Elastomeric bearing pads: Virgin natural polyisoprene or virgin polychloroprene conforming to CAN/CSA-S6

.15 Sliding bearing assembly: Galvanized top steel plate with a type 304 stainless steel highly polished lower surface and bottom elastomeric pad with a polytetrafluoroethylene (Teflon) upper surface. Static and kinetic coefficients of friction not to exceed 5% under working stress. Assembly to have a working stress capacity of 7 MPa on lower pad. Elastomeric bottom pad to allow a 2% rotation of upper plate and still maintain a substantially uniform bearing pressure between plate and pad. For concrete work, provide two 12 dia. anchor studs for top plate and provide water tight polyethylene wrapping for assembly, except for anchor studs, which can be left in place during construction. Manufactured by:

.1 Fabreeka Canada Ltd.

.2 Goodco Ltd.

.3 Structural Tech Corp. Ltd.

.16 Controlled density concrete fill, f'c = 4 MPa:

.1 K-Crete by Dufferin Concrete Products or equivalent

.17 Prefabricated Seepage Protection System:

.1 Terradrain 200 by Terrafix Geosynthetics Inc.

.2 Weeperwick by Subsurface Systems Inc.

.18 Bentonite Geotextile Waterproofing:

.1 Voltex by CETCO (distributor : DRE Industries)

.19 Crack Filler Epoxy: Capweld 524 by Cappar Ltd.

.20 Base under concrete Slabs on Grade: Clean, crushed stone, 20 to 22mm.

2.3 CONCRETE MIXES

.1 Use ready-mix concrete. Proportion concrete in accordance with CSA A23.1, Use a water-reducing agent in all concrete. Obtain approval of the Consultant for the use of admixtures other than water-reducing and air entraining agents.

.2 Supplementary cementing materials: Conform to the directions of the slag and fly ash manufacturers for the proportioning and mixing of concrete. Except as otherwise required, limit supplementary cementing materials to no more than 25% of total cementitious content and limit the fly ash component to no more than 10% of total cementitious content. The limit on supplementary cementing materials may be increased for Class N exposure concrete provided that the effects of the resulting concrete properties, including finishing, rate of early-age strength gain, curing and protection, are considered by the Contractor and a letter describing these effects and any special construction procedures is submitted for review with the mix design. Do not use supplementary cementing materials in architectural concrete.

.3 For columns less than 300mm in least dimension and for walls less than 200mm thick, reduce nominal size of coarse aggregate to 10mm.

.4 Interior slabs, beams, walls and columns: Provide normal density concrete to give following properties unless otherwise noted:
- .1 Class of exposure N
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 25MPa unless specified otherwise on Structural Drawings
- .4 Nominal size of coarse aggregate: 20mm. See also clause 2.3.3.
- .5 Slump at time and point of discharge: 50mm to 110mm

.5 Footings, piers, and foundation walls : Provide normal density, frost resistant concrete to give following properties:
- .1 Class of exposure F-2
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 25MPa unless specified otherwise on Drawings
- .4 Maximum water/cementing material ratio: 0.55
- .5 Nominal maximum size of coarse aggregate: 20mm. See also clause 2.3.3.
- .6 Slump at time and point of discharge: 50mm to 110mm
- .7 Air content: 4 to 7%

.6 Lean concrete and mud slabs: Provide normal density concrete to give following properties:
- .1 Class of exposure N
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 10MPa
- .4 Nominal maximum size of coarse aggregate:20mm.
- .5 Slump at time and point of discharge: 50mm to 110mm

.7 Exterior, exposed walls and columns exposed to freezing and thawing, but not exposed to chlorides: Provide normal density, frost resistant concrete to give following properties:
- .1 Class of exposure F-2
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 25MPa unless specified otherwise on Structural Drawings
- .4 Maximum water/cementing material ratio: 0.55
- .5 Nominal size of coarse aggregate: 20mm. See also clause 2.3.3.
- .6 Slump at time and point of discharge: 50mm to 110mm
- .7 Air content: 5 to 8%

.8 Structurally reinforced concrete exposed to chlorides, including exterior reinforced slabs: Provide normal density concrete to give following properties:
- .1 Class of exposure C-1
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 35MPa
- .4 Maximum water/cementing material ratio: 0.40
- .5 Nominal size of coarse aggregate: 20mm. See also clause 2.3.3.
- .6 Slump at time and point of discharge: 50mm to 110mm
- .7 Air content: 5 to 8%

.9 Interior slabs-on-grade: Provide normal density concrete to give following properties:
- .1 Class of exposure:N
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 25MPa unless specified otherwise on Structural Drawings
- .4 Maximum water/cementing material ratio: 0.55
- .5 Nominal maximum size of coarse aggregate: 20mm. Increase to 40mm where slab-on- grade thickness exceeds 130mm.
- .6 Slump at time and point of discharge: 50mm to 110mm
- .7 Plastic fiber additive: apply at rate of 0.9 kg/m³. Add sufficient water reducing agent to restore slump loss
- .8 Slump at time and point of discharge, after addition of fibers and plasticizer: 50mm to 110mm
- .9 Provide curing/sealing coat to all slabs-on-grade; two coats where slab exposed-refer to 2.2.3.above.

.10 Interior slabs-on-grade with resilient floor finishes: Provide normal density concrete to give following properties:
- .1 Class of exposure:N
- .2 Cement: Type 10
- .3 Minimum compressive strength 25MPa
- .4 Nominal maximum size of coarse aggregate: 40mm
- .5 Water/cementing material ratio: 0.55
- .6 Slump at time and point of discharge: 50mm to 110mm

.11 Construction Method:
- .1 Place & compact 200mm of clean, crushed stone, 20 to 22mm size.
- .2 Construct slab-on-grade on 15 mil polyolefin sheet vapor barrier placed directly below concrete. Terminate vapor barrier by extending vertically up the abutting concrete walls
- .3 Saw cuts should be done with a dry process (soft-cut on the same day of a pour).
- .4 Curing: Apply 24 hours of wet curing. Start curing immediately after finishing slab. Cover slab-on-grade for at least 72 hours using plastic sheets with joints taped and free edges covered.
- .5 Protection: Protect finished and cured slab from surface water (i.e. rain, snow).
- .6 Refer to Architectural Specifications for acceptable moisture content and testing methods prior to placing floor finishes.

.12 Interior and roof concrete toppings, curbs and bases: Provide normal density concrete to give following properties:
- .1 Class of exposure:N
- .2 Cement: Type 10
- .3 Minimum compressive strength 25MPa
- .4 Nominal size of coarse aggregate for:
  - .1 Toppings between 25 and 35mm thick:10mm
  - .2 Toppings between 35 and 50mm thick:14mm
  - .3 Thick toppings: 20mm
- .5 Slump at time and point of discharge: 20mm to 60mm

Where topping is less than 25mm thick, no coarse aggregate is allowed and a bonding agent shall be provided within the mix and to bond the topping to the substrate.

.13 Exterior unreinforced slabs, driveways, sidewalks, curbs and gutters, parking slabs on grade: Provide normal density, chloride resistant concrete to give following properties:
- .1 Class of exposure C-2
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 32MPa
- .4 Maximum water/cementing material ratio: 0.45
- .5 Nominal maximum size of coarse aggregate: 20mm
- .6 Slump at time and point of discharge: 50mm to 110mm
- .7 Air content: 5 to 8%

.14 Exterior, unreinforced pavements: Provide normal density concrete to give following properties:
- .1 Class of exposure C-2
- .2 Cement: Type 10
- .3 Minimum compressive strength at 28 days: 32MPa
- .4 Maximum water/cementing material ratio: 0.45
- .5 Nominal maximum size of coarse aggregate: 20mm
- .6 Slump at time and point of discharge: 40mm to 80mm. Use plasticizer if necessary to increase slump for placement.
- .7 Air content: 5 to 8%

PART 3 – EXECUTION

3.1 CONSTRCUTION REVIEW

.1 Construction reviews are undertaken by the Consultant and the Inspection and Testing Agency so that the Owner may be informed in writing as to the quality of the Contractor's performance and for the protection of the Owner. They will be carried out by examination of representative samples of the Work.

.2 The Contractor will receive copies of the construction review reports and the results of material tests. He will thereby be informed of any defects or deficiencies found.

.3 Bring to the attention of the Consultant, any defects or deficiencies in the Work, which may occur during construction together with a proposal for remedy. The Consultant will decide what corrective action may be taken and will issue the necessary instructions.

3.2 PREPARATION

.1 Obtain written approval of each footing bearing surface by Geotechnical Engineer prior to placing concrete for footings/mud slabs.

.2 Confirm that subgrade and backfill meets specifications and is free of frost and surface water before placing slab-on-grade.

.3 Provide vapor barrier under all slabs placed on the ground including slabs-on-grade and framed slabs.

.4 Grout column base plates and beam bearing plates as soon as steelwork is completed. Do not add load on steelwork until grouting is completed and grout strength has reached at least 20 MPa.

3.3 SLEEVES, OPENINGS AND EMBEDMENTS

.1 Ensure that sleeves and openings do not impair the required strength of the member, and unless shown on the Structural Drawings, are accepted by the Consultant for size, location, and reinforcement before concrete is cast. No trade shall cut holes through existing concrete unless acceptable to the Consultant.

.2 Do not embed in slabs and walls any conduit or pipe whose outside diameter is greater than one- quarter the concrete thickness. Do not space less than 3 diameters on centre. Locate so as not to impair the required strength of the member. Do not install in or below columns, conduit which displaces more than 3 percent of the cross-section.

.3 Cooperate with any trade applying finishes to concrete surfaces to obtain a surface, which will ensure adequate bond. Provide chases, chamfers and reglets where required.

.4 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated on Structural Drawings or approved by the Consultant.

.5 Where approved by Consultant, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Unless indicated on the Structural Drawings, sleeves and openings greater than 100 x 100 mm must be approved by Consultant.

.6 Do not eliminate, cut or displace reinforcement to accommodate openings or hardware. If openings or hardware cannot be located as specified, obtain approval of modifications from Consultant before placing of concrete.

.7 Check locations and sizes of sleeves and openings shown on Structural Drawings with Architectural, Mechanical and Electrical Drawings. Notify Consultant of any discrepancies.

.8 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.9 Anchor bolts: Set anchor bolts using templates under supervision of appropriate trade prior to placing concrete. Locate each anchor bolt group to within 6 mm of required location with no accumulation of tolerances allowed between groups

3.4 PLACING CONCRETE

.1 Notify Consultant 24 hours before placing concrete and 24 hours before closing wall forms.

.2 Do cast-in-place concrete work in accordance with CSA-A23.1.

.3 Remove water and disturbed soil from excavations before placing concrete therein.

.4 Do not overload forms.

.5 Use rubber tipped vibrators for concrete containing epoxy coated reinforcement.

3.5 FINSIHING FLATWORK

.1 Finish flatwork in accordance with CSA-A23.1, and following clauses.

.2 Protect concrete during finishing process in accordance with CSA-A23.1. Also use evaporation reducer during severe drying conditions.

.3 Cast slabs with a top surface that is level or sloping as required by the Drawings. Allow for cambering where required. Set top of slab below finished floor level by the distance required for the type of applied finish.

.4 Provide final finish in accordance with proposed use and as follows:
- .1 Screeded and bull floated for: mud slabs and footings.
- .2 Screeded and bull floated with scratch finish for: base slabs, which receive mortar setting beds or bonded toppings.
- .3 Powered float finish for: roofs and slabs, which receive a membrane.
- .4 Wood float finish with brooming for: exterior exposed slabs.
- .5 Powered steel trowel finish for: interior exposed slabs; slabs which receive resilient flooring, carpet, epoxy-based finishes, thin-set tiles, etc.

.5 Steel trowel exposed interior concrete floors at least twice. Provide final spin trowelling when non-slip finish is required.

.6 Except as noted, conform to finish tolerance Class A for floors and Class B for exterior slabs and base slabs for toppings. For wood flooring, conform to finish tolerance Class C. Compliance will be considered satisfactory if 80% of the measurements, using the straightedge method, are less than or equal to the tolerance and no measurement exceeds the tolerance by more than 25%. When requested by Consultant, make measurements within 3 days of placing concrete and before falsework is removed and submit results to Consultant.

3.6 CURING AND PROTECTION

.1 Cure and protect concrete in accordance with CSA A23.1. In addition to Cold-Weather Protection requirements in A23.1, provide protection so that temperature of concrete surfaces is maintained at not less than 21 degrees C for 3 days after placement, not less than 10 degrees C for the next 2 days and above freezing for the next 2 days. Vent exhaust gases from combustion type heaters to atmosphere outside heated enclosure.

.2 Cure slab surfaces immediately after finishing is completed. Use a curing compound compatible with applied finishes except where bonded topping to be applied. Where curing compound is not used, cover slab surfaces with absorptive mat or fabric and keep continuously wet.

.3 Extend basic curing period until concrete has reached following strength levels for structural safety:
- .1 Framed slabs and beams: 75% of specified 28 day strength.
- .2 Columns, piers and footings: 75% of specified 28 day strength.
- .3 Walls: 50% of specified 28 day strength.

3.7 FINISHING FORMAED SURFACES

.1 Finish formed surfaces in accordance with CSA A23.1. Completely fill holes left by through-bolts with grout.

.2 Do not patch surfaces until instructed in writing by Consultant.

.3 Where honeycombing has cut out in accordance with CSA A23.1. do not patch until reviewed by Consultant.

.4 Provide smooth-form finish for all exposed concrete surfaces.

.5 Provide smooth-rubbed finish to all concrete surfaces exposed to public view. Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.

3.8 BONDED TOPPINGS

.1 Not more than 24 hours prior to applying concrete toppings, clean base slab of dirt, laitance, loose material and grease. Scrub with 10 percent solution of muriatic acid and rinse clean. Four to six hours before laying topping, saturate surface with clean water. Surface shall have reached a damp condition at the time the new concrete is placed. Apply a slurry coat of cement and water to the surface and immediately follow with the topping or apply approved and compatible bonding agent in accordance with manufacturer's instructions.

.2 Do not allow the temperature difference between base slab and new concrete to exceed 6 degrees C when concrete is placed.

.3 Make mix consistency as stiff as can be worked with a sawing motion of the strike-off board. Consolidate concrete by rolling and tamping. Float with a power floating machine weighing at least 90 kg. Finish and cure as specified for floors.

.4 Locate joints in top course directly over joints in base course.

.5 Minimum thickness of topping over cambered base slab shall be 38 mm at high point.

.6 Remove any concrete which seeps through joints of precast units and clean surface before concrete sets

3.9 SLABS ON GRADE

.1 Determine that the compacted granular fill supporting slabs-on-grade has been approved before starting work.

.2 Over compacted granular fill, place & compact 200mm of clean crushed stone, 20 to 22mm size.

.3 Over crushed stone, vapour barrier as per Architectural Specification. Seal all joints and punctures with tape. Repair all tears or holes with layers of sheeting, tapping all seams.

.4 Provide and install joint filler between slab and masonry walls.

.5 See Drawings for thickness of concrete and slab reinforcing.

.6 Provide slab depressions and slopes as indicated on the Architectural Drawings. Slope floors to drain.

.7 Testing & Inspection Company must inspect vapour barrier and reinforcing just prior to placement of concrete and Contractor must rectify any deficiencies noted prior to pour.

3.10 GROUTING UNDER BASE PLATES AND BEARING PLATES

.1 Grout under base plates and bearing plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.

.2 Grout column base plates and beam bearing plates as soon as steelwork is completed. Do not add load on steelwork until grouting is completed and grout strength has reached at least 20 Mpa.

3.11 JOINTS

.1 Slabs-on-grade: Provide joints in both directions. Maximum spacing of construction joints to be 30m with sawcut joints in-between spaced at 30 times slab thickness maximum, but not more than 5m maximum. Locate joints on column centre lines wherever possible and on intermediate lines, which result in approximately square panels. Protect edges of sawcuts from breakage. Clean out sawcuts in exposed slabs and fill with control joint filler after concrete is at least 120 days old. At construction joints in exposed slabs, sawcut top 25 mm for a width of 5 mm and fill with control joint filler after concrete is at least 120 days old. Clean out sawcuts in other slabs and fill with a sand-cement paste one month prior to installing floor coverings.

.2 Construction Joints and Control Joints: See Section 03 10 00.

.3 Expansion Joints: See Structural Drawings for widths, locations and details. Remove all forming and filler material used during construction and provide clear space between structural elements equal to width specified.

.4 Construction Gaps: See Structural Drawings for widths, locations and details. Do not place concrete in gaps in beams and slabs until all concrete at that level is at least 28 days old. Do not fill wall gaps until all adjoining framed slabs, above and below, are at least 28 days old.

.5 Isolation Joints: Provide 10mm thick premoulded joint filler of the same depth as the thickness of the concrete wherever slabs-on-grade abut foundation walls, columns and piers. Omit if slab is chased or dowelled into structure.

3.12 DRILLED ANCHORS

.1 Conform to requirements of manufacturer. Use hammer drill to make holes. Hole diameters must never exceed those required by manufacturer. Tighten all expansion anchors using a torque wrench unless finger-tight is required by the Drawings to allow for movement. Unless otherwise noted on drawings, provide manufacturer's standard embedment length into solid concrete.

.2 Do not cut reinforcement to accommodate anchors. Relocate anchors, at no extra cost to the Contract, when obstructions prevent drilling holes to required depth in locations specified. Obtain Consultant's approval of new location before drilling hole. Fill all abandoned holes with grout.

.3 Arrange for manufacturer's technical representative to be present during installation of first few anchors of each size and type. Submit site reports by manufacturer to Consultant within one week of each visit. Reports to indicate anchor sizes and types installed, locations, and names of those present during installation.

.4 Retain an inspection and testing company to randomly select and pull test 5% of all types and sizes of anchors installed on a weekly basis, but not less than one anchor of each type and size. Pull test to twice the design tension capacity of the anchor given by the manufacturer. Submit reports to Consultant within one week of testing. Reports to indicate each anchor location, test load and mode of failure, if applicable. Notify Consultant immediately if any anchor fails the pull test.

3.13 CRACKS IN SLABS-ON-GRADE

.1 Extensive cracking of slabs-on-grade or cracks in excess of 3 mm in width shall be cause for rejection of slab or portion of slab at the discretion of the Consultant.

.2 Protect edges of cracks in slabs-on-grade from breakage.

.3 Unless slab is rejected, repair cracks that are over 0.4 mm wide in exposed slabs-on-grade in unfinished areas after concrete is at least 120 days old. Repair by filling crack with a sand-cement grout and then, after 7 days, cutting out top 20 mm of crack for a width of 5 mm and filling with control joint filler.

3.14 INSPECTION AND TESTING

.1 Inspection and testing of concrete and concrete materials will be carried out in accordance with A23.1 by a Testing Agency designated by Consultant. Testing agency shall be certified under CSA A283 with category to suit testing provided.

.2 Agency will review all submittals pertaining to concrete mix designs and certification of plant, equipment and materials.

.3 Agency will take additional test cylinders during cold weather concreting. Assist Agency by curing these cylinders for 7 days on site adjacent to the work which they represent and under the same conditions as the concrete which they represent.

.4 Samples will be taken prior to the addition of steel fiber reinforcement or superplasticizers to the mix on site.

.5 Methods for testing concrete will be in accordance with CSA-A23.2.

.6 Inspection or testing by Agency will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

.7 Assist the Agency in its work. Notify Agency as to the concreting schedule and before each pour. Provide concrete samples.

.8 The Agency will report to the Consultant, with copies to the Structural Engineer, Contractor, Concrete Supplier and Municipal Authorities. Reports will include the locations in structure to which tests relate, comments on abnormal results and conditions, and the Supplier's mix design numbers. Test reports shall be provided within five working days.

3.15 PITS, CURBS, BASES

.1 Construct all concrete sumps, pits, trenches, curbs and machinery bases forming part of floor construction that are required within the building by other trades.

.2 Provide isolation joints between machinery bases and slabs-on-grade.

3.16 EXTERIOR SALBS AND SIDEWALKS

.1 Exterior slabs shall be finished with a spin trowel finish followed with a fine broom and the edges shall be rounded with an edging tool. Slab thickness shall be 125mm except as noted on drawings. Reinforce slab with one layer of welded wire mesh in flat sheets or as otherwise noted on drawings and apply one coat of curing sealing compound as soon as the concrete will support a workman without damage to the finish. Saw cut slab into areas as indicated on drawings but not exceeding 9 square meters.

3.17 MUNICIPAL SIDEWALKS

.1 Construction of concrete sidewalks, curbs, gutters, materials and finishes shall be in compliance with OPSS 351 and all other related OPSS. Contractor shall obtain specifications and approvals from the Municipality prior to start of work.

.2 Thickness of sidewalk to be 125mm and 175mm across driveways. The top surface of concrete shall receive a broom finish. Provide dummy joints, contraction joints and expansion joints as specified in OPSS. Sidewalks within the Municipal road allowance shall also comply with the Municipal requirements.

3.18 MECHANICAL AND ELECTRICAL WORK

.1 Construct all concrete underground electrical duct banks, underground water service thrust blocks and supports for underground piping in specified fill. Also construct all concrete pads for pipes passing through foundation walls, manholes and catch basins. See mechanical and electrical drawings and specifications for details and extent of work.

3.19 REJECTED WORK

.1 Do not deliver to the site materials which are known not to meet the requirement of the Specifications. If rejected after delivery, they shall be immediately removed.

.2 Where review reveals materials or workmanship which appear to have failed to meet the specified quality or tolerances, the Consultant shall have the authority to order additional curing; to have tests made of in-situ concrete, concrete cores, reinforcement or other materials; to order a structural analysis of the existing elements; and to load test the structure. All such work will be carried out in order to assist in determining whether the structure may, in the opinion of the Consultant be accepted, with or without strengthening or modification. Testing shall meet the requirements of the Ontario Building Code. All expenses incurred shall be chargeable to the Contractor regardless of the results.

END OF SECTION

PART 1 – GENERAL

1.1 SECTIONS INCLUDES

.1 Finishing concrete floor surfaces.

1.2 RELATED SECTIONS

.1	General Requirements	Division 01
.2	Cast in Place Concrete	Section 03 30 00
.3	Waterproofing	Section 07 13 00
.4	Sealants	Section 07 92 00
.5	Ceramic Tiling	Section 09 30 00
.6	Resilient Flooring	Section 09 65 00

1.3 REFERENCES

.1 ACI-302.lR-96, Guide for Concrete Floor and Slab Construction.

.2 ASTM-C171-97a, Sheet Materials for Curing Concrete.

.3 ASTM-C309-98a, Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.

.4 CSA-A23.1/A23.2-00, Concrete Materials and Methods of Concrete Construction I Methods of Test for Concrete.

1.4 SUBMITTALS

.1 Submit Product data and Shop Drawings under provisions of Section 01 33 00 - Submittals.

.2 Provide list of Products proposed for use on Project where such Products are not specified by trade name or where Specification permits choice or alternatives. Include descriptive manufacturer or Supplier literature.

.3 Include application instructions for concrete curing compound.

1.5 QUALITY ASSURANCE

.1 Conform to CSA-A23.1/A23.2 and ACI 302.lR.

1.6 QUALIFICATION

.1 Concrete Finishes Company specializing in commercial floor finishing with a minimum of five years documented experience, approved by the Consultant.

.2 Submit references two (2) months before concrete work commences.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Deliver Products to site under provisions of General Requirements Division 01.

.2 Store and protect Products under provisions of General Requirements Division 01.

.3 Take delivery of and store packaged materials on site in original undamaged condition with manufacturers' packing, labels and seals intact.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Temporary Lighting: Minimum one 200 W light source, placed 2.5m above the floor surface, for each 40m2 of floor being finished.

.2 Temporary Heat: Ambient temperature of 10 degrees C minimum.

.3 Ventilation: Sufficient to prevent carbon monoxide or high levels of carbon dioxide and other injurious gases from affecting concrete.

.4 Electrical Power: Sufficient to operate equipment normally used.

.5 Work Area: Water-tight protection against rain and detrimental weather conditions.

1.9 WARRENTY

.1 Provide a warranty for the work of this section in accordance with the General Conditions but for a period of three years.

.2 The warranty shall cover defects in concrete floor finishing due to faults in workmanship or materials provided in this section.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Water: clean, potable and not detrimental to quality of concrete.

.2 Concrete Materials: Conform to Section 03 30 00 - Cast in Place Concrete.

.3 Concrete Sealer (SLC): pigmented, resin, copolymer curing compound and sealer. The Euclid Chemical Company: Super Floor Coat Colored.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Verify that substrate surfaces are ready to receive work and elevations are as indicated on Shop Drawings and as instructed by the finish flooring manufacturer.

.2 Beginning of installation shall mean acceptance of substrate and site conditions.

.3 Ensure that underslab vapour retarder specified in section 07 13 00 – Waterproofing is installed and ready to receive the work of this section for slabs-on-grade except as specified below.

3.2 PREPARATION

.1 Steel trowel concrete slabs left exposed or to receive resilient flooring, and applied floor finishes.

.2 Where concrete slabs are to receive ceramic tile, screed off to true lines and levels and leave ready to receive finish. Depress slabs to accommodate finish thickness.

.3 Where floor drains occur, floors shall be level around walls with a minimum 5mm per meter uniform pitch to drains, unless indicated otherwise.

3.3 FINISHING CONCRETE FLOORS

.1 Finish concrete to CSA-A23.1/A23.2.

.2 When concrete is placed, strike off or rod surface with a straight edge. Darby or bull float the surface to smooth and level the concrete.

.3 When the concrete has hardened enough to leave only slight footprints on the surface, float the surface with metal floats and power finishing machines and bring surface to a true elevation. Do not over float. Avoid bringing water and fines to the surface.

.4 Standard Exposed Concrete Floors:

- .1 After floating, allow bleed water or sheen to disappear.
- .2 Steel trowel the surface by means of power and hand trowels.
- .3 Allow slight interval for concrete to harden further and repeat troweling operation, increasing the tilt of the power trowel blades.
- .4 Leave the surface with a smooth, level, burnished finish.
- .5 Cure by any of the curing methods specified below.
- .6 Where indicated on Drawings apply concrete sealer in accordance with the manufacturer's printed instructions.

.5 Concrete Floors for Applied Thin-set Ceramic Tile Finish:

- .1 After floating, allow bleed water or sheen to disappear.
- .2 Steel trowel the surface by means of power and hand trowels.
- .3 Do not bring water and fines to the surface by over trowelling.

.4 Surface shall have a fine even textured steel finish. Do not leave any hard smooth polished or burnished surface areas.
.5 Cure by the moist curing or sealed surface methods only.

.6 Concrete Floors for Applied Resilient Flooring Finish:
.1 After floating, allow bleed water or sheen to disappear.
.2 Steel trowel the surface by means of power and hand trowels.
.3 Do not bring water and fines to the surface by over trowelling.
.4 Allow slight interval for concrete to harden further and repeat trowelling operation.
.5 Leave the surface with a smooth, level, extremely fine textured but not burnished finish.
.6 Cure by any of the curing methods specified below. Ensure that any curing and sealing compounds used are compatible with the resilient flooring adhesive.

.7 Sprinkling of dry cement or dry cement and sand mixture over concrete surfaces is not acceptable.

.8 Saw cut control joints to CSA-A23.1 24 hours maximum after placing of concrete.

.9 Place expansion joint devices in accordance with details, 24 hours maximum after placing of concrete.

.10 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges.

3.4 CURING

.1 Cure concrete in accordance with CSA-A23.1/CSA-A23.2.

.2 Moist Curing Method:
.1 Cover the concrete with burlap or canvas coverings.
.2 Keep the surface continuously wet by sprinkling or fog spray.
.3 Concrete shall be kept moist for a minimum of seven consecutive days when normal Portland cement is used, and for a minimum of three consecutive days when high early strength Portland cement is used.

.3 Sealed Surface Curing Method:
.1 Cover the concrete with waterproof paper or polyethylene sheets. Lap all joints and tape.
.2 Coverings shall be sufficiently heavy to be resistant to tearing and puncturing.
.3 Coverings shall be kept in place for a minimum of seven consecutive days when normal Portland cement is used, and for a minimum of three consecutive days when high early strength Portland cement is used.

.4 Liquid Applied Curing Compound Method:
.1 Apply liquid curing compounds in strict accordance with the manufacturer's instructions.
.2 Ensure that curing compounds are compatible with applied floor finish adhesives.

.5 After curing and when concrete is dry, seal control joints and joints at junction with vertical surfaces with sealing compound.

.6 Concrete Sealer Application:

.1 Ensure concrete surface is clean and free of standing water. Remove all material that may prevent sealer adhesion.

.2 Prime concrete surface as recommended by the concrete sealer manufacturer.

.3 Apply concrete sealer at a uniform coverage by spray or roller application as recommended by the concrete sealer manufacturer.

.4 Apply second coat of concrete sealer, as recommended by the manufacturer, within 24 hours of first coat application.

3.5 TOLERANCES

.1 Exposed High Wear Resistance Surface Dense Trowelled: 6mm in 3000mm.

.2 Exposed Smooth Non-slip Surface Trowelled and Broomed: 8mm in 3000mm.

.3 Level concrete slab to achieve the following tolerances:

.1 Under vinyl composition flooring - 7mm in 3000mm

.2 Under sheet flooring - 3mm in 3000mm

.3 Under thin-set ceramic tile - 3mm in 3000mm and 1.5mm in 305mm maximum

.4 Correct defects in the floor only by grinding or removal and replacement of the defective slabs. Areas requiring corrective work will be identified by the Consultant. Re-measure corrected areas. Costs of corrective work shall be borne by the Contractor.

3.6 FIELD QUALITY CONTROL

.1 Field inspection and testing will be performed under provisions of Section 01 43 00 - Quality Assurance.

.2 The cost of inspection and testing will be paid from the cash allowance specified in General Requirements - Division 01. Allow 24 hours before proceeding with concrete enhancer application.

3.7 PROTECTION

.1 Protect finished installation in accordance with the requirements of General Requirements – Division 01.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

.1 Procedures for unit masonry work.

.2 Procedures for incorporating products to be built into unit masonry.

1.2 RELATED SECTIONS

.1	General Requirements	Division 01
.2	Cast-in-Place Concrete	Section 03 30 00
.3	Masonry Mortar and Grout	Section 04 05 13
.4	Masonry Anchorage and Reinforcement	Section 04 05 19
.5	Concrete Unit Masonry	Section 04 05 22
.6	Masonry Accessories	Section 04 05 23
.7	Clay Unit Masonry.	Section 04 21 00
.8	Structural Steel	Section 05 10 00
.9	Steel Deck	Section 05 30 00
.10	Metal Fabrications	Section 05 52 00
.11	Board Insulation	Section 07 21 13
.12	Air Barriers	Section 07 27 00
.13	Metal Flashing and Trim	Section 07 62 00
.14	Firestopping and Smoke Seals	Section 07 84 00
.15	Sealants	Section 07 92 00
.16	Hollow Metal Doors and Frames	Section 08 11 13

1.3 REFERENCES

.1	CAN/CSA-A179-04(R2009)	Mortar and Grout for Unit Masonry
.2	CAN/CSA-A371-04(R2009)	Masonry Construction for Buildings

1.4 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 – Submittals.

.2 Submit samples:

- .1 One of each type of masonry unit specified.
- .2 One of each type of masonry accessory specified.
- .3 One of each type of masonry reinforcement, tie and connector proposed for use.
- .4 As required by inspection and testing company for testing purposes.

1.5 TEST REPORTS

.1 Submit laboratory test reports in accordance with Section 01 45 00 – Quality Control.

.2 Submit laboratory test reports certifying compliance of masonry units and mortar ingredients with specification requirements.

.3 For clay units, in addition to requirements set out in referenced CSA and ASTM Standards include data indicating initial rate of absorption.

1.6 QUALITY ASSURANCE AND JOB MOCK-UP

.1 Masonry work shall be carried out by experienced masons under the continuous supervision of a competent foreman with a minimum of 5 years' experience with work of similar size and complexity.

.2 Construct mock-ups in accordance with Section 01 45 00 – Quality Control. Construct mock-up panel stepped-back to expose each material used.

.3 Construct mock-up panel of exterior masonry wall construction 1600mm high by 2400mm wide showing masonry colours and textures, use of reinforcement, ties, through-wall flashing, air barrier membrane, insulation, weep holes, vent holes, jointing, coursing, mortar and workmanship.

.4 Construct mock-up panel where directed by the Consultant.

.5 Allow 48 hours for inspection of mock-up panel by the Consultant before proceeding with work.

.6 Construct 3000mm wide by full height mock-up of interior concrete masonry unit partition with wall opening and complete with masonry lintel. Notify the Consultant 48 hours prior to construction of lintel mock-up. The structural consultant will be present during the mock-up construction to review the methods employed. Construct lintel mock-up where directed by the Consultant.

.7 When accepted, mock-ups will demonstrate minimum standard for this work. The approved mock-up panels may remain as part of the finished work.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to job site in dry condition.

.2 Keep materials dry until use except where wetting of bricks is specified.

.3 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Cold Weather Requirements: Supplement Clause 5.16.2 of CAN/CSA-A371 with following requirements:

.1 Maintain temperature of mortar between 5°C and 50°C until batch is used.
.2 Protect masonry work from cold weather in accordance with clause 5.16.3 of CAN/CSA-A371, but for a minimum of 72 hours after construction.

.2 Hot Weather Requirements: Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.

.3 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.

.4 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

.5 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Masonry materials are specified in related Sections indicated in Article 1.03.

PART 3 – EXECUTION

3.1 INSTALLATION

.1 Do masonry work in accordance with CAN/CSA-A371 except where specified otherwise.

.2 Build masonry plumb, level, and true to line, with vertical joints in alignment.

.3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

.4 Extend walls and partitions to underside of deck or slab unless noted otherwise on Drawings.

.5 Construct portions of walls and partitions above doors, screens, windows and other openings to match adjacent wall and partition construction unless noted otherwise on Drawings.

.6 Refer to Structural Drawing for load-bearing masonry structural requirements.

3.2 CONSTRUCTION

.1 Exposed Masonry: Remove chipped, cracked, and otherwise damaged units in exposed masonry and replace with undamaged units.

.2 Jointing:

- .1 Allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, true to line, compressed, uniformly concave joints unless other jointing is indicated or specified.
- .2 Where raked joints are indicated allow joints to set just enough to remove excess water, then rake joints uniformly to 6mm depth and compress with square tool to provide smooth, compressed, raked joints of uniform depth.
- .3 Strike flush all joints concealed in walls and joints in walls to receive plaster, tile, insulation, or other applied material except paint or similar thin finish coating.
- .4 Wall surfaces and joint treatment for concealed portions of walls above ceilings and behind wall mounted fitments shall match exposed surfaces.

.3 Cutting:

- .1 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.
- .2 Make cuts straight, clean, and free from uneven edges.

.4 Building-In:

- .1 Build in items required to be built into masonry including items supplied under Section 05 52 00 – Metal Fabrications and Section 07 62 00 – Metal Flashing and Trim.
- .2 Prevent displacement of built-in items during construction. Check for plumb, location and alignment frequently, as work progresses.
- .3 Build-in hollow metal frames. Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar. Set frame anchors as specified in Section 08 13 13 – Hollow Metal Doors and Frames.
- .4 Where structural steel members penetrate masonry walls fill-in spaces with neatly cut pieces of masonry units set in event mortar beds with tooled joints. Do not use rubble or broken pieces and mortar combinations as in-fill.

.5 Wetting of Bricks:

- .1 Except in cold weather, wet bricks having an initial rate of absorption exceeding 1g/minute/1000mm², wet to uniform degree of saturation, 3 to 24 hours before laying, and do not lay until surface dry.
- .2 Wet tops of walls built of bricks qualifying for wetting, when recommencing work on such walls.

.6 Support of Loads:

- .1 Use concrete specified in Section 03 30 00 –Cast-in-Place Concrete, where concrete fill is used instead of solid units.
- .2 Use grout to CAN/CSA-A179 where grout is used instead of solid units. Cells with reinforcement shall be grouted.
- .3 Install building paper below voids to be filled with concrete or grout; keep paper 25mm back from faces of units.

.7 Provision for Movement:

.1 Leave 10mm space below shelf angles.

.2 Leave 25mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.

.3 Build masonry to tie in with stabilizers, with provision for vertical movement.

.8 Loose Steel Lintels: Install loose steel lintels supplied by Section 05 10 00 – Structural Steel Framing. Centre over opening width.

.9 Bearing Plates and Anchors: Install loose steel bearing plates and anchors supplied by Section 05 10 00 - Structural Steel Framing and Section 05 20 00 – Steel Decking.

.10 Control Joints for Non-loadbearing Masonry Walls:

.1 Construct continuous full height control joints as indicated.

.2 Fill void at control joint with 20 MPa concrete grout to form continuous key.

.3 Locate exterior wall control joints as indicated on elevations.

.4 Locate interior wall control joints at a maximum spacing of 6000mm, and where non-loadbearing walls meet loadbearing walls.

.11 Provide control joints in loadbearing masonry walls only at locations approved by the structural consultant or where shown on Structural Drawings.

.12 Expansion Joints: Build-in continuous expansion joints as indicated.

3.3 SITE TOLERANCES

.1 Tolerances in notes to Clause 5.3 of CAN/CSA-A371 apply.

3.4 RE-INSTALLATION

.1 Cut openings in existing work as indicated.

.2 Openings in walls to be approved by Consultant.

.3 Make good existing work. Use materials to match existing.

3.5 FIELD QUALITY CONTROL

.1 Inspection and testing of masonry work will be carried out by an inspection and testing company designated by the Consultant.

.2 Cost of masonry inspection and testing will be paid by the Owner.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

.1 Mortar for Unit Masonry

1.2 RELATED SECTIONS

1.	General Requirements	Division 01
2.	Cast in Place Concrete	Section 03 30 00
3.	Masonry Procedures	Section 04 05 13
4.	Masonry Anchorage and Reinforcement	Section 04 05 19
5.	Concrete Unit Masonry	Section 04 05 22
6.	Clay Unit Masonry	Section 04 21 00

1.3 REFERENCE STANDARDS

.1	CAN/CSA A179	Mortar and Grout for Unit Masonry
.2	CAN/CSA A371	Masonry Construction for Buildings
.3	CSA A3000	Cementitious Materials Compendium
.4	ASTM C 780	Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
.5	ASTM C 1357	Standard Test Methods for Evaluating Masonry Bond Strength

1.4 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures

.2 Submit two 75mm size samples of each mortar type and colour.

1.5 QUALITY ASSURANCE

.1 Mortar prepared on-site based on proportion specifications:

- .1 Prior to the commencement of masonry work prepared on-site, under the supervision of the inspection and testing company, mortar mixes for each mortar type specified.
- .2 The inspection and testing company will sample and test the mortar mixes to determine a site aggregate/cement ratio Control Value for each mortar type.
- .3 Once Site Control Values are established these will form the basis of acceptance for all subsequent Sample Ratio Tests conducted during the course of the work.

.2 Mortar prepared off-site based on property specifications:

- .1 Prior to the commencement of masonry work the inspection and testing company will sample and perform laboratory test for each mortar type prepared off-site to verify compliance with the specifications.
- .2 Testing shall consist of the determination of:

.1 Aggregate/cement ratio.
.2 Water retention.
.3 Compressive strength.
.4 Air Content

.3 Once acceptable values are established these will form the basis of acceptance for tests conducted during the course of the work.

.3 Arrange for representative of mortar manufacturer to meet with mason on site prior to commencement of masonry work, to review proper mixing procedures of mortar. Mixing must conform to instructions from supplier of pre-mixed mortar materials.

.4 Submit test data as specified below.

1.6 COLD WEATHER REQUIREMENTS

.1 During cold weather, lower than 5oC, when danger of freezing exists, heat all masonry materials using methods accepted in the industry, in conformance to CSA-A371, and approved by the Consultant.

1.7 SUBMITTALS

.1 Submit three (3) copies of performance data sheet for mortar mixtures. Indicate related standards and mortar properties in terms of compressive strength, water retention and air content. Provide all test certificates required for mortar mixture lots delivered to site.

1.8 TESTING

.1 Testing of mortar materials will be carried out by Testing Laboratory designated by Consultant.

.2 Inspection and testing to be paid by Owner.

.3 Submit samples of sand and water for testing to ensure that mortar will not produce efflorescence.

.4 Test for compliance with the performance requirements for integral mortar water-repellence. Mortar shall be capable of achieving a Class E Rating when evaluated using ASTM E 514 with the test extended to 72 hours, using the rating criteria specified in ASTM E 514.

.5 Perform compressive strength tests on all mortar and grout in accordance with the requirements of CSA S304.1. Compressive strengths must conform to the property specifications of CSA-A179.

.6 Perform tests for flexural bond strength of masonry in accordance CSA S304.1. Flexural bond strengths shall not be less than 0.20MPa, in conformance with CSA-A179.

PART 2 – MATERIAL

2.1 MATERIALS

.1	Sand:	fine grain aggregate, graded in accordance with CSA A179
.2	Water:	potable, free off ice and any contaminants, to CSA A179.
.3	Portland cement:	to CAN/CSA-A5 normal Type 10
.4	Hydrated lime:	type 'S', in accordance with ASTM C207

2.2 MORTER

.1 Mortar:

.1 Betomix Plus by Daubois or bulk preblended silo mix as supplied by Max-Mix, or equal approved by Consultant. Colourants to be premixed with mortar materials. Colour to be selected by Consultant.

.2 Mortars for clay brick and concrete unit masonry to be Portland cement/ hydrated lime/ sand mortars to the property standards of CSA A179. Colour to be selected by consultant to match the selected clay brick.

.3 Mortar for masonry foundations, load bearing walls and partitions to be Type 'S' as per property specifications of CSA A179.

.4 Mortar for non-load bearing walls and partitions to be Type 'N' as per property specifications of CSA A179, unless indicated otherwise on the Structural Drawings.

.5 Compressive strengths of mortars shall conform to the values indicated on Tables 8 and 9, for solid brick and concrete block respectively, of CSA Standard A179. Compressive strength of mortars must not exceed the compressive strength of the masonry units with which they are being used.

.6 Except where specified otherwise, the basis of acceptance for mortar prepared on-site shall be the proportion specifications in CAN/CSA-A179

.7 The basis of acceptance for mortar prepared off-site shall be the property specifications in CAN/CSA-A179

2.3 GROUT

.1 Grout:

.1 Coarse grout to CSA A179, with maximum aggregate size of 12.5mm.
.2 Use fine grout where least dimension of void is less than 50mm.
.3 All grout to CSA A179, with sufficient water to produce pouring consistency without segregation of ingredients, but to retain cohesiveness.

.4 Slump is to be 200mm to 250mm. Minimum compressive strength is to be 20 Mpa. Refer to structural drawings for additional grout requirements at reinforcing steel.

2.4 SOURCES

.1 Use same manufactured brands and sources of mortar materials for entire project, in order to ensure uniformity of mix and coloration.

2.5 PARGING

.1 Cement mortar parging: 1 part cement, 1 part lime to 6 parts sand by volume with sufficient water for a trowelable mix.

PART 3 – EXECUTION

3.1 CONSTRUCTION

.1 Do masonry mortar work in accordance with CAN/CSA-A179 except where specified otherwise.

.2 Apply parging in uniform coating coating not less than 8mm thick, where indicated and where dampproofing is to be applied on masonry walls.

.3 Cove parging at junction of foundation wall with footing.

3.2 FIELD QUALITY CONTROL

.1 As masonry work progresses, the inspection and testing company will test and report on mortar properties as follows:

.1 Mortar prepared in accordance with proportion specifications: Aggregate/Cement ratio.

.2 Mortar prepared in accordance with property specifications: compressive strength.

.2 Provide six 50mm by 50mm by 50mm mortar samples taken at random for each test when requested by inspection and testing company.

3.3 MIXING OF MORTARS

.1 Mason to review mixing procedures with mortar manufacturer.

.2 Mix mortar thoroughly, in quantities only as needed for immediate use.

.3 Mix mortar in mechanical mixer operated until homogeneously blended, but not less than 3 minutes after all materials are in mixer.

.4 Obtain manufacturer's approval for any additives.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

.1 Reinforcement for masonry walls and lintels
.2 Connectors for masonry walls

1.2 RELATED SECTIONS

.1	General Requirements	Division 01
.2	Masonry Procedures	Section 04 05 00
.3	Masonry Mortar and Grout	Section 04 05 13
.4	Concrete Unit Masonry	Section 04 05 22
.5	Masonry Accessories	Section 04 05 23
.6	Clay Unit Masonry	Section 04 21 00
.7	Structural Steel	Section 05 10 00

1.3 REFERENCES

.1	ASTM-A153/A153M-95	Standard Specified for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
.2	CAN/CSA-A23.1-04	Concrete Materials and Methods of Concrete Construction.
.3	CAN/CSA-A370-04 (R2009)	Connectors for Masonry
.4	CAN/CSA-A370-04 (R2009)	Masonry Construction for Buildings
.5	CAN/CSA-G30.18-M92 (R2007)	Billet-Steel Bars for Concrete Reinforcement.
.6	CSA-S304.1-04	Design of Masonry Structures
.7	CSA-W186-M1990 (R2007)	Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.4 DESIGN REQUIREMENTS

.1 Seismic Loads: Design size and spacing of masonry reinforcement and masonry veneer connectors to withstand seismic loads in accordance with the Ontario Building Code, Subsection 4.1.8.
.2 Structural Design of masonry reinforcement and masonry veneer connectors shall be by a qualified Professional Engineer licensed to practice in the Province of Ontario

1.5 SUBMITTALS

.1 Submit product data sheets for all reinforcement types proposed for use in this project, in accordance with Section 01 33 00 – Submittal Procedures.

.2 Include a copy of the data sheets in the shop drawing manual at the conclusion of the project.

.3 Submit samples of anchors, ties, and fasteners for approval of Consultant.

1.6 SOURCE QUALITY CONTROL

.1 Upon request, provide the Consultant with a certified copy of mill test report of reinforcement steel and connectors, showing physical and chemical analysis, minimum 5 weeks prior to commencing reinforcement work.

.2 Upon request inform Consultant of proposed source of material to be supplied.

1.7 SHOP DRAWINGS

.1 Submit Shop Drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Shop Drawings shall consist of bar bending details, lists and placing drawings.

.3 On placing Drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.

.4 Shop Drawings shall bear the seal and signature of the Professional engineer providing structural design for reinforcement and connectors.

PART 2 – MATERIAL

2.1 REINFORCEMENT

.1 Bar reinforcement: to CAN/CSA-A371 and CAN/CSA-G30.18.

.2 Wire Joint Reinforcement - Single Wythe Walls: to CAN/CSA-A371, ladder type, 4.76mm diameter wire, size to suit wall thickness.
- .1 Blok-Lok Limited: BL-10 Ladder Reinforcement.
- .2 Dur-O-Wal: DA3200 Single Wythe Ladur.

.3 Wire Joint Reinforcement - Cavity Walls: to CAN/CSA-A371, ladder type, 4.76mm diameter wire, size to suit wall thickness. Blok-Lok Limited: BL-42 Ladder Reinforcement.

.4 Wire Joint Reinforcement - Double Wythe Foundation Walls: to CAN/CSA-A371, ladder type, 4.76mm diameter wire, size to suit wall thickness.
- .1 Blok-Lok Limited: BLll Ladder Reinforcement.
- .2 Dur- O-Wal: DA3200TR Ladur Trirod.

.5 Cavity Wall Connectors: to CAN/CSA-A370. Hot dip galvanized, to ASTM-A153/A153M, Class B2, 458g/ m2 minimum coating.
- .1 Concrete masonry unit backings:
  - .1 Blok-Lok Limited: 4.76mm diameter, System 2000 Tie installed at 400mm on centre vertical spacing and used in conjunction with wire joint

reinforcement specified in subparagraph 2.01.3 for cavity walls and Blok-Lok Limited, Wedge-Lok cavity-wall insulation fasteners.

.2 Fero Corporation: Block Shear Connector complete with V-Tie and insulation supports, installed at 800mm on centre horizontal spacing and 400mm on centre vertical spacing and used in conjunction with wire joint reinforcement as specified in sub-paragraph 2.01.2 installed at 400mm on centre vertical spacing.

.2 Cast-in-Place Concrete Backings:

.1 Install dovetail anchor slots at 800mm on centre spacing and dovetail anchors at 400mm on centre.

.2 Blok- Lok Limited, BL-305 Dovetail Anchor Slot with BL-303 Dovetail Anchors, complete with Blok-Lok Limited, Wedge-Lok cavity wall insulation fasteners.

.3 Steel Stud Backings: Fero Corporation, Stud Shear Connector, 1.6mm thick in appropriate size for wall studs used, complete with four screws for each connector, and 4.76mm diameter V-Tie Lateral Tie-Clip, and cavity wall insulation fasteners. Install at 800mm on centre horizontal spacing and 400mm on centre vertical spacing.

.6 Corrosion Protection for Wire Joint Reinforcement: galvanized to ASTM-A153/A153M.

.1 Exterior Wall: Hot dip galvanized, Class 82, 458g/m 2 minimum coating.

.2 Interior Wall: Mill galvanized.

.3 Foundation Walls: Hot dip galvanized, Class 82, 458g/m2 minimum coating.

2.1 FABRICATION

.1 Fabricate reinforcing in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Ontario.

.2 Fabricate connectors in accordance with CAN/CSAA-370.

.3 Obtain the Consultants approval for locations of reinforcement splices other than those shown on placing drawings.

.4 Upon Consultants approval, weld reinforcement in accordance with CSA-W186.

.5 Ship reinforcement and connectors, clearly identified in accordance with drawings.

PART 3 – EXECUTION

3.1 GENERAL

.1 Do masonry connector and reinforcement work in accordance with CAN/CSA-A370, CAN/CSA-A371, CAN/CSA-A23.1 and CSA-S304.1 unless indicated otherwise.

.2 Accurately place reinforcement, support, and secure against displacement as indicated on structural drawings and in accordance with CAN/CSA-A371

.3 Prior to placing grout, obtain Consultant's approval of placement of reinforcement and connectors.

.4 Do additional reinforcement of masonry as indicated.

.5 Supply dovetail anchor slots for casting into concrete work where required as indicated on the structural drawings and specifications.

3.2 INSTALLATION OF MASONRY ANCHORAGE AND REINFORCEMENT

.1 Refer to Section 04 05 19 for installation of masonry anchorage and reinforcement.

.2 Refer to structural drawings for additional requirements. All reinforcing shall conform to structural requirements as a minimum. Where structural requirements differ from these specifications, the most stringent requirements shall apply.

.3 Note that "solid wall" describes a masonry wall consisting of 1 or more wythes of brick and/or block (which may be solid or hollow core) with mortar joint only between wythes - no air space.

.4 Install reinforcement as indicated above for the materials specified, in conformance with structural drawings and manufacturer's instructions.

.5 For single wythe interior masonry walls, truss type reinforcing is required at every second course for walls 190mm wide or less, and ladder type reinforcing is required at each course at walls wider than 190mm.

.6 Provide and install prefabricated tees and corners at wall corners and intersections.

.7 Install ties in accordance with Ontario Building Code.

.8 Pre-drill for anchors using appropriate type and size of bit. Provide two anchors per tie with minimum embedment of 25mm. Conform to manufacturers specifications.

.9 Test at least two anchors to failure. Test must be carried out by a Professional Engineer and must certify tension load test to anchor failure. Cost of test will be paid by the Owner.

3.3 JOINT REINFORCEMENT

.1 Locations of Joint Reinforcement:
- .1 Concrete masonry unit wythe in cavity walls.
- .2 Single wythe masonry walls and partitions.

.2 Install joint reinforcement horizontally at 400mm on centre vertical spacing, unless indicated otherwise.

.3 Place additional reinforcement extending 600mm beyond jambs in courses 200mm, 400mm and 800mm above and below wall openings.

.4 Lap joint reinforcement 300mm at splices.

.5 Reinforce and grout loadbearing masonry walls as shown on the Structural Drawings.

3.4 BONDING AND TYING

.1 Foundation Walls:
- .1 Bond foundation walls of two or more wythes with the specified wire joint reinforcement.
- .2 Install joint reinforcement at 400mm on centre vertical spacing, unless indicated otherwise.

.2 Bond walls of tow or more wytes using wire joint reinforcement and metal connectors in accordance with the OBC, CSA-S304.1, CAN/CSA-A371 and as indicated.

.3 Tie masonry veneer to backing in accordance with OBC, SCA-S304.1, CAN/SCA-A371 and as indicated.

.4 Install continuous single wire brick joint reinforcement connected to brick ties.

3.5 REINFORCED LINTELS AND BOND BEAMS

.1 Reinforce masonry lintels and bond beams as indicated on Structural Drawings. Make joints in lintels and bond beams to match adjacent walls.

.2 Place and grout reinforcement in accordance with CAN/CSA-A371, and the Structural Drawings.

3.6 GROUTING

.1 Grout masonry in accordance with SCA-S304.1 and as indicated on Structural Drawings.

3.7 METAL ANCHORS

.1 Do metal anchor work as indicated.

3.8 LATERAL SUPPORT AND ANCHORAGE

.1 Do lateral support and anchorage in accordance with SCA-S304.1 and as indicated.

.2 Lateral Support Anchors (for attachment to structural steel): Blok-Lok, Flex-o-Lok.

3.9 CONTROL JOINTS

.1 Terminate reinforcement 25mm short of each side of control joints unless otherwise indicated.

3.10 FIELD BENDING

.1 Do not field bend reinforcement and connectors except where indicated or authorized by the Consultant.

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 Replace bars and connectors which develop cracks or splits.

3.11 FIELD TOUCH-UP

.1 Touch-up damaged and cut ends of epoxy coated or galvanized reinforcement steel and connectors with compatible finish to provide continuous coating.

END OF SECTION

PART 1 – GENERAL

1.1 RELATED WORK

.1	Masonry Mortar and Grout	Section 04 05 13
.2	Masonry Anchorage and Reinforcement	Section 04 05 19

1.2 REFERENCE STANDARDS

.1	CAN/CSA-A165 Series	CSA Standards for Concrete Masonry Units
.2	CAN/CSA-S304.1	Design of Masonry Structures
.3	CAN/CSA-A371	Masonry construction for Buildings
.4	CAN/CSA-A370	
.5	National Concrete Masonry Association	
	1. NCMA TEK 10-2C	Control Joints for Concrete Masonry Walls - Empirical Method
	2. NCMA TEK-3A	Control and Removal of Efflorescence
	3. NCMA TEK-3A	Cleaning Concrete Masonry

1.3 PROTECTION

.1 Protect adjacent surfaces from marking or damage due to masonry work.

PART 2 – MATERIAL

2.1 MATERIALS

.1 Concrete blocks:

- .1 to CAN/CSA-A165 Series, metric modular, Type H/15/A/M in concealed spaces, and H/15/D/M lightweight for exposed walls.
- .2 Provide block of higher compressive strength where indicated on structural drawings.
- .3 Blocks for fire rated partitions to have required percentage of solid material necessary to provide rating.
- .4 Sizes as indicated on drawings.

.2 Curing of lightweight block:

- .1 Autoclave or low-pressure steam curing is acceptable, provided that masonry units comply with linear shrinkage and moisture content requirements of CSA A165.1 for type M units at time of delivery to site.
- .2 Age all units, prior to delivery to site, as follows:
  - .1 Autoclaved units: minimum 7 days.
  - .2 Low pressure steam cured units: minimum 28 days

.3 Special Shapes:

.1 Bond beam, lintel beam, corner and other shapes as required or indicated on drawings.

.2 Provide external corner units as a single unit, with required architectural face appearance on one side and one end.

.4 Metal Anchors: Conforming to Ontario Building Code and Section 04 05 19.

.5 Control Joint Filler: Blok-Lok “Exp-Joint”, closed cell neoprene expansion joint material.

2.2 EXPOSED MASONRY FACES

.1 Notwithstanding visual inspection requirements of CSA standards, masonry units shall be free of surface indentations, surface cracks due to manufacture, or chipping. Units so delivered shall be culled from use for exposed purposes but may be used where concealed.

.2 Concrete masonry units exposed both sides, such as at interior partitions walls, must be visibly uniform in width, so that both faces of the wall are smooth, with all block faces in plane. Total variation in width must not exceed 2mm. Mason shall reject blocks which do not conform to this size requirement.

PART 3 – EXECUTION

3.1 WORKMANSHIP

.1 Build masonry work true-to-line, plumb, square and level, with vertical joints in proper alignment.

.2 Assume complete responsibility for dimensions, plumbs and levels of this work and constantly check same with graduated rod.

.3 Masonry courses to be of uniform height, and both vertical and horizontal joints to be of equal and uniform thickness.

.4 Extend non-loadbearing partitions to underside of floor structure above, providing 25mm deflection clearance. Install lateral support angles, as specified on the structural drawings, and acoustic insulation filler at top of wall.

.5 Carry wall up in uniform manner, no one portion being raised more than 1200mm above another at any time. Build no more than 1500mm of wall measured vertically in any one day.

.6 Buttering corners of units, throwing mortar into joints, deep or excessive furrowing of bed joints not permitted. Do not shift or tap units after mortar has taken initial set. Where adjustments must be made after mortar has started to set, remove mortar and replace with fresh supply.

.7 Where new masonry abuts old or fully set masonry, clean existing surfaces and dampen if necessary to obtain bond.

.8 Evidence of noncompliance with Contract Documents including the following will require replacement and/or repair:

.1 Shrinking
.2 Curling
.3 Spalling
.4 Poor colour blend
.5 Poor texture blend
.6 Discolouration of mortar
.7 Chipping

3.2 BLOCKWORK

.1 Lay concrete block in running bond, except as noted on Drawings, with thicker end of face shell upward. Standard coursing to be modular 200mm for one block and one joint.

.2 Use lightweight concrete blocks for exposed interior surfaces of walls and partitions. Regular concrete blocks may be used for concealed surfaces.

.3 Use special shaped, and finished units where indicated, specified or required. Use bull-nosed units for exposed external corners, window jambs, etc. Exposed open cells not permitted.

.4 Concrete masonry units shall have face shells and their end joints fully filled with mortar, and joints squeezed tight. Also fill webs at cores, to be reinforced and grouted, and strike flush at core taking care to prevent mortar from falling into core.

.5 Tie intersecting non-bearing walls together with masonry reinforcing every second course.

.6 Do not tie intersecting bearing walls together in masonry bond, except at corners.

.7 Exercise special care laying up concrete block in locations where plastic wall coating finish is indicated. Block walls in these locations shall be plumb with joints tooled, concave.

.8 Where resilient base is indicated, tool the joints to within 100mm of the floor. Cut joints flush behind the base.

3.3 MORTAR AND POINTING

.1 Mortar is specified in Section 04 05 13.

.2 Make all joints uniform in thickness, straight, in line, with mortar compressed to form concave joints.

.3 Strike joints flush where walls are to receive insulation, ceramic tile, or similar finishes.

.4 Point faced blockwork by filling holes and cracks in exposed mortar joints. Cut out defective joints, refill solidly with mortar and tool to form neat concave joint.

3.4 BUILDING IN COMPONENTS

.1 Build in door, screen, and window frames, steel lintels, sleeves, anchor bolts, anchors, nailing strips and other items to be built into masonry.

.2 Do not distort metal frames. Bed anchors of frames in mortar and fill frame voids with mortar or grout as wall is erected.

3.5 BEARING POINTS

.1 Fill concrete block solid with 20 MPa concrete grout at the following locations:
- .1 for two courses below bearing points of structural members;
- .2 behind wall-hung mechanical fixtures;
- .3 and elsewhere as indicated on drawings.

.2 Install building paper over wire mesh reinforcing in the beds below solid block section.

.3 Use 100% solid concrete blocks where indicated.

3.6 CONTROL JOINTS

.1 Provide continuous vertical control joints in concrete block and brick partitions and walls at locations indicated, and at maximum 4.0m O.C. Control joints may be at 6.0m O.C. for autoclaved block only.

.2 Control joints are required at changes in wall height, at pilasters and changes in wall thickness, at movement joints in foundations and floors and roofs, at one side of door or window openings under 1.8m wide, on both sides of openings over 1.8m wide, and adjacent to corners.

.3 Confirm all control joint locations with the Consultant prior to wall construction. Provide drawings marked up to show locations of all control joints.

.4 Form control joints as detailed. Stop masonry reinforcing each side of joints; except where structural reinforcing is required, such as at bond beams.

.5 Provide bond breaker at each control joint, of building paper or black polyethylene. Continue bond breaker over lintels at openings.

3.7 HORIZONTAL REINFORCING

.1 Cavity wall and concrete block walls shall be continuously reinforced and tied together with horizontal masonry reinforcing in every second block bed joint.

.2 Additionally, place masonry reinforcing in first and second bed joints above and below openings. Reinforcing in first bed joint shall be continuous. Second bed joint reinforcing shall extend 600 mm beyond each side of opening.

.3 Place continuous reinforcing in second bed joint below top of wall.

.4 Lap reinforcement minimum of 150mm at splices. Supply & install prefabricated sections at corners and intersection of walls to insure continuity of reinforcing.

3.8 FIRE-RATED PARTITIONS

.1 Block shall be of density required to achieve fire rating, in accordance with the Ontario Building Code.

.2 At door openings in fire rated masonry partitions, fill concrete block solid with 20 MPa concrete for a distance of 400mm at each side and 400mm above openings.

3.9 REINFORCED MASONRY WALLS

.1 Construct reinforced masonry walls to conform to the requirements of the Ontario Building Code and CSA-A371, and as indicated on Structural drawings.

.2 Lay units so as to maintain an unobstructed vertical continuity in the cells. All walls and cross webs shall be fully bedded. No over-hanging mortar or debris shall be allowed inside the reinforced cells unless otherwise on the drawings.

.3 Vertical reinforcing shall be provided full length without splicing. It may be installed after the first 1200mm of masonry is erected. Locate rods accurately in the cells as shown on the Drawings. Hold in position top and bottom. Fill cells containing reinforcement solidly with 20 MPa concrete grout, unless noted otherwise on Structural drawings. Consolidate by puddling when placing and again reconsolidate before plasticity is lost. Place concrete grout in lifts not exceeding 1200mm. Stop each lift 38mm below the top of a masonry unit.

.4 Refer to Structural and Architectural drawings for locations and grout strength.

3.10 CUTTING MASONRY

.1 Cutting of masonry units exposed in finished work shall be done with approved type power saw. Where electrical conduit outlet or switch boxes occur, grind and cut units before services installed. Quick saw not permitted for cutting block above grade.

.2 Obtain Consultants approval before cutting any part or area which may impair appearance or strength of work.

.3 Patching of masonry not permitted without Consultants approval.

3.11 BOND BEAMS

.1 Install concrete block bond beams where indicated and where required for bearing of structural members.

.2 Unless more stringent requirements are noted on Structural drawings, make bond beams of special channel blocks with two 15M reinforcing bars placed in bottom, and filled with 20 MPa concrete grout. Extend a minimum length of 200mm, each side of structural member.

3.12 REINFORCED LINTELS

.1 Install reinforced concrete block lintels at openings where steel lintels are not indicated.

.2 Cast and cure lintels on a plank. Set special channel lintel blocks using specified mortar. Place wood stops at each end of lintel to prevent movement.

.3 Refer to Structural drawings for lintel sizes and dimensions. As a minimum, place 25mm of 20 MPa concrete grout in voids, lay in two 15M reinforcing bars and place concrete to level of block sides. Rod and tamp concrete well without disturbing reinforcing. Allow lintels to cure 7 days before loading.

3.13 COORDINATION

.1 Provide openings in masonry walls where required or indicated. Provide reinforced lintels over all openings in both loadbearing and non-loadbearing walls.

.2 Accurately locate chases and openings, and neatly finish to required sizes. Refer to Mechanical and Electrical drawings and co-operate with all trades.

.3 Where masonry encloses conduit or piping, bring to proper level indicated and as directed. Do not cover any pipe or conduit chases or enclosures until advised that work has been inspected and tested.

.4 Build in frames and anchor bolts, and metal brackets for vanities, benches, counters, etc.

3.14 CLEANING

.1 On completion, remove excess mortar and smears using wood paddles or scrapers.

.2 Point or replace defective mortar to match existing, as required or directed.

.3 Clean concrete masonry walls exposed in the finished work in accordance with manufacture's recommendations and NCMA TEK Bulletin #8-4A.

.4 Remove dirt and stains from masonry walls exposed in the finished work in accordance with manufacturer's recommendations and NCMA TEK Bulletin #8-2A.

.5 Remove efflorescence from masonry walls exposed in the finished work in accordance with manufacturer's recommendations and NCMA TEK Bulletin #8-3A.

.6 Repeat cleaning operations until work is satisfactory.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

.1 Masonry accessories.
.2 Masonry flashing.

1.2 RELATED SECTIONS

.1	General Requirements	Division 01
.2	Masonry Procedures	Section 04 05 00
.3	Masonry Mortar and Grout	Section 04 05 13
.4	Masonry Anchorage and Reinforcement	Section 04 05 19
.5	Concrete Unit Masonry	Section 04 05 22
.6	Clay Unit Masonry	Section 04 21 00
.7	Air Barriers	Section 07 27 00
.8	Firestopping and Smoke Seals	Section 07 84 00

1.3 REFERENCES

.1 CAN/CSA-A371-04 (R2009), Masonry Construction for Buildings.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Horizontal Control Joint Filler: purpose-made elastomer for minimum compression of 25% of uncompressed size. Emseal Corporation: Greyflex.
.2 Vertical Control Joint Filler: preformed expanding elastomer for minimum compression of 25% of uncompressed size. Emseal Corporation: Greyflex.
.3 Lap Adhesive: recommended by masonry flashing manufacturer.
.4 Weep Hole Vents: purposed-made PVC:
  .1 Clear plastic tube: Dur-O-Wal Limited: DA1005 Weephole Tube.
  .2 Plastic Vent: Goodco Ltd: Goodco Brick Vent: J.V. Building Products: PVC Brick Vent.

.5 Vent Holes: minimum 100mm high.
  .1 Dur-O-Wal Limited: DA 1069 Cell Vent.
  .2 Block-Lok Limited: Wilco Weephole Ventilator.

.6 Compressible Joint Filler at Penetrations and Top of Masonry Partitions:

.1 AD Fire Protection System Inc.: A/D Firebarrier Mineral Wool Firestopping Insulation.
.2 Fibrex Insulations Inc.: Fibrex Safing Insulation.
.3 Roxul Inc.: RXL Safe Fire Stop Batt.

.7 Mechanical Fasteners: stainless steel, self-tapping.

.8 Metal Drip Flashing: Cold drawn and annealed stainless steel, Type 304, 50mm wide by 2400mm long, with 10mm hemmed edge.

.9 Cavity Wall Flashing: 1.0mm minimum thickness SBS modified self-adhesive or adhesive applied membrane.
.1 Henry/Bakor Inc.: Blueskin TWF.
.2 Soprema: Sopraseal Membrane Flashing.
.3 W.R. Grace and Co. of Canada Ltd.: Perm-A-Barrier Wall Flashing.
.4 W.R.Meadows of Canada Ltd.: Sealtight Air-Shield Flashing Membrane.

.10 Flexible Through-Wall Flashing:
.1 Lexsuco Canada Limited.: F-20 membrane with CA-105 adhesive.
.2 W.R. Meadows of Canada Ltd.: Sealtight Flex-Guard PVC Masonry Flashing with Vinyl Flash Adhesive Compound.

.11 Cavity Wall Air Space Filler: compressible, closed cell neoprene.

.12 Mortar Dropping Control Device: Trapezoidal-shaped polyester mesh with integral insect barrier. Mortar Net USA Ltd.: Mortar Net with Insect Barrier.

PART 3 – EXECUTION

3.1 INSTALLATION

.1 Install continuous control joint fillers in control joints at locations indicated and under shelf angles.

.2 Install weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600mm on centre.

.3 Install vent holes at top of cavities to line-up with weep holes.

.4 Install cavity wall air space filler at corners and as indicated to compartmentalize air space.

.5 Install compressible joint filler at the top of masonry partitions that are not fire separations. Refer to Section 07 84 00 – Firestopping and Smoke Seals for joint treatment and fire separations.

.6 Install compressible joint filler and acoustical sealant at penetrations through walls and partitions between classrooms, both above and below ceilings.

.7 Install one row of mortar dropping control devices above all flashings at base of wall and above wall openings. Install in accordance with the manufacturer's printed instructions.

.8 Prior to applying cavity wall flashing and flexible wall flashing, install metal drip flashing at front edge of steel angles or masonry units. Coat surface of steel angles with bituminous paint prior to setting metal drip flashing. At splices, overlap metal drip sections by 100mm, apply butyl water resistant sealant between spliced pieces, and crimp hemmed edges.

3.2 CONSTRUCTION

.1 Build in flashings in masonry in accordance with CAN/CSA-A371 and as follows:

- .1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings. Install flashings under weep hole courses and as indicated.
- .2 In cavity walls and veneered walls, carry flashings, starting 15mm back from front edge of masonry, under outer wythe, then up backing not less than 200mm, and as follows:
  - .1 For masonry backing, bond to wall, using manufacturer's recommended adhesive where required. Overlap flashing with air barrier membrane.
  - .2 For concrete backing, bond to wall, using manufacturer's recommended adhesive where required. Overlap flashing with air barrier membrane.
  - .3 For wood frame backing, staple flashing to walls behind sheathing paper.
  - .4 For gypsum board backing, bond to wall using manufacturer's recommended adhesive where required and overlap with air barrier membrane.

.2 Lap joints 150mm and seal with adhesive.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

.1 Coordinate this work with the work of the steel joist supplier. Provide all necessary dimension and structural steel shop drawings to the steel joist supplier for the completion of their work.

1.2 WORK FURNISHED AND INSTALLED

.1 Separate column base plates
.2 Columns, beams, purlins, and girts
.3 Bracing
.4 Steel framing around roof and floor openings
.5 Diagonal supports at columns for deck or slabs
.6 Stair landing beams and hangers for steel stairs
.7 Structural steel door frames and sill angles
.8 Hoist beams
.9 Weldable reinforcing steel bars attached to structural steel
.10 Field connections to concrete and masonry

1.3 WORK FURNISHED AND NOT INSTALLED

.1 Anchor bolts
.2 Connection assemblies set in concrete
.3 Loose angle lintels that bear on concrete or masonry
.4 Shelf angles/plates and wall plates that bear on or are attached to concrete or masonry

1.4 WORK INSTALLED ONLY

.1 Installation of steel joists and steel bridging

1.5 RELATED WORK SPECIFIED SHEWHERE

.1	Grouting under base plates,	Section 03 30 00.
.2	Supply of steel joists,	Section 05 21 00.
.3	Steel deck,	Section 05 31 00.
.4	Metal fabrications,	Section 05 50 00.
.5	Cementitious Fireproofing,	Section 07 81 16.

1.6 REFERENCES

.1 CAN/CSA G40.20/G40.21, General Requirements for Rolled or Welded Quality Steel /

Structural Quality Steels.

.2 CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CAN/CSA S16.1, Limit States Design of Steel Structures.

.4 CSA S136, North American Specifications for the Design of Cold Formed Steel Structural Members.

.5 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.6 CSA W48.1, Filler Metals and Allied Materials for Metal Arc Welding.

.7 CSA W59, Welded Steel Construction (Metal Arc Welding).

.8 CAN/CGSB 1.171, Inorganic Zinc Coating.

.9 CAN/CGSB 1.181, Ready Mixed Organic Zinc Coating.

.10 CISC/CPMA 1.73a, A Quick-Drying One-Coat Paint for Use on Structural Steel.

.11 CISC/CPMA 2.75, A Quick-Drying Primer for Use on Structural Steel.

.12 ASTM A53/A53M, Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

.13 ASTM A108, Standard Specification for Steel Bars, Carbon and Alloy, Cold Finished.

.14 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength.

.15 ASTM A325, Standard Specification for Bolts for Steel, Heat Treated 120/105 ksi Minimum Tensile Strength.

.16 ASTM A570/A570, Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.

.17 SSPC, Steel Structures Painting Council.

1.7 QUALITY ASSURANCE

.1 Structural steel fabrication shall be carried out by a firm that has been in structural steel business (for buildings) for at least five years and that is certified by the Canadian Welding Bureau under the requirements of CSA W47.1, Division 1 or 2.

.2 Erection of the structural steel and steel joists shall be carried out by the steel fabricator's own forces, unless written permission to sublet the Work is obtained from the Consultant. Welding shall be carried out by CWB approved welders under the supervision of a CWB approved firm.

.3 Engage a Professional Engineer to be responsible for the design, detailing and installation of all connections related to structural steelwork. Before submitting shop drawings, submit a letter signed and sealed by that Engineer stating that he has been engaged to undertake the responsibility for the above. Also submit a copy of that Engineer’s Certificate of Authorization, and proof of his liability insurance When requested, submit calculations signed and sealed by that Engineer. On completion of erection, submit a letter signed and sealed by that Engineer to certify that Work has been completed in accordance with all shop drawings reviewed by the Consultant and the Structural Engineer.

.4 Before the start of fabrication, supply the independent inspection and testing agency with mill test certificates or producer’s certificates satisfactorily correlated to the materials or products to which they pertain. The onus for ensuring that the materials and products can be properly identified according to grade or specification rests with the Contractor.

.5 Do not splice sections without the prior acceptance of the Consultant and the submission of pertinent shop drawings. Accepted splices will be required to develop the section. Each splice shall be given a non-destructive test by an independent inspection company acceptable to the Consultant. Testing shall be at the Contractor's expense. Evaluate results in accordance with CSA W59 and report to the Consultant.

1.8 TOLERANCES

.1 Conform to the fabrication and erection tolerances of CAN/CSA S16.

.2 In addition if more stringent tolerances are specified elsewhere to suit interfacing materials, the latter shall govern in such cases.

1.9 SHOP DRAWINGS

.1 Refer to Section 01 33 00 - Submittals. "Shop drawings" means erection diagrams and shop details. Shop drawings received after noon will be date-stamped as received the following working day.

.2 Submit to the Consultant for review before fabrication, 4 white prints of erection diagrams. Leave room on drawings for the stamps of the Consultant and the Structural Engineer. Check and sign before submission. Only 2 copies will be returned to General Contractor. The first submission of the erection diagrams to include a complete materials list indicating steel grades, paints, etc.

.3 Show orientation of bearing plates on erection drawings.

.4 In addition to beam designation marks, show beam sizes on erection drawings.

.5 Submit to the Consultant for review before the start of Work, 4 white prints of shop drawings. Leave room on drawings for the stamps of the Consultant and the Structural Engineer. Check and sign before submission. Only 2 copies will be returned to General Contractor.

.6 All shop drawings shall bear the seal and signature of the Professional Engineer responsible for designing the connections.

.7 The Professional Engineer designing the connections shall hold a Certificate of Authorization, and shall carry min. $1,000,000.00 in liability insurance.

.8 It is advisable to submit erection diagrams for review before preparing shop details. Include details of special conditions. Make erection diagrams. Copies of section details developed by VX Engineering Inc. will not be accepted as erection diagrams. If required, structural plans will be available “as-is” for use in the preparation of shop drawings provided that the title blocks are removed and provided that the Owner and the Owner’s

Consultants are not held responsible for any errors or omissions on the drawings. CAD files of the structural sections, elevations and schedules will not be made available for the preparation of shop drawings.

.9 Show the sizes, spacing and the locations of structural steel, connections, attachments, reinforcing and anchorage. Include all necessary plans, elevation and details. Indicate size and type of fasteners. For welded connections use welding symbols in compliance with CISC and indicate clearly the length of weld. Prepare shop drawings using metric sizes and units. All documents shall carry the seal of a Registered Professional Engineer licensed to practice in the Province of Ontario, who shall be responsible for the design of connections and details, and the fabrication, temporary shoring and erection of all structural steel. Show also vent holes required for galvanizing process.

.10 Review of shop drawings by the Consultant and Structural Engineer is a precaution against oversight or error and solely to review conformance with general design intent. It is not a detailed check and must not be construed as relieving the Contractor of responsibility for making the Work accurate and in conformity with the Contract Documents. Design for which the Contractor is responsible under the Contract will not be reviewed. Work done prior to the receipt of the reviewed drawings will be at the risk of the Contractor. Review comments are not authorization for changes to the Contract price.

.11 Provide the office preparing shop drawings with a complete set of Contract Drawings and Specifications plus all Addenda and Change Orders.

.12 Do not release column shop details for fabrication before establishing on site the final elevations of the tops of supporting piers.

.13 Make corrections required by previous review before resubmitting drawings. Clearly indicate all changes and additions to previous submission. Do not add new details to drawings which have been stamped as reviewed or noted.

.14 After review, erection diagrams will be returned to the Contractor stamped to show one of the following:

.1 Reviewe - Reviewed with no comments.
.2 Note - Reviewed with comments noted on drawing. Submit two final record prints as soon as corrections are made.
.3 Resubmit - Reviewed with comments noted on drawing. Correct and resubmit for review.

Conform to the requirements of each authority that has reviewed the drawings.

.15 Allow a minimum of 15 working days for review of each submission of shop drawings in the Structural Engineer's office. Allow more time when large quantities of shop drawings are submitted. Submit in general conformity with the sequence of construction intended. Co- ordinate with the Consultant. Shop drawings received after noon will be date-stamped as received the following working day.

.16 Keep on site at all times a set of shop drawings bearing the review stamps of the Consultant and the Structural Engineer and use only these drawings and the Structural Drawings to erect structural steel. Neatly mark on the Structural Drawings changes issued during the course of construction.

.17 Show details by which steel assemblies, which are set in concrete, are to be connected to the formwork.

.18 If additional instructions are required from the Consultant, allow a minimum of five working days for the Structural Engineer to review and respond to the request for instruction.

1.10 SUBSITUTIONS

.1 Submit all proposals for substitutions to the Consultant in writing in advance of shop drawings. Identify each item clearly. Do not proceed with a proposed change unless it is accepted in writing

.2 Substitution of alternative sections will be allowed provided the new members have equal or greater capacity and stiffness and are of dimensions acceptable at proposed locations.

1.11 SITE CONDITIONS

.1 Determine any potential interference with existing services and protect from disruption and damage.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Rolled shapes and plates.
- .1 Wide flange sections: CAN/CSA G40.21, Grade 350W.
- .2 Hollow structural sections: CAN/CSA G40.21, Grade 350W, Class C.
- .3 Channels, angles and plates: CAN/CSA G40.21, Grade 300W
- .4 Cold formed shapes: ASTM A570/A570M Grade 50, Fy=345MPa
- .5 Standard S beams: ASTM A992, A572, Grade 50, Fy=345 MPa
- .6 Structural pipe: ASTM A53, Grade B, Fy=241 MPa

.2 Welded wide flange shapes: CAN/CSA G40.21, Grade 350W.

.3 Weldable reinforcing steel: weldable steel, grade 400W, deformed bars to CSA G30.18.

.4 Arc welding electrodes and equipment: CSA W48.1. Electrode Classification Number: E480XX.

.5 High-strength bolts: ASTM A325M and CAN/CSA S16. Bolts shall be identifiable by their head markings and galvanized whenever used to connect members which are galvanized or painted with zinc-rich paint.

.6 Machine bolts: ASTM A307.

.7 Anchor bolts: CAN/CSA G40.21, Grade 300W

.8 Stud anchors, headed: ASTM A108, Grades 1010 through 1020, Fy=345 MPa (50 ksi). Lengths of studs given on drawings are the lengths after welding.

.9 Load indicating washers: Coronet - Cooper + Turner

.10 Cast-in-place concrete anchor with threaded bolt: Structural Connection Insert Type EC-2FW - Acrow - Richmond.

.11 Drilled concrete anchor:

.1 Kwik-Bolt 3 – Hilti Carbon steel anchors to be used unless otherwise noted.

.12 Drilled masonry anchor:

.1 Hilti HIT HY20 with threaded HIT-A Rods and screen tube (for hollow masonry).
.2 Hilti HIT HY150 with HAS –E Standard rods (for solid of grouted masonry).

.13 Joint filler for exposed steelwork: Epoxy resin.

.14 Shop primer paint for steel receiving finish coat of paint on site: CISC/CPMA 2-75 except no lead- based paints allowed.

.15 Shop primer paint for steel receiving intumescent paint on site: Primer compatible with intumescent paint to be used. See Section 07800 (Fireproofing).

.16 Shop paint for steel without finish coat: CISC/CPMA 1-73a except no lead-based paints allowed.

.17 Zinc-rich primer and touch-up paint:

.1 inorganic: CGSB 1-GP-171M, or
.2 organic, ready mixed: CAN/CGSB 1.181-92.

.18 Ensure compatibility with specified topcoat.

.19 Galvanizing: CAN/CSA G164

.20 Grating: Galvanized safety grating. Minimum thickness of material 2mm. Banded ends. Bolted connections. Capacity 4.8 kPa unless noted otherwise on drawings. Maximum deflection 1/180th of span. Provide:

.1 Type W/F by Borden Products (Canada) Ltd.
.2 Type 19-2 by Fisher and Ludlow

.21 Checker plate: CAN/CSA G40.21, Grade 300W. Plate with rolled-in embossments to provide non- slip surface.

.22 Sliding bearing assembly: Galvanized top steel plate with a type 304 stainless steel highly polished lower surface and bottom elastomeric pad with a polytetrafluoroethylene (Teflon) upper surface. Static and kinetic coefficients of friction not to exceed 5% under 7MPa to 14MPa working stress. Assembly to have a working stress capacity of 7 MPa)

on lower pad. Elastomeric bottom pad to allow a 2% rotation of upper plate and still maintain a substantially uniform bearing pressure between plate and pad. . Manufactured by:

.1 Fabreeka Canada Ltd.
.2 Goodco Ltd.
.3 Structural Tech Corp. Ltd.

.23 Elastomeric bearing pad: Structural grade 50 durometer neoprene.

.24 Zinc-Rich Shop Primer Paint: CAN/CGSB-1.132.

2.2 CONNECTIONS

.1 Design connections to conform to CAN/CSA S16. Conform also to the CISC Handbook of Steel Construction, except as otherwise required by the specifications.

.2 Retain a Professional Engineer to be responsible for the design of all connections.

.3 In general, make shop and field connections with high-strength bolts or by welding. Use machine bolts only for secondary connections and at slotted holes with finger-tight bolts that are intended to accommodate movement.

.4 Pretension all high-strength bolts used in:

.1 wind bracing connections;
.2 connections where bolts are subject to tensile loadings;
.3 connections using oversized or slotted holes unless finger-tight bolts are required to accommodate movement; and
.4 connections required by CAN/CSA S16 to be pretensioned.

.5 Design non-composite beam connections for an end reaction due to the uniformly distributed load capacity of the member unless a greater reaction is noted on the Drawings.

.6 Use double angle headers or end connection plates whenever possible. Do not use single angle headers for beams greater than 530mm deep. Make minimum depth of headers and end plates one-half the beam depth. Provide seated beam connections with top clip angles. Cantilevered plate connections will only be accepted for secondary members carrying minor loads. Provide all eccentrically loaded spandrel beams with top and bottom flange connections for torsional restraint.

.7 Provide connections designed for a pass-through force equal to the smaller axial force where axial forces occur in beams framing in on opposite sides of a supporting member. Axial force is centred in smaller beam if beam sizes differ.

.8 Install web and flange stiffener plates at moment connections as required by connection design and detail but in every case when indicated on the drawings. If the shear generated in column web exceeds its shear capacity, reinforce the web.

.9 Provide at least one stiffener plate each side of web of beams continuous over columns unless another type of stiffener is shown on the Drawings.

.10 Design gusset plates at compression members for the force equivalent to twice the specified compression member force, or provide stiffeners to prevent gusset plate buckling.

.11 Provide moment connections at splices to maintain continuity of cranked beams. Provide stiffener plates to resist unbalanced flange forces at splices.

.12 Provide all wall supporting members (shelf angles, hangers, stubs, back braces, etc) which are attached to floor beams with adjustable connections capable to compensate for the deflection of the floor beams due to self-weight of concrete slabs. Anticipate beam deflection to be 20 mm. Alternatively, fabricate based on actual deflected shape of the beams as measured after concrete slabs are installed.

.13 Complete welded shop connections prior to galvanizing.

.14 Where slotted holes are required to accommodate deflection, provide slotted holes long enough to allow for deflection indicated plus construction tolerance assuming bolts are in centre of slots. Use A307 bolts. Bolts are to be finger-tight with burred threads to allow for movement during life of structure without bolts loosening.

.15 Where indicated on the drawings, connect to concrete using cast-in weld plates with headed stud anchors. Design and supply assemblies. Determine capacity of each anchor group considering edge distance, spacing and embedment.

.16 Connect new steel members to masonry or concrete using drilled anchors. Design, supply and install anchors. Determine the capacity of each anchor group considering edge distances, spacing, and a factor of safety of 4 minimum against failure. Activate wedge type anchors by applying pre-determined torque recommended by the manufacturer. Do not use epoxy anchors unless approved by Consultant. Do not field weld at connections with epoxy anchors.

.17 Where drilled anchors are shown on the drawings, but the embedment length is not shown, provide manufacturer's standard embedment length.

2.3 FABRICATION

.1 Conform to CAN/CSA S16 and CSA W59.

.2 Orientate straight beams, which have cambers within allowable mill tolerances so that the resulting beam camber is up.

.3 Install stud anchors in the shop with end welds in accordance with the recommendations of the stud manufacturer. Lengths of studs given on drawings are the lengths after welding. Replace studs that crack in the weld or shank.

.4 Increase thickness of curved sections at no extra cost where necessary to fabricate and galvanize the required curvature or fabricate curved sections from plates at no extra cost where necessary to accommodate the required curvature.

.5 Reinforce holes through webs of beams as indicated on drawings or in accordance with design procedure set forth in the CISC Handbook of Steel Construction provided calculations are submitted as part of the shop drawings.

.6 Provide 16 mm diameter weep holes in base plates at all HSS columns, which are not made watertight or that are to be exposed to temperature changes.

.7 Provide vent holes in HSS sections where required for galvanizing process. Holes are not to exceed 16 mm diameter and are to be located so that any water inside HSS will drain away when HSS is in its final position. After galvanizing, fill vent holes with weld material, grind smooth and touch-up with two coats of zinc-rich paint.

.8 Where shop inspection is required, do not ship material to the site before it has been inspected.

2.4 LINTLS

.1 Structural Drawings do not show all lintels required. Refer to lintel notes and Typical Details on the Drawings.

.2 Provide lintels with a minimum of 150 mm bearing at each end but not less than the length of any specified bearing plate.

.3 .Weld or bolt together multiple member lintels. Provide spacers if separated. If angle seats are at different elevations provide steel packing.

.4 .Connect ends of suspended lintels to the structure and/or build into masonry to provide adequate restraint.

.5 .Connect ends of steel lintels to columns where openings are adjacent to columns.

2.5 PLATES AND ANCHORS

.1 Provide beams bearing on walls with bearing plates and wall anchors as specified.

.2 Weld steel members to bearing plates as required.

.3 Where bearing plate sizes are not noted on the Drawings, design bearing plates for a maximum factored bearing pressure of 1.65 MPa (240 psi) on masonry and 7.5 MPa (1100 psi) on concrete.

.4 Set beam bearing plates 12 mm back from edge of support.

.5 Extend beams for full length of bearing plates.

2.6 SUPPORTS AT COLUMNS

.1 Provide cap plates at tops of columns where required for support of deck, slab, joists or beams.

.2 Provide diagonal or cantilevered angles at sides of columns where required for support of deck or slab.

.3 Provide seat angles for support of masonry lintels above openings adjacent to columns. Unless otherwise noted on the Drawings, provide 76 x 76 x 9.5 steel angles attached to sides of columns. Length of seat to equal width of lintel minus 25 mm.

.4 Provide additional angle welded to column for support of precast or deck interrupted by column.

2.7 PAINTING AND GALVANIZING

.1 Clean steelwork prior to application of paint. Refer to CAN/CSA S16.

.2 Surface preparation in shop for paints shall be as follows:
- .1 Shop paint CISC/CPMA 1-73a: Clean off all grease and oil to SSPC SP1 and remove all loose rust, loose scale, dirt, weld flux, etc. by any suitable method.
- .2 Shop primer paint CISC/CPMA 2-75: Clean off all grease and oil to SSPC SP1. Clean steel to SSPC SP7 Brush-Off Blast Cleaning.
- .3 Zinc-rich primer paint and intumescent paint: Clean off all grease and oil to SSPC SP1. Clean steel to SSPC-SP6 Commercial Blast Cleaning, to an average surface profile of 0.04 mm (1.5 mils) or more.

.3 Apply paint under cover. Steel shall be dry when painted and paint shall be dry before loading for shipment.

.4 Apply zinc-rich primer paint not more than 24 hours after blast cleaning, but prior to any visible rust occurring on the surfaces. Do not apply when relative humidity exceeds 80%. Apply to achieve a dry film thickness of 0.08 mm (3 mils).

.5 Apply one coat of shop paint CISC/CPMA 1-73a to steelwork in the shop with the exception of:
- .1 Members to receive a finish coat of paint on site for which a CISC/CPMA 2-75 shop primer is required
- .2 Members to receive intumescent paint on site for which a compatible shop primer is required
- .3 Members for which zinc-rich paint is specified
- .4 Galvanized members
- .5 Surfaces encased in or in contact with cast-in-place concrete including top flanges of beams supporting slabs
- .6 Surfaces and edges to be field welded for a distance of 50 mm from the joint.
- .7 Contact surfaces of slip-resistant type joints assembled with high-strength bolts.
- .8 Surfaces to receive spray fireproofing

.6 Unless otherwise noted, apply one coat of primer paint (CISC/CPMA 2-75) in the shop for steel to receive a finish coat of paint on site.

.7 Unless otherwise noted, apply one coat of compatible primer paint in the shop for steel to receive intumescent paint on site.

.8 Only paints tested to ASTM E736 and approved by the spray fireproofing supplier may be used for steel which will receive spray fireproofing.

.9 Apply galvanizing to:
- .1 Shelf angles and hangers in exterior walls
- .2 Lintels in exterior walls
- .3 Exposed exterior steel members
- .4 Other steel noted on the Drawings

.10 When welding after galvanizing is in place, grind away galvanizing at areas to be welded. Touch up with two coats of zinc-rich paint.

.11 Apply primer paint to architecturally exposed surfaces without runs or sags. Sand down and repaint areas not acceptable to the Consultant.

.12 Apply touch-up paint after erection to all areas which have been missed, field welded, scraped or chipped using the same paint as the shop coat or primer.

.13 Clean surfaces down to bare metal and apply two coats of zinc-rich touch-up paint to any galvanized surface, which has been damaged or field welded, and which is accepted by the Consultant as being capable of repair without galvanizing.

.14 Clean and prepare surfaces of bolts, which will receive a finished coat of paint in the same manner as the connected steelwork.

.15 At exposed exterior structural steel framing members which are to receive a fire-resistant coating, as specified in Section 09 96 43, apply one coat of zinc-rich primer paint, compatible with specified coating. Over zinc-rich primer, apply "Carboguard 888" primer supplied under Section 09 96 43. Comply with product manufacturer's printed instructions for preparation of steel, application of product (over zinc-rich primer), and handling after application.

2.8 EXPOSED STEEL

.1 Conform to the requirements of the A.I.S.C. Specification for Architecturally Exposed Structural Steel and to the additional requirements given below when fabricating and erecting steel members which will remain permanently exposed to view.

.2 Remove all imperfections which are unsightly from members permanently exposed to view. Remove mill and shop marks.

.3 Provide continuous welding at exposed joints or fill between welds with an approved epoxy resin filler finished to the same profile as the adjacent weld. Joint shall be weathertight and suitable for painting.

.4 Exposed welds shall be smooth. Hide bolts in bolted connections. Where exposed bolted connections are permitted, adjacent bolt heads shall be on same side and extensions of shank beyond nuts shall be uniform and not exceed 20 mm.

.5 Do not mark surface with marks that are visible after painting.

PART 3 – EXEXUTION

3.1 CONSTRUCTION REVIEW

.1 General Review during Construction by the Consultant and Structural Engineer and the services of the independent inspection and testing agencies appointed by the Owner are undertaken so that the Owner may be informed as to the quality of the Contractor's performance and for the protection of the Owner. They will be carried out by examination of representative samples of the Work.

.2 The Contractor will receive copies of the construction review reports and the results of material tests. He will thereby be informed of any defects or deficiencies found. The provision of this information does not relieve the Contractor of his responsibility for the performance of the Contract and he shall implement his own supervisory and quality control procedures.

.3 Bring to the attention of the Consultant and Structural Engineer any defects or deficiencies in the Work, which may occur during construction together with a proposal for remedy. The Structural Engineer will decide what corrective action may be taken. The Consultant will issue the necessary instructions.

3.2 COOPERATION

.1 Cooperate with all engaged on the Project. Exchange with related trades shop drawings and other data required to coordinate and schedule Work. Deliver material for installation by other trades when required.

.2 Provide where shown or required, holes and copings for connection and clearance of the Work of other trades. Show on shop drawings before submitting for review. Holes in members shall not cause any appreciable reduction in strength.

.3 Do not cut holes in the field unless sizes and locations are accepted by the Consultant in each case. Accepted field cutting and welding shall be undertaken by this Trade.

.4 Supply and install framing around openings in steel roof and steel floor decks in accordance with Typical Details and Drawing Notes.

.5 Maintain horizontal bracing and its connections below the underside of the deck so as not to interfere with the seating of the latter.

3.3 EXAMINATION OF WORK

.1 Do not begin operations before making a thorough examination of existing conditions and the Work of related trades. Report inconsistencies before proceeding.

3.4 INSPECTION AND TESTING

.1 The Consultant will appoint an independent inspection and testing agency. Notify the Consultant two weeks in advance of the date when the first Work will be ready for inspection.

.2 Pay for the cost of inspection from the Cash Allowance.

.3 Assist the agency in its work. Do not commence fabrication until details of inspection have been worked out with the inspection agency.

.4 Work will be inspected when erected. Items to be cast into concrete will be inspected on site before being installed.

.5 The inspection agency will submit reports to the Consultant, Structural Engineer, Contractor and Municipal Authorities covering the Work inspected and provide details of errors or deficiencies observed.

.6 Inspection will include:

.1 Checking that the mill test certificates or producer’s certificates are satisfactorily correlated to materials and products supplied for the project or that legible

markings were made on the material and products by the producers in accordance with the applicable material or product standards. Where this is not possible, notify the Structural Engineer and carry out sample tests as described below when required by the Structural Engineer.

.2 Confirming that all materials meet specifications.
.3 Sampling fabrication and erection procedures for general conformity with the requirements of the Contract.
.4 Checking welders' CWB Certification.
.5 Checking fabricated members against specified member shapes.
.6 Checking fabricated members against allowable sweep and camber.
.7 Checking fabricated members against specified camber.
.8 Visual inspection of all welded connections including spot checking of joint preparation and fit up.
.9 Sample checking bolted joints.
.10 Sample checking stud anchors.
.11 Sample checking of drilled concrete and masonry anchors.
.12 Sample checking that tolerances are not exceeded during erection including fit-up of field welded joints.
.13 Inspection of field cutting.
.14 Shop paint, including surface preparation, and field touch-up.
.15 Galvanizing and field touch-up.
.16 Grouting under base plates and bearing plates.

.7 Arrange for the inspector to be present during the welding of 25% of moment connections and 25% of butt welds in direct tension.

.8 Sample testing: When required, test coupons will be taken and tested in accordance with CSA G40.20 to establish identification. Cut samples from member locations selected by Structural Engineer and provide to inspection and testing agency. Make good the locations if requested, at no extra cost, by adding new plates and welds acceptable to the Structural Engineer. The agency will have the samples tested for mechanical properties and for chemical composition and will classify the steel as to specification.

.9 Arrange for the inspector to start field inspection as soon as each section of the Work is completed, plumbed, bolts tightened and field welding finished.

.10 The inspector will check high-strength bolts in a representative 10% of bolted connections by torque testing each bolt. He will torque test 10% of the remaining bolts at random, but not less than 2 bolts in each connection. He will remove nuts from 1% of all bearing bolts and check that thread is excluded from the shear planes.

.11 The inspector will randomly select and pull test 5% of all types and sizes of drilled in anchors installed on a weekly basis, but not less than one anchor of each type and size. Pull test to twice the design tension capacity of the anchor given by the manufacturer. Submit reports to Consultant within one week of testing. Reports to indicate each anchor location, test load and mode of failure, if applicable. Notify Consultant immediately if any anchor fails the pull test.

.12 The inspector will visually check all the adjustable connections at wall supporting members to ensure the connections have been finalized after the concrete is poured.

3.5 FILED MEASUREMENTS

.1 Make field measurements necessary to ensure the proper fit of members.

.2 Identify on shop drawings dimensions, which have been obtained by field measurement.

3.6 ERECTION

.1 Comply with the requirements of CAN/CSA S16.

.2 Submit a description of proposed erection methods and sequence to the Consultant for his records if requested.

.3 Make adequate provision for all loads acting on the structure during erection. Provide erection bracing to keep the structure stable, plumb and in true alignment until the completion of masonry Work and the completion of floor and roof decks which together provide the permanent bracing. Prepare erection bracing drawings signed and sealed by a professional engineer and keep these drawings on site until erection bracing is no longer required.

.4 Set column base plates with levelling screws to the proper elevation ready for grouting. Lift base plates for inspection when so directed.

.5 Column base plates and beam bearing plates shall be grouted as soon as steelwork is completed. Do not add load on steelwork until grouting is completed and grout strength has reached at least 20 MPa.

.6 Do not make permanent connections until as much of the structure as will be stiffened thereby has been properly aligned.

.7 Adjust and finalize connections at wall supporting elements affected by floor beam deflections after concrete is poured.

.8 Report ill-fitting connections to the Consultant before taking corrective measures.

.9 Do not weld in an ambient temperature below -17°C. Preheat material adjacent to welding areas when ambient temperature is between -17°C and +4oc.

.10 Remove slag from all completed welds so that they may be visually inspected.

3.7 DRILLED ANCHORS

.1 Conform to requirements of manufacturer. Use hammer drill to make holes. Turn off hammer when drilling masonry with voids. Hole diameters must never exceed those required by manufacturer. Tighten all expansion anchors using a torque wrench unless finger-tight is required by the Drawings to allow for movement. Unless otherwise noted on drawings, provide manufacturer’s standard embedment length into solid concrete.

.2 Do not cut reinforcement to accommodate anchors. Relocate anchors, at no extra cost to the Contract, when obstructions prevent drilling holes to required depth in locations specified. Obtain Consultant's approval of new location before drilling hole. Fill all abandoned holes with grout.

.3 Arrange for manufacturer's technical representative to be present during installation of first few anchors of each size and type. Submit site reports by manufacturer to Consultant within one week of each visit. Reports to indicate anchor sizes and types installed, locations, and names of those present during installation.

3.8 SUSPENDED LOADS

.1 Do not overstress members supporting suspended loads. Hanger loads shall not exceed one kN (220 pounds). Loads from mechanical and heavy electrical services suspended from the steelwork shall not exceed the load allowance provided for such services and shall be distributed uniformly. Prevent torsion from hangers connected to beams by alternating their positions on either side of members. Do not apply twisting loads to joists and make attachment using U-bolts with double hangers or other devices that will centre the hanger load on the joist. Loads shall only be suspended directly at the panel points of joists, unless the chords of the joists have been specifically designed to support the concentrated loads.

.2 Steel Beams: Vertical loads must be applied so that they do not cause twisting of the beams or excessive bending of the flanges. Lateral loads are not to be applied to beams unless approved in writing by the Consultant's structural engineer.

3.9 REJECTED WORK

.1 Do not deliver to the site materials, which are known not to meet the requirements of the Specifications. If rejected after delivery, remove immediately from site.

.2 Where review reveals materials or workmanship which appear to have failed to meet the specified quality or tolerances, the Consultant shall have the authority to order tests made of materials; to order detailed field surveys and measurements; to order a structural analysis of the existing elements and to load test the structure. All such Work will be carried out in order to assist in determining whether the structure may, in the opinion of the Consultant, be accepted, with or without strengthening or modification. Testing shall meet the requirements of the Ontario Building Code. All expense incurred shall be chargeable to the Contractor regardless of the results.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK

.1	Painting and Coating	Section 09 90 00
.2	Electrical	Division 26, 27, 28

1.2 REFERENCES

.1	CAN/CSA O80-Series	Standards for Wood Preservation
.2	CSA O121	Douglas Fir Plywood
.3	CSA O141	Softwood Lumber
.4	CSA O151	Canadian Softwood Plywood
.5	CSA B111	Wire Nails, Spikes and Staples.
.6	National Lumber Grading Authority (NGLA), Standard Grading Rules for Canadian Lumber	

1.3 DELIVERY AND STORAGE

.1 Do not deliver materials until they are required for incorporation into the work.

.2 Protect materials, under weatherproof cover, both in transit and on site.

.3 All exterior and interior finish materials shall, upon delivery, be neatly stored in a dry place and shall be protected from damage due to weather, water, or any other cause.

1.4 PROTECTION

.1 Protect fire-retardant materials against high humidity and moisture.

.2 Protect cabinets with 6 mm plywood or other suitable sheet material.

.3 Protect installed hardware from damage and blemishes.

PART 2 – MATERIALS

2.1 MATERIALS

.1 Wood materials: straight, sawn square, true, dressed four sides, properly sized and shaped to correct dimensions from nominal sizes indicated or specified.

.2 Lumber grade and moisture content:

.1 Comply with the official grading rules of NLGA for the particular lumber and grade, and structurally complying with the latest requirements of the Ontario Building Code.

.2 Comply with CSA Standard O141 Softwood Lumber. Use only grade marked lumber.

.3 All wood materials:

.1 well-seasoned NLGA, free from defects which impair strength and durability.
.2 Moisture content limit:
.1 S-GRN: Unseasoned
.2 S-DRY: Maximum 19% moisture content
.3 KD: Maximum 15% moisture content

.4 Pressure Treated Lumber to CSA O80.

.5 Blocking, cant strips, grounds, nailing strips:
.1 NLGA No. 2 Ontario White Pine, No. 2 Red Pine, all complying with the grading rules of the NLGA for Construction,
.2 Douglas Fir dense complying with COFI standard grading and dressing rules.

.6 Douglas Fir plywood:
.1 comply with CSA Standard O121, COFI Exterior.
.2 Western softwood plywood - comply with CSA Standard O151, COFI Waterproof glue WSP. Exposed two sides shall be grade G2S, and exposed one side shall be grade G1S.

.7 Wood preservative
.1 Pentox Green preservative and Osmose Cut End preservative, as manufactured by Osmose Pentox Inc.; Pentox Conservator Clear for painted wood.
.2 For painted surfaces use clear type and for concealed surfaces use green tinted type.

.8 Fire Retardant Treatment: To ULC S102; flame spread rating 25 or less.

.9 Rough hardware:
.1 nails, screws, bolts, lag screws anchors, special fastening devices and supports as required for the erection of all carpentry items.
.2 For preservative treated wood, use only stainless steel hardware, with the following exception:
.1 where galvanized steel items, such as gates, flashings, etc., are being attached to wood, galvanized steel fasteners shall be used.
.3 Do not mix stainless steel with galvanized steel; contact of these dissimilar metals can cause galvanic corrosion.
.4 Stainless steel hardware to be type 317.
.5 Galvanized hardware must be hot-dipped galvanized as follows:
.1 fasteners meeting CAN/CSA-G164 minimum zinc coating of 600 g/m2 (ASTMA153 Class A or B1 G 185)
.2 connectors meeting CAN/CSA-G164 minimum zinc coating of 600 g/m2 (ASTM A653 Class G-185 sheet) or better.
.3 Electroplated galvanized hardware is not permitted.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Examine surfaces to receive the work of this Section and proceed only when conditions are satisfactory for a proper installation.

.2 Lay out work carefully and to accommodate work of other trades. Accurately cut and fit; erect in proper position true to dimensions; align, level, square, plumb, adequately brace, and secure permanently in place. Join work only over solid backing.

3.2 INSTALLATION – GENERAL

.1 Provide running members of the longest lengths obtainable.

.2 Slowly feed machine-dressed members using sharp cutters. Provide finished members free from drag, feathers, slivers or roughness of any kind. Remove machine marks by sanding.

.3 Machine sand surfaces exposed in the finished work and hand sand to an even smooth surface free of scratches.

.4 Properly frame material with tight joints and rigidly secure in place. Use glue-blocks were necessary.

.5 Design construction methods for expansion and contraction of the materials.

.6 Conceal joints and connections wherever possible. Locate prominent joints only where directed.

.7 Match joints made on the site with joints made in the shop.

.8 Unless otherwise specified glue and blind screw or nail all work. Set and fill and plug surface screws using matching wood plugs.

.9 Accurately scribe, cope and mitre members where required to produce hairline joints.

.10 Erect work plumb, level, square and to the required lines.

.11 Do not regard blocking, strapping and other rough carpentry indicated as complete or exact. Provide rough carpentry items required for the installation of the Work of other Sections.

.12 The use of pressure treated wood is required for the following:

- .1 Wood in direct contact with the ground or framed into concrete below ground level.
- .2 Structural wood elements within 150mm of ground.
- .3 In termite areas, for all structural wood elements within 450mm of ground.
- .4 Wood framing members without a dampproof membrane separating the wood framing member from concrete in contact with the ground.
- .5 Building components where moisture may accumulate.

.13 Aluminum must not be in direct contact with pressure treated wood. Provide minimum 6mm spacing between aluminum products and treated wood, with10mil polyethylene barrier and polyethylene or nylon spacers.

3.3 INSTALLATION - ROUGH CARPENTRY

.1 Blocking and Grounds: Fasten wood nailers, blocking, bucks, grounds curbs, copings and strapping solidly to supporting materials in true planes so that they will remain straight and not be loosened by work of other Trades.

.2 Framing: Do all wood framing in accordance with the Ontario Building Code -latest version, and to CAN 3 086 as applicable.

.3 Wood Cants, Copings: Fasten wood cant blocking to structure with 19 mm. dia. bolts 760mm o.c. Fasten curbs as indicated. Wood cants, curbs and copings to be preservative treated. Plywood to be exterior grade.

.4 Preservative:

.1 Apply preservative to concealed wood members in contact with exterior walls and roof before fixing in place.
.2 Apply preservative to all cut ends of pressure treated wood.
.3 Preserve all other wood indicated to be preserved. Use clear preservative for items to be painted.
.4 Preserve wood by immersing in preservative for at least one hour.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

.1 All finished wood items and trim, other than custom cabinetry, shown on drawings.
.2 End panels at sides of coat rack and hook assemblies.
.3 Installation of shop fabricated casework, including wood trim pieces and solid millwork trim.
.4 Site fabricated fitments.
.5 Installation of wood and steel doors.
.6 Installation of door hardware and miscellaneous hardware.

1.2 RELATED WORK

.1	Rough Carpentry	Section 06 10 00
.2	Architectural Wood Casework	Section 06 41 13
.3	Plastic Laminate Work	Section 06 41 16
.4	Hollow Metal Doors and Frames	Section 08 11 13
.5	Wood Doors	Section 08 21 10
.6	Door Hardware	Section 08 71 00
.7	Painting and Coating	Section 09 90 00

1.3 REFERENCES

.1 ANSI-A208.1-1993, Particleboard, Mat-Formed Wood.
.2 AWI/AWMAC - 2005, Architectural Woodwork Quality Standards.
.3 CSA-B35.4, Wood Screws.
.4 CSA-B111-1974, Wire Nails, Spikes and Staples.
.5 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
.6 CSA-O115-M1982, Hardwood and Decorative Plywood.
.7 CSA-O121-M1978, Douglas Fir Plywood.
.8 CAN/CSA-O132.2 Series-90 (R1996), Wood Flush Doors.
.9 CAN/CSA-O141-91, Softwood Lumber.
.10 CSA-O151-M1978, Canadian Softwood Plywood.
.11 CSA-O153-M1980, Poplar Plywood.
.12 CAN3-O188.1-M78, Interior Mat-Formed Wood Particleboard.
.13 NHLA, Rules for the Measurement and Inspection of Hardwood and Cypress, January 1986.
.14 NLGA, Standard Grading Rules for Canadian Lumber, 1994.

1.4 SUBMITTALS

.1 Submit samples in accordance with Section 01 33 00 - Submittals.
.2 Samples: sample size shall be 300mm by 300mm or 300mm long unless specified otherwise of each wood species which is to receive finishing at the job site; finished samples of each panel material which has a factory applied finish; PVC edge strip.
.3 Submit Shop Drawings in accordance with Section 01 33 42 - Submittals.

.4 Indicate details of construction, profiles, jointing, fastening and other related details.
.5 Indicate all materials, thicknesses, finishes and hardware.

1.5 DELIVERY AND STORAGE

.1 Protect materials against high humidity and moisture at all times.
.2 Store materials in ventilated areas, protected from extreme changes of temperature or humidity.
.3 Wood door delivery, storage and handling shall be in accordance with AWI/AWMAC Quality Standards.
.4 Delivered materials, which are damaged in any way will be rejected by the Consultant and shall be removed from the site and replaced with acceptable materials.

PART 2 – MATERIALS

2.1 MATERIALS AND ACCESSORIES

.1 Wood materials - straight, sawn square, true, dressed four sides, properly sized and shaped to correct dimensions from nominal sizes indicated or specified.
.2 Lumber grade and moisture content - comply with the official grading rules of NLGA for the particular lumber and grade, and structurally complying with the latest requirements of the Ontario Building Code. Comply with CSA Standard 0141 Softwood Lumber. Use only grade marked lumber.
.3 All wood materials unless noted otherwise - well seasoned NLGA, free from defects which impair strength and durability. Moisture content limit: S-GRN: Unseasoned; S-DRY: Maximum 19% moisture content: KD: Maximum 15% moisture content.
.4 Hardwood Lumber: Select white birch moisture content of 7% or in accordance with:
  .1 National Hardwood Lumber Association NHLA
  .2 AWI / AWMAC custom grade moisture content as specified.
.5 Douglas Fir plywood - comply with CSA Standard O121, COFI Exterior. Exposed two sides shall be grade G2S, and exposed one side shall be grade G1S
.6 Canadian Softwood Plywood - comply with CSA Standard O151, COFI Waterproof glue WSP. Exposed two sides shall be grade S2S and exposed one side shall be grade S1S.
.7 Hardwood plywood - conforming to CSA O115 and AWMAC. Face veneer: plain sliced, bookmatched, Select White Maple, veneer facing with solid core of interior mat-formed wood particleboard to CAN3-O188.1.
.8 Solid Wood Gables at Cubbies and Solid Core Wood Doors: to CSA-O132.2, Plain Sliced, bookmatched, Select White Maple, veneer facing with solid core of interior mat-formed wood particleboard to CAN3-O188.1.
.9 Particleboard: medium density, M-3 grade to ANSI-A208.1.
.10 Poplar Plywood (PP): to CSA-O153, standard construction.
.11 Fasteners:
  .1 Wood screws: electroplated, to CSA-B35.4.
  .2 Nails and Staples: to CSA-B111.
  .3 Splines: metal.
  .4 Adhesives: as recommended by manufacturer.
.12 Melamine Panels:
  .1 Melamine overlay, thermofused under heat and pressure to particleboard core. Colour will be selected by the Consultant.

.2 Overlay shall be bonded to both faces where exposed on two sides, and when the panel material requires a finished surface on one side only, the reverse side shall be overlaid with a plain buff balancing sheet.

.3 Edge finishing: matching 3.2mm PVC edge strip, colour and pattern through full thickness of material.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Examine surfaces to receive the work of this Section and proceed only when conditions are satisfactory for a proper installation.

3.2 INSTALLATION – GENERAL

.1 Provide running members of the longest lengths obtainable.

.2 Slowly feed machine-dressed members using sharp cutters. Provide finished members free from drag, feathers, slivers or roughness of any kind. Remove machine marks by sanding.

.3 Machine sand surfaces exposed in the finished work and hand sand to an even smooth surface free of scratches.

.4 Properly frame material with tight joints and rigidly secure in place. Use glue-blocks where necessary. Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.

.5 Design construction methods for expansion and contraction of the materials. Form joints to conceal shrinkage.

.6 Conceal joints and connections wherever possible. Locate prominent joints only where directed.

.7 Match joints made on the site with joints made in the shop.

.8 Unless otherwise specified glue and blind screw or nail all work. Set and fill and plug surface screws using matching wood plugs.

.9 Accurately scribe, cope and mitre members where required to produce hairline joints.

.10 Erect work plumb, level, square and to the required lines.

.11 Install shop fabricated casework and millwork. Refer to Section 06 41 13 - Architectural Casework.

.12 Install site fabricated fitments as shown on Drawings.

.13 Install wood doors. Refer to Section 08 21 00 - Wood Doors.

.14 Install hollow metal doors. Refer to Section 08 11 13 – Hollow Metal Doors and Frames.

.15 Install door hardware. Refer to Section 08 71 00 - Door Hardware.

.16 Install miscellaneous cabinetry hardware. Refer to Section 06 41 13 – Architectural Casework and Hardware.

3.3 CONSTRUCTION

.1 Provide Fastening:

.1 Position items of finished carpentry work accurately, level, plumb, true and fasten anchor securely.

.2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturers.

.3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round cleanly cut hole and plug with wood plug to match material being secured.

.4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

.2 Shelving: Install shelving on ledgers or shelf brackets, as indicated.

.3 Fabricated Items:

.1 Corridor End Gables at Coat Rack and Hook Assemblies:

.1 To AWI/AWMAC standards for custom quality.

.2 Wood: Solid White Maple with clear transparent finish.

.2 Wood Trim with clear transparent finish:

.1 Fabricate fascias and trims as indicated.

.2 Wood Trim: Select White Maple veneer core plywood with solid White Maple edging for fascia and trim.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

Provide all casework indicated on drawings. Casework shall have melamine finish at both exposed panels and concealed interior faces and edges.

1.2 RELATED WORK

1.	Rough Carpentry	Section 06 10 00
2.	Resilient Base	Section 09 65 00
3.	Painting and Coating	Section 09 90 00
4.	Electrical Work	Division 26, 27, 28

1.3 QUALIFICATIONS

.1 All Work to conform to minimum standard for premium Grade Work as specified in Quality Standards for Architectural Woodwork prepared by Architectural Woodwork Manufacturers Association of Canada.

1.4 INTENT

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

.2 It is also the intent of this Section that all casework be manufactured with low or no VOC products, to minimize VOC emissions in the finished products.

1.5 SUBMITTALS

.1 Submit Shop Drawings of all finish carpentry and in accordance with Section 01 30 00.

.2 Draw Shop Drawings in related and/or dimensional positions with sections. Scale minimum 1:10.

.3 Shop Drawings shall show fabrication details, materials, jointing, description of anchorage and hardware. Dimensions shall be based on actual measurements taken at the Site. Provide details and dimensions for all fittings and the like for mechanical and electrical connections to this work.

.4 Submit product data for all finishes.

.5 Submit samples of materials, construction method and finishes for Consultant's approval. The colour of stain shall be selected by the Consultant; submit prepared 300mm x 300mm finished samples for approval.

.6 Submit samples of all hardware.

.7 Submit one full size sample of proposed units of Type selected by Consultant prior to proceeding with the remainder of cabinet work.

1.6 CO-OPERATION

.1 Co-operate with other Sections and do all cutting, fitting and making good of own work for all Sections as may be necessary to carry out the true intent of the Drawings and Specifications. Examine the work and materials installed by others insofar as it affects this Work, and report to Consultant any such work not done properly.

1.7 OWNER'S EQUIPMENT

.1 Confirm the standard equipment dimensions with the OWNER prior to fabrication for all printer/copiers.

1.8 MEASUREMENTS

.1 Take necessary measurements at the Building of spaces and conditions to which work must conform or through which access is required. Take such measurements prior to fabrication of the Work of this Section and in ample time to avoid delays in the Work.

1.9 DELIVERY AND STORAGE

.1 Do not deliver finished material during rain or damp weather or until "Wet Trades" have completed their work and windows are glazed or covered. Carefully protect from damage of any kind.

1.10 WARRANTY

.1 Provide an extended Warranty to the General Conditions of the Contract to two (2) years from date of Substantial Performance of the Contract.

.2 The warranty shall cover replacing, reworking and/or refinishing to make good defects in architectural woodwork due to faulty workmanship or defective materials, which appear during this two (2) year period. Work showing defects during this period shall be replaced or made good without delay and at no cost to Owner.

PART 2 – MATERIALS

2.1 MATERIALS

1. All wood must be straight and true, dressed 4 sides and conform to details. It must conform to official grading rules of Canadian Lumberman's Association for quality and moisture content. It must conform to NBC Structural requirements and be grade stamped according to CSA Standards 0140 or 0151. Stained woods and plywoods must be selected for colour and grain uniformity.
2. All materials shall be low VOC products.
3. Softwood Lumber: Conform to CAN/CSA 0141 and National Lumber Grades Authority requirements.
4. Hardwood Lumber: Conform to National Hardwood Lumber Association (NHLA) requirements. Provide stain finish to AWMAC Premium Grade. Select white hard maple moisture content 7% or less in accordance with:
   .1 National Hardwood Lumber Association (NHLA)
   .2 AWI/AWMAC premium grade, moisture content as specified.
5. Hardwood Plywood: Conform to CSA 0115 and AWMAC. Select white hard maple, plain sliced and bookmathed face veneer core as specified. Exposed faces to be natural grade per AWMAC. Interior of cupboard and closet doors to be classified as exposed faces.
6. Canadian Softwood Plywood: Veneer plywood conforming to CSA 0151.
7. Douglas Fir Plywood: Veneer plywood conforming to CSA 0121.
8. Poplar Plywood: Veneer plywood conforming to CSA 0153.
9. Wood Particleboard:

   Conform to CAN3-0188.1. fabricated from 100% recycled or recovered wood fibre, containing no added urea formaldehyde, and certified by the Forest Stewardship Council (FSC). Conform to ANSI A208.1/Grade M-2, with formaldehyde emissions of 0.09 ppm or less.

   .1 Nu Green 2 Particleboard as manufactured by Uniboard, or equal by Panolam Industries or Flakeboard.
10. Hardboard: Conform to CGSB 11-GP-3M.
11. Nails and Staples: Conform to CSA B111.
12. Glue: Waterproof synthetic resinous glue, of approved type for general carpentry work and thermo-setting type for plastic laminate work, low VOC emitting. Adhesives shall be free of urea formaldehyde. All adhesives to conform to CSA 0112 Series.
13. Melamine Faced Particleboard: Melamine Faced Particleboard: to CAN3-0.188.1-M78, grade "H" particleboard sanded faces, 13 mm, 16 mm, 19 mm, 28.6 mm and 32 mm thickness, faced with laminated plastic. Melamine resin impregnated cover sheet with coloured and/or patterned paper inner layer. Melamine shall be thermally fused to rigid particle board substrate. Melamine faces shall be 120 Gram Weight Paper. Colour to be Hardrock Maple.
14. Melamine Faced Particle Board Edge Banding: Solid polyvinylchloride (PVC), 3 mm thickness x full width of board, wood core, wood grain type to match melamine face by Canada Wood tape or approved

colour equal. Edging rigid PVC with a measured degree of hardness of " 95 shore D" and thickness of "3mm (+0.15mm, -0.2mm)" with the primer side having a concave measuring 0.10 to 0.25mm.

14. Finish at Base Framing: Rubber base. Refer to Section 09 65 00.

2.2 CABINET HARDWARE

.1 The hardware specified herein is to be provided as listed. Any proposed substitutions must be submitted to the Consultant for approval prior to shop drawing submission. Proposed substitutions must be equal or better quality than the specified items and will be considered at the Consultant's discretion. Hinges must be as specified.

.2 Furnish and install all hardware to custom millwork as follows:

Hardware for 19mm thick closet doors			Finish
Hinges at closet doors	Hettich	Continuous Piano Hinge To suit height of doors	Steel Nickel Plated
Roller Catches	Richelieu	Selekta Pro 2000	603
Pulls, D Pull Type	Richeleu	Functional Steel Pull-332 104mm in length 8mm thick	Brushed Nickel
Closet Door Deadbolt Lock	Hafele	235.08.358 complete with lock cores 210.04.606 and cylinder rosettes 210.04.062	Polished Nickel
Strike Plates	Hafele	239.61.319 gable catch 239.08.705 bottom slot	Black
Elbow Latch & Strike	Richelieu		

Hardware for Adjustable Shelves			Finish
Pin Supports	Richelieu	Metal 7mm round	Nickel

Provide associated matching shelf support accessories.

Other Hardware			Finish
Aluminum Bracket at Coat Rack End Panels	Hettich or Richelieu	Cut to suit.	619
Vents at Uniform Storage Closets	Hafele or Richelieu	Cut to suit	Polished nickel

Coat Rods in Closets. Install in locations indicated.:

.1 Rod: 27mm diameter polished stainless steel tube. Knape and Vogt, KV-660SS.

.2 Flanges: Steel end flanges, finished to match coat rod. Knape and Vogt KV-734CHR.

.3 Intermediate Hangers: Vertical hanger rod, finish to match coat rod. Hangers for rods

spanning more than 1200mm. Knape and Vogt KV-760ANO.

Coat Hooks in Closets: Install in locations indicated.

.4 Typical: Zinc die cast, satin nickel finish, 89mm high with 50mm projection. Häfele Canada Inc.: 885.06.209.

.5 Snap-Down Safety Hook: stainless steel with maximum 50mm projection, with snap-down safety hook.

.1 ASI/Watrous, Inc.: Security Clothes Hook W-123.

.2 Bobrick Washroom Equipment Inc.: Vandal Resistant Clothes Hook B-983.

*Provide locks at all casework door panels.

3. Keying:

.1 All locks in a room to be keyed alike.

.2 Provide 6 extractor keys.

2.3 FABRICATION – GENERAL

.1 Check job dimensions and conditions and notify the Consultant in writing of unacceptable conditions. Do not proceed until remedial instructions are received.

.2 As far as practical, assemble work at the shop and deliver to the job ready for installation. Leave ample allowance for fitting and scribing on the job.

.3 Fabricate work square and to the required lines. Recess and conceal fasteners and anchor heads. Fill with matching wood plugs. All fixed elements must be glued and screwed or dowelled to ensure rigid construction.

.4 Comply with glue manufacturer's recommendations for lumber moisture content, glue life, pot life, working life, mixing spreading, assembly time, time under pressure and ambient temperature.

.5 Provide exposed end grain of solid members and edges of exposed plywood and particleboard with matching solid hardwood edging at least 6.4mm thick.

.6 Make all necessary cut-outs in the millwork for mechanical duct work, electrical switch and outlet boxes and pre-drill all mounting holes for equipment, fittings and outlet boxes. Refer to electrical and mechanical Drawings and specifications.

.7 Provide and install pipe covers, scribing pieces, top, bottom and/or and closures and filler panels where necessary, including wherever units require furring out or blocking to existing conduits, pipes, etc.

.8 Provide trim around mechanical and electrical equipment and other equipment and after installation of equipment.

.9 Provide removable panels to be provided at all pipe chases. End closing panels to be provided at all exposed ends of millwork units and assemblies. Front filler panels to be provided where called for on Drawings and as required by field conditions.

.10 Resilient base around all toe spaces where indicated on the drawings is specified in Section 09 65 00.

2.4 CASEWORK COUNTERS, STORAGE CLOSETS

.1 Casework shall be melamine finish.

.2 All door fronts, front panels, exposed gables and all shelving in open shelving units, shall be thermofused melamine finish. Interiors and concealed gables cabinetry shall be thermofused melamine panels. Melamine to be hardrock maple in colour. Panels to be installed with vertical grain pattern.

.3 All exposed edges of melamine panels to have 3mm PVC edging, in colour to match laminate. All other edges to be sealed and moisture proofed before assembly.

.4 Unless noted otherwise on drawings, provide all floor cabinets with 115mm high base of 19 mm water resistant plywood; melamine panels are not to come into contact with the floor. Provide 115mm high toe space set back from front face of cabinets 115 mm minimum. Provide one coat of sealer to cabinet base; ensure compatibility with base adhesive. Plywood base must be concealed by base.

.5 All cabinet work shall be factory assembled in modular, unitized construction. Carefully machine with dovetailed mortised and tenoned or blind dado joints. Each unit shall be self-supporting and designed to be bolted together with fasteners inside units with plastic plugs over fasteners. All joints to be securely glued. Fabricate units as per Drawings and as specified.

.6 Gables to be 19mm thick panels, with PVC edging on all exposed edges.

.7 Provide top front, top back rails and posts of solid maple hardwood 19mm x 50mm framing members, tongue and grooved together and dadoed to gables.

.8 Bottoms to be 19mm melamine panels, with PVC edging.

.9 Panel doors generally to be flush overlay 19mm melamine faced panels with matching pvc edges all four sides.

.10 Back panels shall be minimum 13mm thick melamine panels, removable within unit where access is required behind. Removable panels to have PVC edge trim, four sides. Where back panels are exposed to view, they shall be 19mm melamine faced panels.

.11 Shelves to be 19mm melamine panels, finished all 4 sides edges, with pvc edging on all four edges.

.12 Sit all adjustable shelves on pilaster clips. Pilasters to be recessed into gables and fastened with screws.

.13 Depth of shelving in cabinets and closets are to be as noted on the drawings; full depth of cabinets and shelving except provide a 10mm gap minimum between shelf edge and interior face of doors. Provide centre pilaster to all shelves 1200mm long or over.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Set and place all materials and components in place, rigid, plumb and secure.

.2 Provide heavy duty fixture attachments for wall mounted cabinets.

.3 Install all shelving and doors.

.4 Apply water resistant building paper over wood framing members in contact with masonry or cementitious construction.

.5 After installation, fit and adjust operating hardware for wood cabinet access door panels.

END OF SECTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

.1 Provide all countertops as indicated on drawings, except where counters are part of equipment specified elsewhere. Countertops shall be plastic laminate finish.

1.2 RELATED WORK

.1	Finish Carpentry	Section 06 20 00
.2	Architectural Wood Casework	Section 06 41 13
.3	Door Hardware	Section 08 71 00
.4	Electrical	Divisions 26, 27, 28

1.3 SUBMITTALS

.1 Refer to Section 01 33 23.

.2 Submit two 300 x 300mm samples of all materials to the Consultant for approval. The samples shall be identified by the project number, date and the name of the contractor the samples shall show colours and details of edging, forming and construction. The materials used in the building shall correspond to the approved samples.

.3 Shop Drawings:

- .1 Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
- .2 Show full-size details, edge details, attachments, etc.
- .3 Show locations and sizes of furring, blocking, including concealed blocking and reinforcement required.
- .4 Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers and other items installed in countertops.

.4 Submit data sheets for particle board, plywood, adhesives, joint sealants, and sealers.

.5 Maintenance Data and Materials:

- .1 Submit manufacturer’s care and maintenance data, including repair and cleaning instructions. Include in project closeout documents.
- .2 Provide maintenance kit for finishes.

1.4 PROTECTION

.1 Refer to General Instructions Section 01 10 00.

.2 Handle and store countertops in accordance with manufacturers recommendations. Countertop surfaces shall be covered with heavy kraft paper, or tops shall be put in cartons for protection during shipment.

.3 If protective film is provided, do not remove until counters have been installed.

.4 Remove any stickers immediately after installation

.5 Protect installed countertop surfaces with heavy kraft paper secured in position with masking tape. Do not remove until final inspection.

.6 Comply with the printed directions, issued by the material manufacturers.

1.5 **WARRANTY**

.1 Plastic laminate work shall be warranted against warping or delamination for a period of two (2) years from the date of Substantial Performance of the Contract.

.2 Work showing defects during the warranty periods shall be replaced or made good without delay and at no expense to the Owner.

PART 2 – MATERIALS

2.1 MATERIALS - PLASTIC LAMINATE COUNTERTOPS

.1 Plastic laminate:

.1 Conforming to CAN3-A172; by Formica and Nevamar as indicated below.
.2 1.6mm (.062") thick, general purpose grade for flatwork and 1.25mm (.050") thick standard postforming grade for shaped profiles and bends; finishes to be sued, solid and wood grain colours as later selected by the Consultant from the manufacturers standard range of colours. Balancing sheet shall be the same thickness as surface sheet and shall be supplied by the same manufacturer.
.3 Plastic Laminate selections are as follows:
Nevamar, Silver Alu Metalx, MXT003T or
Formica, Stainless Brush Finish, 9319-BH or
Wilsonart, Satin Stainless, 4830K-18, Linearity Finish

.2 Cores

.1 Wood products shall be FSC certified, manufactured with no added urea formaldehyde.
.2 Particle board shall be NuGreen 2 NAUF particle board, as manufactured by Uniboard, meeting the requirements of ANSI A208.1 Grade M-2. Surface shall be smooth, dense, and free from loose particles, or defects which will telegraph through the laminate.
.3 Plywood core - fir core, poplar faced, 3, 5, or 7 ply, exterior grade veneer plywood, urea-formaldehyde free. Faces and second ply shall be without voids, or fir plywood conforming to CSA 0121, graded solid faces, 3, 5, or 7 ply.

.4 Provide waterproof cores in countertops with sinks and in all other areas where moisture is possible.

.3 Adhesives:

.1 Formulated for use in decorative laminate fabrication and to suit the conditions of application without failure.
.2 Adhesive conforming to CSA 0112 Series, no added urea formaldehyde; Greenguard Children & Schools certified low emitting products.
.3 Adhesive for countertops where sinks will be installed is to be water resistant.
.4 Adhesive shall be acceptable to the laminate manufacturer.
.5 Plastic Laminate adhesives applied onsite and used within the weatherproofing system must have a VOC content equal to or less than 20 g/L as per section 01 67 00.

.4 Sealant - approved water-resistant sealer or glue, low VOC.

.5 Draw bolts - mechanical devices of approved manufacture which can be recessed into the core of decorative laminated panels and used to draw two parts together for permanently tight joints. Fixing clips - 1.6mm. (16 ga.) steel, galvanized (or prime painted), as detailed.

2.2 FINISH SCHEDULES

.1 Refer to room finish schedule and drawings for details of countertop work.

2.3 PLASTIC LAMINATE COUNTERTOPS

.1 All units shall be shop fabricated. Plastic laminate shall be applied to an approved underlayment with a thermosetting adhesive.

.2 Build work plumb, true and square. Arrange adjacent parts of continuous laminate work to match in colour and pattern.

.3 Obtain the governing dimensions before fabricating items which are to accommodate or abut appliances or equipment.

.4 Veneering of plastic laminate to core material shall be done according to the laminate manufacturer's directions. All veneered work shall be backed with a balancing sheet except where exposed in the finished work, then face veneer to be applied to all exposed surfaces.

.5 Where fabrication is done at the site, laminate and core materials shall be stored in the work area for not less than 48 hours for preconditioning before bonding together.

.6 Form shaped profiles and bends as detailed, using postforming or bending grade according to manufacturer's recommendations. Core and laminate profiles shall coincide to provide continuous support and bond over the entire surface.

.7 Self Edging.

.1 Straight self edging shall be decorative laminate 1.6mm thick.
.2 Curved self edging shall be postformed material or bending grade.
.3 Chamfer exposed edges of laminate uniformly, at approximately 15mm.
.4 Do not mitre the decorative laminate sheet at edges.

.8 Joints:

.1 Locate joints where indicated, where not indicated at approximately 2440 or 3660mm centres also include joints at corners, and changes in superficial area.

.2 Accurately fit decorative laminate together to provide tight, flush, butt joints. Joints in cored. panels shall be made with 6mm blind splines and draw bolts, one draw bolt for widths up to 150mm, two or more draw bolts at maximum 450mm o.c. for widths exceeding 150mm.

.3 Seal the core at joints with sealer.

2.4 CUTOUTS

.1 Provide cutouts as required for inserts, grilles, appliances, outlet boxes, and other fixtures. Radius the internal corners, chamfer the edges, and seal the core.

.2 Provide face finish, to match countertop material, at cutouts for under counter sinks.

2.5 EXAMINATION OF SURFACES AND CONDITIONS

.1 Refer to General Instructions 01 10 00.

.2 Surface and ambient temperatures shall be minimum of 20oC at a relative humidity between 20 to 80%.

PART 3 - EXECUTION

3.1 INSTALLATION – GENERAL

.1 Install all work plumb, true and square, neatly scribed to adjoining surfaces.

.2 Make allowances around periphery and where fixed objects pass through or project into countertops, to permit normal movement without restriction.

.3 Secure work by concealed means in an approved manner (or as detailed). Fasteners shall not be more than 600mm o.c. and 150mm from edges and ends. Where concealed fastening is not possible use stainless steel trim threaded screws with matching cup washers or other approved means.

.4 Sand or chamfer site cut edges of the laminate free from chips. Radius any internal angle cuts. Seal core edges.

.5 Isolate decorative laminate panels from direct contact with exterior metal frames.

.6 Upon completion of installation remove identification marks and clean surfaces. Protect as specified in 1.4 above.

.7 At junction of counter back splash and adjacent wall finishes, apply small bead of sealant.

3.2 TRIM

.1 Decorative laminate trim shall be as detailed. Joints shall be kept to the minimum, with none occurring in lengths under 3000mm. Slightly bevel the laminate edges of joints. Secure trim with adhesive.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Surface preparation.
.2 Underslab vapour retarder.

1.2 RELATED SECTIONS

1.	General Requirements	Division 01
2.	Cast in Place Concrete	Section 03 30 00
3.	Concrete Floor Finishing	Section 03 35 00

1.3 SUBMITTALS

.1 Submit under provisions of Section 01 33 00 – Submittal Procedures.

.2 Submit Product data for the Products specified in this section. Include manufacturer's printed application recommendations and certificate stating that Products meet or exceed specified requirements.

1.4 ENVIRONMENTAL REQUIREMENTS

.1 Apply self-adhering sheet waterproofing at substrate temperatures of +4°C or above. Do not apply to frozen concrete.

1.5 QUALITY ASSURANCE

.1 Submit in writing, a certificate stating that the applicator of the waterproofing membranes specified in this section is recognized by the manufacturer as suitable for the execution of the work.

.2 Install the Products of this section in accordance with the printed instructions of the membrane manufacturer and these specifications.

.3 Maintain one copy of the manufacturer's instructions on site.

.4 The membrane manufacturer's representative shall visit the Place of the Work to provide instructions for and supervision of the work of this section prior to the commencement of the work and during its execution.

.5 Waterproofing components shall be produced by one manufacturer, including sheet membranes, liquid sealants, primers, mastics and adhesives.

1.6 STORAGE AND HANDLING

.1 Store self-adhering membrane on pallets and cover if left outside. Keep materials away from sparks and flames. Store where temperature will not exceed 32 °C for extended periods of time.

.2 Store adhesives and primers at temperatures of 5C and above.

.3 Protect materials from direct sunlight until ready for use.

1.7 WARRANTY

.1 Provide a warranty for waterproofing work in accordance with the Contract Requirements, but for the following time periods.

.2 The applicator shall warrant that the waterproofing system shall stay in place and remain watertight for a period of two years.

.3 The manufacturer shall warrant that the waterproofing system shall remain watertight and shall not leak as a result of faulty materials for a period of five years.

.4 Warranties shall be issued to the Owner within two (2) Working Days following the date of Substantial Performance of the Work.

PART 2 – PRODUCTS

2.1 UNDERSLAB VAPOUR RETARDER AND ACCESSORIES

.1 Underslab Vapour Retarder:
- .1 Stego Industries, LLC: Stego Wrap Class A Vapour Retarder.
- .2 W.R. Meadows of Canada, Sealtight Perminator, 0.254mm thick (10mil).

.2 Joint Tape:
- .1 Stego Industries, LLC: StegoTape
- .2 W.R. Meadows of Canada, Sealtight Perminator Tape, 100mm wide.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Verify substrate surfaces are sound, durable, and free of matter detrimental to adhesion or application of waterproofing system, clean, dry, smooth and free of voids.

.2 Verify items which penetrate surfaces to receive waterproofing are securely installed.

.3 Verify that the floor slab base course is in place and compacted prior to commencing installation of underslab vapour retarder.

.4 Verify that concrete is cured at least 14 days.

.5 Commencement of the work shall mean acceptance of the prepared substrate.

3.2 SURFACE PREPARATION

.1 Protect adjacent surfaces not designated-to receive waterproofing.

.2 Clean and prepare surfaces to receive membranes in accordance with manufacturer's instructions.

.3 Do not apply waterproofing to surfaces unacceptable to manufacturer.

.4 Patch all holes and voids and smooth out any surface misalignments. Remove all sharp protrusions.

3.3 APPLICATION: UNDERSLAB VAPOUR RETARDER

.1 Lay vapour retarder over prepared underslab base course.

.2 Lap sides and ends of sheets 150mm and seal with joint tape.

.3 Seal junctures with walls by folding sheet up for full slab thickness and sealing to wall with joint tape.

.4 Seal around all protrusions.

.5 Where vapour retarder is damaged, patch with a piece of vapour retarder overlapping damaged area by 150mm in all directions. Seal all edges with joint tape.

.6 Install under Ground Floor slab-on-grade except for areas where rigid panel waterproofing is specified.

3.4 INSPECTION AND REPAIR

.1 Inspect and repair waterproofing and vapour retarder system immediately before covering.

.2 Cover tears and inadequate overlays with detail strip and seal the patch edges with pointing mastic.

3.5 BACKFILLING

.1 Backfill against vertical walls immediately after protection board installation.

.2 Use care and caution when backfilling to avoid damaging the applied waterproofing system.

END OF SECTION

PART 1 – GENERAL

1.1 SECTIONS INCLUDES

.1 Rigid Insulation at roof penetrations.

1.2 RELATED SECTIONS

.1	General Requirements	Division 01
.2	Masonry Procedures	Section 04 05 00
.3	Rough Carpentry	Section 06 10 00
.4	Sheet Vapour Retarders	Section 07 26 00
.5	Mechanical	Division 22 and 23

1.3 REFERENCES

.1 ASTM-E96-95, Standard Test Methods for Water Vapour Transmission of Materials.
.2 CGSB 71-GP-24M-77, Adhesive, Flexible, for Bonding Cellular Polystyrene Insulation.
.3 CAN/ULC-S701-1997, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
.4 CAN/ULC-S702-1997, Thermal Insulation, Mineral Fibre, for Buildings.

1.4 SUBMITTALS

.1 Submit 200mm by 300mm samples under provisions of Section 01 33 00 – Submittal Procedures.

.2 If requested by Consultant, submit under provisions of Section 01 78 10 - Closeout Submittals, manufacturer's certificate stating that products meet or exceed specified requirements.

1.5 MOCKUP

.1 Mockup is specified in Section 04 05 00 - Masonry Procedures.

.2 Coordinate with all trades involved in exterior wall work to incorporate specified insulation and insulation accessories in the mockup panel.

1.6 PRE-INSTALLATION MEETING

.1 Convene a pre-installation meeting one week prior to commencing work of this section.

.2 Request attendance of parties directly affecting work of this section.

.3 Review conditions of installation, installation procedures, procedure for inspection and coordination of work with related sections.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Store, handle and protect products under provisions of Division 01 – General Requirements.

.2 Minimize the time polystyrene insulation products are stored or exposed to sunlight at project site.

.3 Store products away from construction activity and sources of ignition.

.4 Protect products from damage during handling, installation and at point of installation.

1.8 WARRANTY

.1 Submit a warranty for insulation work in accordance with the Contract Requirements, but for a period of two (2) years.

.2 The warranty shall cover defects in materials, installation, and workmanship.

.3 Warranties shall be issued to the Owner within two (2) Working Days following the date of Substantial Performance of the Work.

PART 2 - PRODUCTS

2.1 INSULATION

.1 Rigid Insulation for Interior Applications at exterior walls and at mechanical dog house:
- .1 Extruded polystyrene to CAN/ULC-S701, Type 3, thickness as indicated on architectural drawings.
- .2 Thermal Resistance: RSI value of 0.87 per 25mm thickness.
- .3 Dow Chemical Canada Inc.: Styrofoam Styrospan.
- .4 Owens Corning Canada Inc.: Celfort 200.

2.2 ADHESIVES

.1 Adhesive (for polystyrene): to CGSB 71-GP-24. Bakor Inc.: Air-Bloc 21.
.2 Adhesive (for insulation clips): Rubber resin, solvent type. Bakor Inc.: 230-35 Insulation Clip Adhesive.

2.3 ACCESSORIES

.1 Air Seal: As specified in Section 07 26 00 – Sheet Vapour Retarders.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Verify that building substrate surfaces, adjacent materials and installation conditions are ready to accept the work of this section. Ensure insulation materials and surfaces are dry.

.2 Verify that substrate is flat, sound, clean and free of objectionable air surface voids, fins, irregularities, and materials or substances that may impede adhesive bond.

.3 Notify Consultant upon completion of installation of vapour retarder and air seal to allow inspection before insulating material is installed or work is obscured.

.4 Beginning of installation shall mean acceptance of substrate.

3.2 PREPARATION

.1 Clean substrates of substances harmful to insulation.

3.3 INSTALLATION – GENERAL

.1 Keep insulation a minimum of 75mm from light fixtures and heat emitting devices.

.2 Use boards of largest possible dimensions to reduce the number of joints. Boards with chipped and broken edges are unacceptable.

.3 Offset both vertical and horizontal joints in multiple layer applications

.4 Apply adhesives in accordance with manufacturer's instructions. Attach boards prior to skinning of adhesive.

3.4 INTERIOR APPLICATIONS

.1 Apply adhesive in three continuous beads each board length. Apply adhesive fully around protrusions.

.2 Install boards on wall surface, vertically between steel "Z" - stud furring.

.3 Stagger end joints. Butt edges and ends tight to adjacent boards and to protrusions.

.4 Extend boards across control and expansion joints, unbonded to substrate for 75mm on one side of joint.

.5 Install vapour retarder in accordance with Section 07 26 00 - Sheet Vapour Retarders.

3.5 PROTECTION

.1 Protect insulation and vapour retarders under provisions of Section 01 51 00 - Temporary Barriers and Controls.

.2 Do not permit work to be damaged prior to covering insulation. Protect from harmful weather exposures and physical abuse.

.3 Provide temporary coverings or enclosures when insulation will be subject to damage and cannot be protected by permanent construction immediately after installation.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDED

.1 Batt Insulation.

1.2 RELATED SECTIONS

.1	Division 1 - General Requirements.	
.2	Rough Carpentry	Section 06 10 10
.3	Sheet Vapour Retarders	Section 07 26 00
.4	Fire Stopping and Smoke Seals	Section 07 84 00
.5	Non – Structural Metal Framing	Section 09 22 00
.6	Mechanical	Division 23

1.3 REFERENCES

.1 CAN/ULC-S702-1997, Thermal Insulation, Mineral Fibre, for Buildings.

PART 2 – PRODUCTS

2.1 INSULATION

.1 Batt Insulation:

- .1 Mineral fibre to CAN/ULC-S702, Type 1-unfaced, thickness as indicated.
- .2 Thermal Resistance: RSI value of 2.1 per 89mm thickness.
- .3 Acceptable Products:
  - .1 CertainTeed Insulation Canada Inc.: Sustainable Insulation Fibre Glass Building Insulation.
  - .2 Owens Corning Canada Inc.: EcoTouch Pink Fiberglas Insulation.

2.2 ACCESSORIES

.1 Insulation Clips: Impale type, perforated 50mm by 50mm cold rolled galvanized carbon steel 0.8mm thick, spindle of 2.5mm diameter annealed steel, length to suit insulation, 25mm diameter washers of self-locking type.

.2 Retaining Mesh: Galvanized steel, hexagonal wire mesh.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Verify that substrate surfaces, adjacent materials and installation conditions are rec1dy to accept the work of this section. Ensure insulation materials and surfaces are dry.

.2 Beginning of installation means acceptance of substrate and conditions.

3.2 INSULATION INSTALLATION

.1 Supply insulation to Section 06 10 10 - Rough Carpentry as required for building-in to work of that section.

.2 Install insulation to maintain continuity of thermal protection and acoustical separation of building elements and spaces.

.3 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation. Trim insulation neatly to fit spaces.

.4 Do not compress insulation to fit into spaces. Install in spaces without gaps or voids.

.5 Install friction fit insulation tight to framing members.

.6 On sloping surfaces or in ceiling applications retain insulation in place with impale type fastener spaced at 600mm on centre. Adhere fastener to substrate with adhesive compatible with fastener and substrate.

.7 In unfinished unexposed applications retain insulation in place with wire mesh secured to framing members with fasteners appropriate for framing material.

.8 Keep insulation minimum 75mm from heat emitting devices such as recessed light fixtures.

.9 Notify the Consultant upon completion of insulation installation to allow for inspection before work is enclosed and obscured.

3.3 PROTECTION

.1 Protect insulation under provisions of Section 01 56 00 -Temporary Controls.

.2 Protect insulation from harmful weather exposures and physical abuse.

.3 Provide temporary coverings or enclosures when insulation will be subject to damage and cannot be protected by permanent construction immediately after installation.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDED

.1 Sheet vapour retarders.
.2 Vapour retarder accessories.

1.2 RELATED SECTIONS

.1	General Requirements	Division 01
.2	Board Insulation	Section 07 21 13

1.3 REFERENCES

.1 CAN/CGSB-19.21-M87, Sealing and Bedding Compound, Acoustical.
.2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

PART 2 – PRODUCTS

2.1 SHEET VAPOUR RETARDER

.1 Polyethylene Film: to CAN/CGSB-51.34, 0.15mm thick.

2.2 ACCESSORIES

.1 Joint Sealing Tape: air resistant pressure sensitive adhesive tape, type recommended by vapour retarder manufacturer, 50mm wide for lap joints and perimeter seals, 25mm wide elsewhere.

.2 Sealants: Non-drying, non-hardening synthetic rubber to CAN/CGSB-19.21. Acceptable Product: Tremo Ltd., Tremco Acoustical Sealant.

.3 Staples: minimum 6mm leg.

PART 3 – EXECUTION

3.1 INSTALATION

.1 Ensure services are installed and inspected prior to installation of retarder.

.2 Install sheet vapour retarder where indicated on warm side of exterior wall, ceiling and floor assemblies prior to installation of wall finish to form a continuous vapour retarder.

.3 Use sheets of largest practical size to minimize joints.

.4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

3.2 EXTERIOR SURFACE OPENINGS

.1 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

3.3 PERIMETER SEALS

.1 Seal perimeter of sheet vapour retarder as follows:
- .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
- .2 At metal stud substrate apply bead of sealant at each stud. Lap sheet over sealant and press into sealant bead. Affix sheet temporarily with joint sealing tape.
- .3 At wood substrate install staples through lapped sheets at sealant bead into substrate.
- .4 Use only enough fasteners to ensure sheet remains in place until wall finish is installed.
- .5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.4 LAP JOINT SEALS

.1 Seal lap joints of sheet vapour barrier as follows:
- .1 Attach first sheet to substrate.
- .2 Apply continuous bead of sealant over solid backing at joint.
- .3 Lap adjoining sheet minimum 150mm and press into sealant bead.
- .4 At metal stud substrate install joint sealing tape to cover joint completely.
- .5 At wood substrate install staples through lapped sheets at sealant bead into substrate.
- .6 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDED

.1 Membrane air seal materials and installation methods.
.2 Air seal materials to bridge and seal openings and penetrations at roofing penetrations.

1.2 RELATED SECTIONS

.1	General Requirements	Division 01
.2	Masonry Procedures: Masonry wall construction	Section 04 05 00
.3	Masonry Accessories	Section 04 05 23
.4	Board Insulation	Section 07 21 13
.5	Sealants: Sealant materials and installation techniques	Section 07 92 00
.6	Fire Stopping and Smoke Seals: Fire stopping materials	Section 07 84 00

1.3 REFERENCES

.1 CAN/CGSB-19.13M-M87, Sealing Compound, One Component, Elastomeric Chemical Curing.
.2 CGSB-19-GP-14M-84, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.
.3 CAN/CGSB-19.18M-M87, Sealing Compound, One Component, Silicone Base, Solvent Curing.
.4 CAN/CGSB-19.24-M90, Multi-Component, Chemical Curing Sealing Compound.
.5 Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification.

1.4 SUBMITTALS

.1 Submit samples of air barrier material in accordance with Section 01 33 00 - Submittals.

.2 Manufacturer's Installation Instructions: Submit indicating preparation, installation requirements and techniques, product storage and handling criteria.

.3 Inspection Company Reports: Submit reports on air barrier membrane installation as it progresses.

1.5 QUALITY ASSURANCE

.1 Perform Work in accordance with Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification.

.2 Air barrier applicators shall be licensed or approved by the membrane material manufacturer.

.3 Air barrier materials and accessory materials shall be from the Product line of one manufacturer.

1.6 QUALIFICATIONS

.1 Applicator: Company specializing in performing work of this section approved and trained by materials' manufacturers.

.2 The applicator shall have proven experience in the work of this section for jobs of similar size.

1.7 MOCKUP

.1 Co-ordinate with Section 04 05 00 - Masonry Procedures to provide mockup of air barrier materials under provisions of Section 01 45 00 - Quality Control.

.2 Allow 48 hours for inspection of mockup by Consultant before proceeding with air barrier work.

1.8 PRE-INSTALLATION CONFERENCE

.1 Convene one week prior to commencing work of this section.

.2 The meeting shall cover the work of other sections directly affecting this section, substrate preparation and acceptance, material storage and handling, air barrier installation and interfaces with other wall components, criteria for air barrier system acceptance, and any special conditions that may affect this work.

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Do not install solvent curing sealants or vapour release adhesive materials in enclosed spaces without ventilation.

.2 Maintain temperature and humidity recommended by materials manufacturers before, during and after installation. Ensure materials are stored at a minimum temperature of 5C.

1.10 SEQUENCING AND COORDINATION

.1 Sequence work to permit installation of materials in conjunction with related materials and seals.

.2 Coordinate work of this section with all sections referencing this section.

1.11 WARRANTY

.1 Provide a warranty in accordance with the Contract Requirements, but for a period of two (2) years.

.2 The warranty shall cover defects in material, installation, and workmanship.

.3 Warranties shall be issued to the Owner within two (2) Working Days following the date of Substantial Performance of the Work.

PART 2 – PRODUCTS

2.1 AIR BARRIER MATERIALS

.1 Membrane Air Barrier - Typical: Self-adhesive, rubberized asphalt bonded to sheet polyethylene, nominal total thickness of 1mm to 1.5mm.
- .1 Henry Company Canada: Blueskin SA.
- .2 Soprema Inc.: Sopraseal Stick 1100T.
- .3 W.R. Grace & Co. of Canada Ltd.: Perm-A-Barrier.
- .4 W.R. Meadows of Canada Ltd.: Sealtight Air-Shield.

.2 Vapour Permeable Air Barrier: Fluid-applied vapour permeable air barrier membrane.
- .1 BASF Corporation: Enershield-1.
- .2 Henry Company Canada: Air-Bloc 31.
- .3 Tremco Incorporated: ExoAir 220.
- .4 W.R. Grace & Co. of Canada Ltd.: Perm-A-Barrier VP.
- .5 W.R. Meadows of Canada Ltd.: Air-Shield LMP.

.3 Sheet Steel Air Barrier: Galvanized steel, 2275 zinc coating, 1.5mm core steel thickness.

2.2 SEALANTS

.1 Sealants: Refer to Section 07 92 00 - Sealants.

.2 Sealant Primer: Recommended by sealant manufacturers.

.3 Substrate Cleaner: Non-corrosive, type recommended by sealant manufacturer, compatible with adjacent materials.

2.3 MASTIC AND PRIMER

.1 Mastic: Compatible with membrane air barrier and substrate, thick mastic of uniform consistency.
- .1 Henry Company Canada: Blueskin Sealant.
- .2 Soprema Inc.: Sopramastic 200.
- .3 W.R. Grace & Co. of Canada Ltd.: Bituthene Mastic.
- .4 W.R. Meadows of Canada Ltd.: Sealtight Pointing Mastic.

.2 Primer: Compatible with membrane air barrier and substrate.
- .1 Henry Company Canada: Bakor Blueskin Primer.
- .2 Soprema Inc.: Elastocol 700 Primer.
- .3 W.R. Grace & Co. of Canada Ltd.: Perm-A-Barrier Primer.

.4 W.R. Meadows of Canada Ltd.: Sealtight Mel-Prime.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Verify that substrate surfaces are dry and clean and conditions are ready to accept the work of this section.

.2 Commencement of work implies the acceptance of substrate surfaces.

3.2 PREPARATION

.1 Remove loose or foreign matter which might impair adhesion of materials.

.2 Clean and prime substrate surfaces to receive air barrier membrane in accordance with manufacturer's instructions.

.3 Prime only substrate surface that can be covered with membrane the same day.

3.3 INSTALLATION OF MEMBRANE AIR BARRIER

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

.2 Seal joints and perimeter edges of sheet steel air barrier.

.3 Co-operate with other trades to ensure continuity of air barrier membrane at junctions of different components and constructions.

.4 Stagger end laps to avoid four-way joints in air barrier membrane.

.5 Apply a bead of mastic to end laps, application terminations, and around all penetrations of the membrane.

.6 Ensure air barrier membrane js lapped and sealed onto window, curtain wall, and door frames.

.7 At the end of each day ensure that the work of this section is protected from adverse weather and other mechanical damage.

3.4 APPLICATION OF VAPOUR PERMEABLE AIR BARRIER

.1 Mix air barrier material until thoroughly blended in conformance with the manufacturer's printed instructions.

.2 Spot all fasteners and sheathing joints, terminations, inside and outside corners with mixed air barrier material.

.3 Place and centre the manufacturer's recommended sheathing fabric at all sheathing joints, terminations, inside and outside corners. Ensure sheathing fabric extends evenly on both sides of sheathing joint.

.4 Lap sheathing fabric 65mm minimum at intersections.

.5 Allow to dry to the touch before applying the air barrier membrane to the entire wall surface.

.6 Apply air barrier membrane to wall surface with. roller, brush, or spray gun to a consistent even coating that is free of voids and pin holes. Follow the manufacturer's printed application recommendations.

.7 Thickness of membrane shall be sufficient to achieve the required air barrier performance requirements.

3.5 PROTECTION OF FINISHED WORK

.1 Protect finished work under provisions of Section 01 61 00 - Product Requirements.

.2 Do not permit adjacent work to damage work of this section.

3.6 FIELD QUALITY CONTROL

.1 Inspection: An inspection and testing company selected by the Owner will inspect and report on the installation of the air barrier system.

.2 The cost of inspection services will be paid from the cash allowance specified in Section 01 21 00 – Allowances.

3.7 SCHEDULE

.1 Wall Air Seal Over Outer Surface of Inner Wythe of Masonry or Concrete: Membrane air barrier over masonry unit or concrete surface, seal masonry anchor and other penetrations air tight.

.2 Window Perimeter: Lap and seal air barrier membrane onto window frames and fill space between frames and wall with air barrier foam sealant and elastomeric sealant as specified in Section 07 92 00 - Sealants.

.3 Wall and Roof Junction: Lap wall membrane air barrier onto roof deck with 150mm of contact over firm bearing. Lap roof air seal membrane over wall membrane air barrier with 100mm of full contact.

.4 Junctions between dissimilar materials: Where shown on Drawings install sheet steel air barriers to configuration shown. Lap and seal air barrier membranes over sheet steel air barrier providing a minimum of 100mm contact.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

.1 Conventional Built-up Felt and Asphalt Roofing to match existing roofing assembly for repairs and patching of existing roofing assembly at roof penetrations.

.2 Roof Insulation; confirm existing and match existing thickness and R Value.

1.2 RELATED SECTIONS

.1	General Requirements.	Division 01
.2	Rough Carpentry	Section 06 10 00
.3	Metal Flashing and Trim	Section 07 62 00
.4	Sealants	Section 07 92 00
.5	Mechanical	Division 22, 23

1.3 PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION

.1 Section 07 62 00 - Metal Flashing and Trim: Scupper boxes and stack jack flashing.

.2 Division 22, 23 - Mechanical: Supply of mechanical equipment curbs, pipe and sleeve flashing and vent stack covers.

1.4 REFERENCES

.1 ASTM-C728-97, Standard Specification for Perlite Thermal Insulation Board.

.2 ASTM-C1177/1177M-99, Standard Specification for Glass Mat Gypsum Substrate for use as Sheathing.

.3 ASTM-D1863-93, Standard Specification for Mineral Aggregate Used on Built-up Roofs.

.4 ASTM-D2178-97a, Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.

.5 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.

.6 CGSB-37-GP-9Ma-83, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.

.7 CGSB-37-GP-ISM-84, Application of Asphalt Primer for Asphalt Roofing, Dampproofing and Waterproofing.

.8 CAN/CGSB-37.29-M89, Rubber-Asphalt Sealing Compound.

.9 CGSB-37-GP-56M-80, Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.

.10 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.

.11 Canadian Roofing Contractors' Association (CRCA), Roofing Specifications Manual, 1997

.12 CSA-A82.27-M1977, Gypsum Board Products.

.13 CSA-A123.3-M1979, Asphalt or Tar Saturated Roofing Felt.

.14 CSA-A123.4-M1979 (R1992), Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems.

.15 CSA-A231.1-1972, Precast Concrete Paving Slabs.

.16 CAN/CSA-A247-M86 (R1996), Insulating Fiberboard.

.17 CSA-B35.3-1962, Tapping and Drive Screws (Slotted and Recessed Head, Thread).

.18 CAN/ULC-S704-01, Standard Specifications for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

.19 CAN/ULC-S770-00, Standard Test Method for Determination of Long Term Thermal Resistance (LTTR) of Closed Cell Thermal Insulating Foams.

1.5 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:
- .1 Indicate roof assembly, flashing, control joints, expansion joints, and tapered insulation details.
- .2 Provide layout for tapered insulation showing the direction of flow, percentage of slopes, and board thicknesses.

.3 Product Data: Submit product data for membrane, flashing and bitumen materials.

.4 Samples: Submit samples of roofing materials, Samples shall be standard factory samples.

.5 Provide a work schedule, names of Project manager and site foreman, and the number of roofing crews for the Work. Changes in personnel shall be indicated in writing to the Owner.

1.6 INSPECTION REPORTS

.1 Submit roof inspection reports prepared by the inspection and testing company.

.2 At completion of roofing installation submit a certificate of acceptance issued by the inspection and testing company.

1.7 QUALITY ASSURANCE

.1 Qualifications:

- .1 Work shall be executed by a Subcontractor who has adequate plant, equipment and skilled tradesman to perform it expeditiously.
- .2 Roofing Subcontractor shall have provided satisfactory installations similar to that specified during the past five years. Submit, if requested, written list of successfully completed projects.
- .3 Roofing Subcontractor must be a member of the O.1.R.C.A. or C.R.C.A.
- .4 Applicators shall have a minimum of five years experience in the installation of modified bituminous membrane materials.

.2 Pre-installation Meeting:

- .1 Arrange for a job site meeting to be held during the week before the roofing starts.
- .2 Owner's representative, the Contractor, Roofing Subcontractor's representative, inspection and testing company representative, and the Consultant are to be in attendance.
- .3 Notify parties a minimum of 5 working days prior to meeting.
- .4 Agenda shall include the following:
  - .1 Review and clarification of specifications;
  - .2 Review and clarification of details;
  - .3 Accessibility and proper working area;
  - .4 Application requirements;
  - .5 Work to be completed before roofing begins.
  - .6 Owner's requirements for roofing work on occupied buildings.

.3 Manufacturer's Certification: The roofing materials manufacturer shall provide on-site inspection and certification of the roofing installation in accordance with Section 01 60 00 - Product Requirements.

1.8 STORAGE AND HANDLING

.1 Provide and maintain dry, off-ground weatherproof storage.

.2 Store materials on supports to prevent deformation. Stand roll materials on end.

.3 Remove only in quantities required for same day use.

.4 Store materials in accordance with manufacturers' written instructions.

.5 Identify all materials with manufacturer's labels and store on raised platforms, protected from sunlight, weather and deleterious materials, using breathable tarpaulins tied with rope. Manufacturer's shrink wrap or plastic shrouds are not acceptable.

.6 Roofing materials that become wet shrink, curl, or otherwise deteriorate shall not be used and shall be marked with paint by the roofing inspector and shall be counted and retained on site until completion of the roofing work. Do not store any materials on roofing surface.

1.9 IDENTIFICATION AND DELIVERY

.1 Use only new materials. All roofing membrane materials shall be from one manufacturer.

.2 Indicate the following on containers or wrappings of materials:
- .1 Manufacturer's name and brand.
- .2 Compliance with applicable standard.
- .3 Mass where applicable.

.3 Deliver materials in original containers, sealed, with labels intact. Ensure that shelf life of materials has not expired.

.4 Deliver fasteners in boxes or kegs and keep in protective storage until used. Do not oil or grease fasteners.

.5 Supply three copies of purchase orders to the Consultant. Include following data:
- .1 Purchase order number.
- .2 Supplier's name and address.
- .3 Purchaser's name and address.
- .4 Contract number and job number.
- .5 Material and governing specification including type, grade, colour, class and quantity.
- .6 Bills of lading for liquid asphalt showing Equiviscous Temperature (EVT), Flash Point Temperature (FP) and Final Blowing Temperature (FBT).
- .7 Shipping instructions.
- .8 Destination.

.6 Store all damaged or rejected materials on site until completion of the work of this section.

1.10 ENVIRONMENTAL REQUIREMENTS

.1 Do not install built-up bituminous membranes when air and substrate temperature remains below 5°C and in accordance with manufacturer's recommendations or when wind chill gives equivalent cooling effect.

.2 Install built-up bituminous membranes on dry substrate, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into the system.

.3 Ensure that the temperature of the substrate and its moisture content conforms to manufacturer's minimum requirements, before proceeding with work.

1.11 PROTECTION

.1 Training:

.1 The Roofing Subcontractor shall thoroughly train all personnel in the recommended safety procedures for the use of kettles, asphalt moppings, propane torching, and the application of roofing Products.

.2 All applicators of modified bituminous roof membranes shall have attended appropriate training for the safe installation of the materials.

.3 The Contractor shall train all personnel in the proper use fire extinguishers as well as fire prevention and related fire-fighting procedures.

.4 The Contractor shall train all personnel on first aid procedures.

.2 Propane Torch Precautions:

.1 The Contractor shall train all personnel in the proper set up and use of propane and torch equipment.

.2 The torch operator shall maintain control over the torch flame at all times.

.3 Provide at least one fully charged 9kg type ABC rated fire extinguisher for each torching device on the roof. The fire extinguishers shall be stored in the immediate work area away from where the propane is being stored.

.4 Never torch directly to combustible materials. Personnel shall exercise extreme caution around the exposed edges of insulation to prevent flames from coming in contact with combustible materials.

.5 Do not use torching equipment in confined spaces or areas without sufficient ventilation.

.6 Conduct fire prevention inspections periodically during installation. A minimum one (1) hour fire watch shall be conducted after the last torch has been extinguished for the day.

1.12 WARRANTY

.1 Roofing Subcontractor's Warranty:

.1 Submit a warranty for Built-up Bituminous Roofing and membrane flashings in accordance with the General Conditions, but for a period of two (2) years.

.2 The warranty shall cover materials, labour, and workmanship and include repair or replacement of all defective work, and other work damaged due to faulty or defective work, not directly attributable to normal weathering.

1.13 COMPATIBILITY

.1 Compatibility between components of the system and adjacent materials is essential.

.2 Provide written declaration to Consultant stating that materials and components, as assembled in system, meet this requirement.

1.14 SOURCE QUALITY CONTROL

.1 Submit laboratory test reports in accordance with Section 01 45 00-Quality Control.

.2 Submit laboratory test reports certifying compliance of bitumens and roofing felts with specification requirements.

PART 2 – PRODUCTS

2.1 SOFFIT SHEATHING - ROOF BOARD

.1 Water resistant and silicone-treated gypsum board with glass fibre mat facing, square edges, in conformance to ASTM-Cl 177, 16mm thick, square edges.
.2 Acceptable Products:
  .1 CGC: Securock Roof Board.
  .2 G.P. Gypsum Corporation: Dens-Deck, Fireguard, Prime.

2.2 PRIMERS

.1 Asphalt Primer: to CGSB-37-GP-9Ma.
.2 Acceptable Products:
  .1 GAF Materials Corporation: GAF Matrix 307 Primer.
  .2 IKO Industries Ltd.: Roofcraft Asphalt Primer.
  .3 Johns Manville Inc.: Concrete Primer.

2.3 VAPOUR RETARDER

.1 Self-adhesive, SBS modified bituminous membrane, to CGSB-37-GP-56M, 0.8mm thick, with a laminated woven polyethylene top surface and self-adhesive bottom surface protected with a silicone release film. Manufacturer's recommended vapour retarder primer for porous surfaces.
.2 Acceptable products:
  .1 Henry/Bakor Company: Vaopor-Bloc SA.
  .2 Soprema Inc.: SOPRAVAP'R.

2.4 BUILT-UP ROOFING MEMBRANE

.1 One ply organic felt and asphalt built-up conventional roof overlay.

.2 Four ply glass fibre and asphalt built-up conventional membrane roof system.

2.5 BITUMEN

.1 Asphalt: to CSA-A123.4, Type 2 and 3.

.2 Rubberized Asphalt: SEBS (Styrene-Ethylene-Butylene-Styrene) polymer modified asphalt 100% solid, breaking ultimate elongation of at least 1300% at 25°C, cold bending down to -29°C, average softening point from 90.6° to 98.9°C.

.3 Acceptable Material:
- .1 Type 2: for slopes up to 1:8.
- .2 Type 3: for slopes over 1:8.
- .3 Rubberized asphalt: for flashings.

2.6 FELTS

.1 Saturated Organic Felts: to CSA-A123.3 No. 15. Perforated Asphalt Felts.

.2 Inorganic Glass Fibre Felts: to ASTM-D2178.
- .1 GAF Materials Corporation: GAFGlasIV.
- .2 IKO Industries Ltd.: Type IV Glass Ply Sheet.
- .3 Johns Manville Inc.: GlasPly IV.

2.7 ROOF INSULATION - ISOCYANURATE (URETHANE), FACED

.1 Type: closed cell polyisocyanurate foam board insulation, meeting the requirements of CAN/ULC-S704, Type 3, Class 2, HCFC free, meeting ULC testing and CCMC test evaluation requirements and FM 4450 requirements for Class1 fire and 1-60 windstorm classifications. Facing: organic/inorganic felt facers. Thickness as required to provide RSI value indicated on Drawings based on a RSI value (LTTR) of 1.00 per 25mm thickness when determined in accordance with CAN/ULC-S770.

.2 Board Size: 1.2m by 2.4m maximum board size for mechanically attached insulation boards.

.3 Board Thickness: 51mm maximum for each layer. When larger total thicknesses are necessary to achieve the minimum RSI value indicated on the Drawings, install insulation in multiple layers to achieve the total required thickness.

.4 Acceptable Products:
- .1 Atlas Roof Corporation: ACFoam-11 Roof Insulation.
- .2 GAF Materials Corporation: EnergyGuard Polyiso Insulation.
- .3 IKO Industries Ltd.: IKOTherm Polyisocyanurate Insulation.
- .4 Johns Manville Inc.: ENRGY 3 Roof Insulation.

2.8 TAPERED INSULATION

.1 To CAN/CSA-A247, Fibreboard Type 1- roof board, multiple-ply, asphalt impregnated, slopes as indicated.

.2 Acceptable Products:
- .1 Accu-Plane Systems Inc.: Accu-Board.
- .2 Everest Supply Inc.: Everslope Tapered Fibreboard Roof Insulation.
- .3 Posi-Slope Enterprises Inc.: Posi-Slope Regular Density Fibreboard.

2.9 FIBREBOARD OVERLAY

.1 To CAN/CSA-A247, Type 1-roofboard, multiple-ply, asphalt impregnated fibreboard, 25mm thick with shiplapped edges.

.2 Minimum Density: 272 kPa.

.3 Board Size: 610mm by 1220mm.

2.10 SEALERS

.1 Plastic Cement: asphalt, to CAN/CGSB-37.5. Acceptable Products:
- .1 GAF Materials Corporation: Matrix Standard Plastic Roof Cement No.203.
- .2 IKO Industries Ltd.: Roofcraft Plastic Cement.
- .3 Johns Manville Inc.: Industrial Roof Cement.

.2 Sealants: Refer to Section 07 92 00 - Sealants.

2.11 PRECAST CONCRETE PAVERS

.1 Concrete Pavers: Solid, hydraulically pressed concrete to CAN/CSA-A231.1 air entrained, minimum weight 60kg/m² non-slip finish, 450mm by 450mm minimum in size.

.2 Acceptable Product: Brooklin Concrete Products Limited, Landscaping Paving Slab, natural finish, natural colour.

2.12 PAVER PEDESTALS

.1 Pedestals and levelling plates made of high density polyethylene with integral spacer ribs on upper surface.

.2 Acceptable Product: Pave-El Paver Pedestals, model No.7X, manufactured by Envirospec Inc.

2.13 PROTECTION BOARD

.1 Multi-ply, semi-rigid, glass fibre and mineral reinforced asphalt protection board, 6mm thick minimum.

.2 Acceptable Products:
- .1 Henry/Bakor Company: Recover Board.
- .2 IKO Industries Ltd.: Protectoboard Asphaltic Panels.
- .3 Johns Manville Inc.: Retro Plus Roof Board
- .4 Lexsuco-3.
- .5 Soprema Inc.: Sopraboard Roof Protection Board.

2.14 CARPENTRY

.1 Refer to Section 06 10 00 - Rough Carpentry

2.15 CANT STRIPS

.1 Fire resistant perlite with 345kPa compressive strength, preformed to 45 degree angle.

.2 Acceptable Products:

.1 GAF Materials Corporation: GAF Energy Guard Perlite Cant Strip.
.2 IKO Industries Ltd.: Perlite Fire Resistant Cant Strip.
.3 Johns Manville Inc.: FesCant Plus Cant Strip.

2.16 FASTENERS

.1 Fasteners and plates shall meet Factory Mutual 4470 Standard for wind uplift and corrosion resistance.

.2 Sheathing to Steel Deck: self drilling, self tapping, Factory Mutual approved stainless steel screws to CSA-B35.3, with 75mm by 75mm stamped steel plates.

.3 Insulation to Steel Deck: self drilling, self tapping, Factory Mutual approved cadmium plated screws to CSA-B35.3, with 75mm by 75mm stamped steel plates.

.4 Flashing: nails and metal discs or special nails with 20mm diameter heads.

2.17 ROOF GRAVEL

.1 Hard, durable, screened and washed, 10mm size, I00% Snow White Calcote aggregate, free of organic matter, saluable elements, and fines to ASTM-D1863. Supplied by Coloured Aggregates.

.2 Size: 10 to 15mm.

2.18 MEMBRANE FLASHING SHEETS

.1 Base Sheet- Fully Mopped System: SBS modified bituminous membrane, to CGSB-37-GP-56M, minimum 2.2mm thick, 180g/m2 polyester reinforcement, Type 1, Class A, Grade 1.

.1 Henry/Bakor Company.: modifiedPLUS NP 180 S/S.
.2 GAF Materials Corporation: GAF Ruberoid Mop 170.
.3 IKO Industries Ltd.: Modiflex MP-180-SS BASE.
.4 Johns Manville Inc.: DynaLastic 180 S.
.5 Soprema Inc.: Sopralene 180 Sanded.

.2 Cap Sheet- Fully Mopped System: SBS modified bituminous membrane, to CGSB-37-GP-56M, minimum 3mm thick, 180g/m² polyester reinforcement, Type 1, Class A, Grade 2.

.1 Henry/Bakor Company.: modifiedPLUS NP 180 gM4.
.2 GAF Materials Corporation: Ruberoid Mop 170 FR Granule, white colour.
.3 IKO Industries Ltd.: Modiflex MP-180 CAP.

.4 Johns ManviJle Inc.: DynaLastic 180.
.5 Soprema Inc.: Sopralene 180 GR.

PART 3 – EXECUTION

3.1 WORKMANSHIP

.1 Do work in accordance with applicable standard in Canadian Roofing Contractors Association (CRCA) Roofing Specifications Manual and to Certification Laboratory Design No. where indicated, except where specified otherwise.

.2 Do priming for asphalt in accordance with CGSB-37-GP-15M.

3.2 HEATING OF ASPHALT

.1 Asphalt shall be heated in kettles or tankers sufficiently to provide correct EVT range at point of application as follows:
  .1 For laminating felts in built-up roofing, apply asphalt at ± 15°C of the asphalt manufacturer's recommended EVT.
  .2 For securing insulation, apply asphalt l5°C to 20°C below the recommended EVT for interply mopping.
  .3 For flood coats, apply asphalt at 20°C to 35°C below the recommended EVT for interply mopping.
  .4 For mopping of modified bituminous membranes, apply asphalt at the asphalt manufacturer's recommended EVT or a minimum of 204°C, whichever is higher.

.2 Use separate kettles for each type ofasphalt used. No mixing of asphalt will be allowed. lftankers are used, copies of bills oflading showing the types of asphalt shall be supplied to the roofing inspector.

.3 In cold weather insulate hauling equipment and re-circulation lines to minimize heat loss.

.4 Do not heat asphalt above its Final Blowing Temperature (FBT) in tanker.

.5 Heating asphalt above its FBT may be permissible in kettle as long as asphalt is used up within four hours.

.6 Equip kettle and tanker with working thermometers. Roofing crews shall have access at all times to a working, accurate liquid thermometer and a digital thermometer.

3.3 PLANT AND EQUIPMENT

.1 Do not use direct fired equipment.

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

.3 Locate kettles in a safe place outside of the building or, if approved by the Consultant, on a noncombustible substrate at a location to avoid danger of igniting combustible material below. When locating kettles, give consideration to the direction of prevailing winds,

building fans and air handling units to minimize the possibility of smoke and fumes entering surrounding occupied buildings. If wind direction causes smoke and fume problems, relocate kettles on a daily basis when directed by the Consultant.

.4 Locate bitumen kettles to avoid smoke discolouration of the building and damage to landscaping materials.

.5 Maintain supervision while kettles are in operation and provide metal covers for kettles to smother flames in case of fire. Provide suitable fire extinguishers.

.6 Maintain efficiency of kettles and equipment by frequent cleaning. Remove all carbonised bitumen.

.7 Use only glass fibre roofing mops.

.8 Proper attire shall be worn when handling products. Users shall read container labels and material safety data sheets prior to use.

3.4 PROTECTION

.1 Cover walls and adjacent work where materials are hoisted or used.

.2 Use warning signs and barriers. Maintain in good order until completion of the work.

.3 Clean off drips and smears of bituminous material immediately.

.4 Dispose of rain water off substrates and away from face of building until drains or hoppers are installed and connected.

.5 Protect from traffic and damage. Comply with precautions deemed necessary by the Consultant.

.6 Place plywood runways over work to enable movement of material and other traffic.

.7 At the end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed work and materials out of storage.

.8 Install insulation promptly to avoid possibility of condensation beneath the vapour retarder.

3.5 SUBSTRATE EXAMINATION

.1 Examine substrates and immediately inform the Consultant in writing of defects.

.2 Prior to the commencement of work ensure:

- .1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris.
- .2 Curbs have been built.
- .3 Drains have been installed at proper elevations relative to finished roof surface.

.4 Plywood and lumber nailer plates have been installed to walls and parapets as indicated.

.5 Curb, parapet and other such surfaces are sloped a minimum of 1:10 for water run-off.

3.6 PREPARATION OF STEEL DECK (CHANNEL TYPE)

.1 Install sound absorbing insulation in flutes of steel acoustical roof deck in accordance with deck manufacturer's instructions.

.2 Install mechanical equipment curbs supplied by Division 23 - Mechanical. Coordinate placement and method of installation of curbs with mechanical Subcontractor.

.3 Ensure mechanical equipment curbs are 300mm minimum or higher as shown on the drawings, above the finished roof surface.

3.7 VAPOUR RETARDER

.1 Ensure deck surface is complete and clean.

.2 Prime porous surfaces prior to installation of vapour retarder.

.3 Install self-adhesive vapour retarder over roof deck.

.4 Vapour retarder side laps shall be 100mm and shall be located at deck ribs and continuously sealed.

.5 At end laps, install 150mm by 1200mm sheet metal support plate across flutes of steel deck to support the vapour retarder and lap.

.6 Vapour retarder end laps shall be 150mm and continuously sealed.

.7 Vapour retarder shall wrap the insulation a minimum of 150mm onto the top surface and be sealed in place at all terminations and projections, including roof drains.

.8 Repair ripped or otherwise damaged areas with a patch extending a minimum of 300mm beyond the damaged area in all directions and sealed with a continuous bead of mastic.

3.8 INSULATION: MECHANICALLY FASTENED APPLICATION.

.1 Unless otherwise specified or indicated on Drawings, mechanically fasten insulation.

.2 Ensure vapour retarder is installed and ready to accept insulation.

.3 Mechanically fasten insulation using screws and pressure distribution plates. Drive fasteners through ridges of roof deck.

.4 Number and pattern of screws per board shall meet Factory Mutual requirements for Class 1-60 windstorm resistance, but not less than 12 fasteners per 1200mm by 2400mm board. Increase number of fasteners for the following:

.1 Corners: minimum 32 fasteners per 1200mm by 2400mm board and within 3600mm of corner.

.2 Roof perimeter: minimum 18 fasteners per 1200mm by 2400mm board and within 3600mm of edge.

.5 Place boards in parallel rows with ends staggered, and in firm contact with one another.

.6 Cut end boards to suit.

.7 Reduce insulation thickness by 25mm for 1200mm around roof drains.

.8 When the insulation is installed in multiple layers stagger joints vertically and offset minimum 300mm between layers.

3.9 TAPERED INSULATION AND OVERLAY: APPLICATION

.1 Install tapered insulation over base insulation. Install fibreboard overlay insulation over tapered insulation.

.2 Mop tapered insulation and fibreboard overlay to base layer of insulation with full bed of hot asphalt at rate of 1 kg/m².

.3 Install fibreboard overlay and tapered insulation over the base thermal insulation, in accordance with Drawings and Shop Drawings. Stagger joints between layers 150mm minimum. Step in all boards.

3.10 CANTS

.1 Install specified cants over insulation overlay.

.2 Apply hot bitumen to receiving surface and embed cant firmly by hand.

.3 Angle cut cants to fit tightly on back and bottom where roof to wall angle varies from 90°.

3.11 ROOF MEMBRANE APPLICATION

.1 One Ply Roof Overlay Application:

.1 Starting at low point, perpendicular to slope, embed one ply of organic roofing felt in hot asphalt over fibreboard overlay.

.2 Overlap starter strips 660mm with first ply, then overlap each succeeding ply 50mm and lap ends 150mm.

.3 Apply asphalt at rate of 1 kg/m² with organic felts.

.4 Extend felt up to top of cant strip.

.5 Apply uniform and continuous pressure to exposed edge and end laps to ensure complete adhesion.

.6 Avoid walking on plies until asphalt has set.
.7 Overlap previous day's work 600mm.
.8 At fishmouths, slit and patch with an additional ply of membrane.

.2 Four Ply Membrane Application:
.1 Starting at low point, perpendicular to slope, embed four plies of glass fibre roofing felts in hot asphalt over one ply roof overlay. Side laps not embedded in asphalt shall be cut and patched with an additional ply of felt.
.2 Overlap sheets 3/4 of their width plus 15mm for four ply membrane and lap ends 150mm. Stagger end laps 900mm minimum.
.3 Apply asphalt at rate of 1.2 kg/m2 with glass fibre felts.
.4 Extend felts up to top of cant strip.
.5 Install water cut-offs at the end of each day, and remove before resuming work. Overlap previous day's work 600mm.
.6 At fishmouths, slit and patch with an additional ply of membrane.
.7 Allow a minimum of 24 hours before the application of the flood coat and gravel specified below.
.8 Ensure proper embedment by closely following roll with squeegee. Do not walk on or allow equipment to travel across the applied membranes until the asphalt has set up.

.3 Flashing Application:
.1 Apply one ply of modified bituminous membrane flashing base sheet fully hot mopped with rubberized asphalt. Commence from a point 200mm from toe of cant on the flat roof.
.2 Apply membrane flashing cap sheet, fully hot mopped with rubberized asphalt, and following the manufacturer's specifications to cover flashing membrane base sheet completely. Commence from a point 200mm on flat roof and provide minimum mm overlaps.
.3 On exterior walls extend membrane flashing up inside face of parapet and over top to outside face of wall, terminating 13mm above lowest point of metal coping.
.4 On interior walls, build base flashing up to cavity wall or through wall flashing as indicated. Lap cavity wall or through wall flashing over base flashing and seal.
.5 Keep nails 200mm above top of cant strip.
.6 Install pipe and sleeve flashing and vent stack covers supplied by Division 23 - Mechanical. Set flanges into a bed of plastic cement and strip-in with 3 plies offelt embedded in asphalt of the same type used for the roof membrane.

.4 Gravel Surfacing:
.1 Inspect the entire area to ensure no wrinkles, buckles or fishmouths exist.
.2 Apply bitumen and gravel surfacing only after placement of roofing felts and membrane flashings.
.3 Apply a flood coat of hot bitumen at the rate of 3 kg/m² and, while bitumen is still hot, apply aggregate at a minimum rate of 20 kg/m². Ensure the aggregate is dry and free from frost. Allow flood coat and aggregate to cool and harden.
.4 Ensure that there are no skips in the flood coat. If some are found, sweep gravel aside and reflood area.
.5 Remove loose aggregate and repeat application of bitumen and gravel at the same rate and quantity as the first application for a total aggregate mass of 40 kg/m².

.6 When second flood coat and aggregate have cooled and hardened remove only remaining loose aggregate.

3.12 PRECAST CONCRETE PAVERS

.1 At concrete paver locations omit gravel and install protection board directly over roof membrane.

.2 Install precast concrete paving slabs at locations indicated.

.3 Install paving slabs on paver pedestals at corners of paving slabs. Allow slight space between slabs to permit drainage of surface water. Shim up as required to obtain a level surface with smooth surface transition from slab to slab.

3.13 ROOF DRAINS

.1 Install roof drains supplied by Division 22, 23 - Mechanical.

.2 Ensure insulation thickness has been reduced to create sump at roof drain locations.

.3 Temporarily block drain pipe opening during installation. Plug or seal drain to prevent water and debris from entering the drain until service connection is completed.

.4 Cast Iron Drains:
- .1 Prime flange and apply one ply roof membrane, 900mm square, centred over drain.
- .2 Extend total roof membrane over drain opening and trim flush with inside diameter of opening.
- .3 Apply a heavy continuous mopping of asphalt around opening and secure clamping ring and strainer.

.5 Copper Drains:
- .1 Set drain into bed of plastic cement.
- .2 Ensure flashing flange is primed and strip-in flange with three plies of membrane.

.6 Scupper Drains:
- .1 Install scupper drains supplied by Section 07620 - Metal Flashing and Trim.
- .2 Ensure scupper drains are prefabricated complete with gravel stop and that flanges are primed.
- .3 Set scupper into a bed of plastic cement, secure and strip-in flanges with three plies of membrane.
- .4 Extend roof membrane through scupper opening.

3.14 VENTS, STACKS, AND ROOF PENETRATIONS

.1 At roof penetrations where curbs are not required, install prefabricated sleeves mechanically fastened to the roof substrate before the installation of the vapour retarder. Sleeves shall extend a minimum of 50mm above the finished roof surface.

.2 Carry the roof membrane to penetrations and neatly trim.

.3 At each penetration install cone or specified stack jack with primed flanges set in mastic on top of the installed membrane.

.4 Install stack jack flashing at window washing roof anchors and seal to membrane in accordance with the manufacturer's recommendations and details.

.5 Install 3 plies of felt flashing in hot asphalt, extending beyond the flange 150mm, 225mm, and 300mm respectively.

3.15 ROOF AREA DIVIDER FLASHING

.1 Cut roof membrane flush with top edge of cant strip.

.2 Prime surfaces to receive base sheet flashing as recommended by the membrane manufacturer. Ensure primer is dry before proceeding with the flashing application.

.3 Install bituminous membrane flashing constructed of two plies of flashing membrane base sheet mopped in with rubberized asphalt up to top of curb.

.4 Extend flashing membrane base sheet 200mm beyond toe of cant.

.5 Extend flashing membrane base sheet in two pieces across the top of the curb, one from each side.

.6 Secure base sheet into wood along top edges with large headed nails or nails through flat metal discs, spaced at 300mm on centre.

.7 Apply the membrane flashing cap sheet embedded in hot rubberized asphalt following the manufacturer's specifications to cover flashing membrane base sheet completely. Commence from a point 100mm beyond edge of underlying base sheet of flashing on flat roof and provide minimum 150mm overlaps.

3.16 ROOF EXPANSION JOINT FLASHING

.1 Ensure wood framing and expansion joint filler are installed and ready to receive flashing.

.2 Install roof membrane and two plies of bituminous membrane flashing as for roof area dividers, but only to top of curb, one ply from each side.

.3 Nail plies into wood along top edge of curb with large headed nails or nails through flat metal discs, spaced at 300mm on centre.

.4 Apply the membrane flashing cap sheet, fully hop mopped with rubberized asphalt, following manufacturer's specifications to cover flashing membrane base sheet completely. Commence from a point 100mm beyond edge of underlying base sheet of flashing on flat roof and provide minimum 150mm overlaps. Ensure membrane is not stretched tight and is formed with a loop at expansion joint to allow for movement.

3.17 WALL-ROOF JUNCTION EXPANSION JOINT FLASHING

.1 Ensure wood framing and expansion joint filler are installed and ready to receive flashing.

.2 Install roof membrane and two plies of bituminous membrane flashing as for roof area dividers, but only to top of curb.

.3 Nail plies into wood along top edge of curb with large headed nails or nails through flat metal discs, spaced at 300mm on centre.

.4 Apply the membrane flashing cap sheet, fully hot mopped with rubberized asphalt, following manufacturer's specifications to cover flashing membrane base sheet completely. Commence from a point 100mm beyond edge of underlying base sheet of flashing on flat roof and provide minimum 150mm overlaps. Ensure membrane is not stretched tight and is formed with a loop at expansion joint to allow for movement.

3.18 JUNCTION TO EXISTING BUILT-UP ROOFING

.1 At junctions of new roofing or new wall construction with existing built-up roofing remove existing metal flashings and scrape back existing roof surface a minimum of 700mm along the entire perimeter involved.

.2 Repair existing roof surface as required due to scraping operations.

.3 Ensure materials for the reinstatement of the existing roof are compatible with existing materials.

.4 Install cants as specified above.

.5 Install three layers of glass fibre felt stripping with asphalt at the rate of 1.2 kg/m2, extending the first layer to a minimum of 150mm onto the flat roof surface. Extend each succeeding layer 150mm beyond the previous layer. Terminate felt stripping at the top of the cant strip.

.6 Apply one ply of modified bituminous membrane flashing base sheet fully mopped with hot rubberized asphalt. Commence from a point 200mm from toe of cant on the flat roof.

.7 Apply membrane flashing cap sheet, fully hot mopped with rubberized asphalt and following the manufacturer's specifications to cover membrane flashing base sheet completely. Commence from a point 100mm beyond edge of membrane flashing base sheet on flat roof and provide minimum 150mm overlaps.

.8 At wall junctions, build base flashing up to wall flashing as indicated. Keep nails 200mm above top of cant strip.

.9 Apply a flood coat of hot bitumen to the existing roof at the rate of 3 kg/m2 and while bitumen is still hot, apply aggregate at a minimum rate of20 kg/m2• Ensure the aggregate is dry and free from frost.

.10 Remove loose aggregate and repeat application of bitumen and gravel at same rate and quantity as the first application for a total aggregate mass of 40 kg/m².

3.19 FIELD QUALITY CONTROL

.1 Inspection and testing of the BUR application will be carried out by an inspection and testing company designated by the Owner.

.2 Costs of tests will be paid by the Owner.

3.20 TESTING

.1 Cut Test:
- .1 Before placing gravel, or as may be directed, provide cut tests as requested.
- .2 Make good installation where tests indicate roofing has not been installed in conformance with specifications.
- .3 Repair roof where cut tests are made.

.2 Inspection:
- .1 The roof inspection company will provide supervision and verification of roofing installation.
- .2 Payment for roofing inspection will be paid by the Owner.

3.21 CLEANING

.1 Clean work in accordance with Section 01 74 00 - Cleaning.

.2 Clean to the Consultant's approval, soiled surfaces, spatters, and damage caused by the work of this section. Repair or replace defaced or disfigured finishes caused by the work of this section.

.3 Check drains to ensure cleanliness and proper function.

.4 Remove debris, equipment and excess material from site.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDED

.1 Metal flashings, reglets and flashing receivers.
.2 Metal copings.
.3 Metal coverings and associated flashing at mechanical dog houses and exhaust penthouse roof penetrations.

1.2 RELATED SECTIONS

1.	General Requirements.	Division 01
2.	Masonry Procedures	Section 04 05 00
3.	Rough Carpentry	Section 06 10 00

1.3 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

.1 Metal flashing receivers and recessed reglets supplied to Section 04 05 00 – Masonry Procedures.

1.4 REFERENCES

1.	AAMA-611-98	Voluntary Specification for Anodized Architectural Aluminum.
2.	ASTM-A653/A653M-11	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3.	ASTM-A924/A924M-10a	Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
4.	ASTM-B32-96	Standard Specification for Solder Metal.
5.	ASTM-D523-89 (1994)e1	Standard Test Method for Specular Gloss.
6.	ASTM-D822-96	Standard Practice for Conducting Tests on Paint and Related Coatings and Materials Using Filtered Open-Flame Carbon-arc Exposure Apparatus.
7.	CAN/CGSB-37.5-M89	Cutback Asphalt Plastic Cement.
8.	CAN/CGSB-51.32-M77	Sheathing, Membrane, Breather Type.
9.	Canadian Roofing Contractors Association (CRCA), Roofing Specifications Manual, 2011.	
10.	CSA-A123.3-M1979	Asphalt or Tar Saturated Roofing Felt.
11.	CSA-Blll-1974	Wire Nails, Spikes and Staples.
12.	SMACNA Architectural Sheet Metal Manual, Fifth Edition, 1993	

1.5 SUBMITTALS

.1 Submit Shop Drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit 100mm by 100mm samples of each type of sheet metal material, colour and finish.

1.6 WARRANTY

.1 Provide a warranty for metal flashing work in accordance with the Contract Requirements, but for a period of five (5) years.

.2 The warranty shall cover materials, installation and workmanship.

.3 Warranties shall be issued to the Owner within two (2) Working Days following the date of Substantial Performance of the Work.

PART 2 – PRODUCTS

2.1 PREFINISHED SHEET METAL MATERIAL

.1 Prefinished steel sheet with factory applied 2-coat silicon modified polyester finish system, Perspectra Series on exposed surfaces.
- .1 Zinc coated steel sheet: commercial quality to ASTM-A653/A653M, with 2275 designation zinc coating to ASTM-A924/A924M.
- .2 Class: F2S.
- .3 Specular gloss: 30 units+/- 5 degrees in accordance with ASTM-D523.
- .4 Coating thickness: not less than 25 micrometers.
- .5 Resistance to accelerated weathering for chalk rating of 8, colour fade 7 units or less and erosion rate less than 20% to ASTM-D822 as follows:
  - .1 Outdoor exposure period 1000 hours.
  - .2 Humidity resistance exposure period 1000 hours.
- .6 Unexposed or reverse side shall have a clear wash coat finish.
- .7 Manufacturers:
  - .1 Stelco Steel.
  - .2 Dofasco Inc.

.2 Prefinished aluminum, supplied by Section 07 42 10 - Composite Aluminum Panels for forming and installation by this section.

2.2 PREFABRICATED FLASHING

.1 Stack Jack Flashing: pre-insulated aluminum flashing sleeve with integral flange coated with bituminous paint, aluminum hood and perforated collar, and EPDM base seal. Thaler Metal Industries: Model SJ-31 Vandal Proof Stack Jack Flashing.

.2 Flexible Conduit Flashing: liquid-tight, gooseneck shaped aluminum flashing pipe sleeve with integral flange coated with bituminous paint, and EPDM end cap and base seals. Thaler Metal Industries: Model MEF-2A liquid Tight Flexible Conduit Flashing.

.3 Rigid Conduit Flashing: aluminum flashing sleeve with integral flange coated with bituminous paint, EPDM base seal, removable cap, and EPDM grommet seal. Thaler Metal Industries: Model MEF-1 Rigid Conduit Flashing.

.4 Square Post Flashing: split stainless steel flashing sleeve with integral flange coated with bituminous paint, contoured vented cap filled with EPDM pressure grommet seal, and continuous EPDM seals at split junctures of sleeve and flange. Thaler Metal Industries: Model SP J-4 Square Split Flashing (Vented Cap).

.5 Mechanical Doghouse and Exhaust Gooseneck Roof Penetrations of Aluminum Sheet Panels and Flashing: pre-insulated aluminum sheet and associated flashing.

2.3 ACCESSORIES

.1 Isolation Coating: alkali resistant bituminous paint.

.2 Plastic Cement: to CAN/CGSB-37.5.

.3 Underlay for Metal Flashing: dry sheathing to CAN/CGSB-51.32 or No. 15 perforated asphalt felt to CSA-A123.3.

.4 Sealants: Refer to Section 07 92 00 – Sealants.

.5 Cleats and Starter Strips: of same material, and temper as sheet metal, minimum 50mm wide. Thickness 1.0mm.

.6 Fasteners: of same material as sheet metal, to CSA-8111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.

.7 Washers: of same material as sheet metal, 1mm thick with rubber packings.

.8 Touch-up Paint: as recommended by prefinished material manufacturer.

2.4 FABRICATION

.1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details and as indicated.

.2 Form pieces in 2400mm maximum lengths. Use lock type joints between sections. Make allowance for expansion at joints.

.3 Hem exposed edges on underside 12mm. Miter and seal corners with sealant.

.4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.5 METAL FLASHINGS

.1 Form flashings, and flashing receivers to profiles indicated of 0.5mm thick prefinished galvanized steel sheet. Colour: QC2624 – Bright Silver

.2 Form copings and fascias to profiles indicated of 0.7mm thick prefinished galvanized steel sheet and 1.0mm thick prefinished aluminum.

.1 Prefinished Metal Flashing at Existing Building. Colour: Charcoal Grey. Colour to be confirmed by Consultant.

2.6 REGLETS AND CAP FLASHINGS

.1 Form recessed and surface mounted reglets and metal cap flashing of 0.5mm thick galvanized steel sheet metal to be built-into masonry work for base flashings as detailed.

.2 Provide slotted fixing holes and steel/plastic washer fasteners.

.3 Colour: QC2624 – Bright Silver.

PART 3 – EXECUTION

3.1 INSTALLATION

.1 Install sheet metal work in accordance with CRCA FL series details, SMACNA Architectural Sheet Metal Manual, and as detailed.

.2 Use concealed fastenings except where approved before installation.

.3 Provide underlay under sheet metal. Secure in place and lap joints 100mm.

.4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock seams forming tight fit over hook strips.

.5 Lock end joints and caulk with sealant.

.6 Install surface mounted reglets true and level, and caulk top of reglet with sealant.

.7 Insert metal flashing under cap flashing to form weathertight junction.

.8 Turn top edge of flashing into recessed reglet or mortar joint minimum of 25mm. Lead wedge flashing securely into joint.

.9 Caulk flashing at reglet with sealant.

.10 Supply metal flashing receivers and recessed reglets to Section 04 05 00 – Masonry Procedures for building into masonry walls.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDED

.1 Firestopping of Penetrations in Rated Assemblies.

.2 Fire Resistive Joint Systems.

.3 Perimeter Fire Containment Systems.

.4 Firestopping of Penetrations in Fire Blocking Compartments.

.5 Smoke Seals

.6 It is the intent of this section of the specifications to establish a single, competent source to be responsible for providing all labour, materials, products, equipment and services, to supply and install firestopping and smoke seals for the area of work, including at the following locations:

- .1 Openings in fire rated walls, floors and roofs both empty and those containing penetrations.
- .2 Gaps between fire rated floor slabs and exterior curtain walls.
- .3 Gaps between fire rated walls and exterior curtain walls.
- .4 Gaps located within expansion joints.
- .5 Openings at each floor level in fire rated shafts or stairwells.
- .6 Gaps between the tops of fire rated walls and underside of fire rated floor or roof assemblies.
- .7 Penetrations through construction enclosing compartmentalized concealed areas (fire blocks), involving both empty openings and openings containing penetrating items.
- .8 Penetrations through smoke barriers.

.7 Note: It is not the intention of this section to delete firestopping work fully specified in the mechanical and electrical specifications. Coordinate with all mechanical and electrical sections to ensure the complete firestopping of the area of work. All firestopping not specifically called for in the mechanical and electrical specifications is to be included under this section.

1.2 RELATED WORK

.1 Fire blocking of concealed spaces:

- .1 Fire separation of concealed spaces shall be provided under applicable specification sections, and as indicated on drawings.

.2 Non-Rated Openings through Floors and Walls:

- .1 Non-rated openings through floors and walls shall be sealed under applicable architectural, mechanical, and electrical specification sections.

.3 Metal sleeves for fire rated openings through floors and walls shall be provided under applicable mechanical and electrical specification sections.

.4 Firestopping and smoke seals within mechanical (i.e. inside ducts, dampers) and electrical assemblies shall be sealed under applicable mechanical and electrical specifications sections and only in accordance with the equipment or device manufacturers' installation instructions.

1.3 RELATED SECTIONS

.1	Concrete Unit Masonry	Section 04 22 00
.2	Sealants	Section 07 92 00
.3	Gypsum Board	Section 09 29 00
.4	Mechanical work requiring firestopping	Division 20, 22
.5	Electrical work requiring firestopping	Division 26, 27, 28

1.4 REFERENCE STANDARDS/DOCUMENTS

.1	ASTM E814	Test Method of Fire tests of Through Penetration Firestops
.2	ASTM E 2174	Standard Practice for On-Site Inspection of Installed Fire Stops
.3	ASTM E 2393	Standard Practice for On-Site Inspection of Installed Fire Stop Joint System.
.4	ASTM E 2307	Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus (ISMA)
.5	ASTM C 920	Standard Specification for Elastomeric Joint Sealants systems

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

.1	UL	Fire Resistance Directory
.2	UL 263	Fire Tests of Building Construction and Materials
.3	ANSI/UL 1479	Fire Tests Of Through-Penetration Firestops
.4	ANSI/UL 2079:	Standard for Tests for Fire Resistance of Building Joint Systems

.2 Underwriters Laboratories, Inc. (UL):

.1	ULC	List of Equipment and Materials, Firestop Systems and Components
.2	CAN/ULC-S101	Standard Methods of Fire Endurance Tests of Building Construction and Materials
.3	CAN/ULC-S115	Standard Method of Fire Tests of Firestop Systems

.3 Underwriters Laboratories of Canada (ULC):

.4 Intertek: WH Mark Product Directory

.5 Factory Mutual Approval Guide

1.5 PERFORMANCE REQUIREMENTS

.1 Provide firestopping systems of sufficient thickness, width and density to provide and maintain a fire resistance rating, as indicated on drawings and in accordance with ULC, cUL or WH design numbers.

.2 Provide a seal completely filling all annular spaces to prevent the passage of flame, smoke and gases through the opening in the fire separation in which it is installed.

.3 Provide materials which are compatible with all materials used in the system including materials used in or on penetrating items as well as all construction materials used in conjunction or contiguous with the system.

.4 Accessories:

.1 Provide components for each firestopping system that are needed to install fill materials.
.2 Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire resistance rated systems.
.3 Accessories include but are not limited to the following items:

.1 Permanent forming/damming/backing materials temporary forming materials
.2 substrate primers
.3 collars
.4 steel sleeves

.5 Provide products that upon curing, do not re-emulsify, dissolve, leach, and breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.

.6 Provide firestop sealants sufficiently flexible to accommodate motion such as pipe vibration, water hammer, thermal expansion and other normal building movement without damage to the seal.

.7 Pipe insulation shall not be removed, cut away or otherwise interrupted through wall or floor openings. Provide products appropriately tested for the thickness and type of insulation utilized.

.8 Openings within walls and floors designed to accommodate voice, data and video cabling shall be provided with re-enterable products specifically designed for retrofit.

.9 Penetrations through fire-resistance rated floor-ceiling assemblies contained within chase wall assemblies shall be protected with products tested by being fully exposed to the fire outside of the chase wall.

.10 Provide fire-resistive joint sealants sufficiently flexible to accommodate movement such as thermal expansion and other normal building movement without damage to the seal.

.11 Provide fire-resistive joint sealants designed to accommodate a specific range of movement and tested for this purpose in accordance with a cyclic movement test criteria as outlined in Standard ANSI/ UL 2079.

.12 Provide through penetration firestop systems and fire-resistive joint systems subjected to an air leakage test conducted in accordance with Standards, ANSI/UL1479 and ANSI/ UL2079, respectively, with published L-Ratings for ambient and elevated temperatures as evidence of the ability of the through penetration firestop system or fire-resistive joint system to restrict the movement of smoke. Provide fire-resistive joint systems subjected to an air leakage test conducted in accordance with Standard, ANSI/ UL2079 with published L-Ratings for ambient and elevated temperatures as evidence of the ability of the fire-resistive joint system to restrict the movement of smoke.

1.6 SUBMITTALS

.1 Manufacturer's Data:

.1 Submit manufacturer's specifications, installation instructions and product data for each material required, in accordance with Section 01 33 23.
.2 Include ULC, cUL, or WH tested systems or designs, to show compliance with the Contract Documents.

.2 Shop Drawings: Submit shop drawings showing typical installation details, including reinforcement, anchorage, fastenings and method of installation for each type of firestopping condition.

.3 Samples: If requested, submit samples of each type of firestopping systems, smoke seals and accessories. Indicate location where material/system shall be utilized.

.4 Qualifications: Submit certificate indicating qualifications of installer.

1.7 QUALITY ASSURANCE

.1 Manufacturer: Manufacturer shall be one of the approved manufacturers listed below.

.2 Applicator: Company having a minimum of three (3) years' experience in the installation of materials specified herein, on projects comparable to this project, who is certified, licensed or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products in accordance with the specified requirements. Installer shall be certified by ULC, or other approved agency.

1.8 REGULATORY REQUIREMENTS

.1 Conform to the Ontario Building Code for fire resistance ratings.

.2 Provide materials, accessories and application procedures which have been listed by ULC, cUL, or tested by a nationally recognized independent testing agency in accordance with ASTM E814, ANSI/UL 1479, CAN4-S115 or ANSI/UL 2079 to achieve the required fire protection rating(s).

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Do not proceed with the installation of firestopping materials when temperatures or weather conditions exceed the manufacturer's recommended limitations for installation.

.2 Ventilate solvent based and moisture-cure firestopping per firestopping manufacturer's instructions by natural means or, where this is inadequate, by forced air circulation.

1.10 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to Site in manufacturer's sealed, undamaged containers, with labels intact. Labels shall identify product and manufacturer, date of manufacture; lot number; shelf life, qualified testing and inspection agency's classification marking, and mixing instructions for multi-component materials.

.2 Handle and store materials in accordance with manufacturer's instructions.

1.11 PROJECT/SITE CONDITIONS

.1 Comply with manufacturer's recommended requirements for temperature, relative humidity and substrate moisture content during application and curing of materials.
.2 Maintain minimum temperature before, during, and for minimum 3 days after installation of materials.
.3 Do not install firestopping products when substrates are wet due to rain, frost, condensation, or other causes.

1.12 SEQUENCING AND SCHEDULING

.1 Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

.2 Coordinate sizing of sleeves, openings, core-drilled holes or cut openings to accommodate through-penetration firestop systems.

.3 Do not install firestopping system until Work within opening has been completed. Coordinate with other applicable Sections.

.4 Schedule installation of safing materials in linear opening at curtain wall prior to construction that limits access to safing slot.

.5 Schedule work of other trades so that firestopping applications can be inspected prior to being covered by subsequent construction.

PART 2 – PRODUCTS

2.1 APPROVED MANUFACTURERS

.1 Provide firestopping silicone sealants, water-based sealants, intumescent sealant, mortars, or firestop devices from one of the following manufacturers:

.1 A/D Fire Protection Systems Inc.
.2 Tremco Fire Protection Systems Group
.3 Hilti (Canada) Corporation
.4 Nuco Inc., Self-Seal Firestops

2.2 MATERIALS

.1 Firestop systems:
- .1 Provide a complete system of asbestos-free firestop systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of CAN4-S115, ASTM E814, ANSI/UL 1479, or ANSI/UL 2079, and listed by ULC, cUL, or Warnock Hersey, and approved by jurisdictional authorities and the Consultant.
- .2 Comply with applicable Building Code requirements for locations and ratings.

.2 Materials specified below are as manufactured by A/D Fire Protection Systems Inc. Equivalent products manufactured by one of the approved manufacturers listed above are acceptable.

.3 Silicone Sealants:
- .1 Primerless, single component silicone sealant, curing to durable, flexible, silicone rubber; to ASTM C 920, Type S, Grade NS, class 25; A/D Fire barrier Silicone Sealant or equivalent.
- .2 For use in: openings with penetrating items subject to high movement; multiple penetration systems; for combustible pipes up to 2-in. diameter; in control joints; in curtain wall joints; expansion joints; floor/wall joints; wall/wall joints; head of wall joints; and as a sealant for smoke barrier construction.

.4 Pourable Sealant:
- .1 Single component, water based, elastomeric sealants, forming durable, flexible, watertight bonds; A/D Firebarrier Seal (pourable) and Seal NS (non-slumping) or equivalent.
- .2 Use non-slumping type for vertical applications.
- .3 Water based firestop sealants for use with: control joints; head of wall joints; floor/wall joints; wall/wall joints; multiple penetration systems; plumbing; mechanical; electrical; and where sprayed sealant application is required or desired.

.5 Intumescent Caulk:
- .1 Single component, water based, elastomeric sealant for use in interior building locations; A/D Firebarrier Intumescent Caulk or equivalent.
- .2 For general use as a firestop sealant with: insulated pipes; pipes; electrical cables and conduit; ducts.

.6 Mortar:
- .1 Non-combustible, fibre reinforced, foamed cement mortar; A/D Fire barrier Mortar or equivalent.
- .2 For use in: large openings; static non-moving penetrations such as cable trays; for multiple penetration systems; electrical and communication bundles; conduits; non-combustible sleeves; and insulated pipes.

.7 Collars:

.1 Steel collars with intumescent silicone strip, in diameters to suit pipe sizes; A/D Firebarrier Collar or equivalent.
.2 For use in openings with single combustible pipe penetrations greater than 50mm diameter; confirm maximum pipe diameter (for applicable tested assemblies) with manufacturer.

.8 Pillows:
.1 Self-supporting, sealed polyethylene bags containing intumescent materials and non-combustible insulation; A/D Firebarrier Pillows or equivalent.
.2 For use in openings with: cable tray; multiple cable penetrations; where retrofitting of penetrating items is anticipated; and as a temporary firestop system.

.9 Mineral Wool:
.1 Non-combustible, semi-rigid, preformed mineral wool strips and sheets; A/D Firebarrier Mineral Wool or equivalent.
.2 For use in tested firestop systems, as fire barrier and forming material.

.10 Additional Materials:
.1 All materials shall be by the manufacturer's listed above and shall be components of tested assemblies, acceptable to local authorities having jurisdiction, for the fire rating required.

.11 Fire Stopping:
.1 Asbestos-free materials and systems capable of maintaining an effective barrier against flame and heat in compliance with requirements of CAN4-S115 and not to exceed opening sizes for which they are intended.
.2 Acceptable Products:
.1 A/D Fire Protection Systems Inc.: A/D Firebarrier Mineral Wool Fire Stopping Insulation.
.2 Roxul Inc.: RXL Safe Fire Stop Batt.

.12 Smoke Seals: fire resistant material capable of maintaining an effective barrier against smoke and gases.
.1 Fire Rated Sealant - Type 1 (for joints in vertical surfaces): non-sagging, fire rated silicone listed for use in fire separations:
.3 Hilti (Canada) Corporation: CP 601S Elastomeric Firestop Sealant.
.4 3M Canada Inc.: Firebarrier 2000.
.5 Tremco Construction Products: TREMstop Fyre-Sil.
.2 Fire Rated Sealant - Type 2 (for head of wall applications): sprayable single component, water-based, acrylic fire stop sealant.
.6 Hilti (Canada) Corporation: CP672 Firestop Joint Spray.
.7 3M Canada Inc.: 3M FireDam Spray.
.8 Tremco Construction Products: TREMstop Acrylic SP.
.3 Fire Rated Sealant - Type 3 (for joints in horizontal surfaces): self-leveling, fire rated silicone, listed for use in fire separations.
.1 Hilti (Canada) Corporation: CP604 Self-leveling Firestop Sealant.
.2 3M Canada Inc.: Firebarrier 2003.
.3 Tremco Construction Products: TREMstop Fyre-Sil Self Leveling

2.3 ACCESSORIES

.1 Damming and backup materials, supports and anchoring devices: Non-combustible, to manufacturer's recommendations and in accordance with the tested system being installed, and as acceptable to local authorities having jurisdiction.

.2 Primers: As required by firestopping manufacturer and compatible with selected system and contiguous materials.

.3 Water: Potable.

.4 Tape: Pressure sensitive masking tape as recommended by the firestopping manufacturer.

.5 Fasteners: Provide suitable fasteners, for applicable substrates, for all collars and other field fastened firestopping components.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Examine substrates, openings, voids, adjoining construction and conditions under which the Work is to be installed. Confirm compatibility of surfaces scheduled to receive firestopping.

.2 Verify that penetrating elements are securely fixed and properly located with the proper space allowance between penetrations and surfaces of openings.

.3 Do not proceed with Work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Surfaces to receive firestopping shall be free of dirt, dust, grease, oil, rust, loose materials, form release agents, frost, moisture or any other matter which would impair the bond of firestopping material to the substrate of penetrating item(s).

.2 Prime substrates in accordance with manufacturer's written instructions or recommendations. Confine primers to areas of bond; do not allow spillage or migration onto exposed surfaces.

.3 Do not apply firestopping and smoke seals to surfaces previously painted or treated with sealers, curing compounds, water repellent or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure that anchoring devices, back-up materials, clips, sleeves, supports and other related materials used in the actual fire tests are provided.

.5 Mask where necessary to prevent firestopping materials from contacting adjoining surfaces that will remain exposed upon completion of Work. Remove tape as soon as it is possible to do so without disturbing firestopping seal with substrates.

.6 Installation is not to proceed until submittals have been reviewed and returned by the Consultant.

3.3 INSTALLATION

.1 Manufacturer's Instruction:

.1 Comply with ULC, cUL, or Warnock Hersey listings and manufacturer's instructions for the type of material and condition of opening in each case.
.2 Consult with the manufacturer's technical representative to determine proper procedure for conditions not fully covered by printed instructions.
.3 Record in writing any oral instructions received, with copy to manufacturer.

.2 Firestopping for vertical applications: Non-sag caulk or spray grade sealants, Mortar, Collars or Pillows.

.3 Firestopping for horizontal applications: Non-sag caulk or self-levelling or spray grade sealants, Mortar, Collars or Pillows.

.4 Firestopping for overhead applications: Non-sag caulk or spray grade sealants or Mortar.

.5 Install firestopping with sufficient pressure to properly fill and seal openings to ensure an effective smoke seal. Tool or trowel exposed surfaces. Remove excess firestopping material promptly as the Work progresses and upon completion.

.6 Damming: Provide leak-proof dams as required to seal openings and contain liquid sealants, putty or mortar until cured. Install damming in accordance with manufacturer's instructions.

.7 Damming Boards: Install forming/damming materials and other accessories of type required to support fill materials during their application and in the position needed to produce the shapes and depths required to achieve fire ratings of through-penetration firestop systems.

.1 Combustible Type: For temporary dams only. Remove after firestopping material has cured.
.2 Non-Combustible Type: For temporary or permanent dams. Provide non-combustible type wherever damming material cannot be removed after applying firestopping materials.

.8 Void Filler: Use materials recommended by the firestopping manufacturer to seal gaps created by non-combustible type damming boards and to seal around cables, conduits, pipes and where void filler material becomes part of the fire rated assembly.

.9 Sealant:

.1 Install damming material or mineral wool as required.
.2 Apply sealant so air voids are not present and sealant is in full contact with penetrating items. Tool sealant to ensure substrate contact.

.3 Remove excess sealant in accordance with manufacturer's recommendations.

.10 Mortar:

.1 Install damming material as required.
.2 Mix mortar in strict accordance with manufacturer's instructions.
.3 Pump, trowel or hand pack mortar through openings to minimum thickness as recommended by manufacturer and as listed by ULC, or cUL, to achieve required fire rating.

.11 Firestopping Mineral Wool:

.1 Install firestopping by compressing material to the minimum required by ULC, cUL, or WH listing.
.2 Apply firestopping in sufficient thickness, depth and density so as to achieve the required fire resistance rating.
.3 Use impaling clips to support and secure firestopping where required by tested system.

.12 Where joint application is exposed to the elements, fire-resistive joint sealant must be approved by manufacturer for use in exterior applications.

3.4 FIELD QUALITY CONTROL

.1 Notify Consultant when completed installations are ready for inspection prior to concealing or enclosing an area containing firestopping materials.

.2 Arrange for inspections by the Owners independent inspection and testing company, appointed and paid for by Owner.

.3 Following field inspections, provide all repair as required to ensure compliance with the Contract Documents.

.4 Keep areas of work accessible until inspection by authorities having jurisdiction

3.5 SCHEDULE

.1 Fire stop for full depth or thickness of the assembly or component being fire stopped.
.2 Apply smoke seal material to both sides of vertical assemblies required to have smoke seals. This applies to all fire separations, whether rated or unrated.
.3 Fire Stop and Smoke Seal At:
  .1 Penetrations through vertical fire separations of masonry, concrete, or gypsum board construction.
  .2 Edge of floor slabs at curtain wall and precast concrete panels.
  .3 Top of fire separations of masonry construction at underside of fluted steel deck assemblies:
    .1 Option No. 1: cUL Design No. HW-D-0098.
      .1 Fire stopping: all specified fire stopping Products.
      .2 Smoke seal: Hilti Type 2 fire rated sealant.
    .2 Option No. 2: ULC Design No. HW23.

.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: 3M Type 2 fire rated sealant.

.3 Option No. 3: cUL Design No. HW-D-0092.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: Tremco Type 2 fire rated sealant.

.4 Top of fire separations of gypsum board construction at underside of fluted steel deck assemblies:

.1 Option No. 1: cUL Design No. HW-D-0042.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: Hilti Type 2 fire rated sealant.

.2 Option No. 2: ULC Design No. HW21.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: 3M Type 2 fire rated sealant.

.3 Option No. 3: ULC Design No. HW71.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: Tremco Type 2 fire rated sealant.

.5 Intersection of fire separations of masonry or gypsum board construction.

.6 Control joints in fire separations of masonry construction.

.1 Option No. 1: ULC Design No. JF83.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: Hilti Type 1 fire rated sealant.

.2 Option No. 2: ULC Design No. JF 13
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: 3M Type 1 fire rated sealant.

.3 Option No. 3: ULC Design No. JF 18
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: Tremco Type 1 fire rated sealant.

.7 Control joints in fire separations of gypsum board construction: ULC Design No. JF 70.

.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: 3M Type 1 fire rated sealant.

.8 Joints in horizontal fire separation assemblies - concrete floor slabs:

.1 Option No. 1: ULC Design No. JF82.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: Hilti Type 3 fire rated sealant.

.2 Option No. 2: ULC Design No. JF13.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: 3M Type 3 fire rated sealant.

.3 Option No. 3: ULC Design No. JF18.
.1 Fire stopping: all specified fire stopping Products.
.2 Smoke seal: Tremco Type 3 fire rated sealant.

.9 Penetrations through fire-resistance rated floor slabs, ceilings and roofs, and horizontal fire separations.

.10 Openings and sleeves installed for future use through fire separations.

.11 Mechanical assemblies penetrating fire separations: Refer to Division 23 - Heating, Ventilating, and Air Conditioning (HVAC).

.12 Electrical assemblies penetrating fire separations: Refer to Division 26 - Electrical.

3.6 CLEANING AND PROTECTION

.1 Clean all surfaces adjacent to sealed openings to be free of excess firestopping materials and soiling as work progresses.

.2 Upon completion of this work, remove all materials, equipment and debris from the site. Leave work area and adjacent surfaces in a condition acceptable to the Consultant.

.3 Leave installed work with sufficient protection to enable it to remain untouched until project turnover.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Sealants and caulking for exterior wall openings and joints.
.2 Sealants and caulking for interior wall openings and joints.
.3 Sealants and caulking for floor joints.

1.2 RELATED WORK

.1	General Requirements	Division 01
.2	Masonry Procedures	Section 04 05 00
.3	Firestopping and Smoke Seal	Section 07 84 00
.4	Aluminum Windows	Section 08 51 13
.5	Non-Structural Metal Framing	Section 09 22 00

1.3 REFERENCES

.1	CGSB-19-GP-5M-84	Sealing Compound, One Component, Acrylic Base, Solvent Curing.
.2	CAN/CGSB-19.13-M87	Sealing Compound, One-Component, Elastomeric, Chemical Curing.
.3	CAN/CGSB-19.17-M90	One-Component Acrylic Emulsion Base Sealing Compound.
.4	CAN/CGSB-19.21-M87	Sealing and Bedding Compound, Acoustical.
.5	CAN/CGSB-19.22-M89	Mildew Resistant Sealing Compound for Tubs and Tiles.
.6	CAN/CGSB-19.24-M90	Multi-Component, Chemical Curing Sealing Compound.
.7	CAN/ULC-S711.1-05	Standard for Thermal Insulation – Bead-Applied One Component polyurethane Air Sealant Foam, Part 1.
.8	CAN/ULC-S711.1-05	Standard for Thermal Insulation – Bead-Applied Two Component Polyurethane Air Sealant Foam, Part 1 : M.

1.4 APPROVED MANUFACTURERS

.1 The products of the following manufacturers are approved for use subject to meeting the specifications for the particular type of sealants listed below. However, this is not an approval to substitute another type of sealant for those specified unless the material manufacturer requests change in his product in writing to the Consultant.

.1 Canadian General Electric Company Ltd.
.2 Dow Corning Canada Inc.
.3 Tremco

.2 Material manufacturers must be willing to review Shop Drawings and drawing details, visit the site to review sealant installation and provide written reports to the Consultant.

1.5 INSTALLER QUALIFICATIONS

.1 Sealants and caulking shall be installed by a specialized Subcontractor, having skilled mechanics thoroughly trained and competent in all aspects of caulking work, with minimum 5 years experience.

.2 Sealants shall be appropriate for the application and materials to be caulked.

1.6 SUBMITTALS

.1 Submit samples of each sealant, in conformance with Section 01 33 00 – Shop Drawings, Product Data and Samples.

.2 Provide colour cards for Consultants selection.

.3 Submit written adhesion and compatibility approval from the sealant manufacturer for all materials to be sealed.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels intact. Protect from freezing, moisture, water and contact with ground or floor.

1.8 ENVIRONMENTAL AND SAFETY REQUIREMENTS

.1 Comply with requirements of Workplace Hazard Materials Information System (WHIMIS) regarding use, handling, storage, and disposal of hazardous materials, and regarding labelling and provision of material safety data sheets acceptable to the authority having jurisdiction.

.2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.3 Ventilate area of work as required and as may be directed by the Consultant by use of approved portable supply and exhaust fans.

1.9 WARRANTY

.1 Extend Contractor's warranty to five (5) years, in writing. Warranty shall commence on the date of Substantial Performance.

.2 Defective work shall include, but not be restricted to, joint leakage, cracking, crumbling, melting, running, loss of adhesion, loss of cohesion, or staining of adjacent surfaces.

.3 Provide manufacturer's project-specific twenty (20) year non-staining warranty and ten (10) year weather seal warranty for "Type A" sealant listed below.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Sealant Type A: For exterior locations. Non-Staining, primer less, silicone weather-proofing sealant:
- .1 SilPruf SCS9000 NB, manufactured by Canadian General Electric Company Limited, Dow Corning 756 SMS, manufactured by Dow Corning Canada Inc., or
- .2 Spectrem 3, manufactured by Tremco Ltd., and
- .3 conforming to the product properties published.

.2 Sealant Type B: For interior locations. Non-staining, primer less, silicone hybrid sealant:
- .1 SCS7000, manufactured by Canadian General Electric Company Limited.
- .2 Dow Corning 756 SMS, manufactured by Dow Corning Canada Inc., or
- .3 Spectrem 3, manufactured by Tremco Ltd., and

.3 Sealant Type C: For interior locations where conditions of high humidity exist such as washrooms, showers, Mildew resistant, one component silicone conforming to CGSB 19-GP.22M and ASTM C920:
- .1 CGE SCS1700 Sanitary Sealant,
- .2 Dow Corning 786, or
- .3 Tremco Tremsil 200 White

.4 Sealant Type D: For interior locations. Paintable, non-staining, primer less, silicone hybrid sealant:
- .1 SCS7000, manufactured by Canadian General Electric Company Limited.

.5 Sealant Type E:
- .1 Multi-component, epoxidized polyurethane sealant conforming to CAN/CGSB-19.24, Type 2, Class B, SWRI Certified.
- .2 Dymeric 240, manufactured by Tremco Ltd.
- .3 Contractors Weatherproofing Sealant (CWS) Contractors Concrete Sealant by Dow Corning.

.6 Colours of sealants and caulking when exposed in the finished work to later selection by the Consultant. Allow different colours for different situations and materials. Allow for custom colours for exterior sealants.

.7 Primers for sealing: As manufactured or recommended by the manufacturer of the sealing materials for the specific applications.

.8 Joint backing material:
- .1 circular foam strips, of approved manufacture, compatible with sealant and 50% greater width than joint width;
- .2 Vertical Surfaces: extruded polyolefin foam, Sof Rod by Tremco Ltd.
- .3 Horizontal Surfaces: closed cell polyethylene foam, Standard Backer Rod by Tremco.

.9 Bond Breaker: pressure sensitive plastic tape backing material, which will not bond to sealant; 3M #226 or #481, or Valley Industries #40.

.10 Acoustical Sealant.
- .1 To CAN/CGSB-19.21.
- .2 Acceptable Product: Tremco Commercial Sealants & Waterproofing, Tremco Acoustical Sealant.

.11 Air Barrier Foam Sealant - One Part.
- .1 One part polyurethane insulating foam sealant, to CAN/ULC-S710.1.
- .2 Acceptable Products:
  - .1 Adfast Inc.: ADFOAM 1885-2
  - .2 Dow Chemical Canada ULC: GREAT STUFF PRO Gaps & Cracks Insulating Foam Sealant.
  - .3 Zerodraft Products Inc.: Zerodraft Foam Sealant.

.12 Air Barrier Foam Sealant - Two Part.
- .1 Two part polyurethane insulating foam sealant, to CAN/ULC-S711.1.
- .2 Acceptable Products:
  - .1 Dow Chemical Canada ULC: FROTH-PAK Foam Sealant.
  - .2 Zerodraft Products Inc.: Zerodraft Insulating Air Sealant.

.13 Preformed Compressible and Non-Compressible Back-up Materials.
- .1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
  - .1 Extruded closed cell foam backer rod.
  - .2 Size: oversize 30 to 50%.
- .2 Neoprene or Butyl Rubber: Round solid rod, Shore A hardness 70.
- .3 High Density Foam: Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200kPa, extruded polyolefin foam, 32kg/m; density, or neoprene foam backer, size as recommended by manufacturer.
- .4 Bond Breaker Tape: Polyethylene bond breaker tape which will not bond to sealant.

.14 Cleaning material for surfaces to receive sealant to be as recommended by the manufacturer of the sealant.

PART 3 – EXECUTION

3.1 LOCATIONS

.1 Seal all exterior junctions and joints wherever required to close gap and wherever sealant is essential to maintain the continuity of air barrier, water barrier, or non-rated smoke separation of wall with Sealant Type A. Areas to be caulked include:

.1 Concrete to metal, masonry, concrete and precast concrete.
.2 Masonry to metal, concrete, precast concrete, and masonry.
.3 Metal to metal, masonry, concrete, and precast concrete.
.4 Around pipes and conduit through foundation walls.
.5 Between hollow metal frames and screens and adjacent materials.
.6 Between metal panels and adjacent materials.
.7 Between window and louvre frames and sills and adjacent materials.
.8 At all control and expansion joints.

.2 Seal all interior junctions and joints wherever required to close gap and wherever sealant is essential to maintain the continuity of air barrier, water barrier, or non-rated smoke separation of wall with Sealant Type B. Areas to be caulked include:

.1 Concrete to metal, masonry, concrete and precast concrete.
.2 Masonry to metal, concrete, precast concrete, and masonry.
.3 Metal to metal, masonry, concrete, and precast concrete.
.4 Around pipes and conduit through walls.
.5 Between hollow metal frames and screens and adjacent materials.
.6 Between window and louvre frames and sills and adjacent materials.
.7 At all joints between millwork and masonry, to provide neat junction.
.8 At junction between all counters and/or splashbacks and adjacent substrate with neat 3mm bead.
.9 At all control and expansion joints.

.3 Seal with Sealant Type C at the following locations:

.1 Around access panels in ceramic tile faced walls with a neat 3mm bead.
.2 Around perimeter of piping penetration at tile work.
.3 At junctions between all counter tops and/or splashbacks and adjacent substrate in washrooms, with neat 3mm bead.
.4 At junctions of lavatories, toilets, and other plumbing fixtures and adjacent substrate.

.4 Seal with Sealant Type D at all interior non-moving joints to be painted.

.5 Seal at all other vertical and horizontal joint locations with Sealant Type E.

.6 Refer to Section 07 84 00, Firestopping and Smoke Seal, for location of fire stopping and fire-resistant caulking.

.7 Refer to Section 09 29 00, Gypsum Board, for acoustic sealant work.

3.2 SUPERVISION

.1 Unless specified otherwise herein comply with the recommendations and directions of the manufacturer whose materials are being used on the work.

.2 Arrange for the sealant manufacturer's technical representatives to visit the site prior to the commencement of the sealing to meet with the Contractor and the Consultant.

.3 Sealant manufacturer to visit site periodically and to provide written reports to Consultant ensuring sealant is in accordance with good trade practice, the manufacturer's recommendations and the intent of this Specification.

3.3 PROTECTION

.1 Protect installed work of other trades from staining or contamination.

3.4 PREPARATION

.1 Install sealants only when surfaces and ambient temperatures are suitable for the material used, as per manufacturer’s recommendations.

.2 Clean all joints and spaces to be sealed.

.3 Ensure that surfaces are structurally sound, free from grease, chalk or other contaminants which may adversely affect the adhesion of the sealing materials. Use dry oil free clean compressed air stream if necessary to clean out the joint.

.4 Clean surfaces with a solvent or cleaner recommended by the manufacturer of the sealant materials.

.5 Remove chalk lines completely. Do not place clear sealant over coloured chalk lines.

.6 Test materials for indications of staining or poor adhesion before any sealing is commenced.

.7 Submit colour chart to Consultant and obtain his written instructions for colours and locations of colours.

3.5 PRIMING

.1 If recommended by the manufacturer of the sealing materials, prime joints to prevent staining, or to assist the bond, or to stabilize porous surfaces.

.2 Apply primer with a brush which will permit the priming of all joint surfaces.

3.6 BACKUP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint back-up to achieve correct joint depth and shape, with approximately 30% compression.

3.7 MIXING

.1 Mix materials in strict accordance with sealant manufacturer's instructions.

3.8 MASKING

.1 Where necessary to prevent contamination of adjacent surfaces, mask the areas adjacent to the joints with masking tape.

3.9 INSTALLATION

.1 Install joint backing materials at all locations as detailed or where required by sealant manufacturer's printed directions.

.2 Install a bond breaker tape or packing over asphalt impregnated fibre board as recommended by sealant manufacturer.

.3 Ensure that the correct sealant depth is maintained.

.4 Finished joints shall be free of wrinkles, sags, air pockets, ridges and embedded impurities.

.5 Tool all sealant surfaces to produce a smooth surface.

.6 Remove droppings and excess sealant as work progresses and before material sets.

.7 Sealing materials shall be gun grade or tool grade consistency to suit the joint conditions.

.8 Commence sealing only after all adjacent surfaces have been painted under Painting Section.

3.10 CLEANING

.1 Clean adjacent surfaces immediately and leave work neat and clean. Remove excess sealant and droppings using recommended cleaners as work progresses. Remove masking after joint tooling.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK

.1	Concrete Unit Masonry	Section 04 22 00
.2	Sealants	Section 07 92 00
.3	Door Hardware	Section 08 71 00
.4	Glazing	Section 08 80 00
.5	Gypsum Board	Section 09 29 00
.6	Painting and Coating	Section 09 90 00
.7	Electrical	Division 26, 27, 28

1.2 WORK INCLUDED

.1 Supply and install all hollow metal products including doors, frames, transom frames, screens, sidelight and window assemblies with provision for glazed, paneled or louvered openings, fire labelled and non-labelled, as scheduled or shown on the Drawings.

.2 Work shall including the following:

- .1 Door cutouts, complete with reinforcing, stops and closers required for glazing.
- .2 Reinforcing for Finishing Hardware.
- .3 Supply all necessary fastening and anchoring devices for above items.
- .4 Steel closure pieces at metal panels, steel columns, horizontal members, and hollow metal frames and screens. Refer to Drawings.
- .5 Metal panels in hollow metal frames.
- .6 Provision of zinc-rich coating on all exterior steel doors, frames and screens.
- .7 Fire rated and labelled doors, frames, & screens where noted on schedule.
- .8 Supply and install HSS and channel reinforcing members where shown at screens and door frames/sidelights.
- .9 Supply and installation of transfer grilles and door louvres, where indicated on Door and Frame Schedule; fire labelled where door rating is indicated.
- .10 Supply and install door silencers on metal frames.

1.3 REFERENCES

.1	CAN4-S104	Fire Tests of Door Assemblies
.2	CAN4-S105	Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104
.3	CAN4-S106	Standard Method for Fire Tests of Window and Glass Block Assemblies

.4 Canadian Steel Door Manufacturers Association (CSDMA)

- .1 Recommended Specifications for Commercial Steel Doors and Frames
- .2 Recommended Dimensional Standards for Commercial Steel Doors and Frames
- .3 Recommended Specifications for Sound Retardant Steel Doors and Frames

.4 Canadian Fire Labelling Guide for Commercial Steel Door and Frame Products
.5 Guide Specification for Installation and Storage of Hollow Metal Doors and Frames

.5	CGSB 82.5	Insulated Steel Doors
.6	CSA A101	Mineral Fiber Thermal Insulation for Buildings
.7	CSA W59	Welded Steel Construction (Metal Arc Welding)
.8	ASTM A653	Standard Specification for Steel Sheet, Zinc-Coated Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
.9	ANSI A250.4	Test Procedure and Acceptance Criteria for Physical Endurance For Steel Doors Frames and Frame Anchors
.10	ANSI A115.IG	Installation Guide for Doors and Hardware
.11	ANSI A250.11	Recommended Erection Instructions for Steel Frames

1.4 PERFORMANCE

.1 Doors and frames covered by this specification shall be certified as meeting Level “A” acceptance criteria when tested in strict conformance with ANSI-A250.4-2011. Swing Test duration shall be 1,000,000 cycles. For door twist tests maximum deflection is not to exceed 32mm (1¼”) when loaded to 136kg (300 lbs), and permanent deflection is not to exceed 3.2mm (1/8"). Tests shall be conducted by an independent nationally recognized accredited laboratory.

.2 Fire labelled product shall be provided for those openings requiring fire protection and temperature rise ratings, as determined and scheduled by the Consultant. Doors, frames, transom frames and sidelight assemblies shall be tested in strict accordance with CAN4-S104. Product shall be listed by Underwriters Laboratories of Canada under an active Factory Inspection Program and shall be constructed as detailed in Follow-Up Service Procedures issued to the manufacturer.

.3 Should any door or frame specified by the Consultant to be fire rated, not qualify for labelling due to design, hardware, glazing or any other reason, advise the Consultant before manufacturing commences.

.4 Core materials for exterior doors shall attain a thermal resistance rating RSI 1.06 (R6.0) when tested in accordance with ASTM C518.

.5 Product quality shall meet standards set by the Canadian Steel Door Manufacturers Association.

1.5 QUALITY ASSURANCE

.1 Supply all steel door and frame product from one manufacturer Member Company of the CSDMA.

.2 Manufacturer must be capable of labelling the fire rated doors, frames, and screens, glazed with specified fire glass. Refer to Section 08 81 00 for fire glass specifications. No Georgian Wire Glass will be permitted on the job.

.3 CSDMA Specification 08 11 13 “Commercial Steel Doors and Frames” is the minimum fabrication standard for this section, as if printed in its entirety herein, except where specified otherwise.

.4 Handle and install product in strict compliance with CSDMA 08 11 13, DHI A115.IG and NFPA 60.

.5 A cash allowance is included in the tender price to cover cost of an independent inspection company, to be selected by Consultant. Allowance is the responsibility of the Contractor and any ensuing deficiency correction costs are the responsibility of the supplier and/or the installer(s), as determined by the inspection report. The Owner reserves the right to have inspection include manufacturing facilities, and work in progress for this project, prior to award of contract or Substantial Performance of the contract.

1.6 SUBMITTALS

.1 Submit confirmation that the manufacturer can label all fire rated doors, frames, and screens, glazed with the fire rated glass to be used on the project, for the fire separation required.

.2 Prepare and submit shop Drawings in accordance with Section 01 33 23, and show the following:

- .1 Door and frame schedules, identifying each unit, with door numbers referencing the numbering in the contract documents.
- .2 Provide columns for Stock Code Numbers for both doors and frames.
- .3 Typical and special details; including mortises, reinforcements, anchorages, locations of exposed fasteners, openings (glazed, panelled or louvered) and arrangement of hardware.
- .4 Materials and finishes; including steel, core, material thickness.
- .5 Hardware preparation.
- .6 Frame anchorage details.
- .7 Submit manufacturer's standard catalogue data for specified products demonstrating compliance with referenced standards.
- .8 Other pertinent information

.3 Submit information on standard shop drawing sheets as approved by the Canadian Steel Door and Frame Manufacturers Association.

.4 Shop drawings for hollow metal screens over 8m2 in size, and for all screens which are required by code to be designed as guards at variations in floor level, must be sealed by a professional engineer, registered in the Province of Ontario.

.5 Submit manufacturer's printed installation instructions.

.6 Operation and Maintenance Data: Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

1.7 PRODUCT HANDLING

.1 Matchmark doors, panels, frames and windows with Stock Code Numbers as shown on the Door Schedule. If Stock Code Numbers are not shown on the Schedule, matchmark with Door Numbers.

.2 Deliver, store and handle components so as to prevent damage, distortion and corrosion.

.3 Store Steel Frames under cover, raised on wood skids at least 100mm above grade, and as required to prevent damage and rusting. Store assembled frames in an upright position. Stack frames to prevent twisting; maximum 5 units per stack. Provide minimum 6mm airspace between frames to permit air circulation. Covers must be vented so as to avoid a build-up of humidity within.

.4 Doors to be delivered to site immediately prior to installation. Store doors protected at corners to prevent damage or marring of finish. Store in upright position, in enclosed, dry space, in a manner to prevent rust and damage. Use vented covers.

1.8 TESTING

.1 Three doors will be selected at random by the Consultant and shall be subjected to destructive testing by an Inspection Company appointed by the Consultant, to verify conformance to the specifications. Replace the doors at no additional cost to the Contract.

1.9 WARRANTY

.1 Provide an extended warranty of three (3) years from date of Substantial Performance against defects of workmanship including failure of welded seams or of reinforced hinge anchorage plates. Work showing defects during this period shall be repaired or replaced without cost to the owner.

PART 2 – MATERIALS

2.1 MATERIALS

.1 General: All materials shall be new and suitable for their various purposes and shall be free from flaws and imperfections.

.2 All doors, frames, and screens shall be from one manufacturer. Only the following manufacturers will be accepted:

.1 Manufacturers:

.1 Fleming Baron Door Products (Assa Abloy)

.2 Daybar Industries Ltd.
.3 All Steel Doors
.4 Gensteel Doors
.5 Trillium Steel Doors
.6 Vision Hollow Metal

.2 Manufacturers must be able to provide and label the fire rated doors, frames, and screens required for this project, using the fire glass specified. If the manufacturer carried in the tender is not capable of providing the fire labelled products, the Contractor will be required to use one of the other listed manufacturers for the work, at no additional cost to the Owner.

.3 Sheet Steel:

.1 General: cold rolled, carbon steel, stretcher levelled. Steel to have hardness of Rockwell 'B' maximum 65 (ASTM E103) suitable for forming and bending without metal or coating fracture.
.2 ASTM A65 3/A653M commercial grade tension levelled hot-dipped galvannealed steel sheet, coating designation Z275

.4 Steel Thicknesses:

.1 Doors:
.1 1.6mm (16 ga) for exterior, high use and oversize doors
.2 1.3mm (18 ga) for other interior doors
.2 Panels: 1.3mm (18 ga)
.3 Frames: 1.6mm (16 ga)
.4 Hinge Reinforcement: 3.5mm (10 ga)

.5 Door Materials:

.1 Exterior, High Use and Oversize Doors:
.1 Includes all exterior doors and all other high use doors, and
.2 all doors over 3m2 and over 1200mm wide or over 3000mm in length
.3 Semi-rigid glass fibre insulation fastened between continuous interlocking steel ribs to prevent sagging or movement.
.4 Doors to be Fleming H-Series, 16 gauge, with continuous welded edge seams.

.2 Other interior doors and panels up to 3m2 and maximum width of 1200mm or maximum length of 3000mm:
.1 Doors to be Fleming D-Series, 18 gauge.
.2 Interior Doors to be reinforced with continuous interlocking steel ribs.

.6 Fire rated doors: in accordance with fire test requirements.

.1 locate U.L.C. label on inside of hinge jamb on frame.

.2 locate U.L.C. label on the top hinged edge of door midway between top hinge and top of door. Doors to be as noted above.

.7 Door Reinforcement: Reinforce all steel doors with 20 ga. vertical interlocking weld steel stiffeners at 150mm o.c., spot welded to face sheets.

.8 Frame reinforcement:

.1 Reinforce frames for high frequency hinge preparation.
.2 Stiffen all mullions and hinge jambs with continuous 3.5mm channel where continuous hinges are required.
.3 Reinforce and provide cut outs and boxes for security devices.
.4 Reinforce for overhead stops.

.9 Exterior Top Caps: galvanized steel caps, flush with top of door.
.10 Zinc Rich Coating: ZRC 221 Cold Galvanizing Compound by ZRC Worldwide, low VOC coating, or equivalent approved by the Consultant.
.11 Metal Filler: Two component epoxy type.
.12 Primer: Rust inhibitive primer
.13 Glass Stop Screws: Oval head, cadium plated, self-tapping steel screws. Other mechanical locking methods may be used but shall be detailed on Shop Drawings for review.
.14 Door Silencers: Rubber - Ives SR64 or approved equal.

2.2 FABRICATION

.1 General

.1 Dissimilar metals in contact, or metals which will be in contact with concrete or masonry when installed, shall be insulated one from another by methods and materials required for such results, as approved by the Consultant.
.2 Components shall be the types and sizes shown on the Drawings.
.3 Reinforce components, where required, for the installation of Finishing Hardware. Drill and tap to suit templates.
.4 Prepare doors and frames for the installation of the security system. Confirm requirements with Consultant.
.5 Ensure adequacy of anchoring devices.
.6 No patching, plugging, skimming or other such means of overcoming defects, discrepancies or errors shall be resorted to without written permission of the Consultant.
.7 Fabricate components from clean steel, free of rust and scale, which has been thoroughly degreased.
.8 The dimensions shown on the Drawings are the full rebate size of the frame.
.9 In addition to specified requirements for hollow metal doors and frames, fire doors and frames shall comply with the Underwriters Laboratories requirements for the specified rating and be provided with the appropriate labels.
.10 All seams in exterior doors, stairwell doors, and all doors over 3m2 and over 1200mm wide or over 3000mm in length, and seams in all frames must be continuously welded. No spot welding will be permitted. All welds must be ground flush. No visible seams will be accepted.

.11 All exterior steel doors, frames and screens to be painted with 2 coats of zinc-rich coating after fabrication and before delivery to site.

.12 All areas where shop applied zinc-rich coating has been damaged on site shall immediately be cleaned and touched up with the same zinc-rich coating product.

.13 Steel framed doors, screens and windows are to be glazed as specified in Section 08 81 00. Exterior and acoustic doors and screens are to be prepared for double glazed units.

.2 Edge Clearances

.1 Unless otherwise specified, allow edge clearances in accordance with Canadian Manufacturing Specifications for Steel Door and Frame Manufacturers Association.

.2 Where hardware items are to be attached to, or mortised into, bottom edges of doors, provide proper clearance between door and floor or threshold to accommodate such hardware.

.3 Hardware Preparation

.1 Refer to Hardware Schedule, included in Section 08 71 00, and prepare doors for hardware listed.

.2 Templated hardware: prepare work in accordance with templates supplied in Section 08 71 00. Prepare doors for mortice locksets according to Hardware Schedule

.3 Reinforce doors and frames for concealed, mortised and surface mounted hardware in
accordance to "Thickness of Steel for Component Parts" in the "Canadian Manufacturing Standards for Steel Doors and Frames", published by the Canadian Steel Door and Frame Manufacturers' Association.

.4 Prepare doors and frames for security system where noted.

.5 At oversized door locations, provide minimum 4 butt hinge preparations.

.6 Prepare all exterior doors and vestibule doors and frames for four hinges.

.4 Hollow Metal Doors and Panels

.1 Doors and panels shall be of seamless, continuously welded construction with no visible seams or joints on faces. Doors to be 44.4mm minimum thickness.

.2 Secure edge seams with suitable continuously welded seams to the approval of the Consultant.

.3 Interlocking seams for doors shall be fully seam welded, for full length of door. All welding to be ground smooth.

.4 Core construction:

.1 Exterior doors to be filled with glass fibre insulation between steel reinforcing. All Type H doors to be steel stiffened as specified herein.

.2 All interior doors shall have steel reinforcing.

.3 Temperature Rise Rated (TRR): Solid slab core of non-combustible, inorganic composite to limit temperature rise on the “unexposed” side of door to 250(C at 30 or 60 minutes, as required by governing building code requirements and determined and scheduled by the Consultant

.5 Welds shall be ground, filled, and dressed smooth to provide an invisible joint and smooth flush surface.

.6 Fully reinforce doors as required for specified hardware. All exterior, stairwell, and washroom doors and all doors noted as “high frequency” shall be reinforced with S.W. Fleming high frequency angle top hinge reinforcement, welded to door skin.

.7 Close top and bottom edges of doors with a continuous, recessed, minimum 1.5mm thick steel channel, extending full width of door and welded to both faces. At exterior doors, provide an additional flush closing channel at top edge and, where required for attachment of weather stripping, a flush closure at bottom edge. Provide similar closure channel at all stair doors.

.8 Surround openings in doors with minimum 1.5mm thick steel edge channels, welded to both face sheets.

.9 Vertical edge profile for single acting swing doors: bevelled 3mm in 50mm.

.10 Glazing Stops:

.1 Equip glazed doors with minimum 0.9mm steel glazing stops, mitred and welded at corners. Where least dimension of stop is less than 12mm, make stop from solid square bar.

.2 Glazing stops at outside of exterior doors and at secure side of interior doors shall be rendered non-removable by welding to door. Secure removable stops with screws.

.3 Glazing stops may be mechanically locked in place, providing details have been reviewed on Shop Drawings.

.4 Glazing stops at fire rated doors and screens shall conform to the requirements of the tested assemblies.

.11 Fabricate exterior panels with a full width steel drip on the outer, lower edge.

.12 Doors for installation in channel frames shall be double-depth mortised to accommodate both butt flanges.

.13 Construct fire rated doors to meet fire test requirements and provide U.L.C. labels.

.5 Steel Frames

.1 Frames shall be of sheet steel, formed profiles shown on the Drawings. Fleming D Series for interior, Fleming H Series for exterior.

.2 Fabricate frames in sections as large as practicable to minimize field jointing. Internally reinforce all mullions and hinge jambs with 1.3mm channel.

.3 Steel thickness: 1.6mm (16 ga.) galvanized steel.

.4 Glazing stops shall be as specified for doors above.

.5 Sidelight framing shall be of same metal and thickness as adjacent door frame.

.6 Assemble components with accurately cut joints. Mitre outside corner joints of frames. Continuously weld joints on inside of profile; grind welds flush and sand to smooth uniform surface. Provide semi-rigid insulation to exterior frames.

.7 Tack weld two (2) removable 1.2mm steel spreader channels to inside faces of door frames at base, for protection during shipping.

.8 Provide adjustable base clips at bottom of each door jamb for anchorage to floor.

.9 Provide button type rubber silencers; three per strike jamb of single doors: two per head member of double door frames.

.10 Prepare door frames for ANSI strike, where doors to be fitted with latchsets or lockets.

.11 Provide removable mullions where noted. Reinforce removable mullions with 3.5mm channel to prevent forcing of latching hardware.

.12 Gypsum Board finished partitions: At interior frames, provide steel stud adjustable anchors of 1.5mm galvanized supplied loose at a rate of 3 per jamb up to 2.2m high, with one additional per jamb for each 0.6m over 2.2m high

.13 Masonry Anchors:

.1 At interior frames, provide masonry anchors of 1.5mm galvanized corrugated tee anchors or 3mm diameter galvanized wire anchors - supplied loose, at rate of 3 per jamb up to 2.2m high; one additional per jamb for each 0.6m over 2.2m high. Frames for observation windows shall be provided with 2 anchors per jamb.

.2 At exterior frames, provide galvanized tee anchors fabricated from 3mm steel plates, installed at rate of 3 per jamb up to 2.2m high; one additional per jamb for each 0.6m over 2.2m high

.14 Provide two 38mm by 38mm by 4.8mm thick steel stiffening angles in the head member of frames for two or more doors totalling over 1980mm, wide. Provide necessary vertical stiffeners where required and carry to structure above. Provide stiffener angles in all exterior door jamb with sidelights and in all centre mullions between doors.

.15 Mounting bars for sidelights shall be as detailed on the Drawings and shall be completely filled with glass fibre insulation.

2.3 INTERIOR WINDOWS

.1 Supply and install steel windows where indicated on drawings. Window frames shall be similar to door frames and as detailed on drawings.

.2 Provide rated frames at windows in fire rated walls. Frames to be labelled.

.3 Steel framed windows are to be glazed as specified in Section 08 81 00.

.4 Provide steel stud anchors, as specified above, at interior windows; minimum 2 anchors per jamb.

PART 3 - EXECUTION

3.1 GENERAL

.1 Store doors and frames as specified under item 1.7, Product Handling, above.

.2 When installing frames during cold weather, installer to coat inside of frames with a corrosion inhibiting bituminous product, prior to installation, to protect against cold weather additives in masonry grout.

.3 Silencers, gaskets, etc., are to be installed in holes in frames prior to installation of frames; so to avoid filling these holes with grout during installation.

.4 Keep steel surfaces free of grout, tar, other bonding materials, and sealers; clean surfaces immediately following installation.

3.2 INSTALLATION

.1 Frame and Screen Installation

.1 Remove all steel spreaders, which are provided to avoid damage during shipping. Provide wood spreaders at base and midpoint of frames. Wood spreaders to be min. 38 x 89mm lumber, notched to clear frame stops; width to be equal to opening between jambs at header level. Wood spreaders to remain in place until frames are set permanently in walls.

.2 Set frames and screens plumb, square, aligned, without twist and at correct elevation. Maximum allowable limits of distortion shall be as follows:

.1 Plumbness: Not more than 1.6 mm out of plumb, measured using a line from the intersection of vertical members and the head to the floor.

.2 Squareness: Not more than 1.6 mm difference between diagonal measurements between corners.

.3 Alignment: Not more than 1.6 mm, measured on jambs, through a horizontal line parallel to the plane of the wall.

.4 Twist: Not more than 1.6 mm, measured at face corners of jambs, on parallel lines perpendicular to the plane of the wall.

.3 At masonry walls, build in frames using the corrugated or wire masonry anchors. Brace frames solidly in position while being built in, with wood spreaders as noted above. Provide vertical support at centre of head for openings exceeding 1200 mm in width.

.4 After installation, fill countersunk screw heads flush with frame and sand smooth ready for painting. Fill exterior frames with glass fibre batt insulation. Cooperate with masonry trade to fill interior frames with mortar.

.5 Where large screens are assembled on site, they must be joined by continuously welded seams, ground smooth. Provide formed covers for structural columns built into screens.

.2 Door Installation

.1 Install hollow metal doors plumb and true.

.2 Co-ordinate installation of hardware.

.3 Adjust operable parts to ensure proper operation. Lubricate using a suitable lubricant compatible with door and frame coatings.

.4 Install hollow metal panels with concealed fastenings.

3.3 TOUCH UP

.1 Remove rust, clean and touch up any damaged galvanizing with "ZRC 221" coating.

.2 Remove rust, clean and touch up any damaged paint with approved rust inhibitive primer.

3.4 CLEANING AND PROTECTION

.1 Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged products. Clean installed products in accordance with manufacturer's instructions before Owner's acceptance.

.2 Remove construction debris associated with this work from project site, and dispose of in accordance with applicable laws.

.3 Protect installed products and finished surfaces from damage during construction.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDED

.1 Ultra-Heavy Duty Flush Wood Interior Doors:
- .1 NAUF particleboard core for intensive use wood doors.
- .2 Finishing of interior wood doors.

.2 Flush Wood Interior Fire Doors:
- .1 Fire rated wood doors - mineral core.

.3 Solid Wood Interior Door Frames
- .1 Solid wood fire-rated interior door frames

1.2 RELATED WORK

1.	Concrete Unit Masonry	Section 04 22 00
2.	Installation of Wood Door Frames	Section 06 20 00
3.	Wood doors in casework	Section 06 41 13
4.	Steel Doors and Frames	Section 08 11 13
5.	Door Hardware	Section 08 71 00
6.	Glazing	Section 08 80 00
7.	Painting	Section 09 91 00

1.3 REFERENCES

.1 All Work to conform to minimum standard for Premium Grade Work as specified in Quality Standards for Architectural Woodwork prepared by Architectural Woodwork Manufacturers Association of Canada (AWMAC) and the Architectural Woodwork Institute (AWI).

1.4 SUBMITTALS

.1 Prepare and submit shop Drawings in accordance with Section 01 33 23, and show the following:

- .1 Product data sheets for each type of door and frame
- .2 Door and frame schedules
  - .1 Provide columns for Stock Code Numbers for both doors and frames.
- .3 Materials and finishes.
- .4 Hardware preparation.
- .5 Installation instructions and details
  - .1 Typical and special details.
  - .2 Frame anchorage details.
  - .3 Method and location of exposed fastenings.

.6 Storage and handling requirements
.7 Other pertinent information.

.2 Samples:
.1 Submit corner sample of wood door, 300mm x 300mm, cut away to show stile, rail, cross-banding, core, and face veneer, accompanied by written description.
.2 Submit wood veneer samples representing manufacturer's full range of available colours and finishes.
.1 Submit duplicate 200mm x 250 mm samples of colours selected by the Consultant, on veneer typical of grain patterns and colouration for the specified species and cut selected.

.3 Submit duplicate 200 x 250 m samples of each colour of plastic laminate finish and pattern required.

1.5 PRODUCT HANDLING

.1 Matchmark doors, panels, frames and windows with Stock Code Numbers as shown on the Door Schedule. If Stock Code Numbers are not shown on the Schedule, matchmark with Door Numbers.

.2 Deliver, store and handle components so as to prevent damage. Store components off the ground and under cover in a dry, protected area.

1.6 WARRANTY

.1 Provide an extended warranty of three (3) years from date of Substantial Performance against defects of workmanship including core ghosting, warping and delamination of veneer. Work showing defects during this period shall be repaired or replaced without cost to the Owner.
.2 Warranty to include hanging and finishing of any replacements that may be necessary.

PART 2 – MATERIALS

2.1 PRODUCTS

.1 Provide premium grade, ultra-heavy duty, 5-ply, 45mm flush slab doors, finished with stain grade maple wood veneer.

.2 Typical Doors shall have particleboard core. Provide acoustic doors where indicated on schedules.

.3 Doors, including cores, adhesives, and finishes shall be low VOC, with no added urea-formaldehyde (NAUF), and FSC Certified Wood.

.4 Wood Doors shall be from one of the following manufacturers:

.1 Baillargeon Door Inc.

.2 JWS Manufacturing Inc.
.3 Lambton Doors
.4 Marshfield Wood Doors
.5 Masonite
.6 Mohawk doors
.7 VT Industries

.5 Provide all wood doors and frames from a single manufacturer, to ensure uniformity in quality of appearance, finish and construction.

.6 Solid Wood Doors:

1.	Stiles and rails shall be bonded to core.	
2.	Stiles:	107mm wide structural composite lumber
3.	Rails:	85mm wide structural composite lumber
	1. Anti-warp rail:	provide central rail of 133mm wide structural composite lumber at doors wider than 914mm
4.	Edges:	11mm min. solid hardwood (Compatible colour edge)
5.	Core:	solid mat formed particle board, density 513 - 577kg/m3, conforming to CSA-O188. No added urea-formaldehyde resins.
6.	Adhesive:	Type 1, Waterproof, no urea formaldehyde, VOC<0.683 g/L.
7.	Face:	hardwood maple veneer

.7 Heavy Duty Hollow Core Doors:

1.	Stiles:	107mm structural composite lumber
2.	Rails:	85mm structural composite lumber
3.	Edges:	16mm min. solid hardwood, [to match face of door] [Compatible colour edge]
4.	Core:	honeycomb core
5.	Lock Block:	
6.	Adhesive:	Type 1, Waterproof, no urea formaldehyde, VOC<0.683 g/L.
7.	Face:	hardwood maple veneer

.8 Fire Rated Doors:

1.	Provide rated doors where indicated or required, with U.L.C. or Warnock Hersey labels attached. Openings must conform to limits noted in Ontario Building Code.	
2.	Rails:	51mm fire proof, structural composite material
3.	Edges	24mm min. solid hardwood (Compatible colour edge)

4.	Cores:	Non-combustible mineral core
5.	Adhesive:	Type 1, Waterproof, no urea formaldehyde, VOC<0.683 g/L.
6.	Face:	hardwood maple veneer

.9 Fire Rated Doors:
- .1 Provide rated doors where indicated or required, with U.L.C. or Warnock Hersey labels attached. Openings must conform to limits noted in Ontario Building Code.
- .2 Rails: 51mm fire proof, structural composite material
- .3 Edges: 24mm min. solid hardwood (Compatible colour edge)
- .4 Cores: Non-combustible mineral core
- .5 Adhesive: Type 1, Waterproof, no urea formaldehyde, VOC<0.683 g/L.
- .6 Face: hardwood maple veneer

.10 Seal top and bottom of all doors.

.11 Prepare doors for installation of glass where indicated on door schedule. Provide glazing stops of solid oak, square design. Finish stops using finishing nails - no staples. Provide U.L.C. approved metal glazing stops where required for fire rating.

.12 Manufacture doors in accordance with CSA-O132.2.

.13 Provide rated doors where indicated or required, with U.L.C. or Warnock Hersey labels attached. Openings must conform to limits noted in Ontario Building Code.

2.2 FINISHING

.1 Carefully prepare all work to receive finish. Thoroughly sand all wood surfaces to remove machine marks and make dust-free before finishing.

.2 Finish all surfaces with one coat of selected stain, one coat of sealer, sanded smooth, and two coats of finish as specified. Apply finish in accordance with best practice and the resultant finish must be of highest quality for furniture use.

.3 Finish unexposed edges with two coats of tinted sealer.

.4 The colour of stain shall be selected by the Consultant. Before proceeding submit prepared 300mm x 300mm finished samples of materials for approval.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Fit all wood doors accurately in their frames. Doors must swing easily and close tightly without movement when latched.

END OF SECTION

1 General

1.01 SECTION INCLUDES

.1 Fire rated and non-fire rated access doors and frame units.

1.02 RELATED REQUIREMENTS

.1 Section 20 05 00 – Common Work Results for Mechanical.

.2 Section 26 05 00 – Common Work Results for Electrical.

1.03 REFERENCES

.1 UL/ULC Fire Resistance Directory.

1.04 ACTION SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for access door components and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Shop Drawings:

.1 Submit catalogue details for each type of door illustrating profiles, dimensions, and methods of assembly.

.2 If access door is to be installed in a fire rated assembly, shop drawing to indicate the rating.

.4 Before commencing installation of work, coordinate with other trades and prepare on a set of reflected ceiling plans and wall elevations, complete layouts of access doors. Submit these layouts for Consultant’s review and show exact sizes and locations of such access doors. Locate and arrange the work to suit.

1.05 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data:

.1 Submit operation and maintenance data for cleaning and maintenance of finishes for incorporation into manual.

.2 Submit manufacturer’s ordering information for additional keys.

.3 At time of instruction of Owner’s operating staff, hand-over and obtain signed receipt for four sets of each type of key used to lock access doors in secure areas.

1.06 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00, and with manufacturer's written instructions.

.2 Delivery and acceptance requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Store and protect access doors from nicks, scratches, and blemishes.

.4 Leave protective coatings in place until final cleaning of building.

2 Products

2.01 MANUFACTURERS

.1 Acudor Acorn.

.2 Baird – ABCO.

.3 Mifab.

.4 Stelpro - Type 700.

.5 Watts Water Technologies (Canada) Inc.

2.02 ACCESS DOORS

.1 Construction:

.1 Access doors shall be flush to edge of frame, concealed continuous hinge with screwdriver operated cam latch.

.2 Steel, prime coated, flush mounted with 180 degree opening door, round safety corners, concealed hinges, plaster lock and anchor straps.

.3 Rounded safety corners, concealed hinges, screwdriver latch, anchor straps, able to open 180 degrees.

.4 Door construction to be minimum 14 gauge with 16 gauge frame.

.5 Fire-rated door construction to be a minimum 20 gauge insulated door with 16 gauge frame. Insulation thickness to provide required rating.

.6 Provide for plaster surfaces recessed 16 gauge prime painted steel door and welded metal lath, ready to take plaster.

.7 Provide for tiled surfaces, recessed type 16 gauge primed steel doors to suit type of tile used.

.8 Provide other access doors of welded 12 gauge steel, factory prime coated, flush type.

.2 Materials:

.1 Tiled or marble surfaces: stainless steel with [brushed satin] [polished] finish.

.2 Other areas: prime coated steel.

.3 Constructed of stainless steel in areas finished with tile or marble surfaces.

.4 Constructed of stainless steel with neoprene gasketed door in damp and high humidity areas.

.5 Latching:

.6 Fitted with screwdriver operated latches.

.7 In areas subject to security risks (Public Corridors, Public Washrooms, etc.), fitted with keyed cylinder locks with similar keys.

.3 Fire Ratings:

.1 When access doors are required to be located in fire rated walls, floor and ceilings, provide ULC tested and labelled units rated in accordance with the structures being penetrated i.e. 3/4 hour, 1 hour, 2 hour.

.4 Minimum dimensions (or as indicated otherwise on drawings):

.1 600 mm by 600 mm (24 inches by 24 inches) for personnel entry.

.2 450 mm by 450 mm (18 inches by 18 inches) for hand entry.

.3 300 mm by 300 mm (12 inches by 12 inches) for viewing only.

.4 Size doors to allow adequate operating/maintenance clearance for devices.

.5 Access doors shall be, wherever possible, of a standard size for each application.

.5 Example products based on Acudor Acorn:

.1 Concealed plaster: PS-5010.

.2 Concealed drywall: DW-5015.

.3 Existing drywall: DW-5040.

.4 Fire-rated: FW-5050/FB-5060 to match assembly.

2.03 EXCLUSIONS

.1 Lay-in tile ceilings: use unobtrusive identification locators.

3 Execution

3.01 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for access door installation in accordance with manufacturer's written instructions.

.2 Lay-in type ceiling tiles, properly marked, with lamacoid label on adjacent ceiling carrying channel, may serve as access panels. Where ceiling tiles are required to be clipped, provide the appropriate access clips.

.3 Before commencing installation of work, coordinate with other trades and prepare on a set of reflected ceiling plans and wall elevations, complete layouts of access doors. Submit these layouts for Consultant’s review and show exact sizes and locations of such access doors. Locate and arrange the work to suit.

.4 Confirm exact access door dimensions and locations with the Consultant prior to ordering and prior to commencing installation. Arrange work to suit.

3.02 INSTALLATION

.1 Access doors are to be installed by the trade responsible for the particular type of construction in which the doors are required.

.2 Provide access doors for [new and existing] concealed valves, dampers, junction boxes, equipment, etc.

.3 Provide access doors wherever equipment, valves, dampers, control devices, junction boxes, pull boxes, etc., are concealed behind walls or inaccessible ceilings.

.4 Provide access doors to give access to all valves, cleanouts, strainers, duct access doors, and other mechanical devices which may need maintenance or repair which are concealed in inaccessible construction.

.5 Access doors shall match wall and ceiling finishes.

.6 Access doors in gypsum ceiling shall be recessed type.

.7 Locate access doors within view of equipment and ensure equipment is accessible for operating, inspecting, adjusting, servicing without using special tools.

.8 Supply access doors, and make arrangements and pay for installation by trade in whose work they occur.

.9 Size and locate access doors in applied tile, block, or in glazed or unglazed structural tile to suit joint patterns.

.10 Access doors in ceilings, where acoustic tile is applied to plaster or gypsum board, to be dish type designed to receive tile insert.

.11 Access doors are not required in removable ceilings. Provide coloured marking devices after completion of ceilings, at one corner of each panel below point requiring access. Colour code markers to show service or device above.

.12 Provide access doors at locations where equipment requires inspection, service, maintenance, or adjustment, including by not limited to the following:

.1 Expansion joints.

.2 Plumbing cleanouts.

.3 Dampers.

.4 Fire dampers.

.5 Air valves.

.6 Air terminal units.

.7 Valves.

.8 Heating or cooling coils.

.9 Junction and pull boxes for power wiring or control wiring.

.10 Any concealed electrical devices.

3.03 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by access door installation.

End of Section

PART 1 - GENERAL

1.1 WORK INCLUDED

.1 Supply and installation of door hardware for wood doors and hollow metal frames.

.2 Supervision and inspection of door hardware installation by hardware supplier.

.3 Supply and installation of automatic operators.

.4 Final inspection and certification by hardware supplier's Architectural Hardware Consultant (AHC).

.5 Door hardware, including all automatic door hardware is carried in the project cash allowance.

1.2 RELATED SECTIONS

.1	Architectural Casework	Section 06 41 13
.2	Hollow Metal Doors and Frames	Section 08 11 13
.3	Wood Doors	Section 08 21 00
.4	Electrical	Division 26

1.3 PRODUCTS SUPPLIED BUT NOT INSTALLED IN THIS SECTION

.1 Power supplies, compressor/control boxes, junction boxes installed by Division 26.

1.4 REFERENCES.

.1	CAN/CGSB-69.17-M	Bored and Pre-assembled Locks and Latches
.2	CAN/CGSB-69.18-M/ANSI/BHMA-A156.1	Butts & Hinges
.3	CAN/CGSB-69.19-M/ANSI/BHMA-A156-3	Exit Devices
.4	CAN/CGSB-69.20-M/ANSI/BHMA-A156-4	Door Controls (Closers)
.5	CAN/CGSB-69.29/ANSI/BHMA-A156-13	Mortise Locks & Latches
.6	CAN/CGSB-69.34/ANSI/BHMA-A156.18	Materials & Finishes

.7 Canadian Steel Door & Frame Manufacturers Association (CSDFMA), Canadian Metric Guide for Steel Doors & Frames (Modular Construction

.8 NFPA 80-Standard for Fire Doors and Windows

.9 Door and Hardware Institute Recommended locations for Architectural Hardware for Standard Steel Doors and Frames.

.10 Door and Hardware Institute Recommended locations for Architectural Hardware for Flush Wood Doors.

.11 Door and Hardware Institute Sequence Format for Hardware Schedule.

.12 Door and Hardware Institute Key Systems and Nomenclature.

.13 Door and Hardware Institute Abbreviations and Symbols used in Architectural Door and Hardware Schedules and Specifications.

.14 Door and Hardware Institute Installation Guide for Doors and Hardware.

1.5 GENERAL REQUIREMENTS

.1 Hardware shall comply with requirements of authorities having jurisdiction.

.2 Hardware for doors in fire separations and exit doors shall be certified by a Canadian Certification Organization accredited by the Standards Council of Canada.

.3 All door closers shall have back checking features and shall be of proper size to operate door efficiently.

.4 Confirm all kick plate and threshold sizes before ordering them.

.5 Use no wall stops on drywall.

.6 Exposed screws for installing hardware shall have Phillips or Robertson heads.

.7 Rim panic device strikes shall be mortise type application. Equip panic devices with six bolts.

.8 Confirm degree of swing for door holders, closers, etc.

1.6 SUBMITTALS

.1 Door and Hardware List:

.1 Contractor is to submit a minimum of three (3) separate quotations from three (3) door hardware suppliers, regarding the supply and installation of door hardware, including automatic door hardware, as required for this project.
.2 Pricing is to include the cost to prepare a detailed final door hardware list prepared by a qualified Architectural Hardware Consultant (AHC) and for a minimum of two site reviews by the AHC.
.3 List all items to be furnished and delivered under this section.
.4 Indicate door hardware proposed, identifying each item by manufacturer name, manufacturer's catalogue model number, material, function, finish, location, and other pertinent information.
.5 The list shall be in the same format as the door hardware list bound in this project manual.
.6 Approval of the Final Door Hardware List by the Consultant and the Owner shall not relieve the Contractor from responsibility for providing all required door hardware.

.2 Product Data:

.1 Within five (5) calendar days after award of hardware supply subcontract, submit product data sheets with the finish hardware schedule showing all items of hardware to be used on the project. Identify each hardware item supplied under this section by product number, function, hand and finish. Finish hardware schedule to be in conformance of door and Hardware Institute Standards. Provide copies of catalogue cuts and other data required to identify individual components listed and/or to demonstrate compliance with specified requirements for all items contained in the finish hardware set. Submission of manufacturer's full line brochure is not acceptable.

.3 Samples:

.1 When requested in writing, provide (to the Consultants Site Office) one sample of each hardware item complete with fasteners, within fifteen (15) calendar days of award of a purchase order. Samples to be clearly labelled with their hardware schedule designation, installation location, and manufacturers' name and model number. Samples will be returned; approved samples may be incorporated into the work.
.2 Substitute new samples for those rejected by the Consultant.
.3 Do not supply door hardware to the site until all samples are approved by the Consultant.

.4 Templates:

.1 Furnish templates within ten (10) calendar days of being requested by the Consultant and/or door and frame manufacturer, the Contractor must submit templates for door and frame preparations and/or mounting of finish hardware items, and identify each template by label indicating applicable specification paragraph number, brand name & number, door number & hardware package number.

.5 Keying Schedule:

.1 Provide three (3) copies of keying schedule for review prepared and detailed in Reference 1.5.5. Include all special keying notes and stamping instructions. Locks and cylinders are not to be ordered until the key schedule has been approved by the owner.

.6 Wiring Diagrams:

.1 Furnish a written description of the functional use of all electrical hardware. Include door and frame elevations showing the location of each item of electrical hardware to be installed, including a diagram showing number and size of all conductors. Include drawings showing all terminal connections.

.7 Operations and Maintenance Data:

.1 Prior to Substantial Performance, provide the following information for inclusion in the Maintenance manuals, in accordance with Section 01 78 00, Closeout Submittals:

.1 Name of hardware distributor, address and contact name
.2 Copy of final "as-built" finish hardware schedule
.3 Wiring diagrams, elevations, risers, point to point
.4 Copy of final keying schedule
.5 Copy of floor plans with keying nomenclature assigned to door numbers as per the approved keying schedule
.6 Maintenance instructions for each product
.7 Catalogue cut sheets and product specifications for each product
.8 Parts list for each product
.9 Installation instructions for each product

.10 A copy of the certification letter from the AHC, confirming the correct supply and installation of hardware, as required by Subsection 3.3, below.

.8 Maintenance Materials:

.1 Provide maintenance materials, in accordance with Section 01 78 00, Closeout Submittals.
.2 Supply four sets of wrenches for door closers, locksets, latchsets, and exit devices.
.3 Supply five sets of other special parts or tools required for proper maintenance and adjustment of door hardware, including those used for locks/passage/privacy, all type of door closers, and all exit devices.

1.7 QUALITY ASSURANCE

.1 Contractor shall coordinate a hardware pre-installation meeting with hardware installer, hardware supplier and hardware sub-consultant (original hardware specifier). Payment for original hardware sub-consultant's time to attend meeting shall be paid for through the cash allowance included for inspections (except where hardware supplier is also the hardware sub-consultant). Review installation procedures with the hardware suppliers.

.2 Supplier and installer shall hold regular review meetings during the installation period. Submit minutes of meetings to the Consultant.

.3 Supplier Qualifications:

.1 Successful hardware distributor to have a minimum of five (5) years experience in the door and hardware industry. The distributor to have on staff an Architectural Hardware Consultant (A.H.C.) who will be responsible for scheduling, detailing, ordering and co-ordination of the finishing hardware for this project. This individual shall be required for jobsite visits, as outlined below and when so requested by the Architect.

.4 Designated Installer:

.1 Hardware Installers must have a minimum of five (5) years experience in installation of hardware. Provide verification of installer's qualification to Consultant for approval. All installers to attend review meetings with the Hardware Distributor.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 Marking and Packaging:

.1 All cartons shall be marked with heading number, door number, and key-set symbol where applicable in original packaging provided by the manufacturer. Pack packaged hardware in suitable wrappings and containers to protect it from damage during shipping and storage. Accessories, fastening devices and other loose items shall be enclosed with each applicable item of hardware.

.2 Delivery:

.1 Deliver hardware to those who are to install it, complete with keys, templates and installation instructions together with all required screws, expansion shields, anchors, jigs and other related accessories for satisfactory attaching or installing hardware.

.3 Storage:

.1 Store in a clean, dry room with lockable man door and adequate shelving to permit organization so item numbers are readily visible.

1.9 WARRANTY

.1 Provide warranties by the accepted manufacturers:

.2 Where manufacturer's standard warranty period exceeds these requirements, it shall prevail.

Hardware Item	Length of Warranty
Mortise Hinges	Lifetime
Locks (ND-Series)	7 yrs
Locks (All other Series)	2 yrs
Exit Devices	3 yrs
Door closers -mechanical	10 yrs
Door Operators - Electro mechanical	2 yrs
Door Hold open Devices - Electro mechanical	2 yrs
Overhead stops/holders	2 yrs
Floor/Wall stops	2 yrs
Electric Strikes/Key Switches/Power Supplies	2 yrs

.3 Door hardware warranties shall cover all defects in material and workmanship that become apparent during the warranty period and such defects shall be made good or the defective product shall be replaced, to the satisfaction of the Owner and at no cost to the Owner.

1.10 MAINTENANCE

.1 Maintenance Service:

.1 After the building is occupied arrange an appointment with the Owner's maintenance staff for instruction of proper use, servicing, adjusting and lubrication of hardware furnished. Submit to the consultant a list of attendees and meeting date.

.2 Extra Materials:

.1 Provide Owner with maintenance materials as specified above.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

.1 Products listed in the finishing hardware schedule are from the manufacturers listed below (substitutions may be submitted for review and acceptance):

ITEM	MANUFACTURER NAME
Full Mortise Hinges	Ives
Locksets, Latchsets/Deadbolts	Schlage
Exit Devices	Von Duprin
Cylinder	Best
Flush Bolts/Constant Latching Flush Bolts Door	Ives
Closers	LCN
Overhead Door Holders/Stops	Glynn Johnson
Door Pulls/Flatware	Canadian Builders Hardware
Wall/Floor Stops	Ives
Weather/Smoke/Sound Seals	KN Crowder
Door Sweeps/Thresholds	KN Crowder
Automatic Door Operators/Actuators	LCN
Electric Strikes	Von Duprin
Power Supplies	Von Duprin

2.2 MATERIALS

.1 Screws and Fasteners:

.1 All screws shall be matching finish to their product and shall be manufacturer's standard. Door closers, door holders and exit devices installed on fire rated wood doors and hollow metal doors shall be attached with sex nuts and bolts.

.2 Materials - Acceptable Manufacturers (Note: Supply all products in a given category from the same manufacturer):

.1 Mortise Hinges:

.1 Furnish three knuckle concealed bearing hinges with NRP option on all reverse bevel doors with locking hardware. Hinge width to accommodate door closer projection, door trim and allow for 180-degree swing. Doors up to 2286mm in height, supply 3 hinges, doors greater than 2286mm in height add one hinge for every additional 760mm of door height. Doors 925mm wide and less furnish 114 mm high hinges, doors greater than 925mm wide furnish 127mm high hinges, heavy weight or standard weight as specified. Supply ferrous (steel), stainless steel material for all interior and/or fire-rated doors and stainless steel for exterior doors. Supply: Ives Hinges, 5BB1, 5BB1HW

.2 Locksets/Passage Sets/Privacy Sets:

.1 Cylindrical-Lever:

.1 Standard duty commercial exterior and interior cUL listed for all functions up to 3-hour doors. Levers to be solid pressure cast zinc with no plastic inserts. Grade 2 lever sets to have through bolts to prevent chassis rotation with internal components and chassis constructed of cold rolled steel with zinc dichromate plating to resist corrosion. Lever sets to have independent heavy duty compression springs as well as precision laser cut stainless steel spindles with interlocking on keyed side.

Supply: Schlage “AL” series

.2 Cylindrical:

.1 Extra heavy duty residential, commercial, institutional and industrial applications. Latch bolts to be steel with minimum ½” throw deadlocking on keyed and exterior functions. ¾” throw anti-friction latchbolt on pairs of fire doors. Provide manufacturer’s standard wrought box strike for each latch or lock, with curved lip extended to protect frame. Locks and latchsets tested to exceed 3,000,000 cycles. Lock case to be steel, incorporate one piece spring cage and spindle. Precision solid brass 6-pin cylinder with nickel silver keys available in all Schlage keyways. All levers to be solid with no plastic inserts.

Supply: Schlage “ND” series

.3 Strike Plates:

.1 Provide lockset and latchset strike plates with lip centre dimensions sized to minimally clear trim. Where strike lip extends beyond the projection of the casing or other trim, provide curved lip strikes. Strike plates applied to inactive leaf of paired openings to have flat lip sized to fit flush with the face of the door skin.

.3 Exit Devices/Exit Device Trims/Mullions:

.1 Heavy Duty

.1 Exit device to be cUL listed for panic hardware and fire exit hardware. Supply exit devices and fire exit devices featuring coil compression springs on all device mechanism subassemblies and dead latching mechanisms for all active latchbolts. Supply exit devices with smooth mechanism case and “the quiet one” fluid dampener to eliminate noise associated with exit device operations. Non-handed device with touchpad assemblies with no exposed fasteners and cast end caps, reinforced aluminum with stainless steel touchpad and raised edge to minimize pinching. Roller strikes to be standard on all rim and surface

vertical rod devices. Doors greater than 915mm wide supply long bar exit devices, doors greater than 2134mm high supply extension rods for required series. 1,000,000cycle testing independently certified by ETL.

Supply: Von Duprin 98 series

.2 Device Trim:

.1 Supply device trim featuring recessed cylinder mounting and coil compression spring design with shear pin protection for all lever designs. Similar lever designs for exits as specified for locksets.

Supply: Von Duprin 996 series

.4 Door Closers/Auto Door Operators:

.1 Door closers to have the following features (see separate closer sections below for further information):

.1 fully hydraulic, rack and pinion action with high strength cast iron cylinders and one piece forged steel pistons.
.2 Include high efficiency, low friction pinion bearings.
.3 hydraulic fluid of a type requires no seasonal adjustments, ULTRA X TM fluid has constant temperature control from -35o C to +49o C
.4 hydraulic regulation controlled by tamper-proof, non-critical screw valves, adjustable with a hex wrench.
.5 separate adjustments for backcheck, general speed and latch speed.
.6 door closers with special template (ST-) numbers include all required associated product, information sheets and instructions.
.7 size 1 manual door closers to provide less than 5 pounds opening force on a 900mm door leaf.
.8 door closer with Pressure Relief Valves are not accepted.
.9 door closer bodies, arms, covers to be powder coated.
.10 closers with painted finishes shall exceed a minimum 100-hour salt spray test, as described in ANSI A156.18 and ASTM B117.
.11 closers detailed with plated finishes shall include plated covers (or finish plates), arms and visible fasteners.

.2 Medium Duty Mechanical:

.1 Non-sized (1-6) and non-handed cylinder body to have 1 ¼" piston diameter with 5/8" single heat-treated shaft. Track closer cylinder body non-sized (2-4) or (1-2). Closers to have forged main arm and forearm, forged steel main arm and forearm EDA and CUSH type arms). Optional arms to be interchangeable within the series of closers, except track arm type closers. Track arm type closers to have single lever arm with low friction track and roller assembly and provisions for an optional bumper to assist backcheck.

Supply: LCN 1460 HD series

.3 Heavy Duty Mechanical:

.1 Non-sized (1-6) and non-handed cast iron cylinder body to have 1½" piston diameter with 3/4" double heat-treated pinions shaft witn 5/8" full compliment bearings. XP closer hydraulic regulation controlled by tamperproof, non-critical screw valves, abrasion resistant Vitron "O" ring, adjustable with a hex wrench. Closers to have forged steel main arm and forearm (forged steel main arm and foreoarm EDA and CUSH type arms). Optional arms to be interchangeable within the series of closers, except track arm type closers. Track arm type closers to have single lever forged arm with low friction track and roller assembly and provisions for an optional bumper to assist backcheck.

Supply: LCN 4040XP series

"NOTE: ALL LOW ENERGY OPERATORS SUPPLIED AND INSTALLED BY THIS

.4 SECTION" .4 Heavy Duty Electric Operator:

.1 Two in one swing door auto door operator, cUL listed for fire door applications.

.1 fully hydraulic, rack and pinion action with high strength cast iron cylinders and one piece forged steel pistons.

.2 include high efficiency, low friction pinion bearings.

.3 hydraulic fluid of a type requires no seasonal adjustments, ULTRA X TM fluid has constant temperature control from -35o C to +49o C

.4 hydraulic regulation controlled by tamper-proof, non-critical screw valves, adjustable with a hex wrench.

.5 separate adjustments for backcheck, general speed and latch speed.

.6 door closers with special template (ST-) numbers include all required associated product, information sheets and instructions.

.7 size 1 manual door closers to provide less than 5 pounds opening force on a 900mm door leaf.

.8 door closer with Pressure Relief Valves are not accepted.

.9 door closer bodies, arms, covers to be powder coated.

.10 closers with painted finishes shall exceed a minimum 100-hour salt spray test, as described in ANSI A156.18 and ASTM B117.

.11 closers detailed with plated finishes shall include plated covers (or finish plates), arms and visible fasteners.

.2 Medium Duty Mechanical:

.1 Non-sized (1-6) and non-handed cylinder body to have 1 ¼" piston diameter with 5/8" single heat-treated shaft. Track closer cylinder body non-sized (2-4) or (1-2). Closers to have forged main arm and forearm, forged steel main arm and forearm EDA and CUSH type arms). Optional arms to be interchangeable within the series of closers, except track arm type closers. Track arm type closers to have single lever arm with low friction track and roller assembly and provisions for an optional bumper to assist backcheck.

Supply :LCN 1460 HD series

.3 Heavy Duty Mechanical:

.1 Non-sized (1-6) and non-handed cast iron cylinder body to have 1½" piston diameter with 3/4" double heat-treated pinions shaft witn 5/8" full compliment bearings. XP closer hydraulic regulation controlled by tamperproof, non-critical screw valves, abrasion resistant Vitron "O" ring, adjustable with a hex wrench. Closers to have forged steel main arm and forearm (forged steel main arm and foreoarm EDA and CUSH type arms). Optional arms to be interchangeable within the series of closers, except track arm type closers. Track arm type closers to have single lever forged arm with low friction track and roller assembly and provisions for an optional bumper to assist backcheck.

Supply: LCN 4040XP series

"NOTE: ALL LOW ENERGY OPERATORS SUPPLIED AND INSTALLED BY
THIS SECTION"

.4 Heavy Duty Electric Operator:

.1 Two in one swing door auto door operator, cUL listed for fire door applications.
- .1 Provisions for separate conduits to carry high and low voltage wiring in compliance with the National Electrical code.
- .2 Push 'n go permits non-switch activation.
- .3 Electromechanical unit with microprocessor control.
- .4 Tested internally to over ten million cycles.
- .5 Certified by cUL for use on labeled doors.
- .6 Adjustable hold open period Of 2 to 30 seconds in automatic or manual mode.
- .7 Push applications

Supply: 9131 series

.5 Actuators:

.1 Wall Type

.1 Wall plate switch to be hard-wired either 12VDC or 24VDC actuator with round, stainless steel touch plate in 4 ½" diameter. Engraved blue filled handicap symbol conforms to most accessibility codes. Units to include heavy grade components for vandal resistant mounting and weather resistant switch standard.

Supply: LCN 8310-856, 8310-874

.5 Overhead Door Stops/Holders:

.1 Heavy Duty Surface Mounted:

.1 Surface overhead stops/holders to be stainless steel base, non-handed for single-acting doors with a heavy-duty channel/slide-arm design and offset jamb bracket to allow for simple field modifications of functions. Channel to be surface mounted to the door with thru bolts and the jamb bracket is surface mounted to the jamb.

Supply: Glynn-Johnson 900 series

.2 Heavy Duty Concealed Mounting:

.1 Concealed overhead stops/holders to be stainless steel base, non-handed for single or double-acting doors with a low profile channel, mortised in the door and jamb bracket is mortised in the doorframe. Unit to be fully concealed when door is in the closed position. Units to be field adjustable for function changes if required.

Supply: Glynn-Johnson 100 series

.6 Door Pulls/Flatware/Coat Hooks:

.1 All flatware to be of stainless steel material, .050 gauge.

Supply as Specified: CBH 903 T304 B4E (Kickplates 40mm less door width single door and 25mm less door width double doors) CBH 380 door push/pull plates, cut for cylinder where specified with deadlocks.

.7 Floor/Wall Stops:

.1 Floor Stops: No floor stops permitted.
.2 Wall Stops (No Button on Locking Hardware):

.1 Wall stops to be constructed of stainless steel or brass/bronze base with special retainer cup that makes the rubber stop tamper resistant. Convex design of rubber bumper.

Supply as Specified:Ives WS401CVX, WS407CVX

.3 Wall Stops (Projecting Button on Locking Hardware):

.1 Wall stops to be constructed of bass/bronze base with special retainer cup that makes the rubber stop tamper resistant. Concave rubber bumper to avoid damage to locks with projecting buttons.
Supply: Ives WS401CCV

.8 Weather/Smoke/Sound Seals:

.1 Supply: KN Crowder W-21 (head/jamb seal)

.9 Electric Strikes, Electro-Magnetic Door Holders:

.1 Grade 1, electric strikes to be cUL listed burglary-resistant and electric strike for fire doors and frames. A label for single doors and B label for double doors. Electric strikes to be stainless steel construction, non-handed available in 12V or 24V AC or DC with continuous duty solenoid and accept ¾" throw latchbolts. Strike box to be adjustable to compensate for any misalignment of the door or frame with two piece plug connector for ease of installation.

Supply: Von Duprin 6000 series

.2 Electro-Magnetic Door Holders:

.1 Provide floor and wall mounted units to hold door in open position and to release and automatically close under fire alarm conditions. Electromagnet shall be protected against transients and voltage surges up to 600 volts. Power requirements, tri-voltage.

Supply: LCN-SEM 7800 series

2.3 FINISHES

.1 Unless otherwise specified, all finishes to be brushed chrome (626).

.2 Finishes are specified as follows:

ITEM	BHMA#	DESCRIPTION	BASE MATERIALS
Hinges	652	satin chrome plated	steel
Lock Trim	626	satin chrome plated	brass/bronze
Exit Devices	626	satin chrome plated	brass/bronze
Door Closer	689	powder coat aluminum	steel
Magnetic Wall Holders	689	powder coat aluminum	steel
Door Pulls	630	satin stainless steel	stainless steel
Protective Plate	630	satin stainless steel	stainless steel
Door Stops/Holders			
Overhead	630	satin stainless steel	stainless steel
Wall/Floor	626	satin chrome plated	brass/bronze
Thresholds	628	anodized aluminum	aluminum
Miscellaneous			
Mullions	689	powder coat aluminum	steel stainless
Electric Strikes	630	satin stainless steel	steel

2.4 CYLINDERS, KEYING SYSTEMS AND KEY CONTROL

.1 Meet with the Owner to finalize keying requirements and obtain keying instructions in writing as outlined in Division 01. Furnish interior cylinders to the existing key system; all permanent core cylinders will be by Owner.

.2 Provide temporary construction keying system during construction period at all locks. Permanent keys will be furnished to the Owner's Representative prior to occupancy. The Owner or Owner's Security Agent will void the operation of the construction keys.

.3 Permanent cylinders to be keyed by factory, combined in sets or subsets, master keyed or great grand master keyed, as directed by Owner.

.4 Furnish keys in following quantities, furnish a sum total of three (3) change keys per cylinder. This sum total of keys to be cut and furnished as directed by Owner. Any unused balance of cut change keys shall be furnished as key blanks directly to Owner with the cut Keys.

.5 All keying requirements to be confirmed by Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Ensure that doors and frames are properly prepared and reinforced to receive finish hardware prior to installation.

.2 Ensure that door frames and finished floor are sufficiently plumb and level to permit proper engagement and operation of hardware.

.3 Submit in writing a list of deficiencies, determined as part of inspection required, to supervising consultant prior to installation of finished hardware.

3.2 INSTALLATION

.1 Hardware Installers must have a minimum of five (5) years experience in installation of hardware. Provide verification of installer's qualification to Consultant for approval. All installers to attend review meetings with the hardware distributor.

.2 Install hardware at mounting heights as specified in the manufacturers templates or specific references in approved hardware schedule or approved elevation drawings.

.3 Where mounting height is not otherwise specified, install hardware at mounting heights as per referenced standards.

.4 Install hardware using only manufacturer supplied and approved fasteners in strict adherence with manufacturers published installation instructions.

.5 Ensure that all locksets / latchsets / deadlocks are of the correct hand before installation to ensure that the cylinder is in the correct position. Handing is part of installation procedure.

.6 Ensure that all exit devices are of the correct hand and adjust device cam for proper outside trim function prior to installation. Handing is part of installation procedure.

.7 Follow all manufactures installation instructions. Adjustment is inclusive of spring power, closing speed, latching speed and back-check at the time of installation.

.8 Delayed action door closers are to be adjusted to forty (40) second delay for handicapped accessibility and movement of materials. Time period to be approved by Owner.

.9 Install head seal prior to installation of "PA"-parallel arm mounted door closers and push side mounted door stops/holders. Trim, cut and notch thresholds and saddles neatly to minimally fit the profile of the door frame. Install thresholds and saddles in a bed of caulking completely sealing the underside from water and air penetration.

.10 Counter sink through bolt of door pull under push plate during installation.

.11 Install blocking material of sufficient type and size in cavities of metal and wood stud walls and partitions. Located concave and convex type door bumpers at the appropriate height to properly contact protruding door trim.

3.3 FIELD QUALITY CONTROL

.1 Verify each door leaf opens closes and latches properly. Inspect fire rated openings to ensure they are installed in compliance with NFPA 80 requirements. Test access control system and electrified hardware devices for proper operation, owner to sign off on verification of operation. Verify electric door release hardware operates properly upon activation of the fire alarm system.

.2 Finishing Hardware supplier's Architectural Hardware Consultant shall perform on-site inspections every two weeks during hardware installation and provide inspection reports listing progress of work, unacceptable work and corrective measures. Repair or replace as directed by the Consultant.

.3 Upon completion of finish hardware installation, the Architectural Hardware Consultant and the Contractor shall inspect work and provide a list of all hardware deficiencies. The Architectural Hardware Consultant shall re-inspect when notified by the Contractor as to the clearing of deficiencies. Final inspection must ensure all hardware items operate as per manufacture requirements. Coordinate inspections with manufacturer's representatives as required to establish warranties.

.4 Once any deficiencies have been corrected, the Architectural Hardware Consultant and the Contractor shall certify in writing that all hardware items and their installation are in accord with requirements of Contract Documents.

3.4 ADJUSTING AND CLEANING

.1 Check and make final adjustments to each operating item of hardware on each door to ensure proper operation and function.

.2 Adjust doors with self closing devices or automatic closing devices for proper operation after the HVAC system is balanced and adjusted. Verify spring power of non sized door closers is properly adjusted.

.3 All hardware to be left clean and free of disfigurements.

.4 Instruct Owner's personnel in the proper operation, adjustment and maintenance of hardware.

.5 Check all locked doors against approved keying schedule.

3.5 PROTECTION

.1 Protect hardware from damage during construction. Wrap locks panic hardware, fire exit hardware, door pull trim with kraft paper or plastic bubble materials to protect finish from damage until date of substantial completion. Remove and reinstalling or where necessary, using temporary hardware to maintain finish in new condition and maintain manufacturer's warranty.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Glazing for interior hollow metal framed screens and wood doors.

1.2 RELATED SECTIONS

.1	General Requirements	Division 01
.2	Sealants	Section 07 92 00
.3	Hollow Metal Doors and Frames	Section 08 11 13
.4	Wood Doors	Section 08 21 00

1.3 REFERNCES

.1 ASTM-D2240-97, Standard Test Method for Rubber Property-Durometer Hardness.
.2 ASTM-E84-98, Standard Test Method for Surface Burning Characteristics of Building Materials.
.3 ASTM-E330-97, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
.4 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
.5 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
.6 CAN/CGSB-12.8-M90, Insulating Glass Units.
.7 CAN/CGSB-12.9-M91, Spandrel Glass.
.8 CAN/CGSB-12.11-M90, Wired Safety Glass.
.9 CAN/CGSB-12.20-M89, Structural Design of Glass for Buildings.
.10 CAN/CGSB-19.13-M87, Sealing Compound, One-Component, Elastomeric Chemical Curing.
.11 CAN/CSA-A440.2-09, Fenestration Energy Performance.
.12 Insulating Glass Manufacturers Alliance (IGMA), Glazing Guidelines for Sealed Insulating Glass Units, 1997.
.13 Glass Association of North America (GANA), Glazing Manual, 2005.
.14 NFRC-100-2010, Procedure for Determining Fenestration Product U-Factors.
.15 NFRC-200-2010, Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
.16 NFRC-400-2010, Procedure for Determining Fenestration Product Air Leakage.

1.4 QUALITY ASSURANCE

.1 Glass and glazing work of this section shall conform to good glazing practice as described in the IGMA-North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use and the GANA Glazing Manual.

.2 Submit all documentation specified to show that all Products used meet or exceed the requirements of these Specifications.

.3 All glass shall bear manufacturer's labels identifying glass type and thickness. Labels shall remain on glass until final cleaning.

.4 Insulating glass manufacturer shall be a member in good standing of IGMA, and be prepared to submit evidence of current membership to the Consultant on demand.

.5 Glazing Subcontractor shall be member in good standing of the Architectural Glass & Metal Contractors Association or the Ontario Glass & Metal Association, and have a minimum of five years uninterrupted experience in successfully carrying out projects of similar size.

1.5 PERFORMANCE REQUIREMENTS

.1 Structural Design of Glass:
- .1 Glass thickness:
  - .1 Specified glass thicknesses are minimums.
  - .2 Confirm glass thicknesses by analyzing Project loads and in-service conditions.
  - .3 Provide glass lights in the thicknesses required to meet or exceed these requirements, but not less than the minimum thickness specified.
- .2 Size glass units and glass thickness in accordance with CAN/CGSB-12.20.
- .3 Size glass to withstand wind loads, dead loads and positive and negative live loads as measured in accordance with ASTM-E330.
- .4 Limit glass deflection to 1/175 of span to a maximum of 15mm with full recovery of glazing materials.
- .5 Probability of Breakage:
  - .1 Vertical glazing – typical: 8 lights per 1000 for lights set vertically or not more than 15 degrees off vertical.
  - .2 Sloped glazing: 1 light per 1000 for lights set greater than 15 degrees off vertical.
  - .3 Glazing acting as guard: 1 light per 1000.

1.6 SUBMITTALS

.1 Submit in accordance with Section 01 33 23 – Shop Drawings, Product Data and Samples.

.2 Submit all documentation and samples for review by Consultants at one time, prior to ordering glass products.

.3 Certification:
- .1 Submit signed report and documentation, prepared by an independent CSA accredited agency, certifying compliance with specified thermal, optical, and air leakage requirements.
- .2 Certification shall be based on full size sample testing and measurement or computer simulation and calculation in accordance with referenced standards.

.3 Submit specified certification documentation together with Shop Drawings.

.4 Shop Drawings:

.1 Submit Shop Drawings for the work of this section.

.2 Shop Drawings shall include glass type, thicknesses, sizes, shapes, accessories, locations, and glazing methods.

.3 Shop Drawings shall include a glazing schedule listing glass types and thicknesses for each size opening and location.

.4 Submit a General Review Commitment Certificate for the work of this section as may be required by the municipality or any authority having jurisdiction.

.5 Letter of Compliance: Submit the necessary documentation indicating compliance with the requirements of the Building Code and the approved drawings which formed the basis of the General Review Commitment Certificate.

.5 Samples:

.1 Submit samples of spandrel glass colours for selection by the Consultant. Submit 300mm by 300mm size samples of each type of glass specified.

.6 Product Data:

.1 Submit Product data for the work of this section.

.2 Provide the manufacturer's transmittance, reflectance, and thermal performance data for insulating glass units.

.3 Submit letter from insulating glass fabricator stating current IGMA compliance number and identifying the types of edge construction covered by that number.

.4 Manufacturers' certification:

.1 Certification shall indicate the Shop Drawings reviewed by enumerating sheet number, dates and revisions.

.2 Identify any specified requirements that are in error or cannot legitimately be met, and provide alternates that meet the intent of the Specifications for the Consultant's approval.

1.7 SITE CONDITIONS AND COORDINATION

.1 Do not install any glazing until all nearby welding, grinding, sandblasting, waterproofing, mortar work and acid etching are complete.

.2 Schedule activities such as welding, sandblasting and grinding of steel or concrete, mortar work, acid etching and any other work harmful to glass, to be completed before start of glass installation. When such activities must be carried out in the vicinity of stored or installed glass, provide hoarding or other suitable protection recommended by Glazing Subcontractor.

.3 Report to the Consultant in writing any defects in existing work, or unsatisfactory site conditions. Start no work until conditions are satisfactory. Starting work shall imply acceptance of existing conditions and surfaces.

.4 Glaze with compounds, sealants, or tapes only when glazing surfaces are at temperatures recommended by the tape or sealant manufacturer, and when the substrates are free of moisture.

.5 When temperature of glazing surfaces is below that recommended by sealant manufacturer, obtain Consultant's approval for glazing methods and protective measures which are to be used under these conditions.

.6 Cooperate with other Subcontractors and with framing Supplier(s) to ensure the work of this section is completed as specified.

1.8 WARRANTY

.1 Warranty all glass to be free from defects in workmanship and materials of any kind for a period of ten (10) years.

.2 Replace (including removal and installation) all glass found to be defective.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Float Glass:
- .1 Conform to CAN/CGSB-12.3, Annealed glazing quality.
- .2 6mm thick unless specified or indicated otherwise and 9.5mm thick where glass units span more than 1220mm in width.

.2 Tempered Safety Glass (TGL):
- .1 Type 2 – tempered.
- .2 Class B – Float glass.
- .3 Category 1.
- .4 Minimum 6mm thick clear tempered glass conforming to CAN/CGSB 12.1.
- .5 Provide minimum 9.5mm thick clear tempered class conforming to CAN/CGSB 12.1 where glass units span more than 1220mm in width.

.3 Setting Blocks: Neoprene, 80 - 90 Shore A durometer hardness to ASTM-D2240, to suit glazing method, glass light weight and area.

.4 Spacer Shims: Neoprene 50 - 60 Shore A durometer hardness to ASTM-D2240, 75mm long by one half height of glazing stop by thickness to suit application. Self-adhesive on one face.

.5 Glazing Tape: Preformed butyl compound with integral resilient tube spacing device, 10 - 15 Shore A durometer hardness to ASTM-D2240; coiled on release paper; size to suit glazing method, black colour.

.6 Sealant: One-part neutral cure silicone to CAN/CGSB-19.13, custom colour selected by the Consultant.
- .1 Dow Corning Corporation: 795 Silicone Building Sealant.

.2 General Electric Canada Inc.: Silpruf Sealant.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Ensure fabricated glass will fit openings and that all required clearances to framing will be maintained.

.2 Clean contact surfaces with solvent and wipe dry.

.3 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.4 Prime surfaces scheduled to receive sealant. Ensure surfaces are free of moisture and frost.

.5 Contractor shall take all precautions necessary to protect materials, before and after installation, from lime, mortar, water run-off from concrete or copper, careless handling of tools, weld spatter, acids, roofing tar, solvents, abrasive cleaners, and other items that could damage the glass surfaces. Do not rely on use of protective plastic films to protect materials.

3.2 INSTALLATION – GENERAL

.1 Install all materials according to manufacturers' instructions and reviewed Shop Drawings and best practices as described in IGMA and GANA glazing manuals. Ensure each material used is compatible with the material which it contacts.

.2 Adjust operating sash before glazing. Glaze operating sash in the closed position. Sash to remain closed, and not be opened by any trade, until glazing materials have properly cured.

.3 Provide specified edge and face clearances and glass bite.

.4 Ensure all vent and weep holes and passages remain free of obstructions.

.5 Follow sealant manufacturer's recommendations for proper joint design, including use of joint fillers, primers, and bond breakers, as required to suit jobsite conditions.

.6 Remove excess glazing and sealant compounds, dirt, and other substances from glass and adjacent surfaces at completion of glazing work.

.7 Provide safety markings to installed glass by attaching streamers or tape to face of sash. Do not apply tape directly to the glass. Do not mark glass with paint or any other substance that is hard to remove or could leave permanent stains.

.8 Replace all defective glass products and glass damaged during installation at no cost to the Owner.

3.3 INSTALLATION: INTERIOR - DRY METHOD (TAPE AND TAPE)

.1 Cut glazing tape to length and set against permanent stops, projecting 1.5mm above sight line.

.2 Place setting blocks at 1/3 points, with edge block maximum 150mm from corners.

.3 Rest glazing on setting blocks and push against tape for full contact at perimeter of light or unit.

.4 Cut glazing tape to length and place glazing tape on free perimeter of glazing, projecting 1.5 mm above sight line.

.5 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

.6 Knife trim protruding tape.

3.4 PROTECTION

.1 Contractor shall take all precautions necessary to protect stored glass and installed glass, from lime, mortar, water run-off from concrete or copper, weld spatter, acids, roofing tar, solvents, abrasive cleaners, careless handling of tools, and any other activities by building trades that could permanently damage the glass surfaces.

.2 Install protective cover to glazing where there is a high risk of damage. Use plywood, heavy Kraft paper or non-staining transparent plastic sheet. Do not let protective materials contact surface of glass. Consult with Glazing Subcontractor to determine appropriate protective measures.

.3 Do not rely on use of adhesive plastic films to protect installed glass. When plastic sheeting is used, it must be transparent, suspended away from the surface of the glass, and be provided with adequate ventilation holes to prevent heat build-up.

3.5 GLAZING SCHEDULE

.1 Hollow Metal Interior Frames and Wood Doors:

.1 Specified in Section 08 11 13 and Section 08 21 00:

.1 Glazed by this section.

.2 Method (interior): Interior Dry (tape and tape).

3.6 CLEANING

.1 As work progresses clean all glass, including fittings. Remove all setting and glazing compounds from adjacent surfaces. Remove all finger and hand prints and other soil.

.2 Protect glass from contact with contaminating substances during construction.

.3 Clean and wash glass by methods recommended by glass manufacturers.

.4 All glass shall be cleaned immediately prior to the Consultant's review for Substantial Performance and again immediately prior to occupancy of the building by the Owner.

.5 Remove all protective materials, glazing materials, and other deposits from finished surfaces.

.6 Remove labels after work is complete.

.7 Do not use vigorous cleaning methods. Avoid scratching glass.

.8 Clean and restore stained or damaged surfaces in accordance with manufacturer's recommendations. Replace glass if cleaning is impossible.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

1.	Rough Carpentry	Section 06 10 00
2.	Hollow Metal Doors and Frames	Section 08 11 13
3.	Gypsum Board	Section 09 29 00
4.	Acoustic Ceilings	Section 09 51 00

1.2 REFERENCES

1. CSA S136 — North American Specification for the Design of Cold-Formed Steel Structural Members
2. CAN/ULC-S101 — Standard Methods of Fire Endurance Tests of Building Construction and Materials
3. AISI — North American Standard for Cold-Formed Steel Framing – Product Data
4. ASTM International

.1	A653/A653M	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
.2	A641/A641M	Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
.3	A792/A792M	Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
.4	A1003	Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic coated for Cold-Formed Framing Members
.5	C645	Standard Specification for Nonstructural Steel Framing Members
.6	C754	Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
.7	C840	Standard Specification for Application and Finishing of Gypsum Board
.8	C841	Standard Specification for Installation of Interior Lathing and Furring
.9	C844	Standard Specification for Application of Gypsum Base to Receive Gypsum Veneer Plaster
.10	C1002	Standard Specification for Steel-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster bases to Wood Studs or Steel Studs
.11	ASTM E90	Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
.12	ASTM E413	Classification for Rating Sound Insulation
.13	E488	Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
.14	E1190	Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members

.5 Canadian Sheet Steel Building Institute (CSSBI:

.1 Lightweight Steel Framing Technical Bulletin Volume 7, Number 1, Maximum Height Tables for Interior Non-Loadbearing Partitions.

1.3 QUALITY ASSURANCE

.1 Fire-Test-Response Characteristics:

.1 For fire-resistance-rated assemblies that incorporate non-loadbearing interior steel framing, provide materials and construction identical to those tested in assembly indicated according to CAN/ULS-S101.

.2 STC-Rated Assemblies:

.1 For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413.

1.4 DELIVERY AND STORAGE

.1 Handle and store materials carefully to prevent damage.

.2 Obtain approval of proposed locations for stockpiling material. Provide any necessary temporary covers, skids and the like.

.3 Do not install damaged or deteriorated material but remove from Site.

1.5 RELATIONS WITH OTHER TRADES

.1 Coordinate with other trades for the locations of items to be framed in and framed around.

.2 Co-ordinate with mechanical and electrical Trades to ensure that all services are installed prior to application of wall board.

.3 Coordinate with mechanical and electrical trades for locations of access panels. Install access doors and panels supplied by those trades.

.4 Co-ordinate with forces installing insulation and vapour barrier in exterior soffits.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Metal framing shall be as manufactured by Bailey Metal Products or approved alternate; to ASTM C645.

.2 Metal Studs and Track: minimum 0.455mm (18 mils) galvanized steel; depths as indicated on drawings, [41mm] [64mm] [92mm] [152mm].

.3 Metal Furring Channels: minimum 0.455 (18 mils) sheet galvanized steel channel and accessories as manufactured by Bailey Metal Products, or approved alternate; to ASTM C645.

.4 Cold Rolled Furring Channel: 20mm, x 12.7mm zinc coated channel weighing minimum 0.446 kg per m.

.5 Cold Rolled Carrying Channel: 38mm x 15mm zinc coated channel weighing min 0.707 kg per m.

.6 Hanger wire: minimum 3.77mm (9ga) galvanized steel wire.

.7 Tie Wire: minimum 1.5mm (16 ga) galvanized soft annealed steel.

.8 CGC Brand Screws (or approved equal) of type recommended by the board manufacturer.

.9 Thermal Break: Permanent adhesive faced rubberized cork, 3 mm thick by width of stud on channel to be used between masonry in exterior wall and metal furring channels.

.10 Ceiling Anchors: Self drilling tie wire anchors, Phillips "Red Head" T-32 or approved equal.

PART 3 - EXECUTION

3.1 GENERALS

.1 Provide plumb, straight, level, rigid, and secure installation. Failing to achieve this result shall be cause for rejection and reinstallation of this work.

.2 Where walls run parallel and under steel joists, the joists shall be framed both sides and enclosed with gypsum board to provide sound barrier between rooms.

3.2 CEILING SUSPENSION

.1 Do not regard grillage system indicated on drawings as exact or complete. The Specification for metal framing contained in CGC Gypsum Construction Handbook and ASTM C840 shall govern installation conditions not covered by this Specification. The more stringent specifications shall apply.

.2 Hangers:

.1 Install hangers for suspended wallboard ceilings to support the grillage independent of walls, columns, pipes, ducts and the like. Erect plumb and securely anchor to the structure. Submit details of proposed method to the Consultant for approval. If so requested, test hangers to prove that anchorage is adequate to support the proposed loading. Erect hangers plumb and securely anchor to structural steel or support channels fastened to structural steel (DO NOT FASTEN TO STEEL DECK).

.2 Space hangers at 1200mm maximum o.c. along the carrying channels and not more than 150mm from ends (or as required to conform with fire tested assemblies where applicable).

.3 Carrying Channels:

.1 Space channels at 1200mm maximum o.c. (or as required to conform with fire tested assemblies where applicable).
.2 Run channels transversely to structural framing members.
.3 Where splices are necessary, lap members at least 200mm and wire each end with two laps; avoid clustering or lining up splices.
.4 Attach to hangers by bending hanger under runner and securely wire in place with a saddle tie.
.5 Provide 25mm clearance between channels and abutting walls and partitions.

.4 Cross Furring
.1 Install drywall screw channels transversely across runner channels, joists or other supports.
.2 Space drywall screw channels at 600mm o.c. and not more than 150mm from perimeter walls. Provide 25mm clearance between channels and abutting walls and partitions. Use closer spacing if so noted on drawings.
.3 Secure drywall screw channels to each support with approved clip or attachment; splice joints by messing minimum 200mm and tying channels together with double strand 16 gauge tie wire.
.4 Level drywall screw channels to a maximum tolerance of 4mm over 3600mm.
.5 Drywall shall not be fixed directly to open web steel joists and the like. Provide cross furring as specified.

.5 Openings
.1 Frame openings with suitable channels; check clearances with respective Trades. Provide support for edges of boards at all cut-outs and openings in ceilings.
.2 Provide all additional hangers and supports for fixtures as required.
.3 Provide additional hangers and framing for enclosure of radiant heating panels.

.6 Bulkheads
.1 Fur out bulkheads in areas indicated and as required to conceal mechanical, electrical or other services in rooms where drywall finishes are scheduled, and elsewhere if called for on drawings.
.2 Use methods and materials as previously specified in this section.

3.3 STEEL STUD SYSTEM (PARTITION) INSTALLATION

.1 Conform to the guidelines for metal framing contained in The Gypsum Construction Handbook, CSA A.82.31, and these specifications. The most stringent requirements shall apply.

.2 Attach metal runners at floor and ceiling to structural elements with suitable fasteners located 50mm from each end and spaced 600 mm. o.c. with toggle or molly bolts spaced 400mm o.c.

.3 Position studs vertically, engaging floor and ceiling runners, and spaced 400mm o.c., unless otherwise noted on drawings. When necessary, splice studs with 200mm nested lap and one positive attachment per stud flange. Place studs in direct contact with door frame jambs, abutting partitions, partition corners and existing construction elements.

.4 Where studs are installed directly against exterior walls install rubberized cork stip between studs and wall surfaces to provide thermal break.

.5 Anchor studs for shelf-walls and those adjacent to door and window frames, partition intersections and corners to ceiling and floor runner flanges with an approved crimping tool. Securely anchor studs to jamb and head anchor clips of door or borrowed-light frames by bolt or screw attachment. Over metal door and borrowed-light frames, place horizontally a cut-to-length section of runner, with a web-flange bent at each end, and secure with one positive attachment per flange. Position a cut-to-length stud (extending to ceiling runner) at vertical panel joints over door frame header.

.6 Stiffen partitions exceeding 3m long or 2.7m high with 19mm. cold rolled channels. Fix horizontally and provide the number of rows necessary to ensure a rigid installation. Provide other partition reinforcing necessary to support wall hung components, cupboards, closets and the like. Use 2 studs at jambs of openings and corners.

.7 Where horizontal runs of service lines are to be installed within the partition, erect studs with web openings aligned.

.8 Provide reinforcing and necessary stiffeners to support hollow metal frames and screens. Reinforcing to be capable of supporting screens rigidly and solid without deflection.

3.4 CHASE WALL INSTALLATION

.1 Align two parallel rows of floor and ceiling runners spaced apart as indicated. Attach to concrete slabs with concrete stub nails or power driven anchors 600 mm o.c. Attach to suspended ceilings with toggle or molly bolts 400mm o.c. Attach to wood framing with suitable fasteners 600mm o.c.

.2 Align metal studs vertically in runners, 200mm o.c. with flanges in the same direction and with studs on opposite sides of chase directly across from each other. Anchor studs to floor and ceiling runner flanges with an approved metal crimping tool.

.3 Cut cross bracing to be placed between rows of studs from gypsum panels, 400mm high by chase wall width. Space braces at quarter points not to exceed 600mm o.c. vertically and attach to stud webs with six 25mm screws 200mm o.c. maximum on each side.

.4 Bracing with 64mm metal studs may be used in place of gypsum panels. Anchor web at each end of metal brace to stud web with two 10mm pan head screws. When chase wall studs are not opposite, install metal stud cross braces 400mm o.c. horizontally and securely anchor each end to a continuous horizontal 64mm runner screw-attached to chase wall studs with the cavity.

.5 Adapt cross bracing as necessary to avoid interference with service.

3.5 WALL FURRING INSTALLATION

.1 Direct Furring Channel Attachment - Attach metal furring channels, vertically or horizontally spaced 400mm o.c. to masonry or concrete surfaces with hammer-set ro power-driven fasteners or concrete stub nails staggered 600mm o.c. on opposite flanges. Nest channels 200mm at splices and anchor with two fasteners in each wing. Where furring channel is installed directly to exterior wall, install thermal break strip between

furring channel and wall. For horizontally placed channels attach maximum 100mm from floor and ceiling.

.2 Bracketed Furring Channel Attachment:

.1 Attach adjustable wall furring brackets with serrated edges up, 900mm o.c. horizontally, 1200mm o.c. vertically, within 100mm of columns or other abutting construction, within 150mm of floor and ceiling, and as required above and below openings. Use 50mm cut nails in mortar joints of brick or clay tile or concrete block, or in field of lightweight aggregate blocks; use 16mm concrete stub nails or power driven nails or other suitable fasteners in monolithic concrete. Place fastener in top hole of bracket.

.2 Lay cold-rolled channels horizontally with flanges down, on furring brackets, plumb with other channels, and tie with double strand 16 ga. or triple strand 18 ga. wire at each junction with cold rolled channel.

.3 Free Standing Furring - In locations where wall furring is indicated as self-supporting, use steel studs and furring channels installed to provide a rigid frame to receive wall board.

3.6 CONSTRUCTION OF SOUND ATTENUATED PARTITIONS

.1 Where sound insulated drywall partitions are indicated on the drawings, provide double stud wall, offsetting studs and wrapping acoustic insulation between studs.

3.7 CONSTRUCTION OF FIRE RATED PARTITIONS

.1 Where fire rated construction is required, the framing shall be governed by rating required and material used in approved assemblies.

.2 Provide 1 hour rated beam enclosures, where required, to ULC design.

3.8 CONSTRUCTION OF SUSPENDED AND FURRED CEILINGS

.1 Apply gypsum panels of maximum practical length with long dimension at right angles to drywall furring channels. Position end joints over furring channel web and staggered in adjacent rows.

.2 Fasten panels to drywall furring channels with screws spaced a maximum of 300mm o.c. in field of panels and along abutting ends and edges.

.3 Provide framing and drywall finish in stairwells, where required to enclose underside of stairs and landings.

.4 Where noted on plans, provide bulkheads with steel framing and drywall finish.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

1.	Rough Carpentry	Section 06 10 00
2.	Hollow Metal Doors and Frames	Section 08 11 13
3.	Acoustic Ceilings	Section 09 51 00
4.	Painting and Coating	Section 09 90 00

1.2 REFERENCES

.1 ASTM International:

1. ASTM C1396	Standard Specification for Gypsum Board
2. ASTM C840	Standard Specification for Application and Finishing of Gypsum board
3. ASTM C1629	Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fibre-Reinforced Cement Panels.

.2 CAN/ULC-S101 Standard Methods of Fire Endurance Tests of Building Construction and Materials

.3 Gypsum Association:

.1	GA-214	Recommended Levels of Gypsum Board Finish
.2	GA-216	Application and Finishing of Gypsum Panel Products

.4 The Gypsum Construction Handbook - CGC Inc.

1.3 DELIVERY AND STORAGE

.1 Handle and store materials carefully to prevent damage. Materials must be delivered to site in their original, unopened packages.

.2 Obtain approval of proposed locations for stockpiling material. Materials must be stored in an enclosed shelter providing protection from exposure to the elements. Provide any necessary temporary covers, skids and the like.

.3 Store all panels flat.

.4 Do not install damaged or deteriorated material but remove from Site.

.5 Materials as delivered shall bear manufacturer's name, brand name of material and where applicable, ULC designation.

1.4 ENVIRONMENTAL CONDITIONS

.1 Do not apply gypsum board or joint filler to surfaces that are damp or contain frost.

.2 During gypsum panel application and joint finishing, temperatures within work areas shall be within the range 12 degrees C. to 25 degrees C.

.3 Provide adequate ventilation to carry off excess moisture

1.5 RELATIONS WITH OTHER TRADES

.1 Co-ordinate with mechanical and electrical Trades to ensure that all services are installed prior to application of wall board.

.2 Coordinate with mechanical and electrical trades for locations of access panels. Install access doors and panels supplied by those trades.

.3 Co-ordinate with forces installing insulation and vapour barrier in exterior soffits.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 All materials to conform to ASTM C1396 unless specified otherwise. Except where noted otherwise, products listed herein are produced by Canadian Gypsum Company (CGC). Equivalent products from Georgia Pacific (GP) and Certainteed will be accepted, subject to acceptance of equivalency by the Consultant.

.2 Gypsum panels:

.1 Typical panels to be 16mm thick abuse resistant and mould resistant, to ASTM C1629. Sheetrock Mold Tough Abuse Resistant Firecode Core gypsum panels or GP ToughRock Fireguard X Mold-Guard Abuse Resistant gypsum board.

.2 Panels in gypsum board ceilings at high ceilings may be 13mm thick mould resistant panels; CGC Sheetrock Mold Tough or GP ToughRock Mold-Guard.

.3 Refer to notes below regarding gypsum panels in washrooms.

.3 Rated Gypsum panels:

.1 To ASTM C1629. Abuse resistant, mould resistant, Type X-Fire Rated
.2 CGC Sheetrock Mold Tough Abuse Resistant Firecode Core gypsum panels or GP ToughRock Fireguard X Mold-Guard Abuse-Resistant gypsum board.
.3 Minimum thickness to be 16mm.

.4 Fibreglass Mat panels:

.1 Where interior panels are to be installed before the building is fully enclosed, all rated and non-rated panels shall be fibreglass mat faced panels. Panels must be warranted by the manufacturer for extended exposure to the elements.
.2 GP DensArmor Plus Abuse Resistant panel.

.5 High Impact Panels:
- .1 To ASTM C1629. Impact resistant, mould resistant wallboard
- .2 CGC “Sheetrock Mold Tough VHI Firecode Core” gypsum board, or GP DensArmor Plus Impact-Resistant interior panels.
- .3 Minimum thickness to be 16mm.
- .4 All framed partition walls within 3m of a floor area shall be constructed using high impact wallboard.

.6 Shaft Liner Panels:
- .1 To ASTM-C442, fire resistant gypsum panel, square cut ends and edges, 600mm wide by practical length.
- .2 to ULC tested assembly
- .3 CGC shaftwall Liner Panels; 25mm
- .4 CertainTeed Gypsum Canada Inc.: Pro ROC shaftliner 25mm thick.
- .5 G-P Gypsum Corporation: GyProc Fireguard Shaft Liner Panels, 25mm thick.

.7 Sheathing at base of gypsum board stud partitions in Washrooms: Georgia Pacific, DensGlass Gold Fibreglass Fireguard Sheathing in 16mm thickness.

.8 Metal Studs and Channels: minimum 0.455mm (26 ga) galvanized steel as manufactured by Bailey Metal Products or approved alternate; to ASTM C645.

.9 Metal Furring Channels: minimum 0.455 (26ga) sheet galvanized steel channel and accessories as manufactured by Bailey Metal Products, or approved alternate; to ASTM C645.

.10 Cold Rolled Furring Channel: 20mm, x 12.7mm zinc coated channel weighing minimum 0.446 kg per m.

.11 Cold Rolled Carrying Channel: 38mm x 15mm zinc coated channel weighing min 0.707 kg per m.

.12 Cold Rolled Carrying Channel: 28 ga. galvanized steel with perforated flanges; one piece per location.

.13 Control Joint: CGC No. 093.

.14 Hanger wire: minimum 3.77mm (9ga) galvanized steel wire.

.15 Tie Wire: minimum 1.5mm (16 ga) galvanized soft annealed steel.

.16 Screws: CGC Brand Screws (or approved equal) of type recommended by the board manufacturer.

.17 Thermal Break: Permanent adhesive faced rubberized cork, 3 mm thick by width of stud on channel to be used between masonry in exterior wall and metal furring channels.

.18 Joint Treatment Material:

.1 Joint compound, topping compound, laminating compound; to ASTM C474 and C475.
.2 Use material recommended by board and tape manufacturer for the proposed use.
.3 CGC Sheetrock or Durabond Setting-Type, for use with CGC fibreglass drywall tape.

.19 Reinforcing Tape:
.1 Paper or fibreglass mesh tape, as recommended by the panel manufacturer for the panel type.

.20 Finish materials
.1 Over surface of glass mat faced boards, use level 5 finisher such as CGC Tuff Hide.

.21 Acoustic sealant: Quietseal Pro as manufactured by Quietrock, or equivaltent as manufactured by CGC, Tremco or Presstite Division of Interchemical Corporation for acoustic partitions.

.22 Acoustic Insulation: AFB acoustic fire batt by Roxul or Thermafiber SAFB Sound Attenuation Fire Blankets (unfaced) from Owens Corning, to thickness shown on drawings, and as required to obtain required S.T.C. rating.

.23 Ceiling Anchors: Self drilling tie wire anchors, Phillips "Red Head" T-32 or approved equal.

.24 Drywall Reveals: Fry Reglet, reveal mouldings and “F” reveal mouldings, 13mm wide, with baked on finish, as follows:
.1 DRM-625-50 and DRM-50-50
.2 DRMF-625-50 and DRMF-50-50
.3 Aluminum alloy 6063 T5 with chemical conversion coating.
.4 Colour to be selected by the Consultant.

.25 Access Panels: Refer to mechanical and electrical.

PART 3 - EXECUTION

3.1 GENERAL

.1 Provide plumb, straight, level, rigid, and secure installation. Failing to achieve this result shall be cause for rejection and reinstallation of this work.

.2 Conform to The Gypsum Construction Handbook, ASTM C840, and these specifications. The most stringent requirements shall apply.

.3 Where walls run parallel and under steel joists, the joists shall be enclosed both sides with gypsum board to provide sound barrier between rooms. Fill with minimum 100 mm acoustic batt insulation.

.4 Install access panels supplied by mechanical and electrical contractors. Rigidly secure panel frames to furring or framing systems.

3.2 CEILING SUSPENSION

.1 Do not regard grillage system indicated on drawings as exact or complete. The Specification for metal framing contained in CGC Gypsum Construction Handbook and ASTM C840 shall govern installation conditions not covered by this Specification. The more stringent specifications shall apply.

.2 Hangers

.1 Install hangers for suspended wallboard ceilings to support the grillage independent of walls, columns, pipes, ducts and the like. Erect plumb and securely anchor to the structure. Submit details of proposed method to the Consultant for approval. If so requested, test hangers to prove that anchorage is adequate to support the proposed loading. Erect hangers plumb and securely anchor to structural steel or support channels fastened to structural steel (DO NOT FASTEN TO STEEL DECK).

.2 Space hangers at 1200mm maximum o.c. along the carrying channels and not more than 150mm from ends (or as required to conform with fire tested assemblies where applicable.

.3 Carrying Channels

.1 Space channels at 1200mm maximum o.c. (or as required to conform with fire tested assemblies where applicable).

.2 Run channels transversely to structural framing members.

.3 Where splices are necessary, lap members at least 200mm and wire each end with two laps; avoid clustering or lining up splices.

.4 Attach to hangers by bending hanger under runner and securely wire in place with a saddle tie.

.5 Provide 25mm clearance between channels and abutting walls and partitions.

.4 Cross Furring

.1 Install drywall screw channels transversely across runner channels, joists or other supports.

.2 Space drywall screw channels at 600mm o.c. and not more than 150mm from perimeter walls. Provide 25mm clearance between channels and abutting walls and partitions. Use closer spacing if so noted on drawings.

.3 Secure drywall screw channels to each support with approved clip or attachment; splice joints by messing minimum 200mm and tying channels together with double strand 16 gauge tie wire.

.4 Level drywall screw channels to a maximum tolerance of 4mm over 3600mm.

.5 Drywall shall not be fixed directly to open web steel joists and the like. Provide cross furring as specified.

.5 Opening

.1 Frame openings with suitable channels; check clearances with respective Trades. Provide support for edges of boards at all cut-outs and openings in ceilings.

.2 Provide all additional hangers and supports for fixtures as required.

.3 Provide additional hangers and framing for enclosure of radiant heating panels.

.6 Bulkheads

.1 Furr out bulkheads in areas indicated and as required to conceal mechanical, electrical or other services in rooms where drywall finishes are scheduled, and elsewhere if called for on drawings.

.2 Use methods and materials as previously specified in this section. Drywall panels at bulkheads shall be as specified for walls.

3.3 STEEL STUD SYSTEM (PARTITION) INSTALLATION

.1 Conform to the guidelines for metal framing contained in The Gypsum Construction Handbook, CSA A.82.31, and these specifications. The most stringent requirements shall apply.

.2 Attach metal runners at floor and ceiling to structural elements with suitable fasteners located 50mm from each end and spaced 600 mm. o.c. with toggle or molly bolts spaced 400mm o.c.

.3 Position studs vertically, engaging floor and ceiling runners, and spaced 400mm o.c., unless otherwise noted on drawings. When necessary, splice studs with 200mm nested lap and one positive attachment per stud flange. Place studs in direct contact with door frame jambs, abutting partitions, partition corners and existing construction elements. Where studs are installed directly against exterior walls install rubberized cork stip between studs and wall surfaces to provide thermal break.

.4 Anchor studs for shelf-walls and those adjacent to door and window frames, partition intersections and corners to ceiling and floor runner flanges with an approved crimping tool. Securely anchor studs to jamb and head anchor clips of door or borrowed-light frames by bolt or screw attachment. Over metal door and borrowed-light frames, place horizontally a cut-to-length section of runner, with a web-flange bent at each end, and secure with one positive attachment per flange. Position a cut-to-length stud (extending to ceiling runner) at vertical panel joints over door frame header.

.5 Stiffen partitions exceeding 3m long or 2.7m high with 19mm. cold rolled channels. Fix horizontally and provide the number of rows necessary to ensure a rigid installation.

Provide other partition reinforcing necessary to support wall hung components, cupboards, closets and the like. Use 2 studs at jambs of openings and corners.

.6 Where horizontal runs of service lines are to be installed within the partition, erect studs with web openings aligned.

.7 Provide reinforcing and necessary stiffeners to support hollow metal frames and screens. Reinforcing to be capable of supporting screens rigidly and solid without deflection.

3.4 CHASE WALL INSTALLATION

.1 Align two parallel rows of floor and ceiling runners spaced apart as indicated. Attach to concrete slabs with concrete stub nails or power driven anchors 600 mm o.c. Attach to suspended ceilings with toggle or molly bolts 400mm o.c. Attach to wood framing with suitable fasteners 600mm o.c.

.2 Align metal studs vertically in runners, 200mm o.c. with flanges in the same direction and with studs on opposite sides of chase directly across from each other. Anchor studs to floor and ceiling runner flanges with an approved metal crimping tool.

.3 Cut cross bracing to be placed between rows of studs from gypsum panels, 400mm high by chase wall width. Space braces at quarter points not to exceed 600mm o.c. vertically and attach to stud webs with six 25mm screws 200mm o.c. maximum on each side.

.4 Bracing with 64mm metal studs may be used in place of gypsum panels. Anchor web at each end of metal brace to stud web with two 10mm pan head screws. When chase wall studs are not opposite, install metal stud cross braces 400mm o.c. horizontally and securely anchor each end to a continuous horizontal 64mm runner screw-attached to chase wall studs with the cavity.

.5 Adapt cross bracing as necessary to avoid interference with service.

3.5 WALL FURRING INSTALLATION

.1 Direct Furring Channel Attachment - Attach metal furring channels, vertically or horizontally spaced 400mm o.c. to masonry or concrete surfaces with hammer-set ro power-driven fasteners or concrete stub nails staggered 600mm o.c. on opposite flanges. Nest channels 200mm at splices and anchor with two fasteners in each wing. Where furring channel is installed directly to exterior wall, install thermal break strip between furring channel and wall. For horizontally placed channels attach maximum 100mm from floor and ceiling.

.2 Bracketed Furring Channel Attachment

.1 Attach adjustable wall furring brackets with serrated edges up, 900mm o.c. horizontally, 1200mm o.c. vertically, within 100mm of columns or other abutting construction, within 150mm of floor and ceiling, and as required above and below openings. Use 50mm cut nails in mortar joints of brick or clay tile or concrete block, or in field of lightweight aggregate blocks; use 16mm concrete stub nails or

power driven nails or other suitable fasteners in monolithic concrete. Place fastener in top hole of bracket.

.2 Lay cold-rolled channels horizontally with flanges down, on furring brackets, plumb with other channels, and tie with double strand 16 ga. or triple strand 18 ga. wire at each junction with cold rolled channel.

.3 Free Standing Furring - In locations where wall furring is indicated as self-supporting, use steel studs and furring channels installed to provide a rigid frame to receive wall board.

3.6 APPLICATION OF GYPSUM BOARD

.1 Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are approved.

.2 Apply all gypsum board parallel to framing. Position all ends over studs. Use maximum practical lengths to minimize end joints. Fit ends and edges closely, but not forced together.

.3 Stagger joints on opposite sides of partition.

.4 Apply single, double or triple layers of gypsum board to metal furring as indicated using screw fasteners.

.5 Maximum screw spacing for single-ply gypsum board and face ply of 2-ply gypsum board to be 300mm o.c.

.6 Maximum spacing of screws for base-ply of 2-ply gypsum board over steel framing to be 300mm o.c. along edges of the gypsum board and 600mm o.c. into stud or furring channel in the field of the gypsum board.

.7 Use cement board as backer board wherever tile is to be installed to walls of shower partitions.

3.7 ADHESIVE APPLICATION

.1 Where gypsum board is called to be laminated to masonry walls, application shall conform to Gypsum Association Publication GA-216-2013, Section 11, “Adhesive Application of Gypsum Panel Products to Interior Masonry, Concrete, or Brick Walls”.

.2 Do taping and filling, as specified below, for paint finish.

3.8 CONSTRUCTION OF SOUND ATTENUATED PARTITIONS

.1 Where sound insulated drywall partitions are indicated on the drawings, provide double stud wall, offsetting studs and wrapping acoustic insulation between studs. Apply one layer of specified soundproof wallboard, on both faces of wall.

.2 Install sound attenuation batts to completely fill void between studs.

.3 A 6mm continuous bead of acoustical sealant around perimeter of wall at web of top and bottom tracks and end studs. Lay gypsum board into position forcing caulking bead to fill space between gypsum board and structure.

.4 Seal full perimeter for cut-outs around electrical boxes and ducts with acoustical sealant.

3.9 CONSTRUCTION OF FIRE RATED PARTITIONS

.1 Where fire rated construction is required, the thickness and number of layers of board shall be governed by rating required and material used in approved assemblies.

.2 Provide 1 hour rated beam enclosures, where required, to ULC design.

3.10 CONSTRUCTION OF SUSPENDED AND FURRED CEILINGS

.1 Apply gypsum panels of maximum practical length with long dimension at right angles to drywall furring channels. Position end joints over furring channel web and staggered in adjacent rows.

.2 Closely fit together, ends and edges but not forced together.

.3 Fasten panels to drywall furring channels with screws spaced a maximum of 300mm o.c. in field of panels and along abutting ends and edges.

.4 Provide control joints in ceilings as noted but maximum 7500 mm o.c. each way or at change in direction.

.5 Provide framing and drywall finish in stairwells, where required to enclose underside of stairs and landings.

.6 Where noted on plans, provide bulkheads with steel framing and drywall finish.

3.11 WALL FURRING

.1 Apply gypsum panels parallel to framing. Position all edges over drywall furring channels with joints staggered in successive courses.

.2 Use maximum practical lengths to minimize end joints. Fit ends and edges closely, but not forced together.

.3 Fasten panels to channels with screws spaced a maximum 300mm oc.

3.12 APPLICATION OF ACCESSORIES

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Joints shall be made tight, accurately aligned and rigidly secured.

.2 Reinforce all vertical and horizontal exterior corners with cornerbead fastened with screws 200mm oc on both flanges along entire length of bead.

.3 Where assembly terminates against masonry or other dissimilar material, apply ledge trim over panel edge and fasten with screws or staples spaced 300 mm. oc.

.4 Power drive screws at least 9mm. from edges or ends of panel to provide uniform dimple 0.8mm deep.

.5 Where recessed reglets are noted on drawings, built into drywall assembly to provide edges flush with drywall.

3.13 TAPING AND FILLING

.1 Finish in accordance with GA-214, as follows:

.1 Exposed gypsum board to Level 5 finish, suitable for finish painting with semi-glass and gloss coatings. Use full skim coat of joint compound over entire surface to achieve smooth and uniform appearance.
.2 Concealed gypsum board to minimum Level 1 finish. Where a fire-resistance rating is required, finishing level must conform to ULC rated assembly design.

.2 Finish face panel joints and internal angles with joint system consisting of self-adhering cross-fibre fibreglass joint tape and joint compound installed according to manufacturer's directions and feathered out into panel faces. Note: If self-adhering joint tape is not used, taping compound will be required.

.3 Be sure drywall surface is dry and clean.

.4 Center and apply CGC Fiberglass Drywall Tape directly over joint, pressing firmly to ensure even adherence to surface. Eliminate wrinkles by pressing entire length of tape with drywall knife. Avoid overlapping tape at intersections. Cut tape with drywall knife.

.5 Cover taped joint with a layer of setting-type joint compound, forcing compound through the tape with a drywall knife or trowel to completely fill and level the joint. Allow joint to dry, and sand lightly. Apply second coat of setting-type or drying-type joint compound, feathering approximately 50mm beyond first coat. Let dry and sand lightly as required.

.6 To finish inside corners, bend tape with to form a “U” shape. Apply tape along one side only. Press tape into corner for approximately 30mm, then apply the other side. Work downward, alternating sides in this manner until tape is pressed firmly in place. Apply setting-type joint compound as specified above, first on one side for the length of the corner and then repeating the process on the second side.

.7 Finish fastener heads, corner bead and trim as required with two to three coats of joint compound, feathered out onto panel faces and sanded to a smooth surface.

.8 Provide skim coat over entire face of boards to ensure smooth surface for painting.

.9 Fill screw head depressions to bring flush with adjacent surface of gypsum board so as to be invisible after painting is completed.

.10 Sand dried taping compound lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.11 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for painting.

.12 Painting shall be done in accordance with Section 09 90 00

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1	General Requirements	Division 01
.2	Concrete Finishing	Section 03 35 00
.3	Concrete Unit Masonry	Section 04 05 22
.4	Joint Sealants	Section 07 92 00
.5	Gypsum Board	Section 09 29 00
.6	Resilient Flooring	Section 09 65 00
.7	Washroom Accessories	Section 10 28 13

1.2 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)

- .1 ANSI A108.1-99, Specification for the Installation of Ceramic Tile (Includes ANSI A108.1A-C, 108.4-.13, A118.1-.10, ANSI A136.1).
- .2 CTI A118.3-92, Specification for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive (included in ANSI A108.1).
- .3 CTI A118.4-92, Specification for Latex Cement Mortar (included in ANSI A108.1).
- .4 CTI A118.5-92, Specification for Chemical Resistant Furan Resin Mortars and Grouts for Tile Installation (included in ANSI A108.1).
- .5 CTI A118.6-92, Specification for Ceramic Tile Grouts (included in ANSI A108.1).

.2 American Society for Testing and Materials International (ASTM)

- .1 ASTM C144-04, Specification for Aggregate for Masonry Mortar.
- .2 ASTM C207-06, Specification for Hydrated Lime for Masonry Purposes.
- .3 ASTM C847-06, Specification for Metal Lath.
- .4 ASTM C979-05, Specification for Pigments for Integrally Coloured Concrete.

.3 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-51.34-M86(R1988) , Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .2 CGSB 71-GP-22M-78(AMEND.), Adhesive, Organic, for Installation of Ceramic Wall Tile.
- .3 CAN/CGSB-75.1-M88, Tile, Ceramic.
- .4 CAN/CGSB-25.20-95, Surface Sealer for Floors.

.4 CSA Group (CSA)

- .1 CSA A123.3-05, Asphalt Saturated Organic Roofing Felt.
- .2 CAN/CSA-A3000-03(R2006), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.5 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

.6 Terrazzo Tile and Marble Association of Canada (TTMAC)

.1 Tile Specification Guide 09 30 00 2006/2007, Tile Installation Manual.

.2 Tile Maintenance Guide 2000.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.

.1 Include manufacturer's information on:

.1 Ceramic tile, marked to show each type, size, and shape required.

.2 Chemical resistant mortar and grout (Epoxy and Furan).

.3 Cementitious backer unit.

.4 Dry-set cement mortar and grout.

.5 Divider strip.

.6 Elastomeric membrane and bond coat.

.7 Reinforcing tape.

.8 Levelling compound.

.9 Latex cement mortar and grout.

.10 Commercial cement grout.

.11 Organic adhesive.

.12 Slip resistant tile.

.13 Waterproofing isolation membrane.

.14 Fasteners.

.3 Provide samples in accordance with Section 01 33 00- Submittal Procedures.

.1 Base tile: submit, 300 x 300 mm sample panels of each colour, texture, size, and pattern of tile.

.2 Floor tile: submit, 300 x 300 mm sample panels of each colour, texture, size, and pattern of tile.

.3 Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, colour, and size.

.4 Adhere tile samples to 11 mm thick plywood and grout joints to represent project installation.

.4 Closeout Submittals in accordance with Section 01 78 00 – Closeout Submittals.

.1 Submit three (3) copies of TTMAC Hard Surface Maintenance Guide, for inclusion in maintenance manuals.

.2 Provide document listing specific warnings of any maintenance products or practices that could possible damage the finish work.

1.4 QUALITY ASSURANCE

.1 Quality Assurance Submittals:

.1 Manufacturer's Instructions: manufacturer's installation instructions.

.2 Manufacturer's Field Reports: manufacturer's field reports specified.

.3 The work of this section shall be carried out by a company that is a member in good standing of the Terrazzo, Tile and Marble Association of Canada.

.4 This work shall be done under proper supervision by person's skilled in the methods following the recommendations of the manufacturer of the Products involved and having a minimum of two years proven experience.

.5 The ceramic tile Subcontractor shall provide proof of having successfully completed at least two years proven experience.

.6 Epoxy grout installation shall be carried out only by an installer experienced in the use of this Product with strict conformance to the manufacturer's installation and cleaning recommendations.

.7 The epoxy grout manufacturer/supplier shall visit the site prior to commencement of grouting to review installation and cleaning procedures with the ceramic tile Subcontractor.

.8 Prevent any traffic over completed floors for a period of 72 hours after completion.

.9 Provide protection of finished floors subject to construction traffic.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle materials in accordance with Manufacturer's written instructions.

1.6 AMBIENT CONDITIONS

.1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 degrees C for 48 hours before, during, and 48 hours after, installation.

.2 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.

.3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

1.7 MOCK-UPS

.1 Construct mock-up panels in accordance with Section 01 45 00 – Quality Control.

.2 Construct mock-up panels of finished ceramic tile work, 2.5m by 2.5m in size, of each ceramic tile type.

.3 Construct mock-up panels where directed by the Consultant.

.4 The procedure for Cleaning the grout from the tile shall be carried out in the presence of the Owner's representative, the Consultant, and the Contractor for a minimum of three washes.

.5 Allow 48 hours for inspection of mock-up panels by the consultant before proceeding with work.

.6 When accepted, mock-up panels will demonstrate minimum standard for this work. The approved mock-up panels may remain as part of the finished work.

1.8 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00- Closeout Submittals.

.2 Provide minimum 2 boxes of each type and colour of tile required for project for maintenance use. Store where directed.

.3 Maintenance material same production run as installed material.

.2 Provide four copies of the TTMAC Maintenance Guide, latest edition, for inclusion in the Maintenance Manual.

.3 Give specific warning of any maintenance practice or material which may damage or disfigure the finish work or alter the coefficient of friction (i.e. slip resistance) of the finished surface.

1.9 WARRANTY

.1 Provide a warranty for ceramic tile work in accordance with the General Conditions, but for a period of three (3) years.

.2 The warranty shall cover the complete installation provided under this section against defective material and workmanship.

PART 2 PRODUCTS

2.1 FLOOR TILE

.1 Porcelain Floor Tile (POR): to CAN/CGSB-75.1, Type 4, Class MR 1, square edges, slip resistant surface. A DCOF value of ≥0.42 is the standard for tiles specified for wet areas with minimal footwear spaces expected to be walked upon when wet, as stated in ANSI A137.1-2012, Section 9.6. All curves, and other cuts where indicated on the drawings shall be laser cut by the tile manufacturer and shall be delivered ready for setting. All materials to match corner interior and exterior trims and shapes. Refer to Architectural Finishes Drawings for location of Anti-slip porcelain floor tile (POR).

.1 Acceptable Products for POR floor tile:

.1 Unicom Starker, Brazilian Slate, colourbody porcelain.

.1 Supplied by Holten Impex, Tel: 905-726-9669.
.2 Size: 30cm x 30cm.
.3 POR or POR1 Field Colour: Elephant Grey.
.4 Finish: Matte.

.2 Regal Series, Porcelain.

.1 Supplied by Olympia Tile and Stone.; Tel: 416-785-6666.
.2 Size: 30cm x 30cm.
.3 POR or POR1 Field Colour: Dark Grey.
.4 Finish: Flamed.

.2 Provide floor base 100mm in height of the same matching POR floor tile.

2.2 WALL TILE

.1 Ceramic Wall Tile (CWT): to CAN/CGSB-75.1, Type 5, Class MR 4, modified square edges. Matching edge trim to suit application.

.1 Acceptable Products for washroom walls:

.1 Unicolour Series, Porcelain Wall Tile.

.1 Supplied by Olympia Tile and Stone.; Tel: 416-785-6666.
.2 Size: 10cm x 40cm.

.3 Finish: Matte.
.4 Installation: Vertical Stackbond.
.5 Colours:
.1 CWT1 Field Colour: Light Grey.
.2 CWT2 Accent Colour: Dark Grey (in barrier-free washroom only).

2.3 BASE TILE

.1 Base: All materials to match porcelain floor tile, interior and exterior corners, trims and shapes indicating field colour or accent bands as indicated on drawings.

.2 At POR floor tile and CWT walls, provide 100mm high POR base with continuous metal top edge described below under 2.8 Accessories.

2.4 TRIM SHAPES

.1 Conform to applicable requirements of adjoining floor and wall tile.

.2 Use slip resistant trim shapes for horizontal surfaces of showers, and drying area curbs.

.3 Use trim shapes sizes conforming to size of adjoining field wall tile, including existing spaces, unless specified otherwise.

.4 Internal and External Corners: provide trim shapes as follows where indicated.

.1 Bullnose shapes for external corners including edges.
.2 Coved shapes for internal corners.
.3 Special shapes for:
.1 Base to floor internal corners to provide integral coved vertical and horizontal joint.
.2 Base to floor external corners to provide bullnose vertical edge with integral coved horizontal joint. Use as stop at bottom of openings having bullnose return to wall.
.3 Wall top edge internal corners to provide integral coved vertical joint with bullnose top edge.
.4 Wall top edge external corners to provide bullnose vertical and horizontal joint edge.

2.5 MORTAR, ADHESIVE MATERIALS AND MIXES

.1 Cement: to CSA-A5, type 10.

.2 Sand: to ASTM C144, passing 16 mesh.

.3 Hydrated lime: to ASTM C207.

.4 Latex additive: formulated for use in cement mortar and thin set bond coat.

.5 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

.6 Adhesives: to be supplied by grout supplier.

.1 Maximum VOC limit 65 g/L to SCAQMD Rule 1168.

.7 Mortar Bed for Floors: 1 part Portland cement, 4 parts sand, 1 part water. Adjust water volume depending on water content of sand. Use latex additive in modification of mortar

bed. Alternatively use Flextile Ltd., 4:1 Dry Pack Mortar and No.44 Latex Additive. Or Flextile Ltd., 4:1 Dry Pack Mortar and No. 43 Latex Additive.

.8 Levelling coat: 1 part Portland cement, 4 part sand, minimum 1/10 part latex additive, 1 part water including latex additive. Alternatively use Flextile Ltd., No.59 Flex-Flo or No.5900 Flex-Flo Plus.

.9 Measure mortar ingredients by volume.

.10 Dry Set Mortar: mix to manufacturer's instructions.

2.6 BOND COAT

.1 Dry set cement mortar: to ANSI A108.1.

.2 Organic adhesive: to ANSI A136.1 CGSB 71-GP-22M.

.1 Maximum VOC limit 65 g/L to SCAQMD Rule 1168.

.3 Latex Cement mortar: to ANSI A108.1, two-component universal dry-set mortar.

.4 Epoxy bond coat: non-toxic, non-flammable, non-hazardous during storage, mixing, application, and when cured. To produce shock and chemical resistant mortars having the following physical characteristics:

.1 Compressive Strength: 246 kg/cm^2.

.2 Bond Strength: 53 kg/cm^2.

.3 Water Absorption: 4.0% Max.

.4 Ozone Resistance, 200 hours @ 200 ppm: no loss of strength.

.5 Smoke Contribution Factor: 0.

.6 Flame Contribution Factor: 0.

.7 Finished mortar and grout to be resistant to urine, dilute acid, dilute alkali, sugar, brine and food waste products, petroleum distillates, oil and aromatic solvents.

.8 Bond Coat: maximum VOC limit 65 g/L to SCAQMD Rule 1168.

.5 Chemical-Resistant Bond Coat:

.1 Epoxy Resin Type: CTI A118.3.

.2 Furan Resin Type: CTI A118.5.

.3 Bond Coat: maximum VOC limit 65 g/L to SCAQMD Rule 1168.

2.7 GROUT

.1 Colouring Pigments:

.1 Pure mineral pigments, limeproof and nonfading, complying with ASTM C979.

.2 Colouring pigments to be added to grout by manufacturer.

.3 Job coloured grout are not acceptable.

.4 Use in Commercial Cement Grout, Dry-Set Grout, and Latex Cement Grout.

.2 Cement Grout: to ANSI A108.1.

.1 Use one part white cement to one part white sand passing a number 30 screen.

.3 Commercial Cement Grout: to CTI A118.6.

.4 Dry-Set Grout: to CTI A118.6.

.5 Latex Cement Grout: to ANSI A108.1, fast curing, high early strength, polymer-modified, stain resistant, sanded mix for floors, unsanded mix for walls and floors with polished tiles commercial tile grout.

.6 Chemical-Resistant Grout:

.1 Epoxy grout: to ANSI A108.1, having quality, colour and characteristics to match epoxy bond coat. Adhesive and grout by same manufacturer.

.2 Furan grout: to CTI A118.5.

2.8 ACCESSORIES

.1 Reinforcing mesh: 50 x 50 x 1.6 x 1.6 mm galvanized steel wire mesh, welded fabric design, in flat sheets.

.2 Divider strips:

.1 Laminated strips, core 32 x 3 mm black neoprene, outsides (both sides) brass 32 x 1.29 mm complete with anchors, both sides spaced at 150 mm on centre.

.3 Cleavage plane: polyethylene film to CGSB 51-34.

.4 Metal lath: to ASTM C847 galvanized finish, 10 mm rib at 2.17 kg/m^2

.5 Transition Strips: purpose made metal extrusion; anodized aluminum type.

.6 Porcelain Tile to Resilient Flooring: Satin anodized profile with sloped exposed surface, 4mm high leading edge, integrated trapezoid-preforated anchoring leg. Schluter-RENO-U, size to suit tile thickness.

.7 Reducer Strips: purpose made metal extrusion; anodized aluminum type; maximum slope of 1:2.

.8 **Porcelain Wall Base Cap at all Floors**: Satin anodized aluminum profile with integrated trapezoid-perforated anchoring leg, and complete with prefabricated corners. Schlüter-RONDEC, size to suit tile thickness. Provide the same profile at the leading edge of the continuous 100mm high porcelain tile curb in Entry Lobby 101.

.9 Junction Strips: Schulter Systems products, for junctions with other floor coverings. Finish: Satin finish anodized aluminum. Profiles as follows:

.1 Reno-V: Sloped transition to low flooring.

.2 Schiene: Tile edge at surface of equal height.

.3 Deco: Transition at tile and hard surface of equal height.

.10 Prefabricated Movement Joints: purpose made, having a Shore A Hardness not less than 60 and elasticity of plus or minus 40 percent when used in accordance to TTMAC Detail 301EJ.

.1 Control joints: Schluter Systems “Dilex-AKWS” movement joint, 6mm wide, with aluminum anchors perforated for bonding into mortar and PVC movement material forming joint surface. Colour to be selected by Consultant, to match grout as closely as possible.

.11 Sealant: in accordance with Section 07 92 00- Joint Sealants.

.12 Sealants: maximum VOC limit 250 g/L to SCAQMD Rule 1168.

.13 Floor sealer and protective coating: to tile and grout manufacturers recommendations.

2.9 MIXES

.1 Cement:

.1 Scratch coat: 1 part cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand, 1 part water, and latex additive where required. Adjust water volume depending on water content of sand.

.2 Slurry bond coat: cement and water mixed to creamy paste. Latex additive may be included.

.3 Mortar bed for floors: 1 part cement, 4 parts sand, 1 part water. Adjust water volume depending on water content of sand. Latex additive may be included.

.4 Mortar bed for walls and ceilings: 1 part cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand and 1 part water. Adjust water volume depending on water content of sand. Latex additive may be included.

.5 Levelling coat: 1 part cement, 4 parts sand, minimum 1/10 part latex additive, 1 part water including latex additive.

.6 Bond or setting coat: 1 part cement, 1/3 part hydrated lime, 1 part water.

.7 Measure mortar ingredients by volume.

.2 Dry set mortar: mix to manufacturer's instructions.

.3 Organic adhesive: pre-mixed.

.1 Adhesives: maximum VOC limit 65 g/L to SCAQMD Rule 1168.

.4 Mix bond and levelling coats, and grout to manufacturer's instructions.

.5 Adjust water volumes to suit water content of sand.

2.10 PATCHING AND LEVELLING COMPOUND

.1 Cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.

.2 Have not less than the following physical properties:

.1 Compressive strength - 25 MPa.

.2 Tensile strength - 7 MPa.

.3 Flexural strength - 7 MPa.

.4 Density - 1.9.

.3 Capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being trowelled to smooth finish.

.4 Ready for use in 48 hours after application.

2.11 CLEANING COMPOUNDS

.1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.

.2 Materials containing acid or caustic material are not acceptable.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 WORKMANSHIP

.1 Do tile work in accordance with TTMAC Tile Installation Manual 2006/2007, "Ceramic Tile", except where specified otherwise.

.2 Apply tile or backing coats to clean and sound surfaces.

.3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.

.4 Maximum surface tolerance 1:800.

.5 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.

.6 Lay out tiles so perimeter tiles are minimum 1/2 size.

.7 Sound tiles after setting and replace hollow-sounding units to obtain full bond.

.8 Make internal angles square, external angles bullnosed.

.9 Use bullnose edged tiles at termination of wall tile panels, except where panel abuts projecting surface or differing plane.

.10 Install divider strips at junction of tile flooring and dissimilar materials.

.11 Allow minimum 24 hours after installation of tiles, before grouting.

.12 Clean installed tile surfaces after installation and grouting cured.

.13 Make control joints at 5.5m maximum in each direction or a length to width ratio of 2.5 to 1. Make joint width same as tile joints. Fill control joints with sealant in accordance with Section 07 92 00- Joint Sealants. Keep building expansion joints free of mortar and grout.

3.3 WALL TILE

.1 Install in accordance with TTMAC detail

3.4 FLOOR AND BASE TILE

.1 Install in accordance with TTMAC detail

3.5 FLOOR SEALER AND PROTECTIVE COATING

.1 Apply in accordance with manufacturer's instructions.

3.6 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.7 EXAMINATION AND PREPARATION

.1 Surfaces shall be clean, dimensionally stable, cured, and free of contaminants such as oil, sealers and curing compounds.

.2 Concrete Substrate Finish: Cure concrete for a minimum of 28 days.

.1 Thin-set applications: steel trowel and fine broom finish.
.2 Mortar bed applications: screed finish.
.3 Mortar bed applications with a cleavage membrane: Steel trowel finish.

.3 Substrate Surface Variation:
.1 Mortar bed applications: 6mm in 3000mm maximum.
.2 Thin-set applications: 3mm in 3000mm and 1.5mm in 305mm maximum.
.3 Vertical surfaces: 3mm in 2400mm.

.4 Examine areas in which the work of this section is to be applied and notify the Consultant of any deficiencies which must be corrected before work can commence.

.5 Do not proceed with the work until improper conditions are corrected.

.6 Protect other work during installation and protect tile work until properly set, grouted and sealed.

.7 Co-ordinate the work of this section related to the work of other sections.

.8 Apply a leveling coat on uneven surfaces, or surfaces which do not guarantee a plumb or level finish to the tile.

3.8 INSTALLATION AND WORKMANSHIP

.1 Apply tile or backing coats to clean and sound surfaces.

.2 Bring every fourth course, vertical and horizontal, to plumb and level continuous lines.
.3 Thoroughly back-up with mortar all cove, cap, nosing, trimmer, and moulded or shaped pieces and secure firmly in place.

.4 Fit tile around corners, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth, even, and free from chipping. Edges resulting from splitting are not acceptable. Rub exposed edges smooth with abrasive stone.

.5 Leave or cut opening to correct sizes to receive accessories, fittings, or other built-in work.

.6 Drill tile for hardware and for pipes where possible. Otherwise, at pipes and fittings, fit tile closely so that escutcheons cover cut edges of tile.

.7 Maximum finished surface tolerance shall be 1:800.

.8 Make joints between tile uniform, plumb, straight, true, even and flush with adjacent tile with a tolerance of 1mm per 3mm of joint width.

.9 Ensure sheet layout is not visible after installation. Align patterns. Align joints of wall tile with floor tile.

.10 Lay out tiles so that fields are centred on areas, and according to the drawings with perimeter and cut tiles a minimum 1/2 size. Maintain height of panels in full courses to nearest indicated dimension.

.11 Keep 2/3 of the depth of grout joints free of setting material.

.12 Sound tiles after setting and replace hollow- sounding units to obtain full bond.

.13 Make internal angles square, external angles rounded.

.14 Use round edged tiles at termination of wall tile panels, except where panel abuts projecting surface or differing plane.

.15 Install divider strips at junction of tile flooring and dissimilar materials.

.16 Allow a minimum of 24 hours after installation of tiles before grouting. Grouting shall be in accordance with manufacturer's directions. Fill joints solidly.

.17 Finished grout shall be uniform in colour, smooth and without voids, pinholes or low spots. Cover setting bed completely.

.18 Protect tiles from grout staining. Test in advance and pre-seal tile if required. Follow grout manufacturer=s recommendations for grout and residue removal. Remove excess grout and polish with clean cloths.

.19 Clean installed tile surfaces after installation and grouting has cured. Final cleaning is specified in Section 01 74 00 – Cleaning and Waste Management.

.20 Finished tile work shall be free of tiles which are pitted, chipped, cracked or scratched.

.21 Install expansion joints where indicated. Install specified control joints at 6000mm on centre in each direction unless indicated otherwise. Make joint width same as tile joints. Where indicated, fill control joints with sealant in accordance with Section 07 92 00 - Sealants. Keep building expansion joints free of mortar and grout. Match colour of sealant to colour of grouted joints.

.22 Caulk around piping and fittings extending through tiled surfaces. Tool to a smooth, flush surface, free from air bubbles and contamination. Provide backer rod under sealant.

.23 Protect installed areas from traffic until setting materials have cured for the periods specified in the TTMAC Tile Installation Manual.

.24 Barricade grouted areas to prevent foot traffic for 24 hours after grouting.

.25 Apply floor sealer and protective coating in accordance with the manufacturer's instructions.

.26 Transition Strips:
- .1 Install specified transition strips where ceramic tile flooring meets dissimilar flooring.
- .2 Install transition strips in mortar, fully bonded to floors following the manufacturer's recommendations.
- .3 Install strips under doors at openings.
- .4 Thoroughly back-up with mortar all hollow areas at underside of transition strips.

3.9 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Management.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1	Gypsum Board	Section 09 29 00
.2	Mechanical Equipment	Division 20, 22
.3	Electrical Equipment	Division 26, 27, 28

1.2 CEILING SYSTEMS

.1 This Specification includes the ceiling assembly systems listed below, noted in schedules and shown on reflected ceiling plans, including ceiling panels, suspension system and trim.

.2 Ceiling systems shall be 610mm x 1220mm lay in exposed Tee system, non- rated.

1.3 REFERENCE STANDARDS

.1	ASTM C635	Specifications for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
.2	ASTM C636	Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
.3	CAN/CGSB 92.1	Sound Absorptive Prefabricated Acoustical Units

1.4 DESIGN

.1	N.R.C. Range:	Unless otherwise noted under description of ceiling system the N.R.C. Range shall be 60-65 (Table 1 of CAN/CGSB 92.1).
.2	Ceiling S.T.C.:	Unless otherwise noted under description of ceiling system the S.T.C. rating shall be 35 or better.
.3	Light Reflectance:	Unless otherwise noted under description of ceiling system, panels shall have a light reflectance co-efficient designation of L.R.1 (0.75 minimum). Table 3 of CAN/CGSB 92.1 refers.

1.5 SHOP DRAWINGS

.1 Reflected ceiling plans indicate proposed layout but this shall not relieve Contractor of responsibility for co-ordination of the work and provision of Shop Drawings where field conditions call for variation from proposed layout.

.2 Submit shop drawings accurately locate lighting fixtures, ventilating grilles, sprinkler heads, exit lights and other ceiling fittings.

.3 Conform to Section 01 33 23 – Shop Drawings, Product Data and Samples.

3.6 SAMPLES

.1 Upon award of the Contract submit duplicate 300mm by 300mm sample panels of each acoustical unit proposed for installation in the project. All panels subsequently used on the job shall match the approved sample.

.2 Submit one representative model sample of each suspension system members for approval prior to commencement of installation.

.3 Ceiling system sample shall show basic construction and assembly, treatment at walls, recessed fixtures, splicing, interlocking, finishes and acoustical unit installation.

3.7 DELIVERY AND STORAGE

.1 Transport, handle and store material in manner to prevent warp, twist and damage to tile and board edges and surfaces in accordance with the manufacturer's recommendations.

.2 Any warped and/or damaged boards, tile and trim shall be rejected and be replaced by new, straight, undamaged and acceptable materials at no cost to the Owner.

.3 Store material in warm, dry place away from water and the elements. Protect against undue loading stresses and shock.

.4 All packaged material shall be delivered in original manufacturers' wrappers and containers with labels and seals intact.

3.8 PROTECTION

.1 Exercise care in the execution of work under this Section to prevent damage to finished surfaces and adjacent work, and mechanical and electrical installations.

3.9 EXTRA PANELS

.1 Provide 2 full boxes of acoustic panels of each type specified for use in maintenance work. Obtain receipt from the Consultant or Owner’s representative on site.

.2 Do not use panels supplied to Owner for maintenance work to make good any damaged or removed tile required by Contract.

.3 Clearly label all boxes and delivery and store the boxes as directed by the Owner.

3.10 SPECIAL CLEANING

.1 Clean, repair or replace dirty, discoloured or defective units or exposed suspension members to Consultant's satisfaction.

3.11 ENVIRONMENT AND REGULATORY REQUIREMENTS

.1 Commence installation after building enclosed and dust- generating activities completed.

.2 Permit wet work to dry prior to commencement of installation.

.3 Maintain uniform minimum temperature of 15 deg. C. and humidity of 20% to 40% prior to, during and after installation.

.4 Comply with Ontario Hydro Electrical Inspection Bulletin No. 30-4-3 regarding support of luminaires in suspended ceilings. Submit to the Consultant a certificate confirming that the ceiling support grid provides support for lighting fixtures in accordance with Ontario Hydro requirements.

.5 Deliver finish materials in unopened packaging provided by manufacturer.

.6 Store materials in work area 48 hours prior to installation, in protected dry areas.

6.1 QUALITY ASSURANCE

.1 Installer is to be experienced in performing work of this section and who has specialized in installation of work similar to that required for this project.

.2 Installer is to have a minimum of five (5) years of experience in performing the work described.

6.2 WARRANTY

.1 The Warranty stipulated in the General Conditions of the Contract shall be deemed to include the following definition in reference to Work specified in this Section. The following will be considered defects without being limited thereto:

- .1 Failure of the suspended ceiling to remain water level.
- .2 Lifting or sagging of tile and board between supports.
- .3 Staining and discolouration of factory finishes.
- .4 Development of corrosion of galvanized ferrous metal.
- .5 Development of cracks, splits and other surface deterioration in acoustic panels.
- .6 Failure of hanging wire anchorage.

.2 The warranty period shall be two (2) years, commencing on the date of Substantial Performance of the Work.

.3 Warranties shall be issued to the Owner within two (2) Working Days following the date of Substantial Performance of the Work.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Acoustic Ceiling Panels (ACT and ACT-N):

- .1 Typical non-fire rated ceilings, to CAN/CGSB-92.1
- .2 Type: Mineral composition acoustical units, sag resistant.
- .3 Pattern: Non-directional fissured.
- .4 Edge type: Square Lay-in.
- .5 Colour: White.
- .6 Thickness: 16mm minimum.
- .7 Size: 610mm x 1220mm. Refer to architectural reflected ceiling plans for location and layout.
- .8 Shape: Flat
- .9 Flame spread rating of 25 or less.
- .10 Smoke developed class of 50 of less.
- .11 Acceptable Products:
  - .1 Armstrong World Industries Canada Ltd., Cortega No.823.
  - .2 Equivalents by CGC Interiors and CertainTeed Ceilings may be submitted for review but may not be considered or accepted.

.2 Suspension:

- .1 Acceptable Products, contingent on compatibility with specified ceiling tiles:
  - .1 Armstrong World Industries Canada Ltd.: Prelude ML Exposed Tee System. The Prelude XL suspension system can be supplied and installed in lieu of the Prelude ML suspension system, as long as the Prelude XL system is compatible with the Armstrong Cortega 823 acoustic ceiling panels.
  - .2 Equivalents as noted above under paragraph 1.11 by:
    - .1 CGC, Suspension system Donn “DX” 24mm wide faced T-bar.
    - .2 CertainTeed Ceilings: Classic Aluminum Capped Hook System.
    - .3 Chicago Metallic Corporation: Series 1200 Suspension System.
- .2 Exposed interlocking tee grid system, formed out of cold rolled zinc-bond steel 0.54mm thick. Provide fire rated grid where fire ratings noted.
- .3 Main Tees: 38mm x 25.4mm double web rectangular bulb top with capping plate in precoat baked-on white paint finish and incorporating holes for hangers and slots for connecting pieces, and capable of supporting 12.5 kg per 1200mm. for continuous spans and 6.5 kg per 1200mm span for single span without exceeding a deflection of 1/360 of the span.
- .4 Standard Cross-Tees: 25.4 x 25.4mm double web, bulb top, capping plate in precoated white baked-on finish, capable of supporting 11.3 kg per 600mm span without exceeding a deflection of 1/360 of span, and with positive interlock with main tees.
- .5 Structural Cross-Tees as main tees, but with crimped ends for lapping bottom flange of main tees and interlocking tack ends to engage slots in main tees.
- .6 Accessories:
  - .1 Splice plate, clips, screws, etc. as required to complete the installation. All galvanized finish.
- .7 Concealed flat spline: 0.71mm flat steel spline.

.8 Edge Trim:
- .1 0.635mm zinc bonded, cold rolled steel mould.
- .2 Trim shall be minimum 22mm x 22mm angles.
- .3 Provide 50mm wide shadowline trim at perimeter of corridor ceilings.

.9 Finish to tees and edge trim: flame resistant white baked enamel satin finish to match panel finish, 2 coats on exposed surfaces, 1 coat elsewhere.

.10 Carrying Channels: 38mm x 19mm cold rolled galv. weighing 1.042 kg per metre.

.11 Tie Wire: 1.6mm galvanized soft annealed steel

.12 Hangers: 2.6mm galvanized steel wire.

.13 Screws: Corrosion resistant, self-tapping Philips truss head, of length and gauge to suit installation.

.14 Ceiling Hanger Pins (for fixing to metal): capacitor discharge ceiling hanger pins, by Continental Studwelding Ltd., or approved equivalent, of type approved by Consultant.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

.1 Employ mechanics skilled in this Trade and install work in strict accordance with the system manufacturer's printed directions to produce a first class, true finish, free from dropping, warpage, soiled or damaged tile.

.2 Make provisions for thermal movement.

.3 Install hanger inserts in a manner approved by Consultant.

.4 Locate hangers directly over Main Tees and as close to intersections as possible. Secure hangers firmly to concrete inserts, steel joists and beams, bracing, etc. Do not install hangers to metal deck, provide separate grid off joists if required.

.5 Erect ceiling grid plumb and square with accurately fitted locked-in joints in true alignment, secure and rigid and with provision for thermal movement. Water level ceiling to tolerance of 1mm in 1m and maximum deviation of 4mm. from mean level.

.6 Frame around recesses fixtures, diffusers, grilles, and the like and provide heavier section hangers and supports as necessary to support same. Provide hanger within 150mm. of each fixture corner.

.7 Consult with Electrical and Mechanical Trades for requirements and provide access to valves and switches.

.8 Ensure that all hangers and carrying members are designed and spaced to support entire ceiling system including recessed lighting fixtures. Note, weight of fixtures is approximately 9-13.5 kg.

.9 Install panels only after all mechanical and electrical equipment, conduits, piping, telephone distribution, etc. are in place.

.10 Co-ordinate ceiling work to accommodate components of other sections, to be built into acoustical ceiling components, such as light fixtures, diffusers, speakers and sprinkler heads.

.11 Neatly cut acoustical units to fit tightly around all building elements that penetrate ceiling.

3.2 INSTALLATION OF LAY-IN SUSPENSION SYSTEM

.1 Install suspension system in accordance with ASTM-C636 except where specified otherwise. Install suspension system to manufacturer's instructions and certification organization's tested design requirements where referenced.

.2 Generally hangers shall be spaced at not more than 1200mm o.c. directly above main runner tees, except at fixtures, where they shall be 600mm o.c. or closer as required to adequately support fixtures. Locate hangers as close as possible to tee junctions. Locate first hanger within 300mm of perimeter wall.

.3 Install main tee runners continuous at 1200mm o.c. with interlocking structural cross-tees each side of fixtures at right angles to main tees. Install standard cross-tees generally at 90 degrees to main tees and as required to achieve pattern shown on reflected ceiling plans. Secure joints by web of tees; snaplock into place forming rigid connections. Main tees shall be as long as possible with butt ends joined by means of splice plates locked into webs.

.4 Frame up around light fixtures, grilles, diffusers, speakers, openings, etc. as required.

.5 Secure edge moldings to walls, bulkheads and other vertical surfaces at perimeter edges of acoustic ceilings. Note special moldings required.

.6 Securely fix hangers to tees by bending ends 90 degrees at the correct height and inserting through holes in top of main tees, then wiring around open side at least 3 turns twisting ends together. Flats shall be bolted to tees. Secure to concrete inserts in similar manner.

.7 Do not erect ceiling suspension system until work above ceiling has been inspected by the Building Inspector.

.8 Do not secure hangers to fluted steel floor or roof deck. Secure hangers to overhead structure using attachment methods as required for particular structure and acceptable to the Consultant. Where structural spacing exceeds ceiling hanger spacing, provide double carrying channels nested and placed perpendicular to and on top of bottom flange of steel beams or on top of the lower chords of the open web steel joists, and secured to each joist with three loops of 1.2mm galvanized soft steel wire.

.9 Where obstructions interfere with the placement of ceiling hangers, provide double carrying channels nested and hung from the structure above on both sides of the obstruction.

.10 Provide isolation hangers at all hangers where indicated as required for specific ceiling assemblies.

.11 Install hangers on main tees spaced at maximum 1200mm centres and within 150mm from ends of main tees and tee splices.

.12 Lay out with border units not less than 50% of standard unit width and according to reflected ceiling plans.

.13 Ensure suspension system is coordinated with location of related components.

.14 Install typical wall moulding to provide correct ceiling height.

.15 Completed suspension system shall support super-imposed loads, such as lighting fixtures, diffusers, grilles, speakers and other ceiling mounted fixtures.

.16 Support at light fixtures and diffusers with additional ceiling suspension hangers within 150mm of each corner and at maximum 600mm around perimeter of fixture. Install an additional hanger immediately above each fastener for ceiling mounted curtain tracks.

.17 Interlock cross member to main runner to provide rigid assembly. Ensure all main tee splices and cross tee end clips are fully engaged.

.18 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.

.19 Finished ceiling system shall be square with adjoining walls and level within 6mm in 3000mm.

3.3 LAY-IN PANEL INSTALLATION

.1 End panels shall not be less than half full size and installation in each area shall be symmetrical, with end tiles and abutting opposite vertical wall surface to be of the same width. Do all necessary cutting and fitting neatly and accurately to suit grid openings and accommodate fixtures, grilles, detectors, speakers and the like located on the ceiling panels.

.2 Lay directionally patterned acoustic panels in one direction, parallel to the longest direction of the grid concerned.

.3 Place panels between tees so that edges bear evenly on flanges.

.4 Confirm with reflected ceiling plans.

.5 Provide fire rated enclosures as required around light fixtures and mechanical equipment in fire rated ceilings, according to applicable ULC Design Criteria.

.6 Where mechanical equipment is located above the ceiling, panels shall be suitably and inconspicuously marked by the use of small colour-coded stickers. Mechanical equipment to be located shall include valves, dampers, heat exchangers, heat pumps, VAV boxes, electrical disconnects, as applicable, and other such equipment not visible from below.

3.4 CLEANING

.1 Upon completion, clean acoustic tile of all finger marks and other defacements.

.2 Remove all accumulated rubbish and excess materials from the site.

.3 Clean acoustic tile and replace any damaged tiles immediately before occupation of building by Owner.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1 Porcelain Tile Installation — Section 09 30 13

1.2 SCOPE OF WORK

.1 Resilient Sheet and Tile Flooring and Rubber Base.
.2 Flooring Preparation and Flooring Accessories.

1.3 REFERENCE STANDARDS

.1 ASTM Standards:

.1	F 141	Resilient Floor Coverings
.2	F 386	Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces
.3	F 511	Quality of Cut (Joint Tightness) of Resilient Floor Tile
.4	F 710	Standard Practice for Preparing Concrete Floors to Receive Resilient
.5	F 1344	Flooring Specification for Rubber Floor Tile
.6	F 1861	Specification for Resilient Wall Base
.7	F 2055	Size and Squareness of Resilient Floor Tile by Dial Gage Method
.8	E 662	Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
.9	E 1907	Methods of Evaluating Moisture Conditions of Concrete Floors to Receive Resilient Floor Coverings
.10	F 970	Standard Test Method for Static Load Limit
.11	F2034	Standard Specification for Linoleum Sheet Floor Covering

.12 CAN/ULC-S102.2 Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies

.13 RFCI:
- .1 IP #1 Recommended Installation Practice for Homogeneous Sheet Flooring.
- .2 Recommended Work Practices for Removal of Resilient Floor Coverings

1.4 SUBMITTALS AND SAMPLES

.1 Submit samples as per Section 01 33 23 – Shop Drawings, Product Data and Samples.

.2 Submit duplicate full-size tiles, 300mm long base, nosing, and treads as specified.

.3 Submit colour samples of flooring accessories for selection by the Consultant.

.4 Submit 300mm x 300mm samples of resilient sheet flooring.

.5 Submit samples of rubber floor base.

.6 Submit product technical data sheets indicating material performance criteria, physical characteristics and requirements.

.7 Submit manufacturer's written installation recommendations and requirements.

.8 Provide maintenance data for resilient flooring for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 EXTRA MATERIALS

.1 Provide extra materials of resilient tile flooring and base.

.2 Provide one unopened box of flooring installed of each colour, pattern and type of flooring material required for this Project for maintenance use.

.3 Provide one 3600mm length of each type and colour of resilient base required for this Project for maintenance use.

.4 Extra materials shall be from same production run as installed materials.

.5 Store where directed by the Owner.

.6 Material to be in wrapped packages or fully labelled as to product and colour.

1.6 WARRANTY

.1 Submit manufacturer's warranty warranting material and performance for a minimum period of five (5) years for all resilient products, following the date of Substantial Performance of the Work.

.2 Installation Warranty: Submit the flooring contractor's installation warranty agreeing to repair or replace work which has failed a as result of defects in workmanship. Failure shall include, but not limited to, tearing, cracking, separation, deterioration or loosening from substrate, seam failure, ripples, bubbling or puckering.

.3 Installation Warranty Period: Two (2) year limited warranty commencing on Date of Substantial Completion from flooring contractor.

.4 Warranties shall be issued to the Owner within two (2) Working Days following the date of Substantial Performance of the Work.

4.7 QUALITY ASSURANCE

.1 Installer is to be experienced in performing work of this section and who has specialized in installation of work similar to that required for this project.

.2 Installer is to have a minimum of five (5) years of experience in performing the work described.

PART 2 – PRODUCTS

4.1 MATERIALS

.1 Primers and Adhesives:
- .1 Solvent-free white acrylic.
- .2 Supply and install as recommended by manufacturers of resilient sheet flooring, vinyl composite flooring, and base.
- .3 Rubber base adhesive: Mapei Ultrabond ECO 575 or equivalent.
- .4 Adhesive must produce good and permanent waterproof bond between wall surfaces and cove base.

.2 Transition strips at dissimilar materials:
- .1 At transition between resilient flooring: Tarkett, Johnsonite Rubber Reducer Transition Strip to floor type SSR-B. Colour to be confirmed at a later date by the Consultant.

.4 Resilient Rubber Sheet Sports Flooring in Gymnasium (RFL1):
- .1 Sheet Flooring to ASTM F2034.
- .2 Slip Resistance: Tested in accordance with ASTM D2047; meeting or exceeding A.D.A recommendations of 0.6.
- .3 Construction: Homogeneous sheet floor covering.
- .4 Minimum Thickness and Wear Layer: 7.2mm.
- .5 Net Fit Seams and Welding Rods: Provide for net fit seams and welding rods to match in colour to sheeting flooring.
- .6 Consultant to pick any standard or premium colours from any of the acceptable products described above. A minimum of two (2) colours may be selected.
- .7 Acceptable Manufacturers and Products:
  - .1 Tarkett, Omnisport 3.5.
  - .3 Caliber Sport Systems, V-Sport 350.

.5 Resilient Sheet Flooring (RFL2):
- .1 Sheet Linoleum Flooring to ASTM F2034.
- .2 Slip Resistance: Tested in accordance with ASTM D2047; meeting or exceeding A.D.A recommendations of 0.6.
- .3 Construction: Homogeneous sheet floor covering.
- .4 Minimum Thickness and Wear Layer: 2.0mm.
- .5 Net Fit Seams and Welding Rods: Provide for net fit seams and welding rods to match in colour to linoleum sheeting flooring.
- .6 Consultant to pick any standard or premium colours from any of the acceptable products described above. A minimum of two (2) colours may be selected.
- .7 Acceptable Manufacturers and Products:

.1 Forbo, Sphera Element.
.2 Tarkett, iQ Optima Homogeneous Sheet Flooring.
.3 Gerflor, Accord.

.5 Resilient Base (RB or RB100): to CAN/CSA-A126.5, Type 1, rubber.
.1 Manufacturer: Tarkett, Rubber Baseworks with toe/cove base.
.2 Minimum 1200mm length and 100mm high by 3mm thick, with grooved back.
.3 Colour: To be confirmed by the Consultant from the standard range.

.6 Sub-floor Filler and Leveler: as recommended by flooring manufacturer for use with their Product.

.7 Sealer: type recommended by flooring manufacturer, meeting the requirements of CAN/CGSB-25.20.

.8 Floor Protection: heavy kraft paper laminated with non-staining adhesive to both sides of glass fibre reinforcing ply.

PART 3 - EXECUTION

3.1 INSPECTION AND TESTING

.1 Check floor surfaces for evidence of carbonation, dusting, excessive moisture or other defects affecting bond of adhesive. Ascertain nature of curing and/or sealing compound used on concrete and its compatibility with flooring adhesive. Take all required remedial measures. Remove compounds if necessary to ensure that adhesive bonds to concrete.

.2 Test concrete slab, using anhydrous calcium chloride test, in conformance with ASTM F1869. Do not proceed until moisture vapour emission rate is equal or less than 2.44kg/100m2/24hours (3lbs/1000sq.ft./24hours).

.3 Confirm ph level of concrete is acceptable to manufacturers of adhesive and tile. Generally, ph level is to be 9 or less.

.4 Perform bond testing to confirm compatibility between concrete slab and adhesives.

.5 Provide test results to manufacturers of products proposed for use and obtain approval of conditions before commencing installation. If the test results exceed the limitations specified to not proceed until the problem is corrected and satisfactory test results are obtained.

3.2 INSTALLATION – GENERAL

.1 Do not start installation of resilient flooring until all other trades have completed their work and just prior to completion of building.

.2 Obtain approval from manufacturers for all adhesives, caulking, patching and levelling agents, and installation methods, before proceeding with the work of this section.

.3 Ensure flooring materials are clean of any contaminants which would interfere with proper bonding.

3.3 PREPARATION

.1 On concrete floors, level depressions and cracks with non-shrinking latex joint filler. Patching and levelling products must be compatible with adhesives; obtain approval from manufacturer of adhesive. Do not use products containing gypsum.

.2 Report large cracks to Consultant. Do not proceed until remedied. Prime surface with approved primer.

.3 Thoroughly clean concrete floors of any substances deleterious to bond of adhesive.

.4 Close off areas where work is in progress to prevent deposit of dust or grit on slabs where flooring is being laid.

.5 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

.6 Clean floor thoroughly of any dirt, oil, grease and other material which may affect adhesive bonding and cause telegraphing. Apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler has cured and is dry.

.7 Prime concrete to flooring manufacturer's printed instructions.

3.4 INSTALLATION - RESILIENT FLOORING

.1 Material Installation:

- .1 Measure the area to be installed and determine the direction in which the material will be installed and seam placement.
- .2 Seams should be a minimum of 6” away from underlayment and concrete joints, saw cuts, etc. Cut the required length for the first sheet off of the roll, adding approximately 3” - 6” for extra trimming. Fit the first sheet along the main (long) wall and at the ends using standard fitting methods. Position the fitted sheet in place against the main wall. The factory edge must be trimmed in order to produce a clean edge suitable for seaming. Utilize a straight edge, utility knife and hooked blade knife may also be used. Position the straight edge approximately 1/2” - 3/4” from the factory edge and score the material using the utility knife along the straight edge.
- .3 After scoring, complete the cut using a hooked blade knife following the score line. Hold the blade at a slight angle to the surface of the material so the seam edge will have a slight undercut. After trimming the seam edge, draw a pencil line on the substrate lengthwise along the trimmed edge. This line will serve as a spread line when applying the adhesive.
- .4 Do not reverse the sheets. Install all sheets in the same direction.
- .5 Immediately roll the flooring in all directions using a 100 lb. roller to ensure proper adhesive transfer. Additional rolling is required during adhesive setup to

ensure that the material is flat and fully adhered. The use of a three-section wall roller or steel seam roller is required at walls, under toe kicks or anywhere the full weight of a 100 lb. roller cannot access or be applied.

.6 Adhesive Application: Follow manufacturer's instructions, using the manufacturer's recommended products.

.7 Seaming: Allsheet products shall be installed utilizing net fit seams. A properly executed net fit seam will have no gaps or fullness. If the material is cut too full, it will result in bubbled or peaked seams. Gaps will allow dirt or contaminants to accumulate. Cut the material at an angle so as to slightly undercut the material. This will compensate for any slight expansion that may occur. Roll the seam with a steel seam roller, making sure that the flooring material is placed into wet adhesive.

.2 Installation Techniques:

.1 Where millwork and partitions and other items are indicated for installation on top of finished flooring, install flooring before these items are installed.

.2 Scribe, cut, fit flooring to butt tightly to vertical surfaces, permanent fixtures, including pipes, outlets, edgings, thresholds and nosings.

.3 Extend flooring into toe spaces, door reveals, closets, and similar openings.

.4 Install flooring on covers for telephone and electrical ducts, and similar items occurring within finish floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers.

.5 Do not install resilient flooring over expansion joints. Use expansion joint covers manufactured for use with resilient flooring. Refer to other specification sections for expansion joint covers.

.6 Adhere resilient flooring to substrate without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed installation.

.7 Use adhesive applied to the substrate in compliance with the flooring manufacturer's recommendations, including those for proper spreading of the adhesive, adhesive missing and adhesive open and working times.

.8 Immediately roll the flooring in all directions using a 100 lb. roller to ensure proper adhesive transfer. Additional rolling is required during adhesive setup to ensure that the material is flat and fully adhered. The use of a three-section wall roller or steel seam roller is required at walls, under toe kicks or anywhere the full weight of a 100 lb. roller cannot access or be applied.

.3 Avoid all traffic for at least 12 hours and limit to light traffic for a period of 72 hours after the installation. Avoid cold or excessive heat, including direct sunlight during this 72 hour period.

.4 Protection: Protect installed product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of Substantial Completion.

.5 72 hours after installation is completed, implement initial maintenance procedures, as per manufacturer's printed maintenance instructions.

3.5 APPLICATION - RUBBER BASE AND TRANSITION STRIPS

.1 Fill cracks and level irregularities of surfaces to which base is to be applied with filler approved by adhesive manufacturer so as to provide solid backing over entire area behind base.

.2 Cement cove base to vertical surfaces so that gaps do not occur behind base, so that front lip of base cove bears firmly and uniformly on floor surface, and so that good and permanent bond is produced between base and surface to which it is applied.

.3 For right angled external corners use preformed matching cove corner units. Make end joints flush with gap.

.4 At wall ends and openings where ends of preformed corners come close together or touch or overlap, cut each corner unit equally so that a neat, inconspicuous joint is formed in middle of wall end or opening or so that filled gap, if gap is necessary, is not less than 38mm wide and located in middle of wall or end of opening.

.5 Resilient Transition Strips:

- .1 Install specified resilient transition strips at junction with dissimilar floor materials and coordinate installation with trades installing these materials.
- .2 Install resilient transition strips fully bonded to floors using manufacturer recommended adhesive.
- .3 Where resilient flooring meets carpet flooring coordinate installation of transition strips with carpet installation.
- .4 Install strips under doors at openings.

3.6 CLEANING AND PROTECTION

.1 Remove surplus adhesive from face of material as work progresses.

.2 Upon completion of work remove all markings and heel scuffs. Broom clean.

.3 Prior to occupation by Owner, broom clean all resilient floors and remove all noticeable stains and marks. Remove all surface soil, debris, sand and grit by dust mopping, sweeping or vacuuming the floor.

.4 All wet mopping will be done by the custodian staff.

.5 Protect new floors from time of final set of adhesive until Project completion.

.6 Prohibit traffic on floor for 72 hours after installation.

.7 Protect floors by lapping joints of protection material a minimum of 150mm, sealing with non-asphaltic tape.

.8 Remove excess adhesive from floor, base and wall surfaces without damage, as work progresses.

.9 Clean and seal resilient base surface to flooring manufacturer's instructions immediately after installation.

.10 Apply sealers and waxing as directed by the manufacturer.

.11 Final cleaning is specified in Section 01 74 00 – Cleaning and Waste Management.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1	Concrete Unit Masonry	Section 04 22 00
.2	Structural Steel	Section 05 12 00
.3	Metal Fabrications	Section 05 52 00
.4	Rough Carpentry	Section 06 10 00
.5	Hollow Metal Doors and Frames	Section 08 11 13
.6	Gypsum Board System	Section 09 29 00
.7	Shop Priming Specified in various Sections of the Specification.	
.8	Factory applied paint coatings unless otherwise specified.	
.9	Mechanical	Division 20, 22
.10	Electrical	Division 26, 27, 28

1.2 SCOPE OF WORK

.1 With exceptions specified above or specifically called for in other Sections of the Specification, all paintwork is included in the scope of this Section of the Specification. Colours will be specified at a later date by the Consultant.

.2 In locations where Drawings do not call for paint or similar finish on walls and/or ceilings, the intent of this Specification is that items, new work and existing surfaces in areas affected by the Work of this project, including miscellaneous metal work, shall be painted.

.3 Work includes moisture testing and surface preparation of substrates as required for acceptance of paint, including cleaning, small crack repair, patching, caulking, and making good surfaces, and specific pre-treatments, sealing, and priming of surfaces.

.4 Check conditions of all existing surfaces to be repainted before commencing new work, including assessing the level of degradation of the surface, the type of coating existing, and the thickness of the existing coating. Perform adhesion tests on all existing coatings to be repainted to ensure that surfaces are sound and well adhered before applying new coatings. It is expected that the Contractor will have visually assessed the existing conditions during the pre-tender site visit, and no contract extras will be considered for addressing conditions which were readily apparent at that time.

.5 Paint all new exterior surfaces which normally require painting, including hollow metal doors, screens, galvanized steel lintels, ladders and hardware and gas lines.

.6 Perform interior painting called for in Room Schedule and Door Schedule and noted on drawings. Paint all new walls, ceilings, bulkheads, and all surfaces which normally receive a paint finish, whether noted on schedules, or not noted. Walls shall be completely painted before installation of tackboards, whiteboards/markerboards and millwork, etc.

.7 All heating units, recessed convectors, grilles, pipes, access panels, hangers and miscellaneous exposed metal work (other than stainless steel, anodized aluminum and

baked enamel) to be painted to match the surfaces on which they occur, unless otherwise directed by Consultant.

.8 For special painted graphics, colour changes, accent stripes, etc. see drawings.

.9 In all renovated areas, paint affected walls as specified for new construction. All other walls in the room are to be cleaned and painted with one coat. If more than one colour is used in the room, confirm colours with Consultant.

.10 Paint exposed drywall and the like in locations where finish is not otherwise specified or noted. Do not paint such surfaces in mechanical shafts, unless specifically noted.

.11 Paint all exposed structural steel and steel roof deck and mechanical ducts in finished areas.

.12 Paint exposed structure and metal deck in all mechanical and storage rooms, except Water Meter and Electrical Rooms.

.13 Paint pipes, conduit, ducts and related thermal insulation and all prime painted mechanical and electrical equipment and supports located in mechanical and electrical rooms and in all locations where Drawings call for paint or similar finish on walls and/or ceilings. Paint all mechanical equipment exposed on the roof. Exposed pipes shall be painted to Owner's Colour Coding/Piping schedule to suit use (i.e. hot water, etc.), included below.

.14 Paint all gas piping, inside and out, whether exposed or concealed. Do not paint other pipe, conduit, ducts, insulation and the like where concealed above ceilings or in service shafts.

.15 Make good paint finish on shop coated work where damaged.

.16 Paint visible portions of steel shelf angles, lintels and structural steel.

.17 Paint edges and all faces of metal doors.

.18 Paint interior of ducts and diffusers visible from exterior on room side.

.19 Painting, as referred to herein shall include paint, enamel, stain, varnish and other finishes herein specified and normally applied to the various materials by the painting Subcontractor.

1.3 REFERENCE STANDARDS

.1 Do painting and finishing to CAN/CGSB-85-GP series standards including Appendix A and to material manufacturer's instructions and to The Master Painters Institute (MPI) Architectural Painting Specification Manual and Maintenance Repainting Manual, except where specifically specified otherwise. The most stringent standards shall apply.

.2 All coatings must conform to Regulation SOR/2009-264, Volatile Organic Compound (VOC) Concentration Limits for Architectural Coatings Regulations, and the VOC limits set therein.

.3 All paints and coatings used must conform to Green Seal Standard GS-11 for paints and coatings based on performance requirements and reduced use of hazardous substances and reduced volatile organic compounds.

1.4 QUALIFICATIONS

.1 The Painting Subcontractor must be a member in good standing of the Ontario Painting Contractors' Association and have a minimum of ten (10) years proven satisfactory experience.

.2 Manufacturer's Qualifications: The paint Products of the Paint Manufacturer shall be as listed in Chapter 5 - Approved Products List of the MPI Manual.

1.5 INSPECTION

.1 A cash allowance has been included for independent painting inspections. The cost of the painting inspection is to be paid from the Cash Allowance included in the Contract. Refer to Section 01 10 10 – Project Instructions.

.2 Prior to commencing the work of this section the painting Subcontractor shall arrange for OPCA inspection in accordance with the requirements of the OPCA Quality Assurance Program.

.3 Painting shall not commence until the inspection company has been notified and the Inspector makes the initial site visit.

.4 Supply the Inspector with a schedule of materials intended for use on the job at the commencement of the painting.

.5 The Inspector will issue Inspection Reports during the Project. On completion of the job, the final Inspection Report will be issued.

1.6 WORK ENVIRONMENT

.1 Do not apply paint finish in areas where dust is being generated.

.2 Maintain environmental conditions within limits recommended by manufacturer, for optimum results. Do not apply coatings under environmental conditions outside manufacturer's absolute limits.

.3 Conform to requirements of MPI Architectural Specification Manual including recommendations for surface preparation.

.4 Temperature: No painting shall be performed when surface and ambient temperatures are below 5^0C. The minimum temperature for Latex paints shall be 10^0C for both interior work and exterior work.

.5 Relative humidity shall not be higher than 85%.
- .1 Moisture Content of Surfaces:
- .2 Tests shall be by electronic moisture meter.
  1. Plaster and Gypsum Board and Cement Board: Maximum moisture content of 12%.
  2. Concrete and Concrete Masonry Units: Maximum moisture content of 12% for solvent type paint. Concrete and masonry walls must be installed at least 28 days and must be visually dry on both sides before painting commences.
  3. Wood: Maximum moisture content of 15%.
  4. Concrete Floors: Shall be tested for moisture by Acover patch test@.

.6 Lighting: Painting shall not proceed unless the permanent lighting is in place and operational or a minimum of 161 lm/m5 lighting is provided on the surfaces to be painted.

.7 Ventilation: In areas where painting is proceeding provide adequate continuous ventilation and heating to maintain temperatures above 7^0C for 24 hours before, during and 24 hours after paint application.

.8 Do not paint exterior work immediately following rain, frost or dew. Do not paint interior work where condensation has formed or is likely to form. Proceed only when proper environmental conditions are achieved.

.9 Avoid applying paint to surfaces when exposed to direct sunlight.

1.7 ACCEPTANCE OF WORK IN PLACE

.1 Submit written confirmation of acceptance of existing conditions, to the Consultant, prior to commencing painting work. Painting may not commence without submission of this confirmation.

.2 Receipt of this confirmation will be considered a prerequisite for certification of payment for this work.

.3 Notify the Consultant, in writing, immediately if any existing condition is encountered that will prevent the attainment of satisfactory results in this work

1.8 REGULATORY REQUIREMENTS

.1 Conform to requirements of applicable Volatile Organic Compound (VOC) concentration limits for Architectural Coatings Regulations.

.2 Conform to the latest edition of Industrial Health and Safety Regulations issued by authorities having jurisdiction regarding site safety, including, but not limited to, ladders, scaffolding, and ventilation.

.3 Conform to requirements of local authorities having jurisdiction regarding the storage, mixing, application, and disposal of all paint and related waste materials.

.4 Notify the OPCA on award of contract and make application for assignment of an inspector using the appropriate forms.

.5 Fully cooperate at all times with the requirements of the OPCA in the performance of their duties, including providing access and assistance as required to complete inspection work.

1.9 SUBMITTALS

.1 Samples:

- .1 Submit triplicate samples consisting of 300mm x 200mm panels of each type of paint finish specified.
- .2 Panels shall be of same material as that on which sample coatings are to be applied in the field where possible.
- .3 Identify each sample as to job, name of paint manufacturer, finish, colour, name and number, sheen and gloss units and name of Contractor.
- .4 Retain one set of approved samples on site until completion of the Work.

.2 Submit manufacturer's data sheets for each paint product, including:

- .1 Product characteristics.
- .2 Surface preparation instructions and recommendations Primer requirements and finish specifications.
- .3 Storage and handling recommendations.
- .4 Application methods.
- .5 Cautions.
- .6 VOC data.
- .7 Complete Material Safety and Data Sheets (MSDS) for each product.

.3 Submit written confirmation of acceptance of existing conditions, as specified above.

1.10 STORAGE AND HANDLING

.1 Store paint and painter's materials in clean, dry locations approved by the Consultant. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

.2 All paint shall be in unopened containers, labelled with:

- .1 manufacturer's name,
- .2 product name, product type,
- .3 instructions for surface preparation and product application,
- .4 VOC content,

.5 environmental issues,
.6 batch date, and
.7 colour name and number.

.3 Provide C02 fire extinguisher minimum 9 kg capacity in paint storage area.

.4 Dispose of materials in accordance with the requirements of authorities having jurisdiction.

.5 Paint materials shall be delivered to the job site in original sealed and labeled containers bearing the manufacturer's name, type of paint, brand name, colour designation, and instructions for mixing and reducing, and application requirements.

.6 Take all necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion. Take appropriate precautions, including no smoking restrictions, where toxic and explosive solvents are used.

1.11 SIGNS

.1 Provide legible signs throughout the Work reading "WET PAINT" in prominent positions during painting and while paint is drying.

.2 Use 75mm high letters on white card or board.

1.12 TEMPORARY COVERS AND PROTECTION

.1 Protect floors and other surfaces with temporary covers such as dust sheets, polyethelene film or tarpaulins. All to Consultant's approval.

.2 Mask identification plates occurring on equipment, switch boxes, and fire rating labels, etc. which require painting.

.3 Protect, remove and replace hardware, accessories, lighting fixtures, and similar items as required except primed for paint door closers which shall be painted. Light switches and electrical communication outlet plates to be removed and reinstalled on completion of painting.

.4 Keep oily rags, waste and other similar combustible materials in closed metal containers; take every precaution to avoid spontaneous combustion, remove waste and combustible materials daily.

.5 Clean surfaces soiled by spillage of paint, paint spattering and the like. If such cleaning operations damage the surface, repair and replace damaged work at no cost to the Owner.

1.13 RETOUCHING

.1 Do all retouching, etc. to ensure that the building may be handed over to the Owner in perfect condition, free of spatter, finger prints, rust, watermarks, scratches, blemishes of other disfiguration.

.2 After fully decorating and retouching a room or other area, notify Consultant. After inspection and final approval by Consultant post sign 'DECORATING COMPLETE - NO ADMITTANCE WITHOUT PERMISSION'.

1.14 TEST AREAS

.1 In areas to be repainted, test existing coatings for adhesion before applying new coatings, in accordance with the recommended practices in the MPI Repainting Specification Manual. Check for loose paint using a scraper and check for adhesion by cutting through the coatings and performing duct tape tests, or other acceptable means of testing adhesion. Once adequate adhesion is confirmed, apply a test section of the proposed new coating, allow to dry, and perform adhesion tests in area of new coating to confirm compatibility with existing coatings before proceeding with repainting work. Perform tests in all areas and on all surface types to ensure positive repainting results. Advise Consultant of any areas in which existing or new coatings fail adhesion tests. Do not proceed with the work until a recommended course of action is agreed upon by all parties. Commencement of work will signify acceptance of existing conditions.

.2 In areas of new construction, A room or area in the building will be designated by the Consultant as a test area to establish standard of workmanship, texture, gloss and coverage.

.3 Prior to any painting being started, request a meeting on Site between Consultant, Contractor, and Subcontractor and Inspector to review conditions, surfaces, anticipated problems and to clarify quality of workmanship acceptable to Consultant.

.4 Apply finishes to each type of surface within room with correct material, coats, colour, texture and degree of gloss in sample area and have same approved prior to providing Work of this Section.

.5 Retain test area until after completion of Work. Test area to be minimum standard for the Work.

.6 Failure to comply with the above will be cause for Consultant to request all Work previously painted to be repainted.

1.15 WASTE MANAGEMENT AND DISPOSAL

.1 Remove and dispose of excess material and waste resulting from the work of this Section.

.2 All excess materials and empty containers shall be removed from the site and disposed of or recycled in accordance with local regulations.

.3 Obtain information regarding applicable Provincial and local government regulations for disposal of paint, stain, wood preservative finishes, and related thinners and solvents.

.4 All waste materials shall be separated and recycled. Collect waste paint by type and provide for delivery to recycling or collection facility. Materials that cannot be reused shall be treated as hazardous waste and disposed of in an appropriate manner.

.5 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.6 Cleaning and Disposal Procedures:
- .1 Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
- .2 Retain cleaners, thinners, solvents, and excess paint and place in designated containers and ensure proper disposal.
- .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
- .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
- .5 Ensure empty paint cans are dry prior to disposal or recycling.
- .6 Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.
- .7 Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.

1.16 MAINTENANCE MATERIALS

.1 Provide one sealed can, one litre capacity, of each product in each colour used in the Work for Owner's use in maintenance Work.

.2 Container to be new fully labelled with manufacturer's name, type of paint, and colour.

.3 Maintenance material shall be of the same run as the installed material.

1.17 WARRANTY/GUARANTEE

.1 Provide a warranty, valid for three (3) years from date of Substantial Performance, or from date of completion of Work if work is not complete at date of Substantial Performance, will be required.

.2 Subcontractor’s shall warrant that the work has been performed in accordance with the standards and requirements of the MPI Architectural Painting Specification Manual, most recent edition.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Paint and finishing materials - highest grade, first line quality, low VOC products provided by any of the following manufacturers:

.1 Benjamin Moore & Co.
.2 The Sherwin-Williams Company
.3 Dulux Paints/PPG Canada

.2 Paints, enamels, fillers, primers, varnishes and stains - ready mixed products of one of the manufacturers listed. Substitutes will not be allowed.

.3 Thinners, cleaners - type and brand recommended by the paint manufacturer, or Inspector.

.4 Only products manufactured by paint manufacturer stated at time of submission of samples will be allowed on Site unless other materials specifically specified herein. No painting to be performed until paint manufacturer identified and acceptance received from the Consultant and Inspector.

.5 Deliver materials to Site in original unbroken containers bearing brand and maker's name. The presence of any unauthorized material or containers for such, on Site shall be of sufficient cause for rejection of ALL paint materials on Site at that time, and all previous painted work repainted with proper material.

2.2 COLOUR SCHEDULE

.1 Consultant will provide detailed colour schedule at a later date. Conform to schedule including patterns, colours, and locations for all finishes.

.2 A minimum of ten (10) paint colours may be selected by the Consultant.

.3 In each room, the Consultant may select one wall where an accent colour may be applied.

.4 Refer to room finishing notes for detailed application instructions.

2.3 FINISHING SYSTEMS

.1 Interior Work:

.1 Gypsum Board:
.1 Walls (typical): INT 9.2M Institutional Low Odour/ Low VOC, semi-gloss finish, 1 coat Primer; MPI #149, Finish: 2 coats MPI #147.
.2 Walls (corridors, service rooms): INT 9.2F Epoxy-Modified Latex (over latex primer sealer), Semi-Gloss finish. Acceptable paint: Sherwin-

Williams, Pro Industrial Zero VOC Waterborne Catalyzed Epoxy or Equivalent.

.3 Ceilings (typical): 2 coats of one of the following:
2 coat Dulux Lifemaster Interior Acrylic Ceiling Flat # 59170 Zero VOC or equal by one of the approved manufacturers.

.4 Ceiling (corridors, mechanical, electrical, custodian and washrooms): INT 9.2F Epoxy-Modified Latex (over latex primer sealer), Flat Finish. Acceptable paint: Sherwin-Williams, Pro Industrial Zero VOC Waterborne Catalyzed Epoxy or Equivalent.

.5 All drywall, whether requiring finish painting or not, must receive prime coat.

.2 Concrete Block, paint (typical):

.1 INT 4.2E (modified), Institutional Low Odour/ Low VOC, semi-gloss finish, 4 coat system.
.2 2 coats latex blockfiller; MPI #4.
.3 2 coats finish; MPI #147.
.4 Provide gloss finish, MPI #148, where noted as “gloss” in Room Finish Schedule.

.3 Concrete Block, glaze and wet areas:

.1 INT 4.2J (modified), Epoxy-modified Latex Finish, 4 coat system
.2 2 coats latex blockfiller; MPI #4
.3 2 Coats epoxy-modified latex finish; MPI #115
.4 Provide in all corridors, custodian room, mechanical room and washrooms, and where noted as “glazed” in Room Finish Schedule.
.5 Acceptable Paint: Sherwin-Williams, Pro Industrial Zero VOC Waterborne Catalyzed Epoxy or Equivalent.

.4 Cast in Place Concrete walls, ceilings:

.1 INT 3.1M Institutional Low Odour/ Low VOC, semi-gloss finish.
.2 1 coat MPI #149.
.3 2 coats MPI #147.

.5 Woodwork (Opaque Finish):

.1 INT 6.4T Institutional Low Odour/ Low VOC, semi-gloss finish.
.2 1 coat latex primer MPI #39.
.3 2 coats institutional low VOC latex finish; MPI #147.

.6 Stain Finish:

.1 LEED Complaint Stain.
.2 Coats Varnish, Water Based, clear gloss; MPI #130.

.7 Ferrous Metal:

.1 INT 5.1S Institutional Low Odour/ Low VOC, semi-gloss finish.
.2 1 coat MPI #107.
.3 2 coats MPI #147.

.8 Shop Primed Ferrous Metal:

- .1 INT 5.1S Institutional Low Odour/ Low VOC, semi-gloss finish.
- .2 Confirm type of shop primer used with structural steel supplier.
- .3 Confirm compatibility of all coatings with manufacturers.
- .4 Touch up prime coat where damaged, with compatible primer, type MPI#107.
- .5 2 coats interior latex, MPI #147

.9 Galvanized Metal:

- .1 Includes all hollow metal doors, frames and screens and pipe rails.
- .2 INT 5.3N Institutional Low Odour/ Low VOC, semi-gloss finish
- .3 1 coat galvanized Primer MPI #134
- .4 2 coats Acrylic Semi-Gloss MPI #147

.10 Insulation on Pipes & Ducts:

- .1 INT 6.8F Institutional Low Odour/ Low VOC, semi-gloss finish
- .2 1 coat Primer MPI #17
- .3 2 coats Acrylic Semi-Gloss MPI #147

.11 Mechanical Equipment:

- .1 Institutional Low Odour/ Low VOC, semi-gloss finish
- .2 As specified for metal types.

.12 Piping, Conduit & Ductwork (uncoated):

- .1 INT 5.3N Institutional Low Odour/ Low VOC, semi-gloss finish
- .2 1 coat galvanized Primer MPI #134
- .3 2 coats Acrylic Semi-Gloss MPI #147

.13 Surfaces behind grilles, within 30mm of grille:

- .1 INT 5.3N Institutional Low Odour/ Low VOC, flat finish
- .2 1 coat galvanized Primer MPI #134
- .3 2 Coats Acrylic Flat, Black; MPI #143

.14 Concrete Floors:

- .1 1 Coat Water-Borne Epoxy (diluted 10-20% with water) MPI #115
- .2 2 Coats Water-Borne Epoxy MPI #115
- .3 VOC emissions of coating not to exceed 200 g/l.

.15 Zinc-Coated Metal:

- .1 INT 5.3M with Epoxy-Modified Latex (over water based galvanized primer), Semi-gloss Finish.
- .2 Acceptable Paint: Sherwin-Williams, Pro Industrial Zero VOC Waterborne Catalyzed Epoxy, or Equivalent.

.16 Exposed Steel Floor and Roof Deck and Steel Floor and Roof Structure:

- .1 INT 5.1CC, Waterborne Dry Fall (over galvanized steel or quick dry shop primer, Flat Finish.

.17 High Temperature Pipe and Fittings: INT 5.2A Heat Resistant Enamel, Semi-gloss Finish.

.18 NOTE: Use heat resistant paint where required.

.2 Exterior Work:
- .1 To MPI Manual Chapter 2.
- .2 Painted Wood: EXT 6.3L Latex (over latex primer), Semi-Gloss Finish.
- .3 Stained Wood: EXT 6.3N Satin, Semi-transparent, Water Based.
- .4 Soffit Sheathing: EXT 9.1A Latex, Flat Finish.
- .5 Ferrous Metal: EXT 5.1F Epoxy (over epoxy primer and high build epoxy) Finish.
- .6 Zinc-Coated Metal: EXT 5.3C Epoxy (over epoxy primer) Finish.

.3 Paint systems are to be of premium grade.

.4 Use low odour, zero VOC products.

PART 3 - EXECUTION

3.1 PREPARATION OF SURFACES

.1 Prepare surfaces in accordance with the following standards and to MPI Architectural Specification Manual Chapters 2 and 3; the most stringent requirements shall apply. Preparation of surfaces must be reviewed with painting inspector. Prepared surfaces must be inspected before application of prime coat.

.1 Prepare wood surfaces to CGSB 85-GP-lM. Use CAN/CGSB 1.126 vinyl sealer over knots and resinous areas. Use CGSB 1-GP -103M wood paste filler for nail holes. Tint filler to match.

.2 Touch up damaged spots of shop paint primer on steel with CAN/CGSB 1.40M to CGSB 85-GP-14M.

.3 Prepare galvanized steel and zinc coated surfaces to CGSB 85-GP-16M. This includes wiped coated steel surfaces.

.4 Prepare masonry and concrete surfaces to CGSB 85-GP-31M.

.5 Prepare wallboard surfaces to CGSB 85-GP-33M. Fill minor cracks with plaster patching compound for stained woodwork.

.6 Prepare concrete floors to CGSB 85-GP-32M.

.7 Prepare copper piping and accessories to CGSB 85-GP-20M.

.8 Apply prime coat on wood scheduled for paint finish before installation.

.9 Back prime wood scheduled for transparent finish. Do not prime surfaces scheduled for transparent finish.

.10 Remove all surface contamination such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mould, mildew, mortar, efflorescence, and sealers from existing surfaces to assure sound bonding to tightly adhering old paint.

.11 Scape peeling paint off existing masonry surfaces and apply a compatible masonry sealer, approved for use by the paint manufacturer, before applying new coatings.

.12 Glossy surfaces must be clean and dull before repainting. Wash with abrasive cleanser, or, wash thoroughly and dull by sanding.

.13 Spot prime any existing bare areas with an appropriate primer.

.14 Check for compatibility between existing and new coatings by applying a test patch of the recommended coating system, covering at least 2 to 3 square feet. Allow surface to dry one week before testing adhesion per ASTM D3359. If the coating system is incompatible, complete removal is required.

.15 NOTE: ABOVE NOTED SURFACES MAY NOT ALL BE APPLICABLE TO THIS PROJECT.

3.2 APPLICATION

.1 Apply coatings in accordance with manufacturer's printed instructions.

.2 Use suitable, clean equipment in good condition.

.3 Maintain dust-free suitable conditions on the surfaces free from machine, tool or sandpaper marks, insects, grease, or any other condition liable to impair finished work to prevent production or good results.

.4 At all hollow metal doors and frames, prime coat must be inspected and signed off by painting inspector before painting work may proceed.

.5 Apply evenly, uniform in sheen, colour and texture, free from brush or roller marks, well brushed or rolled in and free of crawls, runs, join marks or other defects.

.6 Permit paint to dry between coats. Touch up uneven spots after applying first coat. Tint various coats of multiple coat work in light shades of the final colour selected, to distinguish between coats.

.7 Give Consultant and Inspector due notice and sufficient opportunity (minimum 48 hours) to inspect each coat. Do not proceed with subsequent coat until preceding coat approved. Consultant reserves the right to order complete retreatment if this condition is not observed.

.8 Painting coats are intended to cover surfaces perfectly; if in painter's opinion, formula specified is inadequate to provide a first class finished surface, report to the Consultant

and have formulas rectified before commencing work. Surfaces imperfectly covered shall receive additional coats at no additional cost. Provide additional coat where ever dark colours are used.

.9 Use paint unadulterated. Use same brand of paint for primer, intermediate and finish coats. Factory mix all paints.

.10 Paint finish shall be applied by roller except in the case of wood trim, door frames, base board and similar work of small surface area which shall be painted by brush. Do not use roller for applying finish other than paint.

.11 Spray painting will not be permitted unless specifically approved in writing by the Consultant in each instance. Consultant may withdraw approval at any time and prohibit spray painting for reasons such as carelessness, poor masking or protection measures, drifting paint fog, disturbance to other Trades, or failure to obtain a dense, even, opaque finish. Spray painting shall be full double coat, i.e. at least two passes for each coat. Do not use spray or roller on wood or metal surfaces, brush only unless approved in writing by Consultant.

.12 Paint entire surfaces, including areas where millwork or other items are to be installed.

.13 Finish edges of doors with paint or stain treatment as required to match face of door. Seal hidden edges of wood doors with one coat of shellac and one coat gloss varnish or two coats paint. Repaint tops and edges of wood doors after fitting.

.14 Even up stained woodwork in colour as required by nature of wood and as directed by Consultant. Apply same finish on trim, fitments cupboards and other protecting ledges as on surrounding work, disregard sight lines.

.15 Carefully hand smooth and sandpaper wood between coats (including priming). Apply one coat sealer before applying first coat paint filler to knots or sap blemishes on wood surfaces to receive paint or stain finish.

.16 After first coat, fill nail holes, splits and scratches, using putty coloured to match finish.

.17 Remove rust, oil, grease and loose shop paint from metal work by brushing or with wire brushes and make good shop coat before proceeding with final finish. Feather out edges to make touch up patches inconspicuous.

.18 Clean castings with wire brush before application of first paint coat.

.19 Do not etch galvanized metal. Use zinc rich primer. This includes metal door frames and the like with wiped zinc coating.

.20 Note that primer is required on all hollow metal doors, frames and screens. Three coat system is required. Sand between all coats.

.21 Remove form oil or parting compounds from concrete surfaces. Use Xylol or approved compound.

.22 Paint interior of pipe spaces, ducts, etc. visible through grilles or through linear metal ceilings in black matt finish.

.23 Conform with Consultant's colour schedule and exactly match approved samples.

.24 Mechanical and Electrical Pipes, Ducts and Conduits:

.1 Commence Work when piping installation is complete in the area concerned.
.2 Do not paint plated or other prefinished surfaces, unless otherwise noted.
.3 Paint conduit in same colour as background paint.
.4 Apply formulae specified even though surface prime painted at shop prior to delivery. Touch up shop priming where damaged.
.5 Use heat resistant epoxy paint on pipes and surfaces where operating surface temperature exceeds 65 degrees C.
.6 Paint exposed pipes and ducts and their supports and related items in colours to suit colour coding included below; confirm with Consultant. Refer to Mechanical Division 20 for further instructions.

3.3 COLOUR CODING OF PIPING

.1 The following is a preliminary list of painting requirements for piping. All colours are to be confirmed by the Owner prior to commencing this work.

FUNCTION	COLOUR	WHERE EXPOSED	WHERE CONCEALED	DIRECTION INDICATION
Natural Gas	Yellow	Solid	Solid	-
Stand Pipe System	Red	Solid	Solid	-
Heating Water Supply	Dark Green	Solid	12" Band Every 20'	At minimum of every 20', Direction Arrow 9" Long, 1" wide
Heating Water Return	Pale Green	Solid	12” Band Every 20'	
Chilled Water Supply	Orange	Solid	Solid	
Chilled Water Return	Orange	Solid	Solid	
Cooling Water To Tower	Buff	Solid	Solid	
Cooling Water From Tower	Buff	Solid	Solid	
Domestic Hot Water	Dark Blue	Solid	Band Every 20'	At minimum of

Domestic Cold Water	Pale Blue	Solid	Band Every 20'	every 20', Direction Arrow 9" Long, 1" wide

3.4 REPAIRS

.1 Cracks occurring in walls or ceilings requiring patching during "Warranty Period" shall be repainted in such a way that the patch is not visible at a distance of 1m.

.2 If patch painting is not acceptable, repaint entire wall, or ceiling.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 White Markerboards/Writing Boards
.2 Tackboards
.3 Trim and Accessories

1.2 RELATED WORK SPECIFIED ELSEWHERE

.1 Rough Carpentry Section 06 10 00
.1 For blocking and grounds.

1.3 SUBMITTALS

.1 Submit Shop Drawings in accordance with Section 01 33 23. Indicate field dimensions on shop drawings.

.2 Shop drawings to show sizes, types, layouts, and installation details.

.3 Submit samples of visual display boards as requested by the Consultant.

.4 Include copies of trade literature, outlining the care and maintenance of the installation, in Maintenance Manual.

1.4 STORAGE

.1 Deliver units fully assembled to the maximum extent practical.

.2 Store all materials within the building in clean, dry area, and in accordance with manufacturer's recommendations.

.3 Store material in manner which will not damage, mark or cause other defects detrimental to the finished appearance. Provide such protection as necessary to guard against damage and marring from this and other trades. Maintain such protection until ordered removed by the Consultant.

1.5 WARRANTY

.1 Extend the Warranty period stipulated in the General Conditions of the Contract to two (2) years.

.2 Writing boards shall carry a 25-year warranty against defects appearing under regular classroom usage and wear. All Warranties to be given in writing.

PART 2 – PRODUCTS

2.1 MATERIALS AND ACCEPTABLE MANUFACTURERS

.1 Materials listed herein are as manufactured by:
- .1 For Markerboards (WB, WB1):
  - .1 ASI Visual Display Products.
  - .2 Equivalent products as supplied by Global School Products Inc. and Martack Specialties Ltd. are acceptable.
- .2 For Tackboards (TB, TB1, TB2):
  - .1 ASI Visual Display Products.
  - .2 ASP Architectural School Products.

.2 Markerboards (WB, WB1):
- .1 22 gauge white porcelain enamel writing board on steel for markers and magnetic for display.
- .2 12mm thickness composed of magnetic porcelain enamel surface fused under high heat to a high quality enameling steel surface face sheet with 11mm impregnated tentest core with balancing zinc coated steel back-up sheet.
- .3 Porcelain Enamel: To Porcelain Enamel Institute Standards PEI S104 with regards to durability, smoothness of texture, colour continuity. Gloss factor of 6-8 as measured by 45 degree glossometer:
  1. Surface finish for dry erasable markers and suitable for use as a projection screen: white colour.
- .4 The full perimeter of markerboards is to be framed with standard aluminum perimeter trim and provide for extruded marker tray at the full length of markerboards.

.3 Tackboards (TB, TB1, TB2):
- .1 Materials:
  - .1 Laminating Adhesive: to manufacturer's standards.
  - .2 Mounting Adhesive: to manufacturer’s standard.
  - .3 Joint Reinforcement: concealed mechanical jointing system to provide straight, rigid, continuously supported, tight butt, flush joints at surface.
  - .4 Anchor Clips, Brackets and Fasteners: concealed type for fixed mounting.
- .2 Facing - Natural cork tackboards (TB): single layer natural cork, fine grain large granular sheet, 6 mm thick, natural colour, laminated to backing as specified below.
- .3 Classified as to surface burning characteristics in accordance with CAN/ULC-S102, flame spread 55, smoke developed 55-70, fuel contributed 20.
- .4 Backing: Particleboard: to CAN3-O188.1, Grade R, 6mm thick.

.4 Supply and install magnetic white markerboards (WB or WB1) and tackboards (TB or TB1 and TB2z). Markerboards and tackboards are to be of sizes indicated on drawings.

.5 All exposed aluminum to have clear anodized satin finish, AA-A41, in accordance with AAMA-611, clear satin anodic finish,

.6 Standard Aluminum Trim and accessories for each markerboard (WB) and tackboard (TB) to be Series 200, as follows:
- .1 Perimeter Trim to WB and TB: No.205.

Extruded Marker tray for WB: No.212, complete with end pieces.

.7 Joints to be absolutely flush and level, plumb and true with edges finished square and fitted as closely as possible. Use concealed joint fasteners. Internal butt joints are to be provided at tackboards.

.8 Mounting heights of markerboards and tackboards shall be as directed by Consultant, or as indicated on drawings.

PART 3 – EXECUTION

3.1 INSTALLATION

.1 Supply all labour, materials, anchors, fasteners necessary to complete the installation of chalkboards, whiteboards, and tackboards throughout the project. All installations to be done by tradesmen experienced in this type of work.

.2 Erect all units plumb, level and accurately in locations shown on the Drawings or as directed by Consultant. Securely and permanently fix to the wall surfaces with concealed fasteners.

.3 Include for extended aluminum jambs, trim, track and marker trays and accommodate all other special conditions as required.

.4 Accurately cut, machine and fit to form tight flush hairline connections all joints in trim and rails. Corners of trim to be square and true and mitre cut. Cap ends of rails with cast aluminum end fittings.

.5 Joints to be tight hairline flush butt joints properly aligned.

.6 Adjust all operation hardware for smooth, trouble free operation.

.7 Do not install finished materials until overhead work such as acoustic ceiling, electrical, mechanical and painting have been completed.

3.2 CLEANING

.1 Leave trim and board surfaces clean and free of stains or marks.

.2 Completely cover all markerboards with "Pliofilm" immediately after installation. Remove cover at time of occupancy.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Washroom Accessories and Equipment:
- .1 Coat Hook
- .2 Shelf
- .3 Straight Grab Bar
- .4 L-Shaped Grab Bar
- .5 Fold-down Grab Bar
- .6 Fixed Frame Mirror
- .7 Paper Towel Dispenser
- .8 Toilet Tissue Dispenser
- .9 Sanitary Napkin Disposal Bin
- .10 Sanitary Napkin Dispenser
- .11 Soap Dispenser
- .12 Emergency Sign

1.2 RELATED SECTIONS

.1 Section 09 30 13 - Tiling, coordination with layout and installation.

1.3 SUBMITTALS AND SHOP DRAWINGS

.1 Product Data: Submit manufacturer's data sheets for each product specified, including the following:
- .1 Installation instructions and recommendations.
- .2 Storage and handling requirements and recommendations.
- .3 Cleaning and maintenance instructions.
- .4 Replacement parts information.

.2 Schedule: Submit a washroom accessory schedule, indicating the type and quantity to be installed in each washroom area. Use room numbers as indicated on the Drawings.

.3 Country of Origin: Manufacturer must supply, with first submittal, Country of Origin information for each type of washroom accessory for this project.

.5 Emergency Signs:
- .1 Submit drawn-to-scale details for individually fabricated lettering indicating word and letter spacing.
- .2 Submit drawn-to-scale details for individually fabricated lettering indicating word and letter interchangeable components, mounting methods, schedule of signs.
- .3 Submit representative sample of each type of sign, sign image and mounting method.
- .4 Submit colour samples of sign lettering and banding, and each type of acrylic panel specified for review by the Consultant.

1.4 QUALITY ASSURANCE

.1 Manufacturer: Provide products manufactured by a company with a minimum of 10 years successful experience manufacturing similar products.

.2 Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.

.3 Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.

.4 Hazardous Materials: Comply with EU Directive “Restrictions of Hazardous Substances (RoHS) requirements.”

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

1.6 WARRANTY

.1 Manufacturer’s Warranty for Washroom Accessories:
- .1 Two (2) year warranty for materials and workmanship.
- .2 Emergency Sign: Provide a warranty for the work of this section for a period of two (2) years. Warranty shall cover against defects and deficiencies in materials, workmanship, and installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

.1 Specified manufacturer's catalogue references establish minimum acceptable standards for Work of this Section. Products shall be as manufactured by Frost Products Ltd., unless noted otherwise.

.2 Basis of Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Frost Products Ltd.

.3 Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the Contractor's submission of adequate documentation of the substitution in accordance with procedures in Division 01 of the Project Manual.

2.2 ACCESSORIES

.1 **Coat Hook:**
- .1 Locate one (1) in the Barrier-Free Washroom and one (1) in the Staff Washroom.
- .2 Vandal Resistant Safety Coat Hook of stainless steel with maximum 50mm projection, with snap down safety hook.
- .3 Spring loaded and supports up to 11kg (25lbs) before collapsing.
- .4 16 gauge stainless steel with smooth burr-free edges.
- .5 Capacity: Designed to hold 11kg or 25lbs before the hook will collapse.
- .6 Materials:
  - .1 Body: 16 gauge stainless steel, type 304 brushed finish.
  - .2 Hook: 16 gauge stainless steel, type 304 brushed finish.
- .7 Acceptable Product: Frost, Model No. 1150-SS.

.2 **Shelf (barrier-free):**
- .1 Locate one (1) in the Universal Washroom.
- .2 Stainless steel, 22 gauge, no. 4 brushed finish shelf welded to stainless steel wall plate.
- .3 Supplied with mounting screws. All mounting screw holes below shelf.
- .3 Acceptable Product: Frost F-950-4, Stainless Steel, 4” depth by 18” wide.

.3 **Grab Bars (in Barrier-free Washroom):**
- .1 Grab bars to be stainless steel bars, 32mm diameter with heavy duty concealed mounting. Provide peened satin finish, non-slip grip. 80mm diameter wall flange with covers, concealed screw attachment, flanges welded to tubular bar.
- .2 Compliance: Universal/accessibility design, including ADA-ABA and ICC/ANSI. for structural strength.
  - .1 Capacity: Designed to support 900 lbs (408 kg) in compliant installations.
- .3 Grab bar with 90 degree return to flange. Clearance between grab bar and finished wall is 1-1/2 inches (38mm).
- .4 Grab Bar Materials: 18-8, Type 304, 18 gauge (1.2mm) stainless steel tubing with satin finish, ends of grab bar pass through flanges and are heliarc welded to flanges to form one structural unit, outside diameter 1-1/4 inches (32mm).
- .5 Mounting Flanges: Concealed, 18-8, Type 304, 1/8 inch (3mm) thick, stainless steel plate.
  - .1 End Flanges: 2 inches x 3-1/8 inches (50mm x 80mm) with two holes for attachment to wall.
  - .2 Intermediate Flanges: 2-5/8 inches x 3-1/8 inches (65mm x 80mm) wide x 3-1/8 inch (80mm) diameter.
- .6 Snap Flange Covers: 18-8, Type 304, 22 gauge (0.8mm) drawn stainless steel with satin finish, 3-1/4 inch (85mm) diameter x 5/8 inches (16mm) deep; snap over mounting flange to conceal mounting screws.
- .7 Mounting Accessories: Provide the following optional mounting accessories as required for complete installation.
  - .1 Mounting Kits: Provide optional Bobrick Part No. 252-30 Mounting Kit; 3 Type 304 stainless steel, Phillips round-head, sheet-metal screws for each flange.
  - .2 Grab Bar Fasteners: Provide optional Bobrick Part No. 251-4 WingIt Grab Bar Fastener; round-head, Phillips 18/8 stainless steel screws and grab bar fastener for each flange.

.3 Anchor Devices: Provide optional Bobrick Part No. 2586 Optional Mounting Kit; for 1/2 inch (13mm) panels for each flange.

.8 Grab Bars:

.1 Straight Grab Bar: 610mm long.

.1 Acceptable Product: Frost F-1001NP-24.

.2 L-Shaped Grab Bar: 750mm horizontal and 750mm vertical.

.1 Acceptable Products: Frost F-1003NP-30 x 30, left side. Confirm orientation on architectural drawings.

.3 Fold-down Grab Bar with Toilet Tissue Dispenser Holder:

.1 Acceptable Product: Frost F-1055-FTS; fold-down grab bar with safety rail and bracket, all in stainless steel finish. Provide removable toilet paper dispenser in white power coat finish

.4 **Fixed Frame Mirror:**

.1 Materials: Type 430 stainless steel; bright polished finish with vertical grain finish on exposed surfaces.

.2 Stainless steel channel frame; one piece, 50mm by 50mm, 90 mitred corners, concealed fasteners and locking screws.

.3 Corners: Welded, ground, and polished smooth.

.5 Mirror:

.1 6mm thick float glass.

.2 Select float glass mirror guaranteed for 15 years against silver spoilage.

.3 Edges: Protected by plastic filler strips.

.4 Back: Protected by full-size, shock-absorbing, water-resistant, nonabrasive, 1/8 inch (3mm) thick polystyrene padding.

.6 Back and Inner Stiffener Frame: Galvanized steel, one-piece welded construction with slots for mounting screws and integral screw-head lock.

.7 Concealed wall hanger with theft resistant mounting.

.8 Acceptable Product: Frost F- 941-1836.

.5 **Single-Roll Toilet Tissue Dispenser:**

.1 Provided with fold-down grab bar.

.2 Wall mounted dispenser to be supplied by Owner and installed by Contractor.

.6 **Sanitary Napkin Disposal Bin:**

.1 Supplied by Owner and installed by Contractor.

.7 **Soap Dispenser:**

.1 Supplied by Owner and installed by Contractor.

.8 **Paper Towel Dispenser:**

.1 Supplied by Owner and installed by Contractor.

.9 **Wall mounted Toilet Back Rest (BR):**

.1 Acceptable Product: Frost F-1028, stainless steel finish and concealed mounting.

2.3 OTHER WASHROOM EQUIPMENT

.1 **Emergency Signs:**

- .1 Sign posted above the emergency button of the call system in the universal washroom and in the main corridor:
- .2 Materials:
  - .1 Acrylic Sheet: 6mm thick, polymethylmethacrylate (PMMA) cast sheet suitable for intended use in sign fabrication, transparent clear. Acrylic shall be UV resistant and meet or exceed Code requirements for flammability and flame spread. Provide slightly beveled and polished edges.
  - .2 Applied Vinyl: 0.05mm pressure-sensitive film designed for permanent graphics. Vinyl letters applied to back of acrylic sheet. White vinyl sheet to be applied to full back of acrylic.
  - .3 Mounting Hardware: Double-sided tape: 3M VHB 5952 acrylic foam tape.
- .3 Sign Text in Washroom: Sign to read: “IN THE EVENT OF AN EMERGENCY PUSH EMERGENCY BUTTON OR HORIZONTAL PANIC STRIP AND AUDIBLE AND VISUAL SIGNAL WILL ACTIVATE”.
- .4 Sign Text in main Corridor: Sign to read: “THE FLASHING LIGHT INDICATES THAT THERE IS AN EMERGENCY WITHIN THE NEW UNIVERSAL WASHROOM. CONTACT 911 IMMEDIATELY.”.
- .5 Sign Letters: Letters to be minimum 25mm high with a 5mm stroke. Colour to be selected by the Consultant.
- .6 Sign Size: Minimum size of 380mm wide by 300mm high.

PART 3 – EXECUTION

3.1 INSTALLATION

.1 Install products in strict compliance with manufacturer’s written instructions and recommendations, including the following:

- .1 Verify blocking has been installed properly.
- .2 Verify location does not interfere with door swings or use of fixtures.
- .3 Comply with manufacturer’s recommendations for backing and proper support.
- .4 Use fasteners and anchors suitable for substrate and project conditions.
- .5 Install units rigid, straight, plumb, and level, in accordance with manufacturer’s installation instructions and approved shop drawings.
- .6 Conceal evidence of drilling, cutting, and fitting to room finish.
- .7 Test for proper operation.

3.2 CLEANING AND PROTECTION

.1 Clean exposed surfaces of compartments, hardware, and fittings using methods acceptable to the manufacturer.

.2 Touch-up, repair or replace damaged products until Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Coat Rack Shelf and Mounting Brackets and associated Hooks.

1.2 RELATED SECTIONS

.1 Division 01 - General Requirements.

1.3 SUBMITTALS AND SHOP DRAWINGS

.1 Submit in accordance with Section 01 33 00 - Submittals.
.2 Shop Drawings:
  .1 Submit Shop Drawings or Product data sheets.
  .2 Indicate materials, thicknesses, sizes and dimensions, finishes, colours, construction details, and mounting methods.
.3 Samples:
  .1 Submit colour samples for selection by the Consultant.

PART 2 - PRODUCTS

2.1 MATERIALS AND ACCEPTABLE MANUFACTURERS/SUPPLIERS

.1 Coat Rack Shelf and Mounting Brackets and associated Hooks:
  .1 Acceptable Manufacturer: ASI.
  .2 Model No : STL 1001.
  .3 SHELF: to consist of four 3/4" (19mm) OD square 18 gauge steel tubes closed and protected with form fitting black plastic end caps.
  .4 BRACKETS: two-piece heavy duty die cast designed with an integral backplate that provides a positive grip fastening. All screw fastenings shall color match bracket finish.
  .5 DOVETAIL: mounting shall be heavy duty extruded aluminum engineered for a slide fitting vertical adjustment of one full shelf and a length of 13" (330mm). Spacing as per manufacturer's standard but not to exceed 40" (1016mm).
  .6 FINISH: for shelf tubes, brackets, and dovetails is a high performance electrostatically applied powder coating, baked on to provide a uniform, smooth protective finish. Color as selected by architect from manufacturer's standard color range (STL-Black or STL-Gray).
  .7 COAT HOOKS: manufacturer's standard double prong molded ABS high-impact plastic formed to be non-turning, positive gripping and laterally adjustable. Architect to select from manufacturer's standard color range - Black, Red, and Yellow. Hooks to be arranged on 2nd and 4th tubes with spacing to be 6" (152mm) on center.
  .8 Equivalent products may be reviewed during the bidding period for compliance and acceptance.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Provide manufacturer's installation procedures and coordinate with the Contractor the placement of blocking and anchorage devices as may be required, concealed within all partitions.
.2 Install components of this section to meet manufacturer's recommendations.
.3 Locations and mounting heights, and arrangement and spacing shall be as indicated on the drawings. Where not indicated on the drawings, confirm location and height with the Consultant and Owner prior to installation.
.4 Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
.1 Verify blocking has been installed properly.
.2 Verify location does not interfere with door swings or use of fixtures.
.3 Comply with manufacturer's recommendations for backing and proper support.
.4 Use fasteners and anchors suitable for substrate and project conditions.
.5 Install units rigid, straight, plumb, and level, in accordance with manufacturer's installation instructions and approved shop drawings.
.6 Conceal evidence of drilling, cutting, and fitting to room finish.
.7 Test for proper operation.

3.2 ADJUSTING AND CLEANING

.1 Refinish damaged surfaces so that completed installation presents a consistent appearance with no visible defects.
.2 Clean and polish all exposed surfaces. Exercise care to avoid damage to coatings.
.3 Remove debris and packaging materials.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Removable Wall and Floor Padding to be installed on walls and floor of the Sensory Room as described on the architectural drawings.

1.2 RELATED SECTIONS

.1 General Requirements. Division 01

1.3 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Shop Drawings:

.1 Submit Shop Drawings in accordance with Section 01 33 00 – Submittal Procedures and Section 01 33 23 – Shop Drawings, Product Data and Samples.

.2 Indicate locations, quantity by size and description of components, base material, surface finish and colour, and mounting details.

.3 Samples: Submit duplicate samples of metal finishes.

1.4 WARRANTY

.1 Provide a 2 year manufacturer's warranty.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/SUPPLIERS

.1 Acceptable Manufacturer:

.1 Apple Athletic Products;

.1 Contact information: 256 Huges Road Orillia, Ontario L3V 2M4, Telephone: 705 325 6455, Email: info@appleathletic.com

2.2 REMOVABLE WALL AND FLOOR PADDING

.1 Material: Coated vinyl with 100% woven polyester scrim (1000x1300 denier)

.2 Test shall be performed in accordance with ASTM D-3574.

.3 Size: 1220mm by 1800mm by 50mm thick, and provide custom sizes as required to suit extent of existing walls, floor and door to ensure full coverage of all surfaces.

.4 Quantity: Refer to Drawings; for installation at walls, floor and door.

.5 Colour: Blue.

.6 Acceptable Product: Apple Athletic Products, Removable Non-fold Wall and Floor Padding, Polyurethane.

.7 Provide for continuous wall mounted 50mm high Velcro strip to secure the removable padding to walls, floor and door. Refer to the drawings for the extent of padding and Velcro strips required.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Ensure that surfaces are satisfactory and adequate for securing items of this section.

3.2 INSTALLATION

.1 Provide information, templates for installation of gymnasium equipment.

.2 Coordinate work with trades that may be required for the proper installation and functioning of gymnasium equipment.

.3 Assemble equipment and install in accordance with Shop Drawings and manufacturer's recommended specifications. Installed equipment shall be straight, plumb, level, tightly fitted, and well secured to prevent distortion and displacement.

3.3 ADJUSTMENT AND CLEANING

.1 Ensure padding functions properly and make adjustments as required.

.2 Clean and polish all exposed surfaces. Exercise care to avoid damage to coatings.

.3 Remove debris and packaging materials.

3.4 DEMONSTRATION

.1 Demonstrate to the Owner the operation and maintenance requirements for the equipment of this section under the provisions of Section 01 78 00 – Closeout Submittals.

END OF SECTION

1 General

1.01 REFERENCES

.1 Division 00 and Division 01 apply to and are a part of each Mechanical Division:

.1 Division 21 – Fire Suppression;

.2 Division 22 – Plumbing;

.3 Division 23 – Heating, Ventilating, and Air Conditioning;

.4 Division 25 - Integrated Automation.

1.02 APPLICATION

.1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Mechanical Divisions. It is intended as a supplement to each Section and is to be read accordingly.

1.03 SUBMITTALS

.1 Submit shop drawings/product data sheets for:

.1 pressure gauges and thermometers;

.2 electric motors (submit with equipment they are associated with).

.2 Submit weight loads for selected equipment (upon request).

.3 Submit copy of architectural reflected ceiling plan drawings and elevation drawings to indicate proposed access door locations.

.4 Submit a list of equipment identification nameplates indicating proposed wording and sizes.

.5 Submit a list of pipe and duct identification colour coding and wording.

.6 Submit a proposed valve tag chart and a list of proposed valve tag numbering and identification wording.

.7 Submit drawings indicating size and location of required sleeves, recesses and formed openings in poured or precast concrete work.

.8 As specified in Part 2 of this Section, submit a spare belt set, tagged and identified, for each belt driven piece of equipment.

.9 Submit any other submittals specified in this Section or other Sections of Mechanical Divisions.

2 Products

2.01 PIPE SLEEVES

.1 Galvanized Sheet Steel – Minimum #16 gauge galvanized steel with an integral flange at one end to secure sleeve to formwork construction.

.2 Polyethylene – Factory fabricated, flanged, high density polyethylene sleeves with reinforced nail bosses.

.3 Waterproof Galvanized Steel Pipe – Schedule 40 mild galvanized steel pipe with a welded-on square steel anchor and water stop plate at sleeve midpoint.

.4 Galvanized Steel or Cast Iron Pipe – Schedule 40 mild galvanized steel, or Class 4000 cast iron.

2.02 FIRESTOPPING AND SMOKE SEAL MATERIALS

.1 Firestopping and smoke seal system materials for mechanical penetrations through fire rated construction are specified in Section 20 05 17 - Sleeves and Sleeve Seals for Mechanical Piping and work is to be done as part of mechanical work unless otherwise specified in Division 07.

2.03 WATERPROOFING SEAL MATERIALS

.1 Modular, mechanical seal assemblies consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and pipe sleeve or wall opening, assembled with stainless steel bolts and pressure plates and designed so when bolts are tightened the links expand to seal the opening watertight. Select seal assemblies to suit pipe size and sleeve size or wall opening size.

.2 Acceptable products are:

.1 Thunderline Corp. (Power Plant Supply Co.) "LINK SEAL" Model S-316;

.2 The Metraflex Co. "MetraSeal" type ES.

2.04 PIPE ESCUTCHEON PLATES

.1 One-piece chrome plated brass or #4 finish type 302 stainless steel plates with matching screws for attachment to building surface, each plate sized to completely cover pipe sleeve or building surface opening, and to fit tightly around pipe or pipe insulation.

2.05 PIPING HANGERS AND SUPPORTS

.1 Pipe hanger and support materials, including accessories, are to be, unless otherwise specified, in accordance with Manufacturers Standardization Society (MSS) Standard Practice Manual SP-58, Pipe hangers and Supports-Materials, Design and Manufacture, and where possible, MSS designations are indicated with each product specified below. Conform to following requirements:

.1 unless otherwise specified, ferrous hanger and support products are to be electro-galvanized;

.2 hangers and supports for insulated piping are to be sized to fit around insulation and insulation jacket.

.2 Hangers and supports for horizontal suspended piping as follows:

.1 adjustable steel clevis hanger – MSS Type 1;

.2 adjustable swivel ring band hanger – MSS Type 10;

.3 adjustable roller hanger – MSS Types 41, 43, and/or 45, with MSS Type 39 steel protection saddle.

.3 Supports for horizontal pipe on vertical surfaces as follows:

.1 steel offset pipe clamp – Anvil Fig. 103 or Myatt Fig. 170;

.2 heavy-duty steel pipe clip – MSS Type 26;

.3 single steel pipe hook – Myatt Fig. 156;

.4 epoxy coated steel pipe stays are not permitted.

.4 Floor supports for vertical risers as follows:

.1 copper tubing riser clamp – MSS Type 8;

.2 heavy-duty steel riser clamp – MSS Type 8.

.5 Supports for vertical piping on vertical surfaces as follows:

.1 steel offset pipe clamp – Anvil Fig. 103 or Myatt Fig. 170;

.2 heavy-duty steel pipe bracket or soil pipe bracket – MSS Type 26;

.3 extension split pipe clamp – MSS Type 12;

.4 epoxy coated steel pipe stays are not permitted.

.6 Base support for vertical risers in excess of 6 m (20') high extending out from base mounted equipment is to consist of a base elbow support with flange.

.7 For horizontal pipe on racks, Unistrut or equal galvanized steel pipe racks with pipe securing hardware as follows:

.1 standard galvanized steel U-bolts/clamps supplied by rack manufacturer;

.2 adjustable roller chair – MSS Type 44 with MSS Type 39 steel protection saddle.

.8 Special hangers and supports for various applications as follows:

.1 vibration isolated riser supports – black steel riser clamps as specified above, complete with neoprene–steel–neoprene sandwich type vibration isolation pads between clamp and floor;

.2 for groups of pipes having same slope – MSS Type 32 welded steel brackets, Anvil Fig. 46 universal trapeze assemblies, or Unistrut or equal support assemblies, all with U-bolts, clamps, etc., to secure pipes in place;

.3 for sections of piping connected to vibration isolated equipment – hangers and supports as specified above but complete with MSS Type 48 spring cushions;

.4 for plastic piping – generally as specified above but in accordance with pipe manufacturer's recommendations;

.5 for fire protection piping – generally as above but ULC listed and/or FM approved, and in accordance with Chapter requirements of NFPA Standard applicable to piping system;

.6 for bare horizontal copper piping – generally as above but factory vinyl coated to prevent direct copper/steel contact;

.7 for bare copper vertical piping – corrosion resistant ferrous clamps with flexible rubber gasket type material (not tape) to isolate pipe from clamp;

.8 insulation protection shields to and including 40 mm (1-½") dia. – MSS Type 40 galvanized steel shields with ribs to keep shield centred on hanger.

.9 Hanger rods are to be electro-galvanized carbon steel (unless otherwise specified), round, threaded, to ASTM A36, complete with captive machine nuts with washers at hangers, sized to suit loading in accordance with Table 3 in MSS SP-58, but in any case minimum 9.5 mm (3/8") diameter.

.10 Acceptable manufacturers are:

.1 E. Myatt & Co. Inc.;

.2 Anvil International Inc.;

.3 Empire Industries Inc.;

.4 Hunt Manufacturing Ltd.;

.5 Unistrut Canada Ltd.;

.6 Nibco Inc. "Tolco";

.7 Taylor Pipe Supports.

2.06 ACCESS DOORS

.1 Provide all access doors required for Mechanical work unless otherwise specified in Division 08. Coordinate consistency of look and finish of access doors on project with each Division of Work. Coordinate exact requirements with General Trades Contractor.

.2 Access doors to be rust resistant steel door panels, with concealed hinges and positive locking and self-opening screwdriver operated lock. Wall type frame to be suitable for wall installation and have integral keys for plaster walls. Doors in tile wall to be stainless steel and in ceilings to be suitable for plaster covering with only frame joint showing. Other doors to be prime painted steel.

.3 Size access doors to suit the concealed work for which they are supplied, and wherever possible they are to be of standard size for all applications, but in any case they are to be minimum 300 mm x 300 mm (12" x 12") for hand entry and 600 mm x 600 mm (24" x 24") for body entry.

.4 Lay-in type tiles, properly marked, may serve as access panels. Coordinate marking of ceiling tiles with Consultant. Panels in glazed tile walls to be 12 gauge, 304 alloy stainless steel, No. 4 finish, with recessed frame secured with stainless steel counter-sunk flush head screws.

.5 Panels in plaster surfaces to have dish-shaped door and welded metal lath, ready to take plaster. Provide a plastic grommet for door key access.

.6 Other access doors to be welded 12 gauge steel, flush type with concealed hinges, lock and anchor straps, complete with factory prime coat. Submit to Consultant for review, details of non-standard door construction details.

.7 Access doors in fire rated ceilings, walls, partitions, structures, etc., to be ULC listed and labelled and of a rating to maintain fire separation integrity.

.8 Where access doors are located in surfaces where special finishes are required, they are to be of a recessed door type capable of accepting finish in which they are to be installed so as to maintain final building surface appearance throughout.

.9 Acceptable manufacturers include Le Hage, SMS, Pedlar and Acudor.

2.07 PRESSURE GAUGES AND THERMOMETERS

.1 Pressure gauges as follows:

.1 adjustable, glycerine filled, 115 mm (4" or 4-½") diameter and each accurate to within 1% of scale range;

.2 Stainless steel or aluminum case and dial display;

.3 dual scale white dial with a scale range such that working pressure of system is at approximate mid-point of scale;

.4 Provide two (2) year warranty. Contract to extend manufacturer standard warranty where required.

.2 Pressure gauge accessories and additional requirements as follows:

.1 a bronze ball type shut-off valve is to be provided in the piping to each pressure gauge;

.2 each pressure gauge for piping and equipment with normal everyday flow is to be equipped with a brass pressure snubber;

.3 pressure gauges in fire protection piping must be ULC listed and labelled.

.3 Thermometers as follows:

.1 225mm (9”) impact resistant case, universal angle and adjustable, with separable thermowell, red or blue non-mercury fluid;

.2 Provide extensions and pipe fittings where required to suit insulation or to reach fluid flow for accuracy of reading;

.3 Dual scale C/F to suit system temperature;

.4 Provide two (2) year warranty. Contract to extend manufacturer standard warranty where required.

.4 Acceptable manufacturers are:

.1 Winters 9IT/PCT series;

.2 Weiss Instruments;

.3 Trerice;

.4 Ashcroft.

2.08 EQUIPMENT BELT DRIVES

.1 ANSI/RMA Standard V-belt type rated at minimum 1.5 times motor nameplate rating, and in accordance with following requirements:

.1 belts are to be reinforced cord and rubber, and multiple belts are to be matched sets;

.2 sheaves are to be cast iron or steel, secured to shafts with removable keys unless otherwise specified, standard adjustable pitch (± 10% range) for motors under 10 HP, fixed pitch type with split tapered bushing and keyway for motors 10 HP and larger, and, if required, replaced as part of mechanical work to suit system air/water quantity testing and balancing work;

.3 motor slide rail adjustment plates are to allow for centre line adjustment.

.2 Supply a spare belt set (tagged and identified) for each belt drive and hand to Owner upon Substantial Performance of the Work.

2.09 EQUIPMENT DRIVE GUARDS AND ACCESSORIES

.1 For V-belt drives – removable, 4-sided, fully enclosed, galvanized sheet steel guards to OHSA standards, cleaned, factory primed and painted with yellow equipment enamel, complete with a 2-piece full length hinged front panel to permit belt maintenance or replacement without removing guard, and 40 mm (1-½") diameter tachometer openings at each shaft location.

.2 For flexible couplings – removable "U" shaped galvanized steel guards to OHSA Standards with a 2.3 mm (3/32") thick frame and expanded mesh face.

.3 For unprotected fan inlets and outlets – unless otherwise specified, removable 20 mm (¾") galvanized steel wire mesh with galvanized steel frames, all to OHSA Standards.

2.10 ELECTRIC MOTORS

.1 Unless otherwise specified, motors are to conform to NEMA Standard MG1, applicable IEEE Standards, and applicable CSA C22.2 Standards, and are to meet NEMA standards for maximum sound level ratings under full load. Confirm motor voltages prior to ordering.

.2 Vertically mounted and submersible motors are to be purposely designed for mounting in this attitude.

.3 Efficiency of 1-phase motors to 1 HP is to be in accordance with CAN/CSA C747. Efficiency of 3-phase motors 1 HP and larger is to be in accordance with CAN/CSA C390 or IEEE 112B.

.4 Unless otherwise specified, 1-phase motors smaller than ½ HP are to be 115 volt, continuous duty capacitor start type with an NEMA 48 or 56 frame size, solid base, heavy-gauge steel shell with solid die-cast end shields, dynamically balanced die-cast rotor, integral automatic reset thermal overload protection, Class "B" insulation, and a 1.15 service factor at 40°C (105°F) ambient temperature.

.5 Explosion-proof 1-phase motors are to be totally enclosed, fan cooled, 115 volt continuous duty capacitor start type in accordance with CSA C22.2 No. 145, as specified for standard 1-phase motors but suitable for use in Class 1 Group D hazardous locations and complete with a rolled steel shell and a 1.0 service factor at 40°C (105°F) ambient temperature.

.6 Unless otherwise specified, motors ½ HP and larger are to be totally enclosed, fan cooled, 3-phase, T-frame, squirrel cage continuous duty induction motors suitable for voltages indicated on Drawings, NEMA Design "B" for normal starting torque or Design "C" for high starting torque as required by the application, each complete with Class "B" insulation, a 1.15 service factor at 40°C ambient temperature, grease lubricated open ball bearings with grease fittings to permit re-lubrication without dismantling motor, a cast iron frame with cast iron feet where required, cast iron end bracket and precision machined bearing fit, and balanced carbon steel shaft assembly with die-cast aluminum rotor windings.

.7 Explosion-proof 3-phase motors are to be totally enclosed fan cooled motors in accordance with CSA C22.2 No. 145, generally as specified above for standard 3-phase motors but suitable for use in Class 1 Group D hazardous locations and with a 1.0 service factor at 40°C (105°F) ambient temperature.

.8 Motor(s) for 2-speed cooling tower(s) are to be as specified above but 2-speed single winding type.

.9 Motor(s) for 2-speed fan(s) are to be as above but 2-speed double winding type.

.10 Unless otherwise indicated, motors 30 HP and larger are to be complete with a heat sensing PTC thermistor in the end turn of stator winding for each phase and connected in series inside motor with 2 marked leads brought out to motor conduit box.

.11 Motors for equipment with variable frequency drives are to be generally as specified above but inverter duty type to NEMA Standard MG-1 Part 31, quantified by CSA for operation from a variable frequency drive of type specified, and complete with Class "H" insulation. Motors are to be equipped with AEGIS, or approved equal, shaft grounding ring system to protect bearings from damage by diverting harmful shaft voltages and bearing currents to ground.

.12 Motors 150 HP and larger with "wye-delta" reduced voltage starters are to be complete with six leads for connection to motor starter.

.13 Motors for equipment which is scheduled or specified with a corrosion resistant coating or constructed from corrosion resistant materials are to be factory coated with a primer and epoxy paint finish.

.14 Acceptable manufacturers are:

.1 TECO-Westinghouse Motors (Canada) Inc.;

.2 Canadian General Electric;

.3 Baldor Electric Co.;

.4 U.S. Electrical Motors;

.5 Weg Electric Corp.;

.6 Marathon Electric;

.7 Toshiba Corp.;

.8 Leeson Canada.

2.11 MOTOR STARTERS AND ACCESSORIES

.1 Motor starters must be capable of starting associated motors under the imposed loads. Confirm starter voltage matches motor prior to ordering.

.2 Unless otherwise specified, starters for 1-phase motors are to be 115 volt, thermal overload protected manual starting switches with a neon pilot light, a surface or recessed enclosure to suit the application, and, where automatic operation is required, a separate H-O-A switch in an enclosure to match starter enclosure.

.3 Unless otherwise specified, starters for 3-phase motors less than 50 HP are to be combination "quick-make" and "quick-break" fused disconnects and full voltage non-reversing across-the-line starters, each complete with and overload relay per phase, an enclosure to suit the application, and, a H-O-A switch, pilot lights, control transformer, auxiliary contacts, and other accessories as per motor starter schedule.

.4 Unless otherwise specified, starters for 3-phase motors 50 HP to 150 HP are to be reduced voltage, non-reversing, auto-transformer type starters complete with one overload relay per phase, an enclosure to suit the application, and, a H-O-A switch, pilot lights, control transformer, auxiliary contacts, and other accessories as per motor starter schedule.

.5 Unless otherwise specified, starters for 3-phase motors 150 HP and larger are to be reduced voltage, non-reversing, closed transition "wye-delta" starters complete with one overload relay per phase, an enclosure to suit the application, and, a H-O-A switch, pilot lights, control transformer, auxiliary contacts, and other accessories as per motor starter schedule.

.6 Starters for 2-speed double winding motors are to be generally as specified above but suitable for motor and equipped with a 45 second time delay to permit equipment to coast down to low speed before it is operated at low speed.

.7 Starters for 2-speed single winding motors are to be generally as specified above but suitable for motor and equipped with a 45 second time delay to permit equipment to coast down to low speed before it is operated at low speed.

.8 Starters for reversible motors for cooling towers are to be generally as specified above but suitable for motor and equipped with a 45 second time delay to allow fan(s) to coast down to a stop before being operated in reverse rotation.

.9 Unless otherwise specified, motor starter enclosures are to be in accordance with following NEMA ratings:

.1 enclosures located in sprinklered areas – Type 2;

.2 enclosures exposed to the elements – Type 3R, constructed of stainless steel;

.3 enclosures inside the building in wet areas – Type 3R, constructed of stainless steel;

.4 enclosures in explosion rated area – Type 7 with exact requirements to suit the area and application;

.5 enclosures except as noted above – Type 1;

.6 enclosures located in finished areas – as above but recess type with brushed stainless steel faceplate.

.10 Motor control centres are to be multi-unit, 2.28 m (9') high, NEMA Class 1, type "B", factory assembled, dead front, floor mounted, free-standing motor control centre with tin plated copper bus and an NEMA Type 1 or Type 2 enclosure as for loose starters specified above. Each motor control centre is to be complete with starters as specified above, load and control wiring terminal boards, and required facilities for line and load side power wiring connections.

.11 Disconnect switches for motor control centres are to be heavy-duty, CSA certified, front operated switches as per motor starter schedule, each complete with a handle suitable for padlocking in "off" position and arranged so that door cannot be opened with handle in "on" position and an NEMA enclosure as specified for loose starters. Fusible units are to be complete with fuse clips to suit fuse types specified below.

.12 Fuses are to be, unless otherwise scheduled or specified, English Electric Ltd. HRC fuses, Form I Class "J" for constant running equipment and Form II Class "C" for equipment that cycles on and off.

.13 Acceptable manufacturers are:

.1 Rockwell Automation Inc. - Allen-Bradley;

.2 Eaton Corp. – Cutler-Hammer;

.3 Eaton Corp. – Moeller Electric;

.4 Siemens Canada;

.5 Schneider Electric.

2.12 SPRINKLER PROOFING

.1 Provide drip shields for protection of surface mounted equipment enclosures from water spray and dripping of liquids. Features of shields include:

.1 factory constructed by respective equipment manufacturers;

.2 constructed from non-combustible materials (sheet steel);

.3 enamel painted to match equipment;

.4 surfaces and edges filled/sanded smooth prior to painting;

.5 supported from equipment with structural steel rods/metal framing or other method approved by Consultant;

.6 structural support finish painted to match shield.

.2 Include with equipment shop drawings, detailed dimensions of drip shields and methods of supporting.

.3 Equipment with top cable/conduit entries to include additional sealing of entries with gasketting and/or waterproof sealant to prevent water from entering enclosure.

.4 Design ventilation louvers such that live components are not exposed to water spray and dripping liquids.

.5 Above requirements are additional minimum "sprinkler proof" standards for equipment specified as NEMA 1, 2 or 12.

.6 Obtain CSA approval where required by local governing authorities.

2.13 MECHANICAL WORK IDENTIFICATION MATERIALS

.1 Confirm with the Owner if an existing mechanical work identification system is in place and, if so, match accordingly.

.2 If an existing mechanical work identification system is not in place, the following is to be used:

.1 Equipment nameplates are to be minimum 1.6 mm (1/16") thick 2-ply laminated coloured plastic plates, minimum 12 mm x 50 mm (½" x 2") for smaller items such as damper motors and control valves, minimum 25 mm x 65 mm (1" x 2-½") for equipment, and minimum 50 mm x 100 mm (2" x 4") for control panels and similar items. Additional requirements are as follows:

.1 unless otherwise specified or required, each nameplate is to be white, complete with bevelled edges and black engraved wording to completely identify equipment and its use with no abbreviations;

.2 wording is generally to be as per drawings, i.e. Fan EF-1, and is to include equipment service and building area/zone served, but must be reviewed prior to engraving;

.3 supply stainless steel screws for securing nameplates in place;

.4 nameplates for equipment suspended above floor level or generally not within easy viewing from floor level are to be increased in size so as to be easily readable from floor level.

.2 Valve tags are to be coloured, 40 mm (1-½") square, 2-ply laminated plastic with bevelled edges, red-white, green-white, yellow-black, etc., to match piping identification colour, each complete with a 3.2 mm (1/8") diameter by 100 mm (4") long brass plated steel bead chain, and four lines of engraved maximum size identification wording, i.e.:

VALVE V12
200 mm (8")
CHILL. WATER
NORMALLY OPEN

.3 Standard pipe identification is to be equal to Smillie McAdams Summerlin Ltd., Brady or Primark Manufacturing Inc. vinyl plastic with indoor/outdoor type vinyl ink lettering and directional arrows, as follows:

.1 for pipe less than or equal to 150 mm (6") diameter, coiled type snap-on markers of a length to wrap completely around pipe or pipe insulation;

.2 for pipe larger than 150 mm (6") diameter, saddle type strap-on markers with 2 opposite identification locations and complete with nylon cable ties.

.4 Identification wording and colours for pipe identification materials are to be as follows:

PIPE SERVICE	IDENTIFICATION COLOUR	LEGEND
domestic cold water	green	DOM. COLD WATER
domestic hot water supply	green	DOM. HW SUPPLY
domestic hot water recirculation	green	DOM. HW RECIRC.

PIPE SERVICE	IDENTIFICATION COLOUR	LEGEND
tempered domestic water	green	TEMP. DOM. WATER
chilled drinking water	green	CH. DRINK WTR.
storm drainage	green	STORM
sanitary drainage	green	SAN.
plumbing vent	green	SAN. VENT
fire protection standpipe	red	F.P. STANDPIPE
fire protection sprinklers	red	F.P. SPRINKLER
natural gas	to Code	to Code, c/w pressure
natural gas vent	to Code	to Code
propane gas	to Code	to Code, c/w pressure
propane gas vent	to Code	to Code
heating water supply	yellow	HTG. WTR. SUPPLY
heating water return	yellow	HTG. WTR. RETURN
heating water drain	yellow	HTG. WTR. DRAIN
glycol heating supply	yellow	GLY. HTG. SUPPLY
glycol heating return	yellow	GLY. HTG. RETURN
glycol heating drain	yellow	GLY. HTG. DRAIN
glycol heat reclaim return	yellow	GLY. HTG. RECLAIM R.
glycol heat reclaim supply	yellow	GLY. HTG. RECLAIM S.
heat pump geothermal loop – source side supply	green	GEO. LOOP SOURCE SUPPLY
heat pump geothermal loop – source side return	green	GEO. LOOP SOURCE RETURN
heat pump geothermal loop – load side supply	green	GEO. LOOP LOAD SUPPLY
Heat pump geothermal loop – load side return	green	GEO. LOOP LOAD RETURN
condenser water supply	green	COND. WTR. SUPPLY
condenser water return	green	COND. WTR. RETURN
chilled water supply	green	CH. WTR. SUPPLY
chilled water return	green	CH. WTR. RETURN
chilled water drain	green	CH. WTR. DRAIN
pumped condensate	yellow	PUMPED CONDENSATE
refrigerant suction	yellow	REFRIG. SUCTION
refrigerant liquid	yellow	REFRIG. LIQUID
refrigerant hot gas	yellow	REFRIG. HOT GAS

PIPE SERVICE	IDENTIFICATION COLOUR	LEGEND
control air	green	CONTROL AIR

.5 Colours for pipe identification legends and directional arrows are to be as follows:

IDENTIFICATION COLOUR	LEGEND & ARROW COLOUR
yellow	black
green	white
red	white

.6 Duct identification is to be custom made Mylar stencils with 50 mm (2") high lettering to accurately describe duct service, i.e. "AHU-1 SUPPLY", complete with a directional arrow, and coloured ink with ink pads and roller applicators. Ink colour is generally to be black but must contrast with lettering background.

2.14 FLEXIBLE CONNECTORS

.1 Double wall stainless steel flexible connectors for piping connections to vibration isolated equipment, each selected by manufacturer to suit the application. Shop drawings or product data sheets must indicate construction and performance requirements that suit the application. Acceptable manufacturers are:

.1 Hyspan Precision Products Inc.;

.2 Senior Flexonics Ltd.;

.3 The Metraflex Co.

3 Execution

3.01 GENERAL PIPING AND DUCTWORK INSTALLATION REQUIREMENTS

.1 Unless otherwise specified, locate and arrange horizontal pipes and ducts above or at ceiling on floors, arranged so that under consideration of all other work in area, maximum ceiling height and/or usable space is maintained. If required to maintain ceiling heights, reroute and/or resize ductwork, with Consultant’s approval.

.2 Unless otherwise specified, install work concealed in finished spaces, and concealed to degree possible in partially finished and unfinished spaces. Refer to and examine Architectural drawings and room finish schedules to determine finished, partially finished, and unfinished areas. Walls which are painted are considered finished.

.3 Install pipes and ducts parallel to building lines and to each other.

.4 Neatly group and arrange exposed work.

.5 Locate work to permit easy access for service or maintenance as required and/or applicable. Locate valves, dampers and any other equipment which will or may need maintenance or repairs and which are to be installed in accessible construction so as to be easily accessible from access doors. Where valves, dampers and similar piping or ductwork accessories occur in vertical services in shafts, pipe spaces or partitions, locate accessories at floor level.

.6 Make connections between pipes of different materials using adapters suitable for application. Provide cast brass dielectric type adapters/unions at connections between ferrous and copper pipe.

.7 Comply with equipment and material manufacturer's installation instructions unless otherwise specified herein or on drawings, and unless such instructions contradict governing codes and regulations.

.8 Carefully clean ducts, pipe and fittings prior to installation. Temporarily cap or plug ends of pipe, ducts and equipment which are open and exposed during construction.

.9 Install piping and ductwork which are to be insulated so that they have sufficient clearance to permit insulation and finish to be applied continuously and unbroken around pipe or duct, except for ductwork at fire barriers, in which case insulation will be terminated at each side of the duct fire damper.

.10 Inspect surfaces and structure prepared by other trades before performing work. Verify surfaces or structure to receive work has no defects or discrepancies which could result in poor application or cause latent defects in installation and workmanship. Report defects in writing. Installation of work will constitute acceptance of such surfaces as being satisfactory.

.11 Any ferrous piping that exhibits in excess of 5% surface rust, either inside or outside or both, is to be wire brush cleaned to bare metal and coated with suitable primer. Steel pipe, fittings and accessories are to be free of corrosion and dirt when work is complete or prior to being concealed from view. Where dirt is evident, clean piping prior to being concealed.

.12 For factory applied finishes, repaint or refinish surfaces damaged during shipment and installation. Quality of repair work is to match original finish. This requirement also applies to galvanized finishes.

.13 Where mechanical work is located in high humidity areas where ferrous metal products will be subject to corrosion and protection for such products is not specified, provide finishes on products to protect against corrosion or provide products which will not corrode in the environment, i.e. aluminium ductwork, copper or stainless steel pipe, etc.

.14 Provide screwed unions or flanges in piping connections to equipment and in regular intervals in long (in excess of 12 m [40']) piping runs to permit removal of sections of piping.

.15 Unless otherwise specified and except where space limitations do not permit, piping elbows are to be long radius. Eccentric reducers are to be installed with straight side at top of piping.

3.02 PIPE JOINT REQUIREMENTS

.1 Do not make pipe joints in walls or slabs.

.2 Ream piping ends prior to making joints.

.3 Properly cut threads in screwed steel piping and coat male threads only with Teflon tape or paste, or an equivalent thread lubricant. After pipe has been screwed into fitting, valve, union, or piping accessory, not more than 2 pipe threads are to remain exposed.

.4 Site bevel steel pipe to be welded or supply mill bevelled pipe. Remove scale and oxide from bevels and leave smooth and clean. Use factory made welding tees or welding outlet fittings for piping branches off mains. Do not use shop or site fabricated fittings unless written approval has been obtained.

.5 Welded joints are to be made by CWB certified licensed journeyman welders qualified in accordance with CSA B51, Boiler Pressure Vessel and Pressure Piping Code, and who are in possession of a proper certificate of qualification for each procedure to be performed. Each weld is to be identified with the welder’s identification symbol, and welds are not to be concealed until they have been inspected and approved. Electrodes are to be in accordance with CSA W48 Series, Electrodes, and requirements of CAN/CSA W117.2, Safety in Welding, Cutting and Allied Processes are to be followed.

.6 Unless otherwise specified, make flanged joints with Garlock 5500 or equivalent gasket materials to suit the application, and bolts and nuts. Bolts are not to be longer than length necessary to screw nut up flush to the end of bolt. Bolts used for flanged connections in piping with a working pressure of 690 kPa (100

psi) and greater are to be ASTM A-193 Grade B-7, with heavy hexagon nuts to ASTM A-194 CL-2H. Provide suitable washers between each bolt head and flange and between each nut and flange.

.7 A random check of bolted flanged connections will be made to verify flanged connections are properly mated with no shear force acting on bolts. Supply labour to disconnect and reconnect selected flanged joints. If improperly mated joints are found, remove and reinstall affected piping so flanges mate properly. If improperly mated joints are found, additional joints will be checked, and you will be responsible for the repair of any other improper joints discovered.

.8 Unless otherwise specified make soldered joints in copper piping using flux suitable for and compatible with type of solder being used. Clean the outside of pipe end and inside of fitting, valve, or similar accessory prior to soldering.

.9 Install mechanical joint fittings and couplings in accordance with manufacturer's instructions.

.10 Grooves are to be rolled. Make arrangements with coupling and fitting manufacturer for shop and/or site instructions and demonstrations as required, and adhere to manufacturer's instructions with respect to pipe grooving, support, type of gasket required, anchoring and guiding the grooved piping system.

.11 If pressure crimped couplings and fittings are used, ensure gaskets are fully compatible with piping fluid, and valves and piping accessories are suitable. Use only fitting manufacturer supplied crimping equipment. Comply with manufacturer’s latest published specification, instructions, and recommendations with respect to pipe, coupling, and fitting preparation and installation, and support, anchoring and guiding of the piping system.

.12 Solvent weld PVC piping in 2 parts, primer stage and cementing stage, in accordance with manufacturer’s recommendations, ASTM D2855, and CSA requirements.

.13 Install PVC piping with gasketed joints in accordance with manufacturer’s current published specifications, instructions and recommendations, and CSA requirements.

3.03 INSTALLATION OF PIPE SLEEVES

.1 Where pipes pass through concrete and/or masonry surfaces provide pipe sleeves as follows:

.1 in poured concrete slabs – unless otherwise specified, minimum 16 gauge flanged galvanized steel or, where permitted by governing authorities, factory fabricated plastic sleeves;

.2 in concrete or masonry walls – Schedule 40 galvanized steel pipe or Class 4000 cast iron pipe.

.2 Sleeves in waterproofed slabs or walls are to be lengths of Schedule 40 mild galvanized steel pipe with a waterstop plate in accordance with drawing detail. Provide waterproof sleeves in following locations:

.1 in mechanical room floor slabs, except where on grade;

.2 in slabs over mechanical, fan, electrical and telephone equipment rooms or closets;

.3 in floors equipped with waterproof membranes;

.4 in roof slab;

.5 in waterproof walls.

.3 Size sleeves, unless otherwise specified, to leave 12 mm (½") clearance around pipes, or where pipe is insulated, a 12 mm (½") clearance around pipe insulation.

.4 Pack and seal void between pipe sleeves and pipe or pipe insulation in non-fire rated construction for the length of sleeves as follows:

.1 pack sleeves in interior construction with mineral wool and seal both ends of sleeves with non-hardening silicone base caulking compound;

.2 pack sleeves in exterior walls above grade with mineral wool and seal both ends of sleeves water-tight with approved non-hardening silicone base caulking compound unless mechanical type seals have been specified;

.3 seal sleeves in exterior walls below grade (and any other wall where water leakage may be a problem) with link type mechanical seals as specified.

.5 Where sleeves are required in masonry work, accurately locate and mark sleeve location, and hand sleeves to mason for installation.

.6 Terminate piping for sleeves that will be exposed so sleeve is flush at both ends with building surface so sleeve may be completely covered by an escutcheon plate, except for sleeves in waterproof floors which are to terminate 100 mm (4") above finished floor.

.7 "Gang" type sleeving will not be permitted.

.8 Where sleeves are provided in non-fire rated construction for future piping, or where piping has been removed from existing sleeves, cap and seal both ends of sleeved opening.

3.04 INSTALLATION OF WATERPROOF MECHANICAL SEALS

.1 Provide watertight link type mechanical seals in exterior wall openings.

.2 Assemble and install each mechanical seal in accordance with manufacturer's instructions.

.3 After installation, periodically check each mechanical seal installation for leakage and, if necessary, tighten link seal bolts until seal is completely watertight.

3.05 DUCT OPENINGS

.1 Duct openings, air inlet and outlet openings, fire damper and similar openings will be provided in new poured concrete work, masonry, drywall and other building surfaces by trade responsible for particular construction in which opening is required.

.2 Size openings for fire dampers to 600 mm (24") high to suit damper arrangement with folding blade out of air stream.

.3 For duct openings except where fire dampers are required, pack and seal space between duct or duct insulation and duct opening as specified above for pipe openings in non-fire rated construction.

3.06 SLEEVE AND FORMED OPENING LOCATION DRAWINGS

.1 Prepare and submit for review, drawings indicating size and location of required sleeves, recesses and formed openings in poured or precast concrete work.

.2 Such drawings are to be completely and accurately dimensioned and relate sleeve, recesses, and formed openings to suitable grid lines and elevation datum, and are to take into account structural items such as grade beams, column caps, and column drop slabs.

.3 Begin to prepare such drawings immediately upon notification of acceptance of bid and award of Contract.

3.07 INSTALLATION OF PIPE ESCUTCHEON PLATES

.1 Provide escutcheon plates suitably secured over exposed piping passing through finished building surfaces. A finished building surface is any surface with a factory finish or that receives a site applied finish.

.2 Install plates so they are tight against building surface concerned, completely covering pipe sleeves and/or openings, except where waterproof sleeves extend above floors, in which case fit plate tightly around sleeve.

3.08 INSTALLATION OF FASTENING AND SECURING HARDWARE

.1 Provide fastening and securing hardware required for mechanical work to maintain installations attached to structure or to finished floors, walls and ceilings in a secure and rigid manner capable of withstanding dead loads, live loads, superimposed dead loads, and any vibration of installed products.

.2 Use fasteners compatible with structural requirements, finishes and types of products to be connected. Do not use materials subject to electrolytic action or corrosion where conditions are liable to cause such action.

.3 Where floor, wall or ceiling construction is not suitable to support loads, provide additional framing or special fasteners to ensure proper securement to structure that is to support the products. Provide reinforcing or connecting supports where required to distribute loading to structural components.

.4 Obtain written consent before using explosive actuated fastening devices. If consent is obtained, comply with requirements of CAN/CSA Z166.1 and CAN/CSA Z166.2.

.5 Do not attach fasteners to steel deck without written consent from Consultant.

3.09 INSTALLATION OF PIPE HANGERS AND SUPPORTS

.1 Provide required pipe hangers and supports.

.2 Provide any additional structural steel channels, angles, inserts, beam champs and similar accessories required for hanging or supporting pipe. Unless otherwise shown or specified, hang or support pipes from structure only.

.3 For insulated pipe, size hanger or support to suit diameter of insulated pipe and install hanger or support on outside of insulation and insulation finish.

.4 Support requirements for underground piping are as follows:

.1 support underground pipe, unless otherwise specified, on a well compacted bed of dry, natural, undisturbed earth free from rocks or protrusions of any kind, or on compacted material as specified;

.2 support underground service piping penetrating building exterior walls or foundations to prevent pipe damage if minor building settlement occurs;

.3 ensure bedding and supports for underground pipes are flat and true and allowances are made for pipe hubs, couplings, or other protrusions so no voids are left between pipe and bedding.

.5 Unless otherwise shown or specified, hang and/or support horizontal pipe above ground by means of hangers and/or supports specified in Part 2 of this Section. Unless otherwise shown or specified, hangers for suspended pipe less than or equal to 25 mm (1") dia. are to be clevis type or adjustable ring type, and hangers for suspended pipe greater than or equal to 40 mm (1-½") dia. are to be adjustable clevis type.

.6 Space hangers and supports in accordance with following:

.1 cast iron pipe – hang or support at every joint with maximum 2.4 m (8') spacing;

.2 plastic pipe – conform to pipe manufacturer’s recommended support spacing;

.3 glass pipe – conform to pipe manufacturer’s recommended support spacing and support requirements;

.4 copper and steel pipe – hang or support at spacing in accordance with following schedule:

PIPE DIA.	MAX. SPACING STEEL (meters)	MAX. SPACING COPPER (meters)
to 25 mm (1")	2.4 m (8')	1.8 m (6')
40 mm (1-½")	2.7 m (9')	2.4 m (8')
50 mm (2")	3.0 m (10')	2.7 m (9')
65 mm (2-½")	3.6 m (12')	3.0 m (10')
75 mm (3")	3.6 m (12')	3.0 m (10')
90 mm (3-½")	3.6 m (12')	3.6 m (12')
100 mm (4")	4.2 m (14')	3.6 m (12')
250 mm (10")	6.0 m (20')	
300 mm (12")	6.7 m (22')	

.5 flexible grooved pipe/coupling joint piping – as above but with not less than one hanger or support between joints;

.7 Where pipes change direction, either horizontally or vertically, provide a hanger or support on horizontal pipe not more than 300 mm (12") from elbow, and where pipes drop from tee branches, support tees in both directions not more than 50 mm (2") on each side of tee.

.8 When pipes with same slope are grouped and a common hanger or support is used, space hanger or support to suit spacing requirement of smallest pipe in group and secure pipes in place on common hanger or support.

.9 Provide roller hangers or supports for heat transfer piping greater than or equal to 150 mm (6") diameter and conveying a material 75°C (170°F) or greater to facilitate pipe movement due to expansion and contraction, and at each hanger or support tack weld a steel protection saddle to pipe to protect piping insulation.

.10 Unless otherwise shown or specified, support vertical piping by means of supports specified in Part 2 of this Section, spaced in accordance with following:

.1 support vertical pipes at maximum 3 m (10') intervals or at every floor, whichever is lesser;

.2 for sections of vertical piping with a length less than 3 m (10'), support pipe at least once;

.3 for vertical cast iron plain end pipe (mechanical joint type), secure riser or pipe clamp around pipe under a flange integral with pipe for vertical support purposes, or provide a length of hub and spigot pipe to facilitate proper support;

.4 for vertical steel pipe risers in excess of 3 m (10'), weld shear lugs to pipe to carry load;

.5 for vibration isolated piping risers, provide rubber-steel-rubber vibration isolation pads between riser clamps and floor.

.11 Support piping on the roof as follows:

.1 on existing roof – provide support members as specified in Part 2 of this Section spaced as per schedule above and of a type to suit the application, and, for each support, carefully scrape away roofing gravel, bed support in a heavy covering of roofing mastic, then scrape gravel back up around support and secure pipes to supports;

.2 on new roof – supply manufactured roof supports as per Part 2 of this Section to accommodate piping involved and support spacing specified above, and hand supports to roofing trade on roof for installation as part of roofing work, then secure piping in place on supports.

.12 Each hanger, support or securement for horizontal bare copper tubing is to be plastic coated to prevent direct contact between pipe and ferrous hanger. Each wall or floor clamp for vertical bare copper piping is to be isolated from pipe by means of strips of flexible rubber inserts. Use of painted ferrous hangers and supports, including those painted with copper coloured paint, is not acceptable. Site application of tape or other types of isolation is not acceptable.

.13 For insulated horizontal piping less than or equal to 40 mm (1-½") diameter, provide galvanized steel insulation protection shields between insulation and hanger or support. Install shields immediately after pipe is insulated.

.14 Do not support piping from steel deck without written consent from Consultant.

3.10 SUPPLY OF ACCESS DOORS

.1 Supply access doors to give access to mechanical work which may need maintenance or repair but which is concealed in inaccessible construction, except as otherwise specified herein or on drawings.

.2 Before commencing installation of mechanical work, coordinate with other trades and prepare on a set of reflected ceiling plans and wall elevations, complete layouts of access doors. Submit these layouts for Consultant's review and show exact sizes and locations of such access doors. Locate and arrange mechanical work to suit.

.3 Access doors will be installed by trade responsible for particular type of construction in which doors are required. Supply access doors to trade installing same at proper time.

.4 Wherever possible, access doors to be of a standard size for each application. Confirm exact dimensions and minimum size restrictions with Consultant prior to ordering.

.5 Group piping and ductwork to ensure minimum number of access doors is required.

.6 Coordinate with Electrical Contractor and General Trades Contractor to ensure access doors on project are provided by a single manufacturer, installed as part of work of General Trades Contractor and work involving both mechanical and electrical services should, where possible, be accessible from common access door. Coordinate work to ensure common location access doors are not supplied by both Mechanical Divisions and Electrical Divisions.

3.11 INSTALLATION OF VALVES

.1 Generally, valve locations are indicated or specified on drawings or specified in Sections of the Specification where valves are specified, however, regardless of locations shown or specified, following requirements apply:

.1 provide shut-off valves to isolate systems, at base of vertical risers, in branch take-offs at mains and risers on floors, to isolate equipment, to permit work phasing as required, and wherever else required for proper system operation and maintenance;

.2 install shut-off valves with handles upright or horizontal, not inverted, and located for easy access;

.3 unless otherwise specified, provide a check valve in discharge piping of each pump;

.4 valve sizes are to be same as connecting pipe size;

.5 valves are to be permanently identified with size, manufacturer's name, valve model or figure number and pressure rating, and wherever possible, valves are to be product of same manufacturer;

.6 for valves in insulated piping, design of valve stem, handle and operating mechanism is to be such that insulation does not have to be cut or altered in any manner to permit valve operation.

3.12 INSTALLATION OF PRESSURE GAUGES AND THERMOMETERS

.1 Provide pressure gauges in following locations where applicable:

.1 in valved tubing across suction, suction strainer (if applicable), and discharge piping of each circulating pump;

.2 in supply and return piping connections to main mechanical plant equipment such as boilers, chillers, heat exchangers, main coils, etc.;

.3 in expansion tank(s);

.4 in separate domestic hot water storage tank(s);

.5 at top most outlet in each standpipe fire protection system riser;

.6 in piping at each side of a pressure reducing valve;

.7 in potable water service piping downstream of meter;

.8 wherever else shown and/or specified.

.2 Provide thermometers in following locations where applicable:

.1 in supply and return piping connections to main mechanical plant equipment such as boilers, chillers, cooling towers, heat exchangers, main coils, etc., unless temperature indication is supplied with equipment;

.2 wherever else shown and/or specified.

.3 Conform to following installation requirements where applicable:

.1 for installation of thermometers in piping wells, provide a coat of metallic base heat transfer paste or grease in piping well;

.2 for pressure gauges in piping at equipment locations, install pressure gauge between equipment and first pipe fitting;

.3 locate, mount and adjust instruments so they are easily readable;

.4 where pressure gauges and/or thermometers are located at high level or in an area where they cannot be easily seen, provide remote reading instruments.

3.13 INSTALLATION OF EQUIPMENT DRIVE GUARDS AND ACCESSORIES

.1 Provide OHSA guards for exposed accessible rotating parts such as belt drives, couplings, fan wheels, and shaft ends on mechanical equipment.

.2 Install belt guards to allow movement of motors for adjusting belt tension.

.3 Provide a means to permit lubrication and use of test instruments with guards in place.

.4 Secure guards to equipment or equipment base but do not bridge sound or vibration isolation.

.5 Where equipment oil level gauges, oil reservoirs, grease cups, or grease gun fittings are integral with equipment but are not easily accessible for service, extend to an accessible location using aluminium or copper tubing.

3.14 MECHANICAL WORK IDENTIFICATION

.1 Identify new exposed piping and ductwork as per Part 2 of this Section in locations as follows:

.1 at every end of every piping or duct run;

.2 adjacent to each valve, strainer, damper and similar accessory;

.3 at each piece of connecting equipment;

.4 on both sides of every pipe and duct passing through a floor, wall or partition, unless otherwise specified;

.5 at 6 m (20') intervals on pipe and duct runs exceeding 6 m (20') in length;

.6 at least once in each room, and at least once on pipe and duct runs less than 6 m (20') in length.

.2 Unless otherwise specified identify new concealed piping and ductwork as per Part 2 of this Section in locations as follows:

.1 at points where pipes or ducts enter and leave rooms, shafts, pipe chases, furred spaces, and similar areas;

.2 at maximum 6 m (20') intervals on piping and ductwork above suspended accessible ceilings, and at least once in each room;

.3 at each access door location;

.4 at each piece of connected equipment, automatic valve, etc.

.3 Provide an identification nameplate for equipment provided as part of this project, including items such as control valves, motorized dampers, instruments, and similar products. Secure nameplates in place, approximately at eye level if possible, with stainless steel screws unless such a practice is prohibitive, in which case use epoxy cement applied to cleaned surfaces. Locate nameplates in the most conspicuous and readable location.

.4 Paint new natural and/or propane gas piping with primer and 2 coats of yellow paint in accordance with Code requirements. Identify piping at intervals as specified above.

.5 Provide an identification nameplate for each motor starter or disconnect switch located in a motor control centre or on a motor starter panel, and on each individually mounted starter provided as part of mechanical work, and on each disconnect switch provided as part of the electrical work for motorized equipment provided as part of mechanical work.

.6 For electrically traced mechanical work, identification wording is to include "ELECTRICALLY TRACED".

.7 Tag valves and prepare a valve tag chart in accordance with following requirements:

.1 attach a valve tag to each new valve, except for valves located immediately at equipment they control;

.2 prepare a digital valve tag chart to list tagged valves, with, for each valve, the tag number, location, valve size, piping service, and valve attitude (normally open or normally closed);

.3 if an existing valve tag chart is available at site, valve tag numbering is to be an extension of existing numbering and new valve tag chart is to incorporate existing chart;

.4 include a copy of valve tag chart in each copy of operating and maintenance instruction manuals.

.8 Where shut-off valves, control dampers, sensors, and similar items which will or may need maintenance and/or repair are located above accessible suspended ceilings, provide round coloured ceiling tacks in ceiling panel material, or stickers equal to Brady "Quick Dot" on ceiling grid material to indicate locations of items. Unless otherwise specified, ceiling tack or sticker colours are to be as follows:

.1 HVAC piping valves and equipment: yellow

.2 fire protection valves and equipment: red

.3 plumbing valves and equipment: green

.4 HVAC ductwork dampers and equipment: blue

.5 control system hardware and equipment: orange

3.15 FINISH PAINTING OF MECHANICAL WORK

.1 Finish paint exposed mechanical work as specified and/or scheduled in accordance with requirements of Division 09.

.2 Touch-up paint damaged factory applied finishes on mechanical work products.

3.16 PIPE LEAKAGE TESTING

.1 Before piping has been insulated or concealed, and before equipment, fixtures and fittings have been connected, test piping for leakage.

.2 Tests are to be witnessed by Consultant and/or Owner's representative, and, where required, representatives of governing authorities. Give ample notice of tests in writing and verify attendance. Have completed test report sheets dated and signed by those present to confirm proper test results.

.3 When circumstances prevent scheduled tests from taking place, give immediate and adequate notice of cancellation to all who were scheduled to attend.

.4 Gravity Drainage and Vent Piping

.1 Test piping in accordance with local governing building code.

.2 After fixtures and fittings are set and pipes are connected to building drain or drains, turn on water into pipe, fixtures, fittings and traps in order to detect any imperfect material or workmanship. Perform a smoke test if required by local governing authorities.

.5 Pumped Drainage Piping

.1 Test piping with cold water at a pressure of 1-½ times normal working pressure and maintain pressure for a minimum of 2 hours.

.6 Domestic Water Piping

.1 Test piping with cold water at a pressure of 1-½ times normal working pressure and maintain pressure for a minimum of 2 hours.

.7 Sprinkler System Piping

.1 Test system piping in accordance with requirements of NFPA No. 13, "Installation of Sprinkler Systems", and in accordance with any additional requirements of governing authorities.

.8 Standpipe System Piping

.1 Test system piping in accordance with requirements of NFPA No. 14, "Standpipe and Hose Systems", and in accordance with any additional requirements of governing authorities.

.9 Heat Transfer (HVAC) System Piping

.1 Test piping with cold water at a pressure of 1035 kPa (150 psi) for a minimum of 2 hours.

.10 Natural Gas Piping

.1 Test piping in accordance with requirements of CAN/CSA B149.1 and any additional requirements of local governing authorities.

.2 After completion of the verification test, locate required tag stating results of the verification test at the point of entry of gas main into building, affixed to the pipe in a secure manner.

.3 Check piping joints and connections for leaks with a water/soap solution while piping is under pressure.

.11 Propane Gas Piping

.1 Test piping in accordance with requirements of CAN/CSA B149.2 and any additional requirements of local governing authorities.

.2 After completion of the verification test, locate required tag stating results of the verification test at the point of entry of gas main into building, affixed to the pipe in a secure manner.

.3 Check piping joints and connections for leaks with a water/soap solution while piping is under pressure.

.12 Refrigerant Piping

.1 Test refrigerant piping for leakage and dehydrate in accordance with requirements of Chapter 18 of ASHRAE Handbook - Fundamentals.

.13 Control Air Piping and Tubing

.1 Test control air piping and tubing with dry compressed air or nitrogen before concealing and again before connection of instruments.

.2 Rough-in test pressure is to be 345 kPa (50 psi) maintained over 24 hours with a pressure drop not to exceed 35 kPa (5 psi).

.3 Test joints for leaks with a soap solution.

.4 Finish test is to be 205 kPa (30 psi) with a permissible loss of 7 kPa (1 psi) over a 4 hour period. Prior to connecting instruments, blow systems clean and dry, and test component connections for leaks with a water/soap solution.

.14 Following requirements apply to all testing:

.1 ensure piping has been properly flushed, cleaned and is clear of foreign matter prior to pressure testing;

.2 temporarily remove or valve off piping system specialties or equipment which may be damaged by test pressures prior to pressure testing systems, and flush piping to remove foreign matter;

.3 when testing is carried out below highest level of the particular system, increase test pressure by the hygrostatic head of 7 kPa (1 psi) for every 600 mm (24") below the high point;

.4 include for temporary piping connections required to properly complete tests;

.5 piping under test pressure is to have zero pressure drop for length of test period;

.6 make tight leaks found during tests while piping is under pressure, and if this is impossible, remove and refit piping and reapply test until satisfactory results are obtained;

.7 where leaks occur in threaded joints in steel piping, no caulking of these joints will be allowed under any conditions;

.8 tests are be done in reasonably sized sections so as to minimize number of tests required;

.9 in addition to leakage tests specified above, demonstrate proper flow throughout systems including mains, connections and equipment, as well as proper venting and drainage, and include for any necessary system adjustments to achieve proper conditions.

3.17 SUPPLY OF MOTOR STARTERS AND ACCESSORIES

.1 Unless otherwise shown or specified, supply a starter for each item of motorized equipment. Refer to Motor Starter Schedule.

.2 Where 3-phase starters are indicated in motor control centres, supply motor control centres with starters and bolt to a concrete housekeeping pad.

.3 Where package type equipment with integral starters, or equipment with starters integral in loose power and control panels supplied with equipment is fed from a motor control centre, provide a disconnect switch in motor control centre in lieu of a motor starter.

.4 Where 3-phase starters are indicated and/or scheduled to be mounted on a motor starter panel, starters will be mounted and connected, complete with panels and splitter trough, as part of electrical work. Hand starters to electrical trade at site when they are required.

.5 Where package type equipment with integral starters, or equipment with starters integral in loose power and control panels supplied with equipment is fed from a motor starter panel, a disconnect switch will be provided on motor starter panel as part of electrical work.

.6 Unless otherwise specified or shown on drawings, 1-phase motor starters will be mounted adjacent to equipment they serve and connected complete as part of electrical work. Hand starters to electrical trade at site at the proper time.

3.18 ELECTRICAL WIRING WORK FOR MECHANICAL WORK

.1 Unless otherwise specified or indicated, following electrical wiring work for mechanical equipment will be done as part of the electrical work:

.1 "line" side power wiring to motor starters or disconnect switches in motor control centres and starters or disconnects on motor starter panels, and "load" side wiring from starters or disconnects to equipment;

.2 "line" side power wiring to individual wall mounted starters, and "load" side wiring from starters to equipment;

.3 "line" side power wiring to pre-wired power and control panels and variable frequency drives (VFD), and "load" side power wiring from the panels and VFD's to equipment;

.4 provision of receptacles for plug-in equipment;

.5 provision of disconnect switches for motors in excess of 10 m (30') from starter location, or cannot be seen from starter location, and associated power wiring;

.6 motor starter interlocking in excess of 24 volts;

.7 wiring from motor winding thermistors in motors 30 HP and larger to motor starter contacts;

.8 120 volt power connections to electrical receptacles integral with small ceiling exhaust fans, including wiring through light switches or speed controllers;

.9 120 volt wiring connections to lighting fixture/switch combinations integral with air handling units;

.10 120 volt wiring connections to duplex receptacles integral with air handling unit control panels;

.11 120 volt wiring connections to BAS system controllers/panels and other control system or component requiring 120 volt power including, but not limited to, VAV boxes, dampers, low voltage transformers, etc.

.2 Mechanical wiring work not listed above or specified herein or on drawings to be done as part of electrical work is to be installed in conduit and is to be done as part of mechanical work in accordance with wiring requirements specified for electrical work.

3.19 INTERRUPTION TO AND SHUT-DOWN OF MECHANICAL SERVICES AND SYSTEMS

.1 Coordinate shut-down and interruption to existing mechanical systems with Owner. Generally, shut-downs may be performed only between the hours of 12:00 midnight Friday until 6:00 a.m. Monday morning, unless otherwise specified in Division 01. Include for costs of premium time to perform work during nights, weekends or other times outside of normal working hours, which may be necessary to comply with stipulations specified herein this Article. Services for operation of existing non-renovated areas of building are to be maintained.

.2 Upon award of a Contract, submit a list of anticipated shut-down times and their maximum duration.

.3 Prior to each shut-down or interruption, inform Owner and Consultant in writing 5 working days in advance of proposed shut-down or interruption and obtain written consent to proceed. Do not shut-down or interrupt any system or service without such written consent. Shutdowns of some essential services may require additional advance notification time.

.4 Perform work associated with shut-downs and interruptions as continuous operations to minimize shut-down time and to reinstate systems as soon as possible, and, prior to any shut-down, ensure materials and labour required to complete the work for which shut-down is required are available at site.

.5 Pipe freezing shall be used to connect new piping to existing piping. Alternative methods may be proposed, if site conditions are evaluated and permit, and are approved by the engineer.

.6 Where existing isolation valves do not hold, pipe freezing shall be used to connect new piping to existing piping.

3.20 EQUIPMENT BASES AND SUPPORTS

.1 Unless otherwise specified or required, set floor mounted equipment on minimum 100 mm (4") high reinforced concrete housekeeping pads 200 mm (8") clear of equipment on each side and end, or a minimum of 200 mm (8") from centreline of equipment anchor bolts to edge of the base, whichever is larger. Conform to following requirements:

.1 supply dimensioned drawings and equipment base templates, and provide anchor bolts for proper setting and securing of equipment on pads;

.2 place anchor bolts during concrete pour and be responsible for required levelling, alignment, and grouting of equipment;

.3 as a minimum, use wire mesh reinforcement, however, for pads for large heavy equipment, use reinforcement as per structural drawing details.

.2 For equipment not designed for base mounting, where required, provide welded, cleaned and prime coat painted structural steel stands or supports conforming to following requirements:

.1 provide stands and supports, except those for small equipment, designed by a structural engineer registered in jurisdiction of the work, and submit stamped and signed design drawings with calculations as shop drawings for review;

.2 flange bolt steel stands to concrete housekeeping pads;

.3 seismically restrained stands and supports in accordance with applicable requirements.

.3 Where indicated on mechanical drawings, provide welded, cleaned and prime coat painted structural steel platforms, designed by a structural engineer registered in the jurisdiction of the work, for service access to equipment. Submit stamped and signed design drawings with calculations as shop drawings for review. Conform to following requirements:

.1 platforms in accordance with OHSA requirements and adequately sized, braced, anchored, and, as required, seismically restrained;

.2 flooring equal to Fisher & Ludlow "Tru-Weld" Type 19-4, Borden type W/B (19-W-4), welded steel bar type grating;

.3 support legs constructed of welded Schedule 40 black steel pipe with welded steel cross-bracing, securely anchored and sway braced;

.4 safety guard rails, constructed from minimum 32 mm (1-¼") dia. Schedule 40 black steel pipe, for all platforms and complete with vertical stanchions at maximum 1.2 m (48") centres, top and intermediate horizontal railing, and toe plates at floor;

.5 vertical ladders constructed of Schedule 40 black steel pipe, 25 mm (1") dia. for equal height rungs, 40 mm (1-½") for stringers, anchored to floors and walls and sway braced as required;

.6 ships ladders, used wherever space conditions permit, of welded steel construction, climbing at an approximate 60º angle, and complete with channel iron stringers, open grate equal height risers approximately 165 mm (6-½") wide and factory made by grating manufacturer, handrails, and suitable anchoring and support.

3.21 MECHANICAL SERVICE REQUIREMENTS FOR FLOATING FLOOR SLABS

.1 Where mechanical services are required to be installed in or through a vibration isolated floating slab, install such services so as not to transmit any vibration to base slab on which floating floor slab is placed.

.2 Wherever possible, arrange mechanical work to avoid penetrating a floating floor slab.

3.22 CONCRETE WORK FOR MECHANICAL EQUIPMENT BASES/PADS

.1 Unless otherwise specified in Division 03, provide poured concrete work, including reinforcing and formwork, required for mechanical equipment bases/pads. Perform concrete work in accordance with requirements specified in Division 03.

.2 Unless otherwise specified in Division 03, concrete is to be minimum 20,700 kPa ready-mix concrete in accordance with CAN/CSA-A23.1 and the Building Code.

.3 Submit for review, dimensioned shop drawings, prepared and stamped by a professional structural engineer registered in the jurisdiction of the work, for concrete pads or bases for support of large, heavy equipment. Indicate on shop drawings total weight of pad or base as well as equipment it is provided for, and concrete reinforcing.

.4 Ensure that bases and pads are keyed into the structure to meet seismic restraint requirements where applicable.

3.23 EXCAVATION AND BACKFILL WORK

.1 Unless otherwise specified in Division 31, provide all excavation and backfill associated with the mechanical scope of work.

.2 Before commencement of excavation for work, determine in consultation with Consultant, Owner, Municipality and utilities, presence, if any, of existing underground services at site. Engage local utilities to locate and mark out such services. Ensure trades concerned are aware of their presence.

.3 Be responsible for any damage done to underground services caused by neglect to determine and mark out location of such services prior to excavation work commences.

.4 Where Work falls under jurisdiction of local governing utility, confirm requirements and comply with utility requirements.

.5 Unless otherwise specified in Division 31, provide excavation, backfill and related work required for mechanical work. Obtain a copy of soil test report if available from Consultant. Depth of excavations must accommodate local governing requirements and local standard practices to compensate for local frost levels of Place of the Work.

.6 Inverts and locations of existing site services may have been site surveyed and approximate location may be shown on drawings. Confirm inverts and locations are correct, prior to commencing excavation and contact Utilities to accurately locate their services. Where discrepancies are found, immediately inform Consultant, and await a direction. Grade bottom of trench excavations as required.

.7 In firm, undisturbed soil, lay pipes directly on soil, unless otherwise directed.

.8 Before backfilling, arrange for inspection of work by Consultant. Do not backfill work unless reviewed with Consultant. Failure to do so prior to backfilling will require re-excavating work and re-backfill at no additional cost to Owner.

.9 Unless otherwise specified, backfill trenches within building with clean sharp sand in individual layers of maximum 150 mm (6”) thickness compacted to a density of 100% Standard Proctor. Hand compact first layers up to a compacted level of minimum 300 mm (12") above top of pipe. Hand or machine compact the balance up to grade.

.10 Unless otherwise specified, backfill trenches outside the building (not under roads, parking lots or traffic areas), up to a compacted level of 450 mm (18") thick above the pipe, hand compacted to a density of 95% Standard Proctor, using granular "A" gravel. Backfill the balance in 150 mm (6") layers with approved excavated material, compacted to 95% Standard Proctor density.

.11 Unless otherwise specified, backfill trenches outside building under roads, parking lots or traffic areas with crushed stone or granular "A" gravel in layers not exceeding 150 mm (6") thickness, compacted to 100% Standard Proctor density up to grade level.

.12 Provide minimum 1.37 m (4.5') of cover for underground piping subject to freezing and located outside building.

.13 Provide minimum 450 mm (18") of cover for underground piping subject to freezing and located inside building.

.14 After first lift of backfill has been compacted, mark entire path of pipe using continuous 75 mm (3") wide detectable identified marking tape equal to SMS Ltd. D-UGMT.

.15 Unless otherwise directed in Division 02 and/or Division 31, store and dispose of excavated materials as follows:

.1 during progress of contract, place material as directed in such a manner to minimize damage or disfigurement of ground and which in no way impedes progress of work;

.2 separately place surplus topsoil and subsoil as directed; leave site clean and unencumbered.

.16 Perform pumping as required to keep excavations free of water.

.17 Engage services of independent soils testing agency to test final backfill compaction density of each backfilled location. Compact backfill to satisfaction of testing agency and in accordance with Specification. Submit a copy of testing agency's report to Consultant for review.

.18 Fill depressions to correct grade level with appropriate material, after an adequate period has passed to reveal any settlement. Use maximum possible compaction. Pay costs required to make good damages caused by settlement.

.19 Coordinate requirements for final surface toppings (concrete, asphalt, pavers, grass sod, etc.) with General Contractor.

3.24 CUTTING, PATCHING AND CORE DRILLING

.1 Unless otherwise provided by General Trades, perform cutting, patching, and core drilling of existing building required for installation of mechanical work. Perform cutting in a neat and true fashion, with proper tools and equipment to Consultant’s approval. Patching is to exactly match existing finishes and be performed by tradesmen skilled in particular trade or application. Work is subject to review and acceptance by Consultant.

.2 Criteria for cutting holes for additional services:

.1 cut holes through slabs only; no holes to be cut through beams;

.2 cut holes 150 mm (6") diameter or smaller only; obtain approval from Structural Consultant for larger holes;

.3 keep at least 100 mm (4") clear from beam faces;

.4 space at least 3 hole diameters on centre;

.5 for holes that are required closer than 25% of slab span from supporting beam face, use cover meter above slab to clear slab top bars;

.6 for holes that are required within 50% of slab span, use cover meter underside of slab to clear slab bottom bars;

.7 submit sleeving drawings indicating holes and their locations for Structural Consultant's review.

.3 Do not cut or drill any existing work without approval from Owner and Consultant. Be responsible for damage done to building and services caused by cutting or drilling.

.4 Where pipes pass through existing construction, core drill an opening. Size openings to leave 12 mm (½") clearance around pipes or pipe insulation.

.5 Prior to drilling or cutting an opening, determine, in consultation with Consultant and Owner, and by use of non-destructive radar scan (magnetic scan) of slab or wall, presence of any existing services and reinforcement bars concealed behind building surface to be cut and locate openings to suit. Coring is not permitted through concrete beams or girders.

.6 Where drilling is required in waterproof slabs, size opening to permit snug and tight installation of a pipe sleeve sized to leave 12 mm (½") clearance around pipe or pipe insulation. Provide a pipe sleeve, constructed of Schedule 40 galvanized steel pipe with a flange at one end and of a length to extend 100

mm (4") above slab, in opening. Secure flange to the underside of slab and caulk void between sleeve and slab opening with proper non-hardening silicone base caulking compound to produce a water-tight installation.

.7 Firestop and seal openings in fire rated construction. Do not leave openings open overnight unless approved by Owner and Consultant.

3.25 PACKING AND SEALING CORE DRILLED PIPE OPENINGS

.1 Pack and seal void between pipe opening and pipe or pipe insulation for length of opening as follows:

.1 non-fire rated interior construction – pack with mineral wool and seal both ends of opening with non-hardening silicone base caulking compound to produce a water-tight seal;

.2 exterior walls above grade – pack with mineral wool and seal both ends of sleeves water-tight with non-hardening silicone base caulking compound unless mechanical type seals have been specified;

.3 exterior walls below grade (and any other wall where water leakage may be a problem) – seal with link type mechanical seals as specified.

3.26 FLASHING FOR MECHANICAL WORK PENETRATING ROOF

.1 Unless otherwise specified in Division 07, perform required flashing work, including counter-flashing, for mechanical work penetrating and/or set in roof.

.2 Perform flashing work in accordance with requirements of drawing details and/or requirements specified in Division 07.

3.27 CLEANING MECHANICAL WORK

.1 Refer to cleaning requirements specified in Division 01.

.2 Clean mechanical work prior to application for Substantial Performance of the Work.

.3 Include for vacuum cleaning interior of air handling units and ductwork systems.

3.28 CONNECTIONS TO OTHER EQUIPMENT

.1 Carefully examine Contract Documents during bidding period and include for mechanical work piping and/or ductwork connections to equipment requiring such connections.

3.29 SEISMIC RESTRAINT ANCHOR POINTS FOR EQUIPMENT

.1 Where mechanical equipment requires seismic restraint, it is to be complete with manufacturer designed and rated seismic restraint anchor points and attachments, certified by equipment manufacturers, so equipment may be bolted down or restrained in the field.

.2 Equipment to be restrained must be designed such that the strength and anchorage of the internal components of equipment exceeds force level used to restrain and anchor equipment itself to the supporting structure.

3.30 INSTALLATION OF FLEXIBLE CONNECTORS

.1 Provide flexible connectors in piping connections to seismically restrained equipment, where applicable, and wherever else shown.

.2 Provide flexible connectors in piping connections to vibration isolated equipment.

3.31 FAN NOISE LEVELS

.1 Submit sound power levels with fan shop drawings/product data, with levels measured to AMCA 300 and calculated to AMCA 301.

3.32 EQUIPMENT AND SYSTEM MANUFACTURER'S CERTIFICATION

.1 When equipment/system installation is complete, but prior to start-up procedures, arrange and pay for equipment/system manufacturer's authorized representative to visit site to examine installation, and after any required corrective measures have been made, to certify in writing to Consultant that equipment/system installation is complete and in accordance with equipment/system manufacturer's instructions.

3.33 EQUIPMENT AND SYSTEM START-UP

.1 When installation of equipment/systems is complete but prior to commissioning, perform start-up for equipment/systems as specified in mechanical work Sections in accordance with following requirements:

.1 submit a copy of each equipment/system manufacturer's start-up report sheet to Consultant for review, and incorporate any comments made by Consultant;

.2 under direct on-site supervision and involvement of equipment/system manufacturer's representative, start-up equipment/systems, make any required adjustments, document procedures, leave equipment/systems in proper operating condition, and submit to Consultant complete set of start-up documentation sheets signed by manufacturer/supplier and Contractor.

End of Section

1 General

1.01 SECTION INCLUDES

.1 This Section specifies requirements, criteria, methods and execution for mechanical demolition work that are common to one or more mechanical work Sections, and it is intended as a supplement to each Section and is to be read accordingly.

2 Products – Not Used

3 Execution

3.01 DISCONNECTION AND REMOVAL OF EXISTING MECHANICAL WORK

.1 Where indicated on drawings, disconnect and remove existing mechanical work, including hangers, supports, insulation, etc. Disconnect at point of supply, remove obsolete connecting services and make system safe. Cut back obsolete piping behind finishes and cap water-tight unless otherwise specified.

.2 Scope and extent of demolition or revision work is only generally indicated on drawings. Estimate scope, extent and cost of work at site during bidding period site visit(s). Claims for extra costs for demolition work not shown or specified but clearly visible or ascertainable at site during bidding period site visits will not be allowed.

.3 If any re-design is required due to discrepancies between mechanical drawings and site conditions, notify Consultant who will issue a Site Instruction. If, in the opinion of Consultant, discrepancies between mechanical drawings and actual site conditions are of a minor nature, required modifications are to be done at no additional cost.

.4 Where existing mechanical services extend through, or are in an area to serve items which are to remain, maintain services in operation. Include for rerouting existing services concealed behind existing finishes and which become exposed during renovation work, so as to be concealed behind new or existing finishes.

.5 Unless otherwise specified, remove from site and dispose of existing materials which have been removed and are not to be relocated or reused.

3.02 ROOFING WORK

.1 Where roof revisions and/or replacements are part of project, include for disconnecting, lifting, or temporarily removing mechanical equipment on roof as required to permit completion of roofing work, and for re-installing equipment when roofing work is complete.

End of Section

1 General

1.01 REFERENCES

.1 Division 00 and Division 01 apply to and are a part of this Section.

1.02 APPLICATION

.1 This Section specifies requirements that are common to Mechanical Divisions work Sections and it is a supplement to each Section and is to be read accordingly. Where requirements of this Section contradict requirements of Divisions 00 or 01, conditions of Division 00 or Division 01 to take precedence.

.2 Be responsible for advising product vendors of requirements of this Section.

1.03 DEFINITIONS

.1 "concealed" – means hidden from normal sight in furred spaces, shafts, ceiling spaces, walls and partitions.

.2 "exposed" – means work normally visible, including work in equipment rooms, service tunnels, and similar spaces.

.3 "finished" - means when in description of any area or part of an area or a product which receives a finish such as paint, or in case of a product may be factory finished.

.4 “provision” or "provide" (and tenses of "provide") – means supply and install complete.

.5 "install" (and tenses of "install") – means secure in position, connect complete, test, adjust, verify and certify.

.6 "supply" – means to procure, arrange for delivery to site, inspect, accept delivery and administer supply of products; distribute to areas; and include manufacturer’s supply of any special materials, standard on site testing, initial start-up, programming, basic commissioning, warranties and manufacturers’ assistance to Contractor.

.7 "delete" or "remove" (and tenses of "delete" or “remove”) – means to disconnect, make safe, and remove obsolete materials; patch and repair/finish surfaces to match adjoining similar construction; include for associated re-programming of systems and/or change of documentation identifications to suit deletions, and properly dispose of deleted products off site unless otherwise instructed by Owner and reviewed with Consultant.

.8 "BAS" – means building automation system; "BMS" – means building management system; "FMS" – means facility management system; and “DDC” means direct digital controls; references to "BAS", "BMS", "FMS" and “DDC” generally mean same.

.9 "governing authority" and/or "authority having jurisdiction" and/or "regulatory authority" and/or "Municipal authority" – means government departments, agencies, standards, rules and regulations that apply to and govern work and to which work must adhere.

.10 "OSHA" and "OHSA" – stands for Occupational Safety and Health Administration and Occupational Health and Safety Act, and wherever either one is used, they are to be read to mean local governing occupational health and safety regulations that apply to and govern work and to which work must adhere, regardless if Project falls within either authority's jurisdiction.

.11 "Mechanical Divisions" – refers to Divisions 20, 21, 22, 23, 25 and other Divisions as specifically noted, and which work as defined in Specifications and/or on drawings is responsibility of Mechanical Contractor, unless otherwise noted.

.12 "Electrical Divisions" – refers to Divisions 26, 27, 28 and other Divisions as specifically noted, and which work as defined in Specifications and/or on drawings is responsibility of Electrical Contractor, unless otherwise noted.

.13 "Consultant" – means person, firm or corporation identified as such in Agreement or Documents, and is licensed to practice in Place of the Work, and has been appointed by Owner to act for Owner in a professional capacity in relation to the Work.

.14 Wherever words "indicated", "shown", "noted", "listed", or similar words or phrases are used in Contract Documents they are understood, unless otherwise defined, to mean product referred to is "indicated", "shown", "listed", or "noted" on Contract Documents.

.15 Wherever words "reviewed", "satisfactory", "as directed", "submit", or similar words or phrases are used in Contract Documents they are understood, unless otherwise defined, to mean that work or product referred to is "reviewed by", "to the satisfaction of", "submitted to", etc., Consultant.

1.04 DOCUMENTS

.1 Documents for bidding include but are not limited to issued Drawings, Specifications and Addenda.

.2 Specification is arranged in accordance with CSI/CSC 49 Divisions of MasterFormat.

.3 Drawings and Specifications are portions of Contract Documents and identify labour, products and services necessary for performance of work and form a basis for determining pricing. They are intended to be cooperative. Perform work that is shown, specified, or reasonably implied on the drawings but not mentioned in Specification, or vice-versa, as though fully covered by both.

.4 Review Drawings and Specifications in conjunction with documents of other Divisions and, where applicable, Code Consultant’s report.

.5 Unless otherwise specifically noted in Specifications and/or on Drawings, Sections of Mechanical Divisions are not intended to delegate functions nor to delegate work and supply of materials to any specific trade, but rather to generally designate a basic unit of work, and Sections are to be read as a whole.

.6 Drawings are performance drawings, diagrammatic, and show approximate locations of equipment and connecting services. Any information regarding accurate measurement of building is to be taken on site. Do not scale Drawings, and do not use Drawings for prefabrication work.

.7 Drawings are intended to convey the scope of work and do not show architectural and structural details. Provide, at your cost, offsets, fittings, transformations and similar products required as a result of obstructions and other architectural and/or structural details but not shown on Drawings.

.8 Locations of equipment and materials shown may be altered, when reviewed by Consultant, to meet requirements of equipment and/or materials, other equipment or systems being installed, and of building, all at no additional cost to Contract.

.9 Specification does not generally indicate specific number of items or amounts of material required. Specification is intended to provide product data and installation requirements. Refer to schedules, Drawings (layouts, riser diagrams, schematics, details) and Specification to provide correct quantities. Singular may be read as plural and vice versa.

.10 Starter/motor control centre (MCC)/variable frequency drive (VFD) schedule drawings are both mechanical and electrical, and apply to work of Mechanical Divisions and Electrical Divisions. Be responsible for reviewing starter, MCC, VFD, and motor specification requirements prior to Bid submission. Confirm and coordinate exact scope of work and responsibility of work between Mechanical Divisions and Electrical Divisions.

.11 Drawings and Specifications have been prepared solely for use by party with whom Consultant has entered into a contract and there are no representations of any kind made by Consultant to any other party.

.12 In the case of discrepancies between the drawings and specifications, documents will govern in order specified in “General Conditions”, however, when scale and date of drawings are same, or where discrepancy exists within specification, most costly arrangement will take precedence.

1.05 METRIC AND IMPERIAL MEASUREMENTS

.1 Generally, both metric and imperial units of measurement are given in Sections of Specification governed by this section. Measurement conversions may be generally "soft" and rounded off. Confirm exact measurements based on application. Where measurements are related to installation and onsite applications, confirm issued document measurements with applicable local code requirements, and/or as applicable, make accurate measurements onsite. Where significant discrepancies are found, immediately notify Consultant for direction.

1.06 EXAMINATION OF DOCUMENTS AND SITE

.1 Carefully examine Documents and visit site to determine and review existing site conditions that will or may affect work, and include for such conditions in Bid Price.

.2 Report to Consultant, prior to Bid Submittal, any existing site condition that will or may affect performance of work as per Documents. Failure to do so will not be grounds for additional costs.

.3 Upon finding discrepancies in, or omissions from Documents, or having doubt as to their meaning or intent, immediately notify Consultant, in writing.

1.07 WORK STANDARDS

.1 Where any code, regulation, bylaw, standard, contract form, manual, printed instruction, and installation and application instruction is quoted it means, unless otherwise specifically noted, latest published edition at time of submission of Bids adopted by and enforced by local governing authorities having jurisdiction. Include for compliance with revisions, bulletins, supplementary standards or amendments issued by local governing authorities.

.2 Where regulatory codes, standards and regulations are at variance with Drawings and Specification, more stringent requirement will apply unless otherwise directed by Owner and reviewed with Consultant.

.3 Supplementary mandatory specification and requirements to be used in conjunction with project include but are not limited to following:

.1 Air-Conditioning, Heating and Refrigeration Institute (AHRI);

.2 Air Movement and Control Association (AMCA);

.3 American Iron and Steel Institute (AISI);

.4 American National Standards Institute (ANSI);

.5 American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., (ASHRAE);

.6 American Society of Mechanical Engineers (ASME);

.7 American Society of Testing and Materials (ASTM);

.8 American Water Works Association (AWWA);

.9 Associated Air Balance Council (AABC);

.10 Building Industry Consulting Services, International (BICSI);

.11 Canadian Gas Association (CGA);

.12 Canadian General Standards Board (CGSB);

.13 Canadian Standards Association (CSA);

.14 Electrical and Electronic Manufacturers Association of Canada (EEMAC);

.15 Electrical Safety Authority (ESA);

.16 Electronic Industries Association (EIA);

.17 Factory Mutual Systems (FM);

.18 Illuminating Engineering Society (IES);

.19 Institute of Electrical and Electronic Engineers (IEEE);

.20 International Standards Organization (ISO);

.21 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS);

.22 National Building Code of Canada (NBC);

.23 National Electrical Manufacturers Association (NEMA);

.24 National Environmental Balancing Bureau (NEBB);

.25 National Fire Protection Association (NFPA);

.26 National Standards of Canada;

.27 NSF International;

.28 Occupational Health and Safety Act (OHSA);

.29 Ontario Building Code (OBC);

.30 Ontario Electrical Safety Code (OESC);

.31 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA);

.32 Technical Standards and Safety Authority (TSSA);

.33 Thermal Insulation Association of Canada (TIAC);

.34 Underwriters’ Laboratories of Canada (ULC);

.35 Workplace Hazardous Materials Information System (WHMIS);

.36 Material Safety Data Sheets by product manufacturers;

.37 Local utility inspection permits;

.38 Codes, standards, and regulations of local governing authorities having jurisdiction;

.39 Additional codes and standards listed in Trade Sections;

.40 Owner’s standards.

.4 Provide applicable requirements for barrier free access in accordance with latest edition of local governing building code.

.5 Where any governing Code, Regulation, or Standard requires preparation and submission of special details or drawings for review they are to be prepared and submitted to appropriate authorities. Be responsible for costs associated with these submittals.

.6 Unless otherwise specified, install equipment in accordance with equipment manufacturer's recommendations and instructions, and requirements of governing Codes, Standards, and Regulations. Governing Codes, Standards, and Regulations take precedence over manufacturer's instructions.

.7 Work is to be performed by journeyperson tradesmen who perform only work that their certificates permit, or by apprentice tradesmen under direct on site supervision of experienced journeyperson tradesman. Journeyperson to apprentice ratio is not to exceed ratio determined by the Board as stated in Ontario College of Trades and Apprenticeship Act or local equivalent governing body in Place of the Work.

.8 Journeyperson tradesmen are to have a copy of valid trade certificates available at site for review with Consultant at any time.

.9 Experienced and qualified superintendent is to be on-site at times when work is being performed.

.10 Coordinate work inspection reviews and approvals with governing inspection department to ensure that construction schedule is not delayed. Be responsible for prompt notification of deficiencies to Consultant and submission of reports and certificates to Consultant.

.11 Properly protect equipment and materials on site from damage due to elements and work of trades, to satisfaction of Owner and reviewed with Consultant. Equipment and materials are to be in new condition upon Substantial Performance of the Work.

.12 Mechanical piping system work, including equipment, must comply in all respects with requirements of local technical standards authorities and CSA B51, Boiler, Pressure Vessels and Pressure Piping Code. Where required, mechanical work products must bear a CRN number.

.13 Electrical items associated with mechanical equipment are to be certified and bear stamp or seal of a recognized testing agency such as CSA, UL, ULC, ETL, etc., or bear a stamp to indicate special electrical utility approval.

1.08 PERMITS, CERTIFICATES, APPROVALS, AND FEES

.1 Contact and confirm with local authorities having jurisdiction including utility providers, requirements for approvals from such authorities. Obtain and pay for permits, certificates, and approvals required to complete Work.

.2 Be responsible for ensuring that authorities having jurisdiction which require on-site inspection of work, have ample notification to perform inspection, with sufficient lead time to correct deficiencies in a manner that will not impede schedule of completion of Work. If any defect, deficiency or non-compliant is found in work by inspection, be responsible for costs of such inspection, including any related expenses, making good and return to site, until work is passed by governing authorities.

.3 Obtain and submit to Consultant, approval/inspection certificates issued by governing authorities to confirm that Work as installed is in accordance with rules and regulations of local governing authorities and are acceptable.

.4 Include in each copy of operating and maintenance instruction manuals, copies of approvals and inspection certificates issued by regulatory authorities.

1.09 REQUIREMENTS FOR CONTRACTOR RETAINED ENGINEERS

.1 Professional engineers retained to perform consulting services with regard to Project work, i.e. seismic engineer, fire protection engineer or structural engineer, are to be members in good standing with local Association of Professional Engineers, and are to carry and pay for errors and omissions professional liability insurance in compliance with requirements of governing authorities in Place of the Work.

.2 Retained engineer's professional liability insurance is to protect Contractor's consultants and their respective servants, agents, and employees against any loss or damage resulting from professional services rendered by aforementioned consultants and their respective servants, agents, and employees in regards to the Work of this Contract.

.3 Unless otherwise specified in Division 00 or 01, liability insurance requirements are as follows:

.1 coverage is to be a minimum of $1,000,000.00 CDN inclusive of any one occurrence;

.2 insurance policy is not to be cancelled or changed in any way without insurer giving Owner minimum thirty days written notice;

.3 liability insurance is to be obtained from an insurer registered and licensed to underwrite such insurance in the Place of the Work;

.4 retained consultants are to ascertain that sub-consultants employed by them carry insurance in the form and limits specified above;

.5 evidence of the required liability insurance in such form as may be required is to be issued to Owner, Owner's Consultant, and Municipal Authorities as required prior to commencement of aforementioned consultant's services.

1.10 WORKPLACE SAFETY

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials. Submit WHMIS MSDS (Material Safety Data Sheets) for products where required, and maintain one copy at site in a visible and accessible location available to personnel.

.2 Comply with requirements of Occupational Health and Safety Act and other regulations pertaining to health and safety, including worker's compensation/insurance board and fall protection regulations. When working in confined spaces, comply with requirements of Occupational Health and Safety Act - Ontario Regulation 632, "Confined Spaces" and any other applicable Ministry of Labour requirements.

.3 If at any time during course of work, hazardous materials other than those identified in Documents and pertaining to Project Scope of Work, are encountered or suspected that were not identified as being present and which specific instructions in handling of such materials were not given, cease work in area in question and immediately notify Consultant. Comply with local governing regulations with regards to working in areas suspected of containing hazardous materials. Do not resume work in affected area without approval from Owner and reviewed with Consultant.

1.11 PLANNING AND LAYOUT OF WORK

.1 Base installation layout, design, terminations, and supply of accessories, on Contract Documents with specific coordination with reviewed shop drawings.

.2 Plan, coordinate, and establish exact locations and routing of services with affected trades prior to installation such that services clear each other as well as other obstructions. Generally, order of right of way for services to be as follows:

.1 piping requiring uniform pitch;

.2 piping 100 mm (4") dia. and larger;

.3 large ducts (main runs);

.4 cable tray and bus duct;

.5 conduit 100 mm (4") dia. and larger;

.6 piping less than 100 mm (4") dia.;

.7 smaller branch ductwork;

.8 conduit less than 100 mm (4") dia..

.3 Unless otherwise shown or specified, conceal work in finished areas, and conceal work in partially finished and/or unfinished areas to extent made possible by the area construction. Install services as high as possible to conserve headroom and/or ceiling space. Notify Consultant where headroom or ceiling space appears to be inadequate prior to installation of work.

.4 Do not use Contract Drawing measurements for prefabrication and layout of piping, sheet metal work and such other work. Locations and routing are to generally be in accordance with Contract Drawings, however, prepare layout drawings for such work. Use established bench marks for both horizontal and vertical measurements. Confirm inverts, coordinate with and make allowances for work of other trades. Accurately layout work, and be entirely responsible for work installed in accordance with layout drawings. Where any invert, grade, or size is at variance with Contract Drawings, notify Consultant prior to proceeding with work.

.5 Prepare plan and interference drawings (at a minimum drawing scale of 1:50 or ¼"=1' 0") of work for coordination with each trade Contractor. Arrange for preparation of detailed section drawings of ceiling spaces of corridors and any other congested areas. Sections are to be cross referenced with plan drawings so that trades may make use of section drawings. Section drawings to indicate lateral and elevation dimensions of major services within ceiling space. Lateral dimensions are to be from grid lines and elevations from top of floor slab. Obtain from Consultant, engineering drawings for this use. Contractors' interference drawings are to be distributed among other Trade Contractors. Submit drawings to Consultant for review. Failure of General Contractor to prepare and coordinate overall interface drawings of trades does not relieve respective Division Contractor of responsibility to ensure that work is properly planned and coordinated.

.6 Carry out alterations in arrangement of work that has been installed without proper coordination, study, and review, even if in accordance with Contract Documents, in order to conceal work behind finishes, or to allow installation of other work, without additional cost. In addition, make necessary alterations in other work required by such alterations, without additional cost.

.7 Shut-off valves, balancing devices, air vents, equipment and similar products, particularly such products located above suspended ceilings must be located for easy access for servicing and/or removal. Products which do not meet this location requirement are to be relocated to an accessible location at no additional cost.

.8 Be responsible for making necessary changes, at no additional cost, to accommodate structural and building conditions that were missed due to lack of coordination.

1.12 PHASING

.1 Include for any and all scheduling, coordination, and construction phasing to suit project, specified in Division 01 and/or as indicated on the drawings. Review exact phasing requirements with Consultant prior to start of Work.

.2 Phasing and scheduling of Work is required in order to maintain existing building operations. Include costs (including costs for "off hours" work) for scheduling, co-ordination, and construction phasing to suit

this project as specified in Division 01 and on drawings. Review phasing requirements with Consultant prior to start of Work.

.3 Protect existing areas above, below and adjacent areas of Work from any debris, noise, or interruptions to existing services to satisfaction of Owner and reviewed with Consultant. Maintain in operation existing services to these areas to allow Owner to continue use of these areas. If services that are required to be maintained run through areas of renovations, provide necessary protection to services or reroute, in coordination with Owner and Consultant. Include for required premium time work to meet these requirements.

.4 Work being performed within occupied spaces and work affecting surfaces adjacent to occupied spaces may need to be performed after regular business hours. For areas where spaces are used by Owner on a 24 hours basis or over various hours, coordinate hours of work with Owner on a regular basis to suit Owner's schedule. Execute work at times confirmed with and agreed to by Owner and reviewed with Consultant, so as not to inconvenience Owner's occupation or in any way hinder Owner's use of building. Include for required premium timework to meet these requirements.

.5 Project partial occupancy permits may be required throughout project. Provide for each partial permit, required local governing authority certificate and any other testing/verification certificates for systems.

1.13 COORDINATION OF WORK

.1 Review Contract Documents and coordinate work with work of each trade. Coordination requirements are to include but not be limited to following:

.1 requirements for openings, sleeves, inserts and other hardware necessary for installation of work;

.2 concrete work such as housekeeping pads, sumps, bases, etc., required for work, and including required dimensions, operating weight of equipment, location, etc.;

.3 depth and routing of excavation required for work, and requirements for bedding and backfill;

.4 wiring work required for equipment and systems but not specified to be done as part of mechanical work, including termination points, wiring type and size, and any other requirements.

.2 Ensure materials and equipment are delivered to site at proper time and in such assemblies and sizes so as to enter into building and be moved into spaces where they are to be located without difficulty.

.3 Wherever possible, coordinate equipment deliveries with manufacturers and/or suppliers so equipment is delivered to site when it is required, or so it can be stored within building, subject to available space as confirmed with Owner and reviewed with Owner, and protected from elements.

.4 Ensure proper access and service clearances are maintained around equipment, and, where applicable, access space for future equipment removal or replacement is not impeded. Comply with code requirements with regards to access space provision around equipment. Remove and replace any equipment which does not meet this requirement.

.5 Where work is to be integrated, or is to be installed in close proximity with work of other trades, coordinate work prior to and during installation.

1.14 PRODUCTS

.1 Be responsible for ordering of products (equipment and materials) in a timely manner in order to meet project-scheduling timelines. Failure to order products to allow manufacturers sufficient production/delivery time to meet project-scheduling timelines is an unacceptable reason to request for other suppliers or substitutions.

.2 Provide Canadian manufactured products wherever possible or required and when quality and performance is obtainable at a competitive price. Products are to be supplied from manufacturer's

authorized Canadian representative, unless otherwise noted. Unless otherwise specified, products are to be new and are to comply with applicable respective Canadian standards. References to UL listings of products to include requirements that products are to be also Underwriters Laboratories of Canada (ULC) listed for use in Canada. Products are to meet or exceed latest ANSI/ASHRAE/IES 90.1 standards, as applicable. Do not supply any products containing asbestos materials or PCB materials.

.3 Systems and equipment of this Project are to be "State of the Art" and be most recent and up to date series/version of product that is available at time of shop drawing review process. Products that have been stored or "on shelf" for an extended period of time will not be accepted. Software is to be of latest version available and be provided with updates available at time of shop drawing review process. Systems are to be designed such that its software is backwards compatible. Future upgrades are not to require any hardware replacements or additions to utilize latest software.

.4 Products scheduled and/or specified have been selected to establish a performance and quality standard, and, in some instances, a dimensional standard. In most cases, base specified manufacturers are stated for any product specified by manufacturer’s name and model number. Where acceptable manufacturers are listed, first name listed is base specified company. Bid Price may be based on products supplied by any of manufacturers’ base specified or named as acceptable for particular product. If acceptable manufacturers are not stated for a particular product, base Bid Price on product supplied by base specified manufacturer.

.5 Documents have been prepared based on product available at time of Bidding. If, after award of Contract, and if successful manufacturer can no longer supply a product that meets base specifications, notify Consultant immediately. Be responsible for obtaining other manufacturers product that complies with base specified performance and criteria and meets project timelines. Proposed products are subject to review and consideration by Consultant and are considered as substitutions subject to a credit to Contract. In addition, if such products require modifications to room spaces, mechanical systems, electrical systems, etc., include required changes. Such changes are to be submitted in detail to Consultant for review and consideration for acceptance. There will be no increase in Contract Price for revisions. Above conditions supplement and are not to supersede any specification conditions with regards to substitutions or failure to supply product as per issued documents.

.6 Listing of a product as "acceptable" does not imply automatic acceptance by Consultant and/or Owner. It is responsibility of Contractor to ensure that any price quotations received and submittals made are for products that meet or exceed specifications included herein.

.7 If products supplied by a manufacturer named as acceptable are used in lieu of base specified manufacturer, be responsible for ensuring that they are equivalent in performance and operating characteristics (including energy consumption if applicable) to base specified products. It is understood that any additional costs (i.e. for larger starters, larger feeders, additional spaces, etc.), and changes to associated or adjacent work resulting from provision of product supplied by a manufacturer other than base specified manufacturer, is included in Bid Price. In addition, in equipment spaces where equipment named as acceptable is used in lieu of base specified equipment and dimensions of such equipment differs from base specified equipment, prepare and submit for review accurately dimensioned layouts of rooms affected, identifying architectural and structural elements, systems and equipment to prove that equipment in room will fit properly meeting design intent. There will be no increase in Contract Price for revisions.

.8 In addition to manufacturer’s products base specified or named as acceptable, other manufacturers of products may be proposed as substitutions to Consultant for review and consideration for acceptance, listing in each case a corresponding credit for each substitution proposed. However, base Bid Price on products base specified or named as acceptable. Certify in writing to Consultant that proposed substitution meets space, power, design, energy consumption, and other requirements of base specified or acceptable product. It is understood that there will be no increase in Contract Price by reason of any changes to associated equipment, mechanically, electrically, structurally or architecturally, required by acceptance of proposed substitution. Consultant has sole discretion in accepting any such proposed substitution of product. Indicate any proposed substitutions in areas provided on Bid Form. Do not order such products until they are accepted in writing by Consultant.

.9 Where products are listed as "or approved equal", certify in writing that product to be used in lieu of base specified product, at least meets space, power, design, energy consumption, and other requirements of base specified product and is equivalent or better than base specified product. When requested by Consultant, provide full design detail drawings and specifications of proposed products. Acceptance of these "or approved equal" products is at sole discretion of Consultant. It is understood that there will be no increase in Contract Price by reason of any changes to associated equipment, mechanically, electrically, structurally or architecturally, required by acceptance of approved equal product. There must be no increase in Contract price due to Consultant’s rejection of proposed equivalent product.

.10 Whenever use of product other than base specified product is being supplied, ensure corresponding certifications and product information (detailed catalogue and engineering data, fabrication information and performance characteristics) are submitted to Consultant for review. Failure of submission of these documents to Consultant in a timely manner to allow for review will result in base specified product to be supplied at Consultant’s discretion, at no additional cost to Contract.

.11 Products supplied by a manufacturer/supplier other than a manufacturer listed as acceptable may be considered for acceptance by Consultant if requested in writing with full product documentation submitted, a minimum of 10 working days prior to Bid closing date.

.12 Any proposed changes initiated by Contractor after award of Contract may be considered by Consultant at Consultant’s discretion, with any additional costs for such changes if accepted by Owner and reviewed with Consultant, and costs for review, to be borne by Contractor.

.13 Whenever use of product other than based specified products or named as acceptable is being supplied, time for process of submission of other products and Consultant's review of products will not alter contract time or delay work schedule.

1.15 SHOP DRAWINGS

.1 At start-up meeting, review with Consultant products to be included in shop drawing submission. Prepare and submit list of products to Consultant for review.

.2 Submit electronic copies of shop drawings unless otherwise directed by Consultant. Coordinate exact requirements with Consultant.

.3 Submit for review, drawings showing detail design, construction, and performance of equipment and materials as requested in Specification. Submit shop drawings to Consultant for review prior to ordering and delivery of product to site. Include minimally for preparation and submission of following, as applicable:

.1 product literature cuts;

.2 equipment data sheets;

.3 equipment dimension drawings;

.4 system block diagrams;

.5 sequence of operation;

.6 connection wiring schematic diagrams;

.7 functionality with integrated systems.

.4 Each shop drawing or product data sheet is to be properly identified with project name and product drawing or specification reference. Shop drawing or product data sheet dimensions are to match dimension type on drawings.

.5 Where any item of equipment is required by Code or Standard or By-Law to meet a specific energy efficiency level, or any other specific requirement, ensure this requirement is clearly indicated on submission.

.6 Ensure proposed products meet each requirement of Project. Endorse each shop drawing copy "CERTIFIED TO BE IN ACCORDANCE WITH ALL REQUIREMENTS". Include company name, submittal date, and sign each copy. Shop drawings that are received and are not endorsed, dated and signed will be returned to be resubmitted.

.7 Consultant to review shop drawings and indicate review status by stamping shop drawing copies as follows:

.1 "REVIEWED" or "REVIEWED AS NOTED" (appropriately marked) – If Consultant's review of shop drawing is final, Consultant to stamp shop drawing;

.2 "RETURNED FOR CORRECTION" – If Consultant's review of shop drawing is not final, Consultant to stamp shop drawing as stated above, mark submission with comments, and return submission. Revise shop drawing in accordance with Consultant's notations and resubmit.

.8 Following is to be read in conjunction with wording on Consultant's shop drawing review stamp applied to each and every shop drawing or product data sheet submitted:

.1 "THIS REVIEW BY CONSULTANT IS FOR SOLE PURPOSE OF ASCERTAINING CONFORMANCE WITH GENERAL DESIGN CONCEPT. THIS REVIEW DOES NOT MEAN THAT CONSULTANT APPROVES DETAILED DESIGN INHERENT IN SHOP DRAWINGS, RESPONSIBILITY FOR WHICH REMAINS WITH CONTRACTOR. CONSULTANT'S REVIEW DOES NOT RELIEVE CONTRACTOR OF RESPONSIBILITY FOR ERRORS OR OMISSIONS IN SHOP DRAWINGS OR OF CONTRACTOR'S RESPONSIBILITY FOR MEETING REQUIREMENTS OF CONTRACT DOCUMENTS. BE RESPONSIBLE FOR DIMENSIONS TO BE CONFIRMED AND CORRELATED AT JOB SITE, FOR INFORMATION THAT PERTAINS SOLELY TO FABRICATION PROCESSES OR TO TECHNIQUES OF CONSTRUCTION AND INSTALLATION, AND FOR COORDINATION OF WORK OF SUB-TRADES."

.9 Submit each system and each major component as separate shop drawing submissions. Submit together, shop drawings for common devices such as devices of each system are to be submitted together.

.10 Obtain shop drawings for submission from product manufacturer's authorized representatives and supplemented with additional items specified herein.

.11 Do not order product until respective shop drawing review process has been properly reviewed with Consultant.

.12 Where extended warranties are specified for equipment items, submit specified extended warranty with shop drawing submittal.

.13 Applicable mechanical equipment has been selected to meet energy efficiency requirements of ANSI/ASHRAE/IES 90.1, Energy Standards for Buildings, and shop drawings/product data submittals for such equipment must indicate compliance with this Standard or they will be returned for correction and re-submittal.

1.16 EQUIPMENT LOADS

.1 Supply equipment loads (self-weight, operating weight, housekeeping pad, inertia pads, etc.) to Consultant, via shop drawing submissions, prior to construction.

.2 Where given choice of specific equipment, actual weight, location and method of support of equipment may differ from those assumed by Consultant for base design. Back-check equipment loads, location, and supports, and include necessary accommodations.

.3 Where supporting structure consists of structural steel framing, it is imperative that equipment loads, location, and method of support be confirmed prior to fabrication of structural steel. Review locations of equipment with Consultant prior to construction.

1.17 OPENINGS

.1 Supply opening sizes and locations to Consultant to allow verification of their effect on design, and for inclusion on structural drawings where appropriate.

.2 No openings are permitted through completed structure without written approval from Owner and reviewed with Consultant. Show required openings on a copy of structural drawings. Identify exact locations, elevations, and size of proposed openings and submit to Consultant for review, well in advance of doing work.

.3 Prior to leaving site at end of each day, walk through areas of work and check for any openings, penetrations, holes, and/or voids created under scope of work of project, and ensure that any openings created under scope of work have been closed off, fire-stopped and smoke-sealed. Unless directed by Owner and reviewed with Consultant, do not leave any openings unprotected and unfinished overnight.

1.18 SCAFFOLDING, HOISTING AND RIGGING

.1 Unless otherwise specified or directed, supply, erect and operate scaffolding, rigging, hoisting equipment and associated hardware required for work, and subject to approval from Owner and reviewed with Consultant.

.2 Immediately remove from site scaffolding, rigging and hoisting equipment when no longer required.

.3 Do not place major scaffolding/hoisting equipment loads on any portion of structure without approval from Owner and reviewed with Consultant.

1.19 CHANGES IN THE WORK

.1 Whenever Consultant proposes in writing to make a change or revision to design, arrangement, quantity or type of work from that required by Contract Documents, prepare and submit to Consultant for review, a quotation being proposed cost for executing change or revision.

.2 Quotation is to be a detailed and itemized estimate of product, labour, and equipment costs associated with change or revision, plus overhead and profit percentages and applicable taxes and duties.

.3 Unless otherwise specified in Division 00 or 01, allowable maximum percentages for overhead and profit are to be 7% and 5% respectively.

.4 Unless otherwise specified in Divisions 00 or 01, following additional requirements apply to all quotations submitted:

.1 when change or revision involves deleted work as well as additional work, cost of deleted work (less overhead and profit percentages but including taxes and duties) is to be subtracted from cost of additional work before overhead and profit percentages are applied to additional work;

.2 material costs are not to exceed those published in local estimating price guides;

.3 mechanical material labour unit costs are to be in accordance with Mechanical Contractors Association of America Labor Estimating Manual, less 25%;

.4 electrical material labour unit costs are to be in accordance with National Electrical Contractors Association Manual of Labor Units at difficult level, less 25%;

.5 costs for journeyperson and apprentice labour must not exceed prevailing rates at time of execution of Contract and must reflect actual personnel performing work;

.6 cost for site superintendent must not exceed 10% of total hours of labour estimated for change or revision, and change or revision must be such that site superintendent's involvement is necessary;

.7 costs for rental tools and/or equipment are not to exceed local rental costs;

.8 overhead percentage will be deemed to cover quotation costs other than actual site labour and materials, and rentals;

.9 quotations, including those for deleted work, to include a figure for any required change to Contract time.

.5 Quotations submitted that are not in accordance with requirements specified above will be rejected and returned for re-submittal. Failure to submit a proper quotation to enable Consultant to expeditiously process quotation and issue a Change Order will not be grounds for any additional change to Contract time.

.6 Make requests for changes or revisions to work to Consultant in writing and, if Consultant agrees, will issue Notice of Change.

.7 Do not execute any change or revision until written authorization for the change or revision has been obtained from Consultant.

1.20 PROGRESS PAYMENT BREAKDOWN

.1 Prior to submittal of first progress payment draw, submit a detailed breakdown of work cost to assist Consultant in reviewing and approving progress payment claims.

.2 Payment breakdown is subject to Owner's approval and Consultant's review. Progress payments will not be processed until an approved breakdown is in place. Breakdown is to include one-time claim items such as mobilization and demobilization, insurance, bonds (if applicable), shop drawings and product data sheets, commissioning including testing, adjusting and balancing, system testing and verification, and project closeout submittals.

.3 Indicate equipment, material and labour costs for site services (if applicable) and indicate work of each trade in same manner as indicated on progress draw.

1.21 NOTICE FOR REQUIRED FIELD REVIEWS

.1 Whenever there is a requirement for Consultant to perform a field review prior to concealment of any work, to inspect/re-inspect work for deficiencies prior to Substantial Performance of the Work, for commissioning demonstrations, and any other such field review, give minimum 5 working days' notice in writing to Consultant.

.2 If Consultant is unable to attend a field review when requested, arrange an alternative date and time.

.3 Do not conceal work until Consultant advises that it may be concealed.

.4 When Consultant is requested to perform a field review and work is not ready to be reviewed, reimburse Consultant for time and travel expenses.

1.22 PRELIMINARY TESTING

.1 When directed by Consultant, promptly arrange, pay for, and perform site tests on any piece of equipment or any system for such reasonable lengths of time and at such times as may be required to prove compliance with Specification and governing Codes and Regulations, prior to Substantial Performance of the Work.

.2 When, in Consultant's opinion, tests are required to be performed by a certified testing laboratory, arrange and pay for such tests.

.3 These tests are not to be construed as evidence of acceptance of work, and it is agreed and understood that no claim for delays or damage will be made for injury or breakage to any part or parts of equipment or system due to test where such injuries or breakage were caused by faulty parts and/or workmanship of any kind.

.4 When, in Consultant's opinion, tests indicate that equipment, products, etc., are defective or deficient, immediately remove such equipment and/or products from site and replace them with acceptable equipment and/or products, at no additional cost.

1.23 PROVISIONS FOR SYSTEMS/EQUIPMENT USED DURING CONSTRUCTION

.1 Permanent building mechanical systems are not to be used for temporary heating or cooling purposes during construction.

1.24 TEMPORARY SERVICES

.1 Coordinate with Prime Contractor, requirements for temporary services including but not limited to temporary heating, cooling and water. Unless otherwise noted, provide required services in compliance with requirements of local governing building code and local governing inspection authorities.

.2 Maintain fire protection of areas which may include fire watch during temporary shutdowns of existing systems, in accordance with requirements of local governing code and local governing authorities.

1.25 MAINTAINING EQUIPMENT PRIOR TO ACCEPTANCE

.1 Maintain equipment in accordance with the manufacturer's printed instructions prior to start-up, testing and commissioning.

.2 Employ a qualified millwright to check and align shafts, drives, and couplings on all base mounted split coupled motor driven equipment.

.3 Where equipment lubrication fittings are not easily accessible, extend the fittings to accessible locations using copper or aluminium tubing.

.4 All filters are to be new upon Substantial Performance of the Work. This is in addition to any spare filters specified.

1.26 CLEANING

.1 During construction, keep site reasonably clear of rubbish and waste material resulting from work on a daily basis to the satisfaction of Owner and Consultant. Before applying for a Certificate of Substantial Performance of the Work, remove rubbish and debris, and be responsible for repair of any damage caused as a result of work.

.2 Clean equipment and devices installed as part of this project.

1.27 RECORD AS-BUILT DRAWINGS

.1 Drawings for this project have been prepared on a CAD system using AutoCAD software of release version reviewed with Consultant. For purpose of producing record "as built" drawings, copies of Contract Drawings can be obtained from Consultant.

.2 As work progresses at site, clearly mark in red in a neat and legible manner on a set of bound white prints of Contract Drawings, changes and deviations from routing of services and locations of equipment shown on Contract Drawings, on a daily basis. Changes and deviations include those made by addenda, change orders, and site instructions. Use notes marked in red as required. Maintain white print red line as-built

set at site for exclusive use of recording as-built conditions, keep set up-to-date at all times, and ensure set is always available for periodic review. As-built set is also to include the following:

.1 dimensioned location of inaccessible concealed work;

.2 locations of control devices with identification for each;

.3 for underground piping and ducts, record dimensions, invert elevations, offsets, fittings, cathodic protection and accessories if applicable, and locate dimensions from benchmarks to be preserved after construction is complete;

.4 for fire protection systems, record actual locations of equipment, sprinkler heads, and valves, drains, and test locations, and deviations of pipe routing and sizing from that shown on the drawings;

.5 location of piping system air vents;

.6 location of concealed services terminated for future extension and work concealed within building in inaccessible locations.

.3 Before applying for a Certificate of Substantial Performance of the Work, update a clean copy of Contract Drawing set in accordance with marked up set of "as-built" white prints including deviations from original Contract Drawings, thus forming an "as-built" drawing set. Submit "as-built" site drawing prints to Consultant for review. Make necessary revisions to drawings as per Consultant’s comments, to satisfaction of Consultant.

.4 Use final reviewed "as-built" drawing set to provide CAD files of drawings thus forming true "as-built" set of Contract Drawings. Identify set as "Project Record Copy". Load digital copies of final reviewed by Consultant as-built drawings onto USB type flash drive. Provide 2 complete sets of "as-built" drawings on separate USBs. Submit "as-built" sets of white prints and USBs to Consultant.

.5 Submitted drawings are to be of same quality as original Contract Drawings. CAD drawing files are to be compatible with AutoCAD software release version confirmed with Consultant.

.6 Unless otherwise noted in Divisions 00 or 01, failure to maintain accurate record drawings will incur additional 5% holdback on progress claims until drawings are brought up to date to satisfaction of Owner and reviewed with Consultant.

.7 For projects with phased turnover of project (refer to Division 01), review with Consultant completeness of as-built drawings prior to turn over of an area. Interim as-built drawings to be made available to Owner's maintenance personnel.

.8 Where part of the Mechanical Scope of Work, retain and pay for services of a land surveyor registered in Place of the Work to measure, verify, and record size, location, invert elevation and pitch of buried piping services, and, when complete, transfer survey work to as-built drawings.

1.28 OPERATING AND MAINTENANCE MANUALS

.1 For each item of equipment for which a shop drawing is required (except for simple equipment), supply indexed copies of equipment manufacturers' operating and maintenance (O&M) instruction data manuals. Consolidate each copy of data as a PDF file on a USB drive. Consolidated O&M manual PDF to include:

.1 front cover: project name; wording – "Mechanical Systems Operating and Maintenance Manual"; and date;

.2 introduction sheet listing Consultant, Contractor, and Subcontractor names, street addresses, telephone and fax numbers, and e-mail addresses;

.3 equipment manufacturer's authorized contact person name, telephone number and company website;

.4 Table of Contents sheet, and corresponding index tab sheets;

.5 copy of each "REVIEWED" or clean, updated "REVIEWED AS NOTED" shop drawing or product data sheet, with manufacturer's/supplier's name, telephone and fax numbers, email address, company website address, and email address for local source of parts and service; when shop drawings are returned marked "Reviewed As Noted" with revisions marked on shop drawing copies, they are to be revised by equipment supplier to incorporate comments marked on "Reviewed" shop drawings and a clean updated copy is to be included in operating and maintenance manuals;

.6 Operating data is to include:

.1 pressure test reports, and certificates issued by governing authorities;

.2 description of each system and its controls;

.3 control schematics for equipment/systems including building environmental controls;

.4 wiring and connection diagrams;

.5 if applicable, BAS architecture and all required operating data;

.6 description of operation of each system at various loads together with reset schedules and seasonal variances;

.7 operation instruction for each system and each component;

.8 description of actions to be taken in event of emergencies and/or equipment failure;

.9 valve tag schedule, and flow diagrams to indicate valve locations.

.7 Maintenance data is to include:

.1 operation and trouble-shooting instructions for each item of equipment and each system;

.2 schedules of tasks, frequency, tools required, and estimated task time;

.3 recommended maintenance practices and precautions;

.4 complete parts lists with numbers.

.8 Performance data is to include:

.1 equipment and system start-up data sheets;

.2 equipment performance verification test results, and final commissioning report;

.3 final testing, adjusting and balancing reports.

.9 copies of warranties;

.10 items requested specifically in Section Articles.

.2 Operating and maintenance instructions are to relate to job specific equipment supplied under this project and related to Owner's building. Language used in manuals is to contain simple practical operating terms and language easy for in-house maintenance staff to understand how to operate and maintain each system.

.3 Before applying for a Certificate of Substantial Performance of the Work, assemble one copy of O & M Manual and submit to Consultant for review prior to assembling remaining copies. Incorporate Consultant's comments into final submission.

1.29 COMMISSIONING

.1 After successful start-up and prior to Substantial Performance of the Work, commission the mechanical work. Commissioning work is the process of Contractor demonstrating to Owner and Consultant, for purpose of final acceptance, by means of successful and documented functional performance testing, that systems and/or subsystems are capable of being operated and maintained to perform in accordance with requirements of Contract Documents, as further described below.

.1 Retain services of a testing, adjusting, and balancing agency to perform testing and balancing of mechanical system air/fluid flows and capacities, prior to operational performance testing. Refer to Section 20 05 93 – Testing, Adjusting, and Balancing for Mechanical Systems.

.2 Test, adjust and operate equipment and systems after start-up but before functional performance testing, to confirm operations are in accordance with requirements of Contract Documents. Verify modes and sequences of control and monitoring, interlocks, and responses to emergency conditions. Complete commissioning data sheets to document successful operational performance testing.

.3 Repeat successful operational performance testing with completed commissioning data sheet documentation in the presence of Consultant and Owner to validate and verify equipment and systems are complete in all respects, function correctly, and are ready for acceptance.

.4 Submit final commissioning data sheets, TAB reports as specified in Section 20 05 93 – Testing, Adjusting, and Balancing for Mechanical Systems, project closeout documents, and other required submittals.

1.30 WARRANTY

.1 Unless otherwise specified in Divisions 00 and 01, warrant mechanical work to be in accordance with Contract Documents and free from defects for a period of two (2) years from date of issue of a Certificate of Substantial Performance of the Work.

.2 Where equipment includes extended warranty period, e.g., 5 years, first year of warranty period is to be governed by terms and conditions of warranty in Contract Documents, and remaining years of warranty are to be direct from equipment manufacturer and/or supplier to Owner. Submit signed and dated copies of extended warranties to Consultant.

.3 Warranty to include parts, labour, travel costs and living expenses incurred by manufacturer’s authorized technician to provide factory authorized on-site service.

.4 Repair and/or replace any defects that appear in Work within warranty period without additional expense to Owner. Be responsible for costs incurred in making defective work good, including repair or replacement of building finishes, other materials, and damage to other equipment. Ordinary wear and tear and damage caused wilfully or due to carelessness of Owner’s staff or agents is exempted.

.5 Do not include Owner deductible amounts in warranties.

.6 It is understood that warranties are to commence from time of Substantial Performance of the Work, regardless of what is noted within following Sections of Specification. Be responsible for providing whatever "bridging" or additional extended warranty period is required from time that material is purchased until this time.

.7 Visit building during warranty period with Owner representatives. Owner to organize these visits. At these meetings, Owner representatives are to review performance of systems. If performance is satisfactory,

then no further action needs to be taken. If unsatisfactory, then correct deficiencies, as directed by Owner representatives, to satisfaction of Owner's representatives. These site visits to occur:

.1 once during 1st month of building operation;

.2 once during 3rd month of building operation;

.3 once between 4th and 10th month in a season opposite to 1st and 3rd month visits.

1.31 CLOSEOUT SUBMITTALS

.1 Prior to application for Substantial Performance of the Work, submit required items and documentation specified, including following as applicable to the project:

.1 Operating and Maintenance Manuals;

.2 as-built record drawings and associated data;

.3 extended warranties for equipment as specified;

.4 operating test certificates, i.e. Sprinkler Test Certificate;

.5 final commissioning report and TAB report;

.6 identified keys for equipment and/or panels for which keys are required, and other items required to be submitted;

.7 other data or products specified.

1.32 INSTRUCTIONS TO OWNER

.1 Refer to equipment and system operational and maintenance training requirements specified in Division 01.

.2 Train Owner’s designated personnel in aspects of operation and maintenance of equipment and systems as specified. Demonstrations and training are to be performed by qualified technicians employed by equipment/system manufacturer/supplier. Supply hard copies of training materials to each attendee.

.3 Unless where specified otherwise in trade Sections, minimum requirements are for manufacturer/suppliers of each system and major equipment, to provide minimum two separate sessions each consisting of minimum 4 hours on site or in factory training (at Owner’s choice), of Owner’s designated personnel (for up to 6 people each session), on operation and maintenance procedures of system.

.4 For each item of equipment and for each system for which training is specified, prepare training modules as specified below. Use Operating and Maintenance Manuals during training sessions. Training modules include but are not limited to:

.1 Operational Requirements and Criteria – equipment function, stopping and starting, safeties, operating standards, operating characteristics, performance curves, and limitations;

.2 Troubleshooting – diagnostic instructions, test and inspection procedures;

.3 Documentation – equipment/system warranties, and manufacturer’s/supplier’s parts and service facilities, telephone numbers, email addresses, and the like;

.4 Maintenance – inspection instructions, types of cleaning agents to be used as well as cleaning methods, preventive maintenance procedures, and use of any special tools;

.5 Repairs – diagnostic instructions, disassembly, component removal and repair instructions, instructions for identifying parts and components, and review of any spare parts inventory.

.5 Before instructing Owner's designated personnel, submit to Consultant for review preliminary copy of training manual and proposed schedule of demonstration and training dates and times. Incorporate Consultant's comments in final copy.

.6 Obtain in writing from Consultant list of Owner's representatives to receive instructions. Submit to Consultant prior to application for Certificate of Substantial Performance of the Work, complete list of systems for which instructions were given, stating for each system:

.1 date instructions were given to Owner's staff;

.2 duration of instruction;

.3 names of persons instructed;

.4 other parties present (manufacturer's representative, consultants, etc.).

.7 Obtain signatures of Owner's staff to verify they properly understood system installation, operation and maintenance requirements, and have received operating and maintenance instruction manuals and "as-built" record drawings.

.8 Submit to Consultant copy of electronic version of training materials and include in operating and maintenance manuals submission.

1.33 FINAL INSPECTION

.1 Submit to Consultant, written request for final inspection of systems. Include written certification that:

.1 deficiencies noted during job inspections have been completed;

.2 field quality control procedures have been completed;

.3 systems have been tested and verified, balanced and adjusted, and are ready for operation;

.4 maintenance and operating data have been completed and submitted to, reviewed with Consultant and accepted by Owner;

.5 tags and nameplates are in place and equipment identifications have been completed;

.6 clean-up is complete;

.7 spare parts and replacement parts specified have been provided and acknowledged by Consultant;

.8 as-built and record drawings have been completed and submitted to and reviewed with Consultant and accepted by Owner;

.9 Owner's staff has been instructed in operation and maintenance of systems;

.10 commissioning procedures have been completed.

2 Products – Not Used

3 Execution – Not Used

End of Section

1 General

1.01 APPLICATION

.1 This Section specifies firestopping and smoke seal requirements that are common to mechanical work Sections of the Specification and it is a supplement to each Section and is to be read accordingly.

1.02 SUBMITTALS

.1 Submit a product data sheet and a WHIMIS sheet for each firestopping and smoke seal product.

.2 Submit for review, full company name and experience of proposed firestopping and smoke seal system applicator.

.3 Submit a letter of proper firestopping and smoke seal certification as specified in Part 3 of this Section.

1.03 QUALITY ASSURANCE

.1 Comply with firestopping and smoke seal product manufacturer’s recommendations regarding suitable environment conditions for product installation.

2 Products

2.01 FIRESTOPPING AND SMOKE SEAL SYSTEM MATERIALS

.1 Asbestos-free elastomeric materials tested, listed and labelled by ULC in accordance with ULC S115 and ULC S101 for installation in ULC designated firestopping and smoke seal systems to provide a positive fire, water and smoke seal, and a fire-resistance rating (flame, hose stream and temperature) not less than fire resistance rating of surrounding fire rated construction.

.2 Materials are to be compatible with abutting dissimilar materials and finishes and complete with primers, damming and back-up materials, supports, and anchoring devices in accordance with firestopping manufacturer’s recommendations and ULC tested assembly.

.3 Pipe insulation forming part of a fire and smoke seal assembly is specified in Section entitled Mechanical Insulation.

.4 Acceptable manufacturers are:

.1 A/D Fire Protection Systems "FIREBARRIER";

.2 Tremco Inc. Fire Protection Systems Group "TREMSTOP";

.3 3M Canada;

.4 Hilti (Canada) Ltd. Firestop Systems;

.5 Specified Technologies Inc.

3 Execution

3.01 INSTALLATION OF FIRESTOPPING AND SMOKE SEAL MATERIALS

.1 Where mechanical work penetrates fire rated construction, provide ULC listed and labelled firestopping and smoke seal materials installed in accordance with requirements of ULC S115, ULC S101, and other governing authorities to seal penetrations.

.2 Abide by following requirements:

.1 Examine substrates, openings, voids, adjoining construction and conditions under which firestop and smoke seal system is to be installed. Confirm compatibility of surfaces.

.2 Verify penetrating items are securely fixed and properly located with proper space allowance between penetrations and surfaces of openings.

.3 Report any unsuitable or unsatisfactory conditions to Contractor and Consultant in writing, prior to commencement of work. Commencement of work will mean acceptance of conditions and surfaces.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces. Remove stains on adjacent surfaces.

.3 Conform to following application requirements:

.1 Prime substrates in accordance with product manufacturer's written instructions.

.2 Provide temporary forming as required and remove only after materials have gained sufficient strength and after initial curing.

.3 Tool or trowel exposed surfaces to a neat, smooth, and consistent finish.

.4 Remove excess compound promptly as work progresses and upon completion.

.5 At fusible link damper locations, seal perimeter of angle iron framing on both sides of wall or slab with ULC listed and labelled sealant materials to provide a positive smoke seal.

.4 Notify Consultant when work is complete and ready for inspection, and prior to concealing or enclosing firestopping and smoke seal materials and service penetration assemblies. Arrange for final inspection of work by Municipal Building Inspector prior to concealing or enclosing work. Make any corrections required.

.5 On completion of firestopping and smoke sealing installation, submit a Letter of Assurance to Consultant certifying the firestopping and smoke sealing installation has been carried out throughout the building to mechanical service penetrations and that installation has been done in strict accordance with requirements of Provincial Building Code, any applicable local Municipal Codes, ULC requirements, and manufacturer's instructions.

End of Section

1 General

1.01 APPLICATION

.1 This Section specifies vibration isolation product requirements that are common to mechanical work Sections of the Specification and it is a supplement to each Section and is to be read accordingly.

1.02 SUBMITTALS

.1 Submit copies of manufacturer's product data sheets for products specified in this Section. Product data sheets are to include product characteristics, limitations, dimensions, finishes, and installation recommendations.

.2 Submit a letter from vibration isolation manufacturer to certify correct installation of products, as specified in Part 3 of this Section.

1.03 SEISMIC RESTRAINT REQUIREMENTS

.1 Where applicable to the project, refer to Section 20 05 48.16 "Seismic Controls for Mechanical Systems" for requirements for the use of a Seismic Consultant and seismic restraint requirements required for vibration isolated materials and equipment.

2 Products

2.01 GENERAL

.1 Vibration isolation products are to be in accordance with the most recent edition of the ASHRAE Handbook and/or as indicated on drawings, schedules, details, and as specified below.

.2 Springs are to be stable, colour coded, selected to operate at no greater than ⅔ solid load, designed in accordance with Society of Automotive Engineers Handbook Supplement 9 entitled Manual on Design and Application of Helical and Spiral Springs, and with spring diameters in accordance with manufacturer's recommendations to suit static deflection and maximum equipment load.

.3 Steel components of isolation products not exposed to the weather or moisture are to be zinc plated. Steel components of isolation products exposed to the weather or in a damp, moist environment are to be factory painted with rust inhibiting primer and 2 coats of neoprene.

.4 Where weight of isolated equipment may change significantly due to draining or filling with a liquid, vibration isolators are to be equipped with limit stops to limit spring extensions.

.5 Seismic rated isolators and snubbers are to be listed, rated, and approved by State of California Office of Statewide Health and Planning Department (O.S.H.P.D.) and carry an O.S.H.P.D. pre-approved number. Seismic restraints supplied with vibration isolation are to meet requirements specified in Section entitled Seismic Control and Restraint.

.6 Flexible piping connections to vibration isolated equipment are specified in the appropriate piping sections of the Specification.

2.02 ISOLATION PADS

.1 Sandwich type pads, 20 mm (¾") nominal thickness, selected for 3.2 mm (1/8") static deflection unless otherwise specified, consisting of 2 waffle type or ribbed 50 durometer neoprene pads permanently bonded to a minimum #10 gauge steel plate, and complete with rubber bushed bolt holes and equipment anchor bolts with neoprene isolation grommets.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type NSN;

.2 The VMC Group Vibration Mounting & Controls Inc. (Korfund-Dynamics) "SHEAR-FLEX PLATES";

.3 Kinetics Noise Control Vibron Products Group Type NGS/NGD;

.4 Mason Industries Inc. Type SW/S/SW with HG Bolt Insertion Washers;

.5 J. P. America Inc. Type JSJ.

2.03 RUBBER FLOOR ISOLATORS

.1 Captive, bridge bearing quality neoprene mount selected for a minimum 4 mm (0.15") static deflection unless otherwise specified, with an integral ductile iron housing and integral equipment anchor bolt.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type R;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) Type RSM;

.3 Kinetics Noise Control Vibron Products Group Type RQ;

.4 Mason Industries Inc. Type BR;

.5 J. P. America Inc. Type TRM.

2.04 SPRING FLOOR ISOLATORS

.1 Seismically rated captive spring mount isolator complete with levelling bolts, upper and lower neoprene spring cups, neoprene cushion, ductile iron housing, neoprene sound pads, and neoprene isolation grommets for securing bolts.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type SFS;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) Type AMSR;

.3 Kinetics Noise Control Vibron Products Group Type FLSS;

.4 Mason Industries Inc. Type SSLFH;

.5 J. P. America Inc. Type TSO-C-SC.

2.05 OPEN SPRING MOUNTS

.1 Base mount free-standing assemblies, each complete with a stable colour coded steel spring welded in place, drilled mild steel mounting plate bonded to a ribbed rubber or neoprene acoustical pad, and an external 16 mm (5/8") diameter level adjustment bolt.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type FS;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) "Spring-Flex" Type A;

.3 Kinetics Noise Control Vibron Products Group Type FDS;

.4 Mason Industries Inc. Type SLFH;

.5 J. P. America Inc. Type TSO.

2.06 CLOSED SPRING MOUNTS

.1 Base mount free-standing enclosed assemblies, each complete with stable colour coded spring(s), 2 piece cast housing, non-binding rubber horizontal stabilizers, a ribbed rubber or neoprene acoustical pad bonded to base of the closed housing, and an external level adjustment bolt.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type CM;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) "Spring-Flex" Types B and C;

.3 Kinetics Noise Control Vibron Products Group Type FLS;

.4 Mason Industries Inc. Type C;

.5 J. P. America Inc. Type TSC.

2.07 TOTALLY RETAINED SPRING MOUNTS

.1 Base mount free-standing enclosed and retained assemblies to limit both vertical and lateral movement of mounted equipment, each complete with stable colour coded spring(s), drilled welded steel housing and top plate, ribbed rubber or neoprene acoustical pad bonded to bottom of housing, vertical limit adjusting hardware, and a level adjustment bolt.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type CSR;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) "Spring-Flex" Type MS;

.3 Kinetics Noise Control Vibron Products Group Type SM;

.4 Mason Industries Inc. Type SLRSO;

.5 J. P. America Inc. Type TSR.

2.08 SPRING HANGERS

.1 Welded steel plate housing with top and bottom rod mounting holes and spring retainer, neoprene double deflection isolation element, stable colour coded spring, and heavy-duty rubber washers.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type SHR-SN;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) "Spring-Flex" Series HRSA;

.3 Kinetics Noise Control Vibron Products Group. Type SRH;

.4 Mason Industries Inc. Type 30N;

.5 J. P. America Inc. Type TSH.

2.09 NEOPRENE HANGER ISOLATORS

.1 Neoprene double deflection rod isolators with steel housing and hanger rod bushing, selected for a minimum 4 mm (0.15") static deflection unless otherwise specified.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type NH;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) Type HR;

.3 Kinetics Noise Control Vibron Products Group Type RH;

.4 Mason Industries Inc. Type HD or WHD;

.5 J. P. America Inc. Type TRH.

2.10 CONCRETE INERTIA TYPE EQUIPMENT BASE

.1 Welded steel bases, each complete with a structural black steel channel frame, concrete reinforcing rods, and brackets for spring mounts welded to frame.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type CIB;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) Type CPF;

.3 Kinetics Noise Control Vibron Products Group. Type CIB;

.4 Mason Industries Inc. Type KSL;

.5 J. P. America Inc. Type BCI.

2.11 STEEL EQUIPMENT BASE

.1 Fully welded structural steel equipment and motor support bases, each complete with a wide flange steel frame, full depth cross members, brackets for spring mounts, and adjustable motor slide rails.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type SB;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) Type WFB;

.3 Kinetics Noise Control Vibron Products Group Type SFB;

.4 Mason Industries Inc. Type WFSL;

.5 J. P. America Inc. Type BWS (with motor slide rail).

2.12 COMBINATION STEEL /CONCRETE INERTIA EQUIPMENT BASE

.1 Welded steel bases with a structural black steel channel frame, concrete reinforcing rods, bottom sheet steel pan, brackets for spring mounts welded to frame and adjustable motor slide rails.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type CIB (with motor slide rails);

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) Type WPF (with motor slide rails);

.3 Kinetics Noise Control Vibron Products Group Type CIB (with motor slide rails);

.4 Mason Industries Inc. Type BMK or K;

.5 J. P. America Inc. Type BSI (with motor slide rail).

2.13 SLUNG STEEL BASE

.1 Slung steel bases of structural members with gusset plates welded to ends and complete with adjustable motor slide rails and vertical section size to suit equipment's motor power output.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type SS;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) Type CPF;

.3 Kinetics Noise Control Vibron Products Group Type CIB-H;

.4 Mason Industries Inc. Type MSL.

2.14 CONTINUOUS RAIL TYPE ISOLATION FOR ROOF MOUNTED EQUIPMENT

.1 Continuous rooftop isolation shipped completely assembled, consisting of:

.1 galvanized steel sections formed to fit roof curb and associated equipment with a flexible air and weather seal joining upper and lower rail sections;

.2 stable springs, cadmium plated and selected to provide minimum deflection with 50% additional travel to solid;

.3 neoprene cushioned and wind restraints allowing 6 mm (¼") movement before engaging and resisting wind loads in any lateral direction.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Vibro-Acoustics Type RTR;

.2 The VMC Group Vibration Mounting and Controls (Korfund-Dynamics) Type RTIR;

.3 Kinetics Noise Control Vibron Products Group Type KSR;

.4 Mason Industries Inc. Type RSC;

.5 J. P. America Inc. Type BRC.

3 Execution

3.01 INSTALLATION OF VIBRATION ISOLATION MATERIALS

.1 Unless otherwise stated in the drawings, schedules and/or typical details, vibration isolation is to be provided for all mechanical equipment as per the recommendations contained within in the most recent edition of the ASHRAE Handbook.

.2 Supply to vibration isolation product manufacturer or supplier a copy of a "reviewed" shop drawing or product data sheet for each piece of equipment to be isolated and dimensioned pipe layouts of associated piping to be isolated.

.3 Unless otherwise specified, vibration isolation products are to be product of one manufacturer.

.4 Ensure vibration isolation manufacturer coordinates material selections with equipment provided in order to ensure adherence to performance criteria. Allow for expansion and contraction when material is selected and installed.

.5 Unless otherwise indicated, install isolation materials for base mounted equipment on concrete housekeeping pad bases which extend at least over the full base and isolated area of the isolated equipment. Additional requirements are as follows:

.1 block and shim bases level so ductwork and piping connections can be made to a rigid system at proper operating level, before isolated adjustment is made, and ensure there is no physical contact between isolated equipment and building structure;

.2 steel bases are to clear the sub-base by 25 mm (1");

.3 concrete bases are to clear the sub-base by 50 mm (2").

.6 Isolate piping larger than 25 mm (1") dia. directly connected to motorized and/or vibration isolated equipment with 25 mm (1") static deflection spring hangers at spacing intervals in accordance with following:

.1 for pipe less than or equal to 100 mm (4") dia. – first 3 points of support;

.2 for pipe 125 mm (5") to 200 mm (8") dia. – first 4 points of support;

.3 for pipe equal to or greater than 250 mm (10") dia. – first 6 points of support;

.7 First point of isolated piping support is to have a static deflection of twice the deflection of the isolated equipment but maximum 50 mm (2").

.8 Secure top of spring hanger frame rigidly to structure, and do not install spring hangers in concealed locations.

.9 Where it is impossible to use at least 2 spring hangers, provide Senior Flexonics Ltd. Style 102 (or 102-U as required) or equal, twin sphere, moulded rubber flexible connection assemblies, selected by manufacturer and suitable in all respects for intended application, and complete with required nipples and connections to provide proper vibration isolation.

.10 Isolate designated piping risers at floor support points in accordance with drawing detail and/or where indicated on drawings.

.11 Erect roof curb vibration isolation in accordance with instructions shipped with assembly. Match vibration isolation with associated roof top unit and orient isolation as identified by manufacturer to ensure proper loading and optimum performance. Caulk top of roof curb with 2 beads of caulking provided and centre isolation assembly onto roof curb and, unless otherwise noted, screw in place with 50 mm (2") lag screws at 900 mm (36") O.C. Position gasket on top rail or alternatively, caulk with 2 beads of caulking provided and orient and lower roof top unit onto isolation rails and, unless otherwise noted, screw unit into top rail with 25 mm (1") lag screws at 900 mm (36") O.C. After roof top unit is secured in place, but before damageable work is installed, spray each isolated equipment assembly with water and correct any water leaks.

.12 For control wiring connections to vibration isolated equipment ensure flexible metallic conduit with 90° bend is used for conduit 25 mm (1") dia. and smaller, and for conduit larger than 25 mm (1") dia., use Crouse Hinds EC couplings. Connections are to be long enough so that conduit will remain intact if

equipment moves 300 mm (12") laterally from its installed position, and flexible enough to transmit less vibration to structure than is transmitted through vibration isolation. Coordinate these requirements with mechanical trades involved. If electrical power connections are not made in a similar manner as part of the electrical work, report this fact to Consultant.

.13 Arrange and pay for vibration isolation product manufacturer to visit site to inspect installation of his equipment. Perform revision work required as a result of improper installation. When vibration isolation equipment manufacturer is satisfied with the installation, obtain and submit a letter stating manufacturer has inspected the installation and equipment is properly installed.

.14 Refer to Section entitled Seismic Control and Restraint for requirements pertaining to seismically restrained vibration isolation.

End of Section

1 General

1.01 SECTION INCLUDES

.1 This Section specifies mechanical system testing, adjusting, and balancing requirements that are common to mechanical work Sections of the Specification and it is a supplement to each Section and is to be read accordingly.

1.02 DEFINITIONS

.1 “Agency” – means agency to perform testing, adjusting and balancing work.

.2 “TAB” – means testing, adjusting and balancing to determine and confirm quantitative performance of equipment and systems and to regulate specified fluid flow rate and air patterns at terminal equipment, e.g., reduce fan speed, throttling, etc.

.3 “hydronic systems” – includes heating water, chilled water, glycol-water solution, condenser water, and any similar system.

.4 “air systems” – includes outside air, supply air, return air, exhaust air, and relief air systems.

.5 “flow rate tolerance” – means allowable percentage variation, minus to plus, of actual flow rate values in Contract Documents.

.6 “report forms” – means test data sheets arranged for collecting test data in logical order for submission and review, and these forms, when reviewed and accepted, should also form permanent record to be used as basis for required future testing, adjusting and balancing.

.7 “terminal” – means point where controlled fluid enters or leaves the distribution system, and these are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.

.8 “main” – means duct or pipe containing system’s major or entire fluid flow.

.9 “submain” – means duct or pipe containing part of the systems’ capacity and serving 2 or more branch mains.

.10 “branch main” – means duct or pipe servicing 2 or more terminals.

.11 “branch” – means duct or pipe serving a single terminal.

1.03 SUBMITTALS

.1 Within 30 days of work commencing at site, submit name and qualifications of proposed testing and balancing agency in accordance with requirements of article entitled Quality Assurance below.

.2 Submit sample test forms, if other than those standard forms prepared by Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB), are proposed for use.

.3 Submit a report by Agency to indicate Agency’s evaluation of mechanical drawings with respect to service routing and location or lack of balancing devices. Include set of drawings used and marked-up by Agency to prepare report.

.4 Submit a report by Agency after each site visit made by Agency during construction phase of this Project.

.5 Submit a draft report, as specified in Part 3 of this Section.

.6 Submit a final report, as specified in Part 3 of this Section.

.7 Submit a testing and balancing warranty as specified in Part 3 of this Section.

.8 Submit reports listing observations and results of post construction site visits as specified in Part 3 of this Section.

1.04 QUALITY ASSURANCE

.1 Employ services of an independent testing, adjusting, and balancing agency meeting qualifications specified below, to be single source of responsibility to test, adjust, and balance building mechanical systems to produce design objectives.

.2 Testing, adjusting and balancing of complete mechanical systems is to be performed over entire operating range of each system in accordance with 1 of following publications:

.1 National Standards for a Total System Balance published by Associated Air Balance Council;

.2 Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems published by National Environmental Balancing Bureau;

.3 Chapter 37, Testing, Adjusting, and Balancing of ASHRAE Handbook HVAC Applications.

1.05 ACCEPTABLE SERVICE COMPANIES

.1 Acceptable service companies are as follows:

.1 Air Audit;

.2 Clarke Balancing;

.3 Airwaso;

.4 Dynamic Flow Balancing;

.5 Air Velocities Control;

.6 Flowset Balancing.

2 Products – Not Used

3 Execution

3.01 SCOPE OF WORK

.1 Perform total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of fluid quantities of mechanical systems as required to meet design specifications and comfort conditions, and recording and reporting results.

.2 Mechanical systems to be tested, adjusted and balanced include:

.1 TAB of domestic water systems (all piping extended from Municipal main) is to include:

.1 domestic hot water recirculation piping;

.2 tempered water piping flows.

.2 TAB of heating systems is to include piping and equipment fluid temperatures, flows and control, and if TAB is not done during heating season, a follow-up site visit during heating season will be required to confirm proper flows and temperatures, and any required system "fine tuning".

.3 TAB of cooling systems is also to include piping and equipment fluid temperatures, flows and control, and if TAB is not done during cooling season, a follow-up site visit during cooling season will be required to confirm proper flows and temperatures, and any required system "fine.

.4 TAB of air handling systems is to include equipment and ductwork air temperatures, capacities and flows.

3.02 TESTING, ADJUSTING, AND BALANCING

.1 Conform to following:

.1 as soon as possible after award of Contract, Agency is to carefully examine a set of mechanical drawings with respect to routing of services and location of balancing devices, and is to issue a report listing results of the evaluation;

.2 set of drawings examined by Agency is to be returned with evaluation report, with red line mark-ups to indicate locations for duct system test plugs, and required revision work such as relocation of balancing devices and locations for additional devices;

.3 after review of mechanical work drawings and specification, Agency is to visit site at frequent, regular intervals during construction of mechanical systems, to observe routing of services, locations of testing and balancing devices, workmanship, and anything else that will affect testing, adjusting and balancing;

.4 after each site visit, Agency is to report results of site visit indicating date and time of visit, and detailed recommendations for any corrective work required to ensure proper adjusting and balancing;

.5 testing, adjusting and balancing is not to begin until:

.1 building construction work is substantially complete and doors have been installed;

.2 mechanical systems are complete in all respects, and have been checked, started, adjusted, and then successfully performance tested.

.6 mechanical systems to be tested, adjusted and balanced are to be maintained in full, normal operation during each day of testing, adjusting and balancing;

.7 obtain copies of reviewed shop drawings of applicable mechanical plant equipment and terminals, and temperature control diagrams and sequences;

.8 Agency is to walk each system from system "head end" equipment to terminal units to determine variations of installation from design, and system installation trades will accompany Agency;

.9 Agency is to check valves and dampers for correct and locked position, and temperature control systems for completeness of installation before starting equipment;

.10 wherever possible, Agency is to lock balancing devices in place at proper setting, and permanently mark settings on devices;

.11 Agency is to leak test ductwork as specified in Section entitled HVAC Air Distribution in accordance with requirements of SMACNA "HVAC Air Duct Leak Test Manual", coordinate work with work of aforementioned Sections, provide detailed sketch(es) to Sheet Metal Contractor and Consultant identifying ductwork not in accordance with acceptable leakage values specified in aforementioned Sections, and retest corrected ductwork;

.12 Agency is to balance systems with due regard to objectionable noise which is to be a factor when adjusting fan speeds and performing terminal work such as adjusting air quantities, and should objectionable noise occur at design conditions, Agency is to immediately report problem and

submit data, including sound readings, to permit an accurate assessment of noise problem to be made;

.13 Agency is to check supply air handling system mixing plenums for stratification, and where variation of mixed air temperature across coils is found to be in excess of ±5% of design requirements, Agency is to report problem and issue a detail sketch of plenum baffle(s) required to eliminate stratification;

.14 Agency is to perform testing, adjusting and balancing to within ±5% of design values, and make and record measurements which are within ±2% of actual values;

.15 for air handling systems equipped with air filters, test and balance systems with simulated 50% loaded (dirty) filters by providing a false pressure drop;

.16 Balance air flow keeping the building slightly positive at 0.01”wc (3Pa) pressure whenever possible to allow doors to properly close.

.17 test, adjust and balance air conditioning systems during summer season and heating systems during winter season, including at least a period of operation at outside conditions within 2.8°C (5°F) wet bulb temperature of maximum summer design condition, and within 5.5°C (10°C) dry bulb temperature of minimum winter design condition, and take final temperature readings during seasonal operation.

.2 Prepare reports as indicated below.

.1 Upon completion of testing, adjusting, and balancing procedures, prepare draft reports on AABC or NEBB forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in same manner specified for final reports and submit for review.

.2 Upon verification and approval of draft reports, prepare final reports organized and formatted as specified below. Use units of measurement (SI or Imperial) as used on Project Documents.

.3 Report forms are to be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Report forms complete with schematic systems diagrams and other data are to be consolidated in electronic format as a PDF. PDF file to be indexed and organized into sections, as it applies to the project, as follows:

.1 General Information and Summary;

.2 Air Systems;

.3 Hydronic Systems;

.4 Temperature Control Systems;

.5 Special Systems.

.4 Agency is to provide following minimum information, forms and data in report:

.1 inside cover sheet to identify Agency, Contractor, and Project, including addresses, and contact names and telephone numbers and a listing of instrumentation used for procedures along with proof of calibration;

.2 remainder of report is to contain appropriate forms containing as a minimum, information indicated on standard AABC or NEBB report forms prepared for each respective item and system;

.3 Agency is to include for each system to be tested, adjusted and balanced, a neatly drawn, identified (system designation, plant equipment location, and area served) schematic "as-built" diagram indicating and identifying equipment, terminals, and accessories;

.4 Agency is to include report sheets indicating building comfort test readings for all rooms.

.3 After final testing and balancing report has been submitted, Agency is to visit site with Contractor and Consultant to spot check results indicated on balancing report. Agency is to supply labour, ladders, and instruments to complete spot checks. If results of spot checks do not, on a consistent basis, agree with final report, spot check procedures will stop and Agency is to then rebalance systems involved, resubmit final report, and again perform spot checks with Contractor and Consultant.

.4 When final report has been accepted, Contractor is to submit to Owner, in name of Owner, a certificate equal to AABC National Guaranty Certification or a NEBB Quality Assurance Program Bond, and in addition, Contractor is to submit a written extended 2-year warranty from Agency covering one full heating season and one full cooling season, during which time any balancing problems which occur, with exception of minor revision work done during scheduled site visits, will, at no cost, be investigated by Agency and reported on to Owner, and if it is determined that problems are a result of improper testing, adjusting and balancing, they are to be immediately corrected without additional cost to Owner.

.5 Balancing Company shall re-visit the site at least once after the system has operated for a period of approximately three months and make necessary adjustments in the airflows / water flows to insure space temperatures meeting the approval of the Owner and Consultant are maintained.

End of Section

1 General

1.01 APPLICATION

.1 This Section specifies insulation requirements common to Mechanical Divisions work Sections and it is a supplement to each Section and is to be read accordingly.

1.02 DEFINITIONS

.1 "concealed" – means mechanical services and equipment above suspended ceilings, in non-accessible chases, in accessible pipe spaces, and furred-in spaces.

.2 "exposed" – means exposed to normal view during normal conditions and operations.

.3 "mineral fibre" – includes glass fibre, rock wool, and slag wool.

.4 "domestic water" or "potable water" – means piping extended from building Municipal supply main.

1.03 SUBMITTALS

.1 At least 4 weeks prior to insulation work commencing, submit a sample of each type of insulation (and insulation accessories and finish), in applied form, for review. Mount samples on a plywood board. Identify each product with manufacturer's name and insulation type, and proposed use of insulation. When sample board has been approved, mechanical insulation work is to conform to approved sample board.

.2 Submit a product data sheet for each insulation system product.

.3 Submit a fabrication drawing for each custom made cover to indicate material and fabrication details, and a 300 mm (12") square sample of proposed cover material.

.4 In accordance with Part 3 of this Section, submit a letter from fire rated duct wrap supplier to certifying duct wrap has been properly installed.

.5 Submit a colour chart for coloured lagging adhesive for canvas jacketed insulation.

1.04 QUALITY ASSURANCE

.1 Mechanical insulation is to be applied by a licensed journeyman insulation mechanic, or by an apprentice under direct, daily, on-site supervision of a journeyman mechanic.

.2 Do not apply insulation unless leakage tests have been satisfactorily completed.

.3 Ensure surfaces to be insulated are clean and dry.

.4 Ensure ambient temperature is minimum 13°C (55°F) for at least 1 day prior to application of insulation, and for duration of insulation work, and relative humidity is and will be at a level such that mildew will not form on insulation materials.

.5 Insulation materials must be stored on site in a proper and dry storage area. Any wet insulation material is to be removed from site.

2 Products

2.01 FIRE HAZARD RATINGS

.1 Unless otherwise specified, insulation system materials inside building must have a fire hazard rating of not more than 25 for flame spread and 50 for smoke developed when tested in accordance with ULC S102, Surface Burning Characteristics of Building Materials and Assemblies.

2.02 THERMAL PERFORMANCE

.1 Unless otherwise specified, thermal performance of insulation is to meet or exceed values given in Tables entitled Minimum Piping Insulation Thickness Heating and Hot Water Systems and Minimum Piping Insulation Thickness Cooling Systems, as stated in ANSI/ASHRAE/IES Standard 90.1 version referenced in Ontario Building Code.

2.03 PIPE INSULATION MATERIALS

.1 Horizontal pipe insulation at hangers and supports are to be equal to Belform Insulation Ltd. "Koolphen K-Block" insulated pipe support inserts consisting of minimum 150 mm (6") long, pre-moulded, rigid, sectional phenolic foam insulation (of same thickness as adjoining insulation) with a reinforced foil and kraft paper vapour barrier jacket and a captive galvanized steel saddle.

.2 Flexible foam elastomeric is to be closed cell, sleeve type, longitudinally split self-seal, foamed plastic pipe insulation with a water vapour transmission rating of 0.10 in accordance with ASTM E96, Procedure B, and required installation accessories. Acceptable products are:

.1 Armacell AP/Armaflex SS;

.2 IK Insulation Group K-Flex "LS" Self-Seal Pipe Insulation.

.3 Closed cell foamed glass is to be Pittsburgh Corning "FOAMGLASS", expanded, sectional, rigid sleeve type insulation with a liquid or vapour permeability rating (as per ASTM C240) of 0.00, and a factory applied "PITTWRAP SSII" self-sealing jacket.

.4 Fire rated pre-moulded mineral wool is to be non-combustible, fire-rated, rigid, sectional, longitudinally split mineral wool or basalt pipe insulation with a reinforced vapour barrier jacket and compatible with ULC S115 and ULC-S101 firestopping. Acceptable products are:

.1 Roxul "Techton 1200";

.2 IIG (Johns Manville Inc.) MinWool-1200;

.3 Paroc 1200.

.5 Pre-moulded mineral fibre is to be rigid, sectional, sleeve type insulation to ASTM C547, with a factory applied vapour barrier jacket. Acceptable products are:

.1 Johns Manville Inc. "Micro-Lok AP-T Plus";

.2 Knauf Fiber Glass "Pipe Insulation" with "ASJ-SSL" jacket;

.3 Manson Insulation Inc. "ALLEY K APT";

.4 Owens Corning “Fiberglas” Pipe Insulation.

.6 Blanket mineral fibre is to be blanket type roll insulation to CGSB 51-GP-11M, 24 kg/m3 (1-½ lb/ft³) density, with a factory applied vapour barrier facing. Acceptable products are:

.1 Johns Manville Inc. Microlite FSK Duct Wrap Type 150;

.2 Knauf Fiber Glass Blanket Insulation FSK Duct Wrap Type III;

.3 Manson Insulation Inc. ALLEY WRAP FSK Duct Wrap Type III;

.4 Certainteed Corporation Softtouch FSK Duct Wrap Type 150.

.7 Pre-moulded weatherproof jacketed mineral fibre is to be Knauf Insulation "Redi-Klad 1000" sectional, sleeve type pipe insulation with a self-sealing weather-proof jacket and a 100 mm (4") butt joint sealing strip with each section.

2.04 BARRIER-FREE LAVATORY PIPING INSULATION KITS

.1 Removable, flexible, reusable, white moulded plastic insulation kits for barrier-free lavatory drain piping and potable water supplies exposed under lavatory.

.2 Acceptable products are:

.1 Truebo "Lav-Guard 2" E-Z Series;

.2 Zeston "SNAP-TRAP";

.3 McGuire Manufacturing Co. Inc. "ProWrap".

2.05 EQUIPMENT INSULATION MATERIALS

.1 Blanket mineral fibre is to be blanket type roll form insulation to ASTM C553, 24 kg/m3 (1-½ lb/ft³) density, with a factory applied vapour barrier facing. Acceptable products are:

.1 Johns Manville Inc. Microlite FSK Duct Wrap Type 150;

.2 Knauf Fiber Glass Blanket Insulation FSK Duct Wrap Type III;

.3 Manson Insulation Inc. ALLEY WRAP FSK Duct Wrap Type III;

.4 Certainteed Corporation Softtouch FSK Duct Wrap Type 150.

.2 Semi-rigid mineral fibre board is to be roll form, moulded insulation to ASTM C1393, with a factory applied vapour barrier facing consisting of laminated aluminum foil and kraft paper. Acceptable products are:

.1 Knauf Fiber Glass Pipe and Tank Insulation;

.2 Manson Insulation Inc. "AK FLEX";

.3 Johns Manville Inc. Pipe and Tank Insulation “Micro-Flex”;

.4 Multi-Glass Insulation Ltd. "MULTI-FLEX MF";

.5 Owens Corning Pipe and Tank Insulation;

.6 Glass-Cell Fabricators Ltd. "R-Flex".

.3 Closed cell foamed glass is to be Pittsburgh Corning "FOAMGLAS" expanded, rigid board and block type insulation with a liquid or vapour permeability rating (as per ASTM C240) of 0.00.

2.06 REMOVABLE/REUSABLE INSULATION COVERS

.1 Valve, etc. covers are to be NO SWEAT reusable insulation wraps with vapour barrier jacket and self-sealing ends and longitudinal seam, with a length to suit the application and an insulation thickness equal to adjoining insulation.

.2 Custom manufactured equipment covers conforming to shape of item to be insulated, designed to be easily removable and replaceable to suit use and maintenance procedures of particular item, and to provide adequate personnel protection. Covers are to be complete with minimum 95 kg/m3 (6 lb/ft³) density ceramic fibre insulation sewn between minimum 542.5 g/m2 (1.8 oz/ft²) weight silicone impregnated fibreglass fabric in a quilted pattern using double stitches made with Kelvar or Teflon coated

fibreglass thread. Overlap flaps are to be secured using laces, snaps, or Velcro double stitched in place. Acceptable manufacturers are:

.1 Crossby Dewar Inc.;

.2 Insufab Systems Inc.;

.3 ADL Insulflex Inc.;

.4 Firwin Corp.;

.5 GlassCell Isofab Inc.

2.07 DUCTWORK SYSTEM INSULATION MATERIALS

.1 Rigid mineral fibre board is to be pre-formed board type insulation to ASTM C612, 48 kg/m3 (3 lb/ft³) density, with a factory applied reinforced aluminum foil and kraft paper facing. Acceptable products are:

.1 Knauf Fiber Glass Insulation Board with FSK facing;

.2 Manson Insulation Inc. "AK BOARD FSK";

.3 Johns Manville Inc. Type 814 "Spin-Glas";

.4 Owens Corning 703.

.2 Semi-rigid mineral fibre board is to be roll form insulation to ASTM C1393, consisting of cut strips of rigid mineral board insulation glued to an aluminium foil and kraft paper facing. Acceptable products are:

.1 Multi-Glass Insulation Ltd. "Multi-Flex MKF";

.2 Glass-Cell Fabricators Ltd. "R-FLEX";

.3 Owens Corning Pipe and Tank Insulation;

.4 Johns Manville Inc. Pipe and Tank Insulation.

.3 Blanket mineral fibre is to be blanket type roll form insulation to ASTM C553, 24 kg/m3 (1½ lb/ft3) density, 40 mm (1-½") thick, with a factory applied vapour barrier facing. Acceptable products are:

.1 Johns Manville Inc. Microlite FSK Duct Wrap Type 150;

.2 Knauf Fiber Glass Blanket Insulation FSK Duct Wrap Type III;

.3 Manson Insulation Inc. ALLEY WRAP FSK Duct Wrap Type III;

.4 Certainteed Corporation Softtouch FSK Duct Wrap Type 150.

.4 Pre-moulded calcium silicate is to be rigid block and sheet insulation. Acceptable products are:

.1 Johns Manville Inc. "Thermo-12 Gold";

.2 Industrial Insulation Group "Thermo-12 Gold".

.5 Flexible foam elastomeric sheet is to be sheet form, CFC free, closed cell, self-adhering elastomeric nitrile rubber insulation with a water vapour permeability rating of 0.08 in accordance with ASTM E96 Procedure A. Acceptable products are:

.1 Armacell "AP/Armaflex SA";

.2 IK Insulation Group "K-Flex Duct Wrap", S2S.

2.08 FIRE RATED DUCT WRAP

.1 Flexible, non-combustible, blanket type mineral fibre duct wrap completely encapsulated in reinforced foil, suitable for installation with zero clearance to combustibles (for grease ducts), and ULC tested and listed (ULC Designs FRD-17 & 23 for ventilation ducts, ULC Design FRD-19 for kitchen exhaust/grease duct) to facilitate a 2 hour fire resistance rating (76 mm [3"] thick) to kitchen grease exhaust duct in accordance with requirements of NFPA-96, and/or a 1 or 2 hour fire resistance rating (38 mm [1-½"] thick) to ventilation or pressurization ductwork in accordance with requirements of ISO 6944.

.2 Acceptable manufacturers are:

.1 3M Fire Barrier Duct Wrap 615;

.2 CL4 Inc. "CL4Fire";

.3 Unifrax Corp. "FyreWrap Elite 1.5";

.4 Morgan Thermal Ceramics "FireMaster FastWrap XL".

2.09 INSULATING COATINGS

.1 Equal to Robson Thermal Manufacturing Ltd. insulating coatings as follows:

.1 anti-condensation coating, "No Sweat-FX";

.2 thermal insulating coating, "ThermaLite".

2.10 INSULATION FASTENINGS

.1 Wire – minimum #15 gauge galvanized annealed wire.

.2 Wire with Mesh – minimum #15 gauge galvanized annealed wire factory woven into 25 mm (1") hexagonal mesh.

.3 Aluminium Banding – equal to ITW Insulation Systems Canada "FABSTRAPS" minimum 12 mm (½") wide, 0.6 mm (1/16") thick aluminium strapping.

.4 Stainless Steel Banding – equal to ITW Insulation Systems Canada "FABSTAPS" 0.6 mm (1/16") thick, minimum 12 mm (½") wide type 304 stainless steel strapping.

.5 Duct Insulation Fasteners – weld-on 2 mm (3/32") diameter zinc coated steel spindles of suitable length, complete with minimum 40 mm (1-½") square plastic or zinc plated steel self-locking washers.

.6 Tape Sealant – equal to MACtac Canada Ltd. self-adhesive insulation tapes, types PAF, FSK, ASJ, or SWV as required to match surface being sealed.

.7 Mineral Fibre Insulation Adhesive – clear, pressure sensitive, brush consistency adhesive, suitable for a temperature range of -20°C to 82°C (-4°F to 180°F), compatible with type of material to be secured, and WHMIS classified as non-hazardous.

.8 Flexible Elastomeric Insulation Adhesive – Armacell "Armaflex" #520 air-drying contact adhesive.

.9 Closed Cell Foamed Glass Insulation Adhesive – Pittsburgh Corning PC88 multi-purpose 2-component adhesive.

.10 Lagging Adhesive – white, brush consistency, ULC listed and labelled, 25/50 fire/smoke rated lagging adhesive for canvas jacket fabric, suitable for colour tinting, complete with fungicide and washable when dry.

.11 Screws – No. 10 stainless steel sheet metal screws.

2.11 INSULATION JACKETS AND FINISHES

.1 Canvas Jacket Material – ULC listed and labelled, 25/50 fire/smoke rated, roll form, minimum 170 g (6 oz.).

.2 Roll Form Sheet and Fitting Covers – minimum 15 mm (1/2") thick white PVC, 25/50 fire/smoke rated tested in accordance with ULC S102, complete with installation and sealing accessories. Acceptable products are:

.1 Proto Corp. "LoSMOKE";

.2 The Sure-Fit System "SMOKE-LESS 25/50";

.3 Johns Manville Inc. "Zeston" 300.

.3 Rigid Aluminium Jacket – equal to ITW Insulation Systems Canada "Lock-on" 0.406 mm (0.016") thick embossed aluminum jacket material to ASTM B209, factory cut to size and complete with polysurlyn moisture barrier and continuous modified Pittsburgh Z-Lock, butt straps with "Fabstraps" to weatherproof the end to end joints, and 2-piece epoxy coated pressed aluminum fittings with weather locking edges.

.4 Adhesive backed flexible aluminium is to be MFM Building Products Corp. "Flex-Clad 400" roll form sheet material with an aggressive rubberized asphalt adhesive backing, high density polyethylene reinforcement, and an embossed aluminum facing.

.5 Heat resistant, trowel consistency thermal insulating and finishing cement to CAN/CGSB 51.12, and suitable for the application.

.6 Foamed glass insulation protective coating is to be Pittsburgh Corning "PITTCOTE 404" flexible acrylic latex weather barrier coating, white unless otherwise specified.

.7 Flexible foam elastomeric insulation protective coating equal to Armacell "WB Armaflex" weatherproof, water-based latex enamel finish.

3 Execution

3.01 GENERAL INSULATION APPLICATION REQUIREMENTS

.1 Unless otherwise specified, do not insulate following:

.1 factory insulated equipment and piping;

.2 heating piping within radiation unit enclosures, including blank filler sections of enclosures;

.3 heating piping in soffits and/or overhang spaces and connected to bare element radiation in spaces;

.4 branch potable water piping located under counters to serve counter mounted plumbing fixtures and fittings, except barrier-free lavatories;

.5 exposed chrome plated potable water angle supplies from concealed piping to plumbing fixtures and fittings, except barrier-free lavatories;

.6 heated liquid system pump casings, valves, strainers and similar accessories;

.7 heating system expansion tanks;

.8 fire protection pump casings;

.9 manufactured expansion joints and flexible connections;

.10 acoustically lined ductwork and/or equipment;

.11 factory insulated flexible branch ductwork;

.12 fire protection system water storage tanks;

.13 piping unions, except for unions in "cold" category piping.

.2 Install insulation directly over pipes and ducts, not over hangers and supports.

.3 Install piping insulation and jacket continuous through pipe openings and sleeves.

.4 Install duct insulation continuous through walls, partitions, and similar surfaces except at fire dampers.

.5 When insulating "cold" piping and equipment, extend insulation up valve bodies and other such projections as far as possible, and protect insulation jacketing from the action of condensation at its junction with metal.

.6 When insulating vertical piping risers 75 mm (3") diameter and larger, use insulation support rings welded directly above lowest pipe fitting, and thereafter at 4.5 m (14.7') centres and at each valve and flange. Insulate as per Thermal Insulation Association of Canada National Insulation Standards, Figure No. 9.

.7 Where piping and/or equipment is traced with electric heating cable, ensure cable has been tested and accepted prior to application of insulation, and ensure cable is not damaged or displaced during the application of insulation.

.8 Where existing insulation work is damaged as a result of mechanical work, repair damaged insulation work to Project work standards.

.9 Where mineral fibre rigid sleeve type insulation is terminated at valves, equipment, unions, etc., neatly cover exposed end of insulation with a purpose made PVC cover on "cold" piping, and with canvas jacket material on "hot" piping.

.10 Carefully and neatly gouge out insulation for proper fit where there is interference between weld bead, mechanical joints, etc., and insulation. Bevel away from studs and nuts to permit their removal without damage to insulation, and closely and neatly trim around extending parts of pipe saddles.

.11 Where thermometers, gauges, and similar instruments occur in insulated piping, and where access to heat transfer piping balancing valve ports and similar items are required, create a neat, properly sized hole in insulation and provide a suitable grommet in the opening.

3.02 INSULATION FOR HORIZONTAL PIPE AT HANGERS AND SUPPORTS

.1 At each hanger and support location for piping 50 mm (2") diameter and larger and scheduled to be insulated, except where roller hangers and/or supports are required, and unless otherwise specified, supply a factory fabricated section of phenolic foam pipe insulation with integral vapour barrier jacket and captive galvanized steel shield. Supply insulation sections to piping installers for installation as pipe is erected.

.2 For 100 mm (4") diameter and larger heating system piping where roller type hangers and supports are provided, a steel saddle will be tack welded to pipe at each roller hanger or support location. Pack saddle voids with loose mineral wool insulation.

3.03 PIPE INSULATION REQUIREMENTS – MINERAL FIBRE

.1 Insulate following pipe inside building and above ground with mineral fibre insulation of thickness indicated:

.1 domestic cold water piping, less than 100 mm (4") dia. – 25 mm (1") thick;

.2 domestic cold water piping, greater than or equal to 100 mm (4") dia. – 40 mm (1-½") thick;

.3 domestic hot water piping, less than 40 mm (1-½") dia. – 25 mm (1") thick;

.4 domestic hot water piping, greater than or equal to 40 mm (1½") dia. – 40 mm (1-½") thick;

.5 tempered domestic water piping, supply and return, less than 40 mm (1-½") dia. – 25 mm (1") thick;

.6 tempered domestic water piping, supply and return, greater than or equal to 40 mm (1-½") dia. – 50 mm (2") thick;

.7 storm drainage piping from roof drains to the point where main vertical risers extend straight down, without offsets, and connect to horizontal underground mains – 25 mm (1") thick;

.8 condensate drainage piping from fan coil unit or any other air conditioning system/unit drain pans to main vertical drain risers or to indirect drainage point – 25 mm (1") thick;

.9 drainage piping from refrigerated drinking fountains to nearest 75 mm (3") dia. or larger drain pipe – 25 mm (1") thick;

.10 chilled water piping, supply and return, less than 100 mm (4") dia. – 25 mm (1") thick;

.11 chilled water piping, supply and return, greater than or equal to 100 mm (4") dia. – 40 mm (1-½") thick;

.12 chilled glycol solution piping, supply and return, less than 100 mm (4") dia. – 25 mm (1") thick;

.13 chilled glycol solution piping, supply and return, greater than or equal to 100 mm (4") dia. – 40 mm (1-½") thick;

.14 hot water heating piping, supply and return, less than 40 mm (1-½") dia. – 40 mm (1-½") thick;

.15 hot water heating piping, supply and return, greater than or equal to 40 mm (1-½") dia. – 50 mm (2") thick;

.16 glycol solution heating or heat reclaim piping, supply and return, less than 40 mm (1-½") dia. – 40 mm (1-½") thick;

.17 glycol solution heating or heat reclaim piping, supply and return, greater than or equal to 40 mm (1-½") dia. – 50 mm (2") thick;

.18 chilled domestic cold water piping from remote water cooler(s) to drinking fountain(s) – 40 mm (1-½") thick;

.19 piping indicated to be traced with electric heating cable – minimum 50 mm (2") thick;

.20 drum drip(s) in dry zone standpipe and/or sprinkler system piping – 50 mm (2") thick;

.21 refrigerant suction piping (between compressor and evaporator coil) inside building – 25 mm (1") thick;

.22 refrigerant hot gas piping (between compressor and condenser) inside building – 25 mm (1") thick;

.23 refrigerant hot gas by-pass piping (between compressor discharge and evaporator coil) inside building – 25 mm (1") thick;

.24 air compressor set fresh air intake piping – 25 mm (1") thick;

.25 heat pump equipment earthloop piping – 25 mm (1") thick.

.2 Secure overlap flap of the sectional insulation jacket tightly in place. Cover section to section butt joints with tape sealant.

.3 Insulate fittings with sectional pipe insulation mitred to fit tightly, and cover butt joints with tape sealant, or, alternatively, wrap fittings with blanket mineral fibre insulation to a thickness and insulating value equal to the sectional insulation, secure in place with adhesive and/or wire, and cover with PVC fitting covers.

.4 Unless otherwise specified, insulate unions, valves, strainers, and similar piping system accessories in "cold" piping with cut and tightly fitted segments of sectional pipe insulation with joints covered with tape sealant, or, alternatively, wrap piping union, valve, strainer, etc., with blanket mineral fibre and cover with PVC covers as for paragraph above.

.5 Terminate sectional insulation approximately 50 mm (2") from flange or coupling on each side of flange or coupling. Cover flange or coupling with a minimum 50 mm (2") thickness of blanket mineral fibre insulation wide enough to butt tightly to ends of adjacent sectional insulation. Secure blanket insulation in place and cover with a purpose made PVC coupling cover.

.6 Drum drips in dry zone sprinkler and/or standpipe system piping will be traced with electric heating cable as part of electrical work, and are generally not shown on drawing(s). Confirm number and size of drum drips required with trade providing piping and include for insulation to suit. Wherever possible drum drips will be located in heated areas.

.7 Take special care at concealed water rough-in piping at plumbing fixtures to ensure piping is properly insulated. If necessary due to space limitations, use 12 mm (½") thick sectional pipe insulation in lieu of 25 mm (1") thick insulation.

.8 Insulate seismic restraint hardware such as hanger rods, braces, anchors, etc., directly connected to "cold" category piping and equipment for a distance of 300 mm (12") from piping or equipment with insulation and finish to match pipe or equipment insulation. Coat seismic restraint hardware for a distance of 300 mm (12") from the termination of insulation with Robson Thermal "NO-SWEAT-FX" water based anti-condensation coating.

3.04 PIPE INSULATION REQUIREMENTS – FLEXIBLE FOAM ELASTOMERIC

.1 Install flexible elastomeric pipe insulation in strict accordance with manufacturer’s published instructions to suit the application, and using adhesive, joint sealants and finish to produce a water-tight installation. Insulate following pipe with flexible elastomeric pipe insulation of thickness indicated:

.1 refrigerant suction and hot gas piping outside building – 25 mm (1") thick.

3.05 PIPE INSULATION REQUIREMENTS – CLOSED CELL FOAMED GLASS

.1 Install closed cell foamed glass insulation in strict accordance with manufacturer’s published instructions to suit the application, and using adhesive, joint sealants, and jacketing to produce a water-tight installation. Insulate following pipe with closed cell foamed glass of thickness indicated:

.1 piping located outside building and indicated to be heat traced – minimum 50 mm (2") thick.

3.06 PIPE INSULATION REQUIREMENTS – FIRE RATED INSULATION

.1 Where pipe (inside building and above ground) which is to be insulated as specified above penetrates fire rated construction, provide fire-rated, non-combustible sectional insulation on portion of pipe in fire barrier and for a distance of 50 mm (2") on either side of fire barrier. Insulation thickness is to be as specified, but in any case minimum 25 mm (1").

3.07 INSTALLATION OF BARRIER FREE LAVATORY INSULATION KITS

.1 Provide manufactured insulation kits to cover exposed drainage and water piping under barrier free lavatories.

3.08 EQUIPMENT INSULATION REQUIREMENTS – BLANKET TYPE MINERAL FIBRE

.1 Insulate following equipment with mineral fibre blanket type insulation of thickness indicated:

.1 chilled water and/or domestic cold water pump casings – 40 mm (1-½") thick;

.2 roof drain sumps where inside the building – 25 mm (1") thick;

.3 water meter(s) – 40 mm (1-½") thick;

.4 top of radiant ceiling panels – 50 mm (2") thick.

.2 Unless otherwise noted, wrap equipment to a thickness and insulating value equal to an equivalent thickness of rigid sectional pipe insulation. Laminate insulation in place with a full coverage of adhesive and secure with wire. Apply a jacket of insulation vapour barrier material secured in place with adhesive or sealant tape.

.3 Cover roof drain sumps with purpose made PVC fitting covers.

.4 Lay fibreglass blanket on radiant ceiling panels after testing is complete.

3.09 EQUIPMENT INSULATION REQUIREMENTS – SEMI-RIGID MINERAL FIBRE

.1 Insulate following equipment with semi-rigid mineral fibre board insulation of thickness indicated:

.1 refrigeration machine water chiller(s) and suction elbow(s) – 50 mm (2") thick;

.2 uninsulated domestic hot water storage tank(s) – 40 mm (1-½") thick;

.3 shell and tube type heat exchangers – 40 mm (1-½") thick;

.4 chilled water or chilled glycol solution storage tank – 50 mm (2") thick;

.5 heating main air separator – 40 mm (1-½") thick;

.6 chilled water expansion tank – 40 mm (1-½") thick.

.2 Install insulation as required to fit shape and contour of equipment. Secure insulation in place with adhesive, and with aluminum straps on 450 mm (18") centres. Apply a 6 mm (¼") thick skim coat of insulating cement, then, when insulating cement has dried, apply a 6 mm (¼") thick coat of cement trowelled smooth.

.3 For "cold" equipment, prime insulation with suitable sealer and apply a jacket of glass thread reinforced foil and kraft paper vapour barrier jacket material laminated in place with a full coverage of adhesive.

.4 Provide removable and replaceable insulated metal covers for equipment with removable heads to permit heads to be removed and replaced without damaging adjacent insulation work.

3.10 EQUIPMENT INSULATION REQUIREMENTS – REMOVABLE/REUSABLE TYPE

.1 Provide custom designed and manufactured removable and reusable insulation covers for following:

.1 plate type heat exchanger(s);

.2 150 mm (6") dia. and larger piping strainers, backflow preventers, etc.;

.2 Provide "wrap type" removable and reusable insulation covers for "cold" circuit balancing valves, backflow preventers, and similar items, and for steam traps and similar items requiring service in piping less than 150 mm (6") dia.

3.11 DUCTWORK INSULATION REQUIREMENTS – MINERAL FIBRE

.1 Insulate following ductwork systems inside building and above ground with mineral fibre insulation of thickness indicated:

.1 outside air intake ductwork, casings and plenums from fresh air intakes to and including mixing plenums or sections, or, if mixing plenums or sections are not provided, to first heating coil, or if both mixing plenums or sections and heating coil sections are not provided, and fresh air is not tempered, then the fresh air ductwork system complete – minimum 40 mm (1-½") thick as required;

.2 mixed supply air or preheated supply air casings, plenums and sections to and including the fan section where not factory insulated – minimum 25 mm (1") thick rigid board or minimum 40 mm (1-½") thick flexible blanket as required;

.3 supply air ductwork outward from fans, except for supply ductwork exposed in area it serves – minimum 25 mm (1") thick rigid board or minimum 40 mm (1-½") thick flexible blanket as required;

.4 exhaust discharge ductwork for a distance of 3 m (10') downstream (back) from exhaust openings to atmosphere, including any exhaust plenums within the 3 m (10') distance – minimum 25 mm (1") thick rigid board or minimum 40 mm (1-½") thick flexible blanket as required;

.5 any other ductwork, casings, plenums or sections specified or detailed on drawings to be insulated – thickness as specified.

.2 Provide rigid board type insulation for casings, plenums, and exposed rectangular ductwork. Provide blanket type insulation for round ductwork and concealed rectangular ductwork.

.3 Liberally apply adhesive to surfaces of exposed rectangular ducts and/or casings. Accurately and neatly press insulation into adhesive with tightly fitted butt joints. Provide pin and washer insulation fasteners at 300 mm (12") centres on bottom and side surfaces. Secure and seal joints with 75 mm (3") wide tape sealant. Additional installation requirements as follows:

.1 at trapeze hanger locations, install insulation between duct and hanger;

.2 provide drywall type metal corner beads on edges of ductwork, casings and plenums in equipment rooms, service corridors, and any other area where insulation is subject to accidental damage, and secure in place with tape sealant.

.4 Liberally apply adhesive to surfaces of concealed rectangular or oval ductwork, and wrap insulation around duct with a top butt joint and tight section to section butt joints. Provide pin and washer insulation fasteners at 300 mm (12") centres on bottom surfaces. Secure and seal joints with 75 mm (3") tape sealant. At each trapeze type duct hanger, provide a 100 mm (4") wide full length piece of rigid mineral fibre board insulation between duct and hanger.

.5 Accurately cut sections of insulation to fit tightly and completely around exposed and concealed round or oval ductwork. Liberally apply adhesive to surfaces of duct, and wrap insulation around duct with a top butt joint and tight section to section butt joints. Seal joints with tape sealant. At duct hanger locations install insulation between duct and hanger. At each hanger location for concealed ductwork where flexible blanket insulation is used, provide a 100 mm (4") wide full circumference strip of semi-rigid board type duct insulation between duct and hanger.

.6 Insulation application requirements common to all types of rigid ductwork are as follows:

.1 at duct connection flanges, insulate flanges with neatly cut strips of rigid insulation material secured with adhesive to side surfaces of flange with a top strip to cover exposed edges of the side strips, then butt the flat surface duct insulation up tight to flange insulation, or, alternatively, increase insulation thickness to depth of flange and cover top of flanges with tape sealant;

.2 installation of fastener pins and washers is to be concurrent with duct insulation application;

.3 cut insulation fastener pins almost flush to washer and cover with neatly cut pieces of tape sealant;

.4 accurately and neatly cut and fit insulation at duct accessories such as damper operators (with standoff mounting) and pitot tube access covers;

.5 prior to concealment of insulation by either construction finishes or canvas jacket material, patch vapour barrier damage by means of tape sealant.

3.12 DUCTWORK INSULATION REQUIREMENTS – FLEXIBLE ELASTOMERIC

.1 Insulate exposed exterior ductwork (except fresh air intake ductwork) and associated plenums and/or casings outside building with minimum 40 mm (1-½") thick flexible elastomeric sheet insulation as required, applied in 2 minimum 20 mm (¾") thick layers with staggered tightly butted joints.

.2 Install with adhesive in strict accordance with manufacturer's instructions to produce a weather-proof installation. Ensure sheet metal work joints are sealed watertight prior to applying insulation.

3.13 DUCTWORK INSULATION REQUIREMENTS – CALCIUM SILICATE

.1 Insulate following kitchen exhaust ductwork with minimum 40 mm (1-½") thick calcium silicate block insulation:

.1 kitchen exhaust ductwork from exhaust hood to masonry shaft – 2 hour rating;

.2 Secure insulation in place with adhesive and with wire on 450 mm (18") centres. Point gaps and joints with insulating cement. Where ductwork is exposed, cover insulation with wire mesh secured to wire and with edges laced together and apply a coat of finishing cement trowelled smooth. Use drywall type metal corner bead for duct edges where finishing cement is applied.

3.14 DUCT WRAP REQUIREMENTS – FIRE RATED MATERIAL

.1 Provide blanket type fire rated duct wrap system material for following ductwork to produce fire rating indicated:

.1 kitchen exhaust ductwork from exhaust hood to masonry shaft – 2 hour rating;

.2 Install duct wrap material in accordance with ULC design requirements and supplier's/manufacturer's instructions.

.3 Coordinate installation of duct wrap with installation of ductwork.

.4 Arrange and pay for duct wrap supplier to examine completed duct wrap system at site. Submit a letter from supplier to certifying duct wrap system has been properly installed.

3.15 APPLICATION OF INSULATING COATINGS

.1 Apply, in accordance with manufacturer's instruction, insulating coatings to following bare metal surfaces:

.1 paint bare metal surfaces clear of "cold" piping and/or equipment insulation for a distance of from 300 mm (12") to 600 mm (24") clear of pipe or equipment insulation, with "No Sweat-FX" anti-condensation coating;

.2 paint bare metal surfaces associated with mechanical systems with an operating temperature 60°C (140°F) with "ThermaLite" insulating coating.

.2 Apply coatings with a brush. Remove any splatter or excess coating from adjacent surfaces.

3.16 INSULATION FINISH REQUIREMENTS

.1 Unless otherwise shown and/or specified, jacket exposed mineral fibre insulation, and calcium silicate duct insulation work inside building with canvas secured in place with a full covering coat of lagging adhesive. Accurately cut canvas with scissors or a knife. Do not rip or tear canvas to size. Remove lagging adhesive splatter from adjacent uninsulated surfaces.

.2 Jacket exposed pipe insulation work inside building with white sheet PVC and fitting covers. Install sheet PVC and fitting covers tightly in place with overlapped circumferential and longitudinal joints arranged to shed water. Seal joints to produce a neat water-tight installation. Provide slip-type expansion joints where required by manufacturer’s instructions.

.3 Apply 2 heavy coats of "PITTCOTE 404" coating with 24 hr. between coats to foamed glass insulation exposed above grade.

.4 Apply 2 coats (with 24 hr. between coats) of specified coating to flexible elastomeric insulation outside building.

End of Section

1 General

1.01 APPLICATION

.1 This Section specifies commissioning requirements that are common to Mechanical Divisions work Sections and it is a supplement to each Section and is to be read accordingly. When requirements of this Section contradict requirements of Division 00 or Division 01, conditions of Division 00 or Division 01 to take precedence.

1.02 REFERENCE

.1 Refer to commissioning requirements specified in Division 01.

1.03 COMMISSIONING AGENT INVOLVEMENT VERSUS WARRANTY OBLIGATIONS

.1 Involvement of Commissioning Agent performing duties as described in this Section is not in any way to void or alter any Contractual warranty obligations.

1.04 SUBMITTALS

.1 Submit to Commissioning Agent, at same time as submittal to Consultant, one copy of each shop drawing or product data sheet associated with equipment or systems to be commissioned.

.2 Submit for review, a Commissioning Plan with schedule, commissioning procedures for commissioning events, and a copy of Commissioning Agent's commissioning data sheets for equipment/systems to be commissioned.

.3 Submit a list of commissioning instruments and for each instrument, indicate purpose of instrument and include a recent calibration certificate.

.4 Submit equipment and system manufacturer's start-up and test report sheets for review a minimum of 1 month prior to equipment and system start-up procedures.

.5 After start-up and successful pre-functional performance testing and submittal of completed forms, submit, for each system or subsystem, a letter confirming pre-functional performance testing has been successfully completed and system or subsystem is ready for functional performance testing and commissioning process to commence.

1.05 DEFINITIONS

.1 Commissioning: process of demonstrating to Owner and Consultant, for purpose of final acceptance, by means of successful and documented functional performance testing, that systems and/or subsystems are capable of being operated and maintained to perform in accordance with requirements of Contract Documents, all as further described below.

.2 Commissioning Agent: commissioning authority who will supervise commissioning process, and who will recommend final acceptance of commissioned mechanical work.

.3 Start-Up and Adjusting: process of equipment manufacturer's/supplier's technical personnel, with Contractor, starting and operating equipment and systems, making any required adjustments, documenting process, and submitting manufacturer's/supplier's start-up reports to confirm equipment has been properly installed and is operational as intended.

.4 Pre-Functional Performance Testing: testing, adjusting and operating of components, equipment, systems and/or subsystems, by Contractor, after start-up but before functional performance testing, to confirm components, equipment, systems and/or subsystems operate in accordance with requirements of Contract Documents, including modes and sequences of control and monitoring, interlocks, and responses to emergency conditions, and including submittal of pre-functional performance testing documentation sheets.

.5 Functional Performance Testing: a repeat of successful pre-functional performance testing by Contractor, in presence of Commissioning Agent and Consultant with completed Commissioning Agent's commissioning documentation sheets to document, validate and verify equipment, systems and subsystems are complete in all respects, function correctly, and are ready for acceptance.

.6 Commissioning Documentation Sheets: prepared sheets for pre-functional performance testing and for functional performance testing supplied by Commissioning Agent for each piece of equipment/system to be commissioned, each sheet or set of sheets complete with Project name and number, date of commissioning, equipment/system involved, equipment/system name and model number, equipment tag in accordance with drawings, and, for each commissioning procedure listed, a column giving expected data in accordance with Contract Documents, a column to fill in observed data during commissioning, and space for signatures of Contractor and Commissioning Agent.

.7 Systems Operating Manual: a manual prepared by Commissioning Agent to present an overview of building mechanical systems and equipment to be used by building maintenance personnel to assist them in daily operation of systems.

.8 Validate: to confirm by examination and witnessing tests correctness of equipment and system operation.

1.06 QUALITY ASSURANCE

.1 Commissioning work is to be in accordance with requirements of following:

.1 CSA Z320, Building Commissioning Standard and Check Sheets;

.2 ASHRAE Guideline 0, The Commissioning Process;

.3 ASHRAE Guideline 1.1, The HVAC Commissioning Process;

.4 ASHRAE Guideline 1.2, The Commissioning Process for Existing HVAC&R Systems;

.5 ASHRAE Guideline 1.5, Commissioning Smoke Control Systems;

.6 Owner designated Commissioning Agent.

1.07 COMMISSIONING OBJECTIVES

.1 Objectives of commissioning process:

.1 to support quality management by means of monitoring and checking installation;

.2 to verify equipment/system performance by means of commissioning of completed installation;

.3 to move completed equipment/systems from "static completion" state to "dynamic" operating state so as to transfer a complete and properly operating installation from Contractor to Owner.

1.08 TESTING EQUIPMENT

.1 Supply instruments and test equipment required to conduct start-up, testing and commissioning procedures.

2 Products – Not Used

3 Execution

3.01 COMMISSIONING

.1 Commission work in accordance with requirements of this Section and as required by Commissioning Agent.

.2 Prerequisites to successful completion of commissioning:

.1 submittal of signed start-up and test reports;

.2 completion of system testing, adjusting and balancing (TAB), and acceptance of TAB reports;

.3 permanent electrical and control connections of equipment;

.4 successful completion and documentation of pre-functional performance testing;

.5 submittal of letters to Consultant certifying systems and subsystems have been started, tested, adjusted, successfully pre-functional performance tested, are ready for functional performance testing, and are in accordance with requirements of Contract Documents.

3.02 PHASING OF COMMISSIONING

.1 If Project will be constructed in phases, phase commissioning accordingly to suit progress and phases of Work.

3.03 DEFICIENCIES LISTED DURING COMMISSIONING

.1 Correct deficiencies listed by Consultant and Commissioning Agent during commissioning process within 15 calendar days of notification unless agreed otherwise with Consultant, and when deficiencies have been corrected, notify Consultant and Commissioning Agent immediately.

3.04 SYSTEMS TO BE COMMISSIONED

.1 Mechanical systems to be commissioned include, but are not to be limited to, systems described below. Specific commissioning procedures are to be as directed by Commissioning Agent.

.2 Commissioning of drainage systems includes:

.1 commissioning of drainage pumps and controls by means of tests recommended by manufacturer to confirm proper operation and performance;

.2 commissioning of equipment such as interceptors and backflow preventers.

.3 Commissioning of fire protection systems will be considered complete upon preparation and submittal by Contractor of completion certificates required by applicable NFPA Standards, demonstration of proper system operation to local Fire Chief and any other authorities, including Owner’s insurance underwriter as required, and coordination and cooperation with fire alarm system commissioning procedures, in particular smoke control systems and other such fan system control sequences.

.4 Commissioning of water systems (all piping extended from Municipal main) includes:

.1 commissioning of pumps and controls;

.2 commissioning of water heaters;

.3 commissioning of piping specialties such as backflow preventers, mixing valves, and similar components;

.4 commissioning of trap seal primer units, including adjustment of water flows and confirmation of water flow at each connected trap;

.5 commissioning of plumbing fixtures.

.5 Commissioning of swimming pool systems includes pool piping and fittings, pumping equipment and controls, filtering equipment, and chemical treatment equipment, as well as any specialized equipment for pool area such as dehumidifiers.

.6 Commissioning of laboratory systems includes piping, fittings including bench work fittings, and associated equipment including special ventilation systems.

.7 Commissioning of medical gas systems is not part of mechanical commissioning work and will be done as part of work specified in the Section 22 63 00 – Gas Systems for Laboratory and Healthcare Facilities.

.8 Commissioning of compressed air system includes "head end" compressor equipment, pressure reducing equipment, and outlets.

.9 Commissioning of natural gas system includes pressure regulating equipment. Perform commissioning in accordance with requirements of CAN/CSA B149.1, and any supplemental requirements of governing authorities.

.10 Commissioning of propane gas system includes pressure regulating equipment. Perform commissioning in accordance with requirements of CAN/CSA B149.2, and any supplemental requirements of governing authorities.

.11 Perform commissioning of fuel oil system in accordance with requirements of CAN/CSA B139.

.12 Commissioning of heating systems includes piping, piping specialties, equipment, and control, as well as checking and validating temperature and flow documentation contained in TAB reports. If TAB is not done during heating season, a follow-up site visit during heating season will be required to confirm proper flows and temperatures, and any required system "fine tuning".

.13 Commissioning of cooling systems includes piping, piping specialties, equipment, and control, as well as checking and validating temperature and flow documentation contained in TAB reports. If TAB is not done during cooling season, a follow-up site visit during cooling season will be required to confirm proper flows and temperatures, and any required system "fine tuning".

.14 Commissioning of HVAC chemical treatment systems includes feed and monitoring equipment, and testing of system fluids to confirm proper concentration of chemical.

.15 Commissioning of air handling systems includes equipment, ductwork, ductwork specialties, controls, interlocks, and checking and validating air capacities and flows in accordance with TAB reports.

.16 Control work commissioning includes confirmation of proper operation of individual control components, and overall operation of controls in conjunction with operation of connected building systems, including heating season/cooling season testing requirements specified above.

.17 Commissioning of BAS includes confirmation of proper operation of components, input/output points, hardware and software, and demonstration of system performing required procedures.

.18 Commissioning of special usage room controls includes confirmation of proper operation of individual components, and proper operation of overall control system, all in accordance with governing Codes and Standards.

.19 Commissioning of noise and vibration control equipment includes noise and vibration measurements to confirm proper operation of equipment.

3.05 COMMISSIONING PROCESS

.1 Perform commissioning process in stages and include, but not be limited to, following:

.1 Stage 1: Commissioning of equipment/systems as listed in this Section, which is a prerequisite to an application for Substantial Performance of the Work and includes supervising and validating results of functional performance testing, and submittal of reviewed Systems Operating Manual.

.2 Stage 2: Commissioning work performed 12 months after issue of a Certificate of Substantial Performance and which includes supervision of Contractor's "fine tuning" of equipment/systems through seasonal occupancy, and any other such work to achieve optimal comfort and performance conditions.

.3 Stage 3: Successful completion of satisfactory equipment/system operation during 1st month after issue of a Certificate of Total Performance of the Work.

.4 Stage 4: Successful completion of satisfactory equipment/system operation during 3rd month after issue of a Certificate of Total Performance of the Work.

.5 Stage 5: Successful seasonal commissioning of building.

3.06 RESPONSIBILITIES OF CONTRACTOR

.1 During construction phase, Contractor is to:

.1 prepare and submit an installation schedule which includes a time schedule for each activity with lead and lag time allowed and indicated, shop drawing and working detail drawing submissions, and major equipment factory testing and delivery dates;

.2 prepare and submit a commissioning schedule which is to include a time schedule coordinated with installation schedule referred to above and Commissioning Agent, and allowances for additional time for re-tests as may be required, and update schedule on a monthly basis as required;

.3 when requested by Commissioning Agent, arrange site commissioning meetings with Owner, Consultant, and applicable subcontractors present, to be chaired by Commissioning Agent who will also prepare and distribute meeting minutes;

.4 promptly correct reported deficient work, and report when corrective work is complete;

.5 where required by Codes and/or Specification, retain equipment manufacturers/suppliers or independent 3rd parties to certify correct installation of equipment/systems;

.6 under supervision of equipment manufacturers/suppliers, start-up and adjust equipment to design requirements, and submit start-up sheets which include equipment data such as manufacturer and model number, serial number where applicable, and performance parameters, all signed by equipment manufacturer/supplier and Contractor;

.7 complete Commissioning Agent's commissioning data sheets for multiple items of smaller equipment such as air terminal boxes, fan coil units, backflow preventers, etc., submit sheets to Commissioning Agent, accompany Commissioning Agent for an on-site check of 30% of data sheet information for each type of equipment, and perform any corrective action required as a result of site checks;

.8 perform system testing, adjusting and balancing and, when complete, issue a copy of final report to Commissioning Agent for review and a site check of results, and perform any corrective work required as a result of site checks by Commissioning Agent;

.9 in accordance with updated commissioning schedule and actual progress at site, certify in writing to Consultant and Commissioning Agent that equipment and/or systems are complete, have been checked, started and adjusted, successfully pre-functional performance tested and documented, and are ready for functional performance testing and commissioning procedures, giving Consultant and Commissioning Agent a minimum of 5 working days' notice;

.10 perform system and subsystem functional performance testing under supervision of Commissioning Agent, and submit to Consultant and Commissioning Agent, completed and signed functional performance testing and commissioning data sheets (issued by Commissioning Agent) and also signed by Commissioning Agent.

.2 During post construction phase, Contractor is to:

.1 optimize system operation in accordance with building occupant’s needs and comments using System Operation Manual prepared by Commissioning Agent as reference;

.2 complete commissioning procedures, activities, and performance verification procedures that were delayed or not concluded during construction phase;

.3 accompanied by Commissioning Agent, complete system checks and "fine tuning" with signed documentation as follows:

.1 once during 1st month of building operation;

.2 once during 3rd month of building operation;

.3 once between 4th and 10th months in a season opposite to 1st and 3rd month visits.

.4 correct deficiencies revealed by system checks described above, and, where required, involve equipment manufacturers/suppliers during corrective actions, and report completion of corrective work;

.5 3 months after Substantial Completion conduct a question and answer session(s) at building with Owner’s operating and maintenance personnel, with duration of session(s) dictated by number of questions and concerns that have to be addressed.

End of Section

1 General

1.01 SUBMITTALS

.1 Submit shop drawings/product data sheets to regulatory authority for review and approval prior to submitting to the Consultant. Conform to following requirements:

.1 submit shop drawings/product data sheets for all products specified in this Section except pipe and fittings;

.2 sprinklers shall be referred to on drawings and product submittals, and be specifically identified by the manufacturer's listed model or series designation. Trade names and other abbreviated listings are not allowed;

.3 submit complete CAD layout drawings indicating source of water supply with test flow and pressure, "head-end" equipment piping schematic, pipe routing and sizing, and zones, all signed and sealed by a qualified professional mechanical engineer registered in jurisdiction of the work as specified below;

.4 submit copies of all calculations, including hydraulic calculations, stamped and signed by same engineer who signs layout drawings, and a listing of all design data used in preparing the calculations, system layout and sizing, including occupancy-hazard design requirements;

.5 in addition to submitting shop drawings to regulatory authority as specified above, shop drawings must be approved by Owner’s insurer prior to being submitted to the Consultant for review.

1.02 CLOSEOUT SUBMITTALS

.1 Submit a complete sprinkler system test certificate as specified in Part 3 of this Section.

1.03 SPARE PARTS

.1 Fill spare sprinkler head cabinet complete with spare heads.

1.04 QUALITY ASSURANCE

.1 Fire protection sprinkler system work is to be in accordance with following Codes and Standards:

.1 NFPA 13, Standard for the Installation of Sprinkler Systems;

.2 CSA B137.2, Polyvinylchloride (PVC) Injection-Moulded Gasketed Fittings for Pressure Applications;

.3 CSA B137.3, Rigid Polyvinylchloride (PVC) Pipe for Pressure Applications;

.4 ASTM A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless;

.5 ASTM A135, Standard Specification for Electric-Resistance-Welded Steel Pipe;

.6 ASTM A234, Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service;

.7 ASTM A536, Standard Specification for Ductile Castings;

.8 ASTM A795, Standard Specification for Black and Hot-Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use;

.9 ANSI/ASME B16.4, Grey Iron Threaded Fittings (Classes 125 and 250);

.10 CAN/CSA B64.10, Backflow Preventers and Vacuum Breakers.

.2 Fire protection sprinkler work is to be performed by a sprinkler company who is a member in good standing of the Canadian Automatic Sprinkler Association. Site personnel are to be licensed in jurisdiction of the work and under the continuous supervision of a foreman who is an experienced fire protection system installer and a journeyman pipe fitter licensed in jurisdiction of the work.

.3 Check and verify dimensions and conditions at site and ensure work can be performed as indicated. Coordinate work with trades at site and accept responsibility for and cost of making adjustments to piping and/or spacing to avoid interference with other building components.

.4 Verify working condition of existing sprinkler system equipment which has direct interface with project work and is to remain. Replace with new equipment where necessary.

.5 System components must be ULC listed and labelled.

.6 All grooved couplings, and fittings, valves and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

.7 All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

1.05 DESIGN REQUIREMENTS

.1 Fire protection sprinkler work is to be designed in accordance with NFPA 13 and Provincial Standards, and, where required, local building and fire department requirements and standards of Owner's Insurer. If water supply flow and pressure test data is not available, conduct Municipal main water flow and pressure tests at nearest fire hydrant to obtain criteria to be used in system design. Include hydrant location and flow and pressure test data with system design calculations.

.2 Include for a qualified mechanical professional engineer registered and licensed in the jurisdiction of the work to design the fire protection standpipe work. For requirements regarding Contractor retained engineers, refer to Section 20 05 10 – Mechanical Work General Instructions.

.3 Sprinkler /System Occupancy – Hazard Design requirements: In accordance with NFPA 13 occupancy-hazard density requirements, unless otherwise specified.

2 Products

2.01 PIPE, FITTINGS, AND JOINTS

.1 Pipe, fittings, and joints are to be as follows, with exceptions as specified in Part 3 of this Section:

.1 PVC

.1 Class 200, DR14, rigid, hub and spigot pattern PVC pipe and CSA certified fittings to CAN/CSA B137.2 and B137.3 and complete with gasketed joints.

.2 Schedule 40 Steel – Grooved Coupling Joints

.1 Schedule 40 mild black carbon steel, ASTM A53, Grade B, complete with grooved ends and mechanical fittings and couplings equal to Victaulic "FireLock" fittings and Victaulic Style 009N, 107H, and 107N QuickVic and 005 rigid coupling joints. Strap type outlet fittings such as Victaulic "Snap-Let" are not acceptable.

.3 Schedule 40 Steel – Screwed and Welded Joints

.1 Schedule 40 mild black carbon steel, ASTM A53, Grade B. Screwed piping complete with Class 125 cast iron screwed fittings to ANSI/ASME B16.4. Welded piping complete with

factory made seamless carbon steel butt welding fittings to ASTM A234, Grade WPB, long sweep pattern wherever possible.

.4 Schedule 10 Steel – Grooved Coupling Joints

.1 Schedule 10 mild black carbon steel, ASTM A53, Grade B, complete with grooved ends and fitings and couplings equal to Victaulic "FireLock" fittings and Victaulic Style 009N, 107H, and 107N QuickVic and 005 rigid coupling joints.

.5 Schedule 10 Steel – Screwed Joints

.1 Schedule 10 mild black carbon steel, ASTM A53, Grade B, complete with mill or site threaded ends, Class 125 cast iron screwed fittings to ANSI/ASME B16.4, and screwed joints.

.6 "Lightwall" Steel – Grooved Coupling Joints

.1 Commercial quality. "Lightwall" rolled mild carbon steel pipe to ASTM A135, Grade A, complete with a galvanized exterior, grooved ends, and fittings and couplings equal to Victaulic "Fire Lock" grooved fittings and Victaulic Style 009N QuickVic or 005 rigid coupling joints.

.7 "Lightwall" Steel – Screwed Joints

.1 Commercial quality, "Lightwall" rolled mild carbon steel pipe to ASTM A135, Grade A, ULC listed, mill or site threaded, complete with galvanized exterior, Class 125 cast iron screwed fittings to ANSI/ASME B16.4, and screwed joints.

.8 Flexible Pipe – Equal to Victaulic "VicFlex"

.1 The drop system shall consist of a braided type 304 stainless steel flexible tube, zinc plated steel 1" NPT Male threaded nipple for connection to branch-line piping, and a zinc plated steel reducer with a 1/2" or 3/4" NPT female thread for connection to the sprinkler head.

.2 Option: Victaulic FireLock IGS Groove Style 108 coupling for connection to branch-line piping, and a zinc plated steel reducer with a female thread for connection to the sprinkler head.

.3 The drop shall include a cULus/FM approved Series AH2 braided hose with a bend radius to 2" to allow for proper installation in confined spaces.

.4 The hose shall be listed for:

.1 (4) bends at 31" length;

.2 (5) bends at 36" length;

.3 (8) bends at 48" length;

.4 (10) bends at 60" length;

.5 (12) bends at 72" length.

.5 Union joints shall be provided for; ease of installation, prevention of hose torque stresses and on site changing of factory 5.75" straight reducing nipple in reduced spaces under obstructions (optional reducing nipples; 4.83" or 6.57" reducing 90 and 9" or 13" straight reducer x ½ or ¾" outlet) All VicFlex assemblies and related accessories to be installed as per the guidelines and listings in Victaulic submittal 10.85.

.6 On T Bar ceiling grid with drop in tile application, the flexible drop shall attach to the ceiling grid using a one-piece open gate Series AB1 bracket. The bracket shall allow installation before the ceiling tile is in place.

.7 On T Bar ceiling grid designed for hard lid drywall application; the flexible drop shall attach to the ceiling grid using a one-piece open gate Series AB2 bracket. The bracket shall allow for the vertical adjustment of the reducer/head from below the drywall, post drywall installation.

.8 On Hat Furring Channel grid with hard lid drywall application; the flexible drop shall attach to the ceiling grid using a one-piece open gate Series AB4 bracket. The bracket shall allow for the vertical adjustment of the reducer/head from below the drywall, post drywall installation.

.9 The braided drop system shall be cULus listed and FM Approved for sprinkler services to 175 psi (1206 kPa).

.10 For dry sprinkler heads Victaulic VicFlex dry sprinkler model VS1. The sprinkler shall provide a vertical or horizontal flexible connection with a bend radius to 2”, and allow for up to 4 bends. The sprinkler body shall be die cast brass with brass deflector, supplied finished to match application and to architectural direction, and glass bulb with glycerin solution. The product shall consist of a braided type 300 stainless steel flexible hose with a swivel type branch line threaded connection, EPDM gasket seal, with PTFE-coated Beryllium Nickel and stainless-steel spring-seal assembly. The bracket shall be open gate or metal strap to provide for sprinkler placement and alignment. The flexible dry sprinkler and bracket system is UL listed for sprinkler services to 175 psi.

.9 Copper – Solder Joint

.1 Type "L" hard drawn seamless copper to ASTM B88, complete with copper solder type fittings to ASME/ANSI B16.18 and soldered joints.

.10 CPVC Pipe

.1 Equal to IPEX BlazeMaster solvent weld, orange, SDR 13.5 pipe and Schedule 80 fittings, ULC listed for use in wet pipe automatic sprinkler systems, with a flame spread rating less than 25 and a smoke developed rating less than 50 when tested in accordance with CAN/ULC S102.2, and in accordance with NFPA 13 requirements.

.2 Victaulic Standard Mechanical Couplings: Manufactured in two segments of cast ductile iron, conforming to ASTM A-536, Grade 65-45-12. Gaskets shall be pressure-responsive synthetic rubber, grade to suit the intended service, conforming to ASTM D-2000. Mechanical Coupling bolts shall be zinc plated (ASTM B-633) heat treated carbon steel track head conforming to ASTM A-449 and ASTM A-183. Couplings shall comply with ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

.3 Rigid Type: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with NFPA 13. Couplings shall be fully installed at visual pad-to-pad offset contact. Couplings that require exact gapping of bolt pads at specific torque ratings are not permitted.

.4 Flexible Type: Use in locations where vibration attenuation and stress relief are required. Victaulic Style 177 (Quick-Vic™), Installation ready flexible coupling.

2.02 SERVICE MAIN DOUBLE CHECK VALVE ASSEMBLIES

.1 Minimum 1205 kPa (175 psi) rated dual check valve backflow preventer assembly to CAN/CSA B64, complete with tight-closing resilient seated shut-off valves, test cocks and strainer.

.2 Manufacturers:

.1 Watts Industries Canada;

.2 Zurn/Wilkins;

.3 Apollo Valves (Conbraco Industries).

2.03 SHUT-OFF VALVES

.1 Minimum 2070 kPa (300 psi) rated full port brass or bronze body screwed ball valves and lug body or grooved end type butterfly valves.

.2 Butterfly valves shall include a pressure responsive seat, and the stem shall be offset from the disc centerline to provide complete 360-degree circumferential seating.

.3 Basis of Design: Victaulic Style 705.

.4 OS&Y Gate Valves: 1725 kPa (250 psi), grooved ends. Ductile iron body, yoke, and handwheel conforming to ASTM A-536; EPDM coated ASTM A-126-B cast iron disc; ASTM B16 brass rising stem; flanged and epoxy coated ductile iron bonnet; EPDM O-ring stem seals and body gasket. Victaulic Series 771H (Grooved ends) and Series 771F (Grooved x Flanged).

.5 Supervised closed applications:

.1 Basis of Design: Victaulic Series 707C supervised closed butterfly valve.

2.04 CHECK VALVES

.1 Minimum 1725 kPa (250 psi) resilient seat check valves, suitable for vertical or horizontal installations.

.2 Basis of Design: Victaulic Series 717.

.3 Check valves associated with Fire Department connections and fire pump test connection are to be tapped for site installation of a 20 mm (¾") diameter ball drip.

2.05 BALL DRIPS

.1 Equal to National Fire Equipment Ltd. Model #A58, 20 mm (¾") diameter automatic ball drip.

2.06 SHUT-OFF VALVE SUPERVISORY SWITCHES

.1 Tamper-proof supervisory switches, each arranged to activate a fire alarm system trouble alarm condition if the valve is closed or tampered with, each suitable in all respects for the application, and each complete with all required mounting and connection hardware.

.2 Actuator housings shall be weatherproof.

2.07 FIRE DEPARTMENT CONNECTIONS

.1 Wall mounting polished brass clapper type dual inlet Fire Department connection with two 65 mm (2-½") diameter inlets threaded to Fire Department hose requirements and equipped with caps and chains, an outlet sized as shown, and a faceplate.

.2 Faceplate is to be polished brass and complete with "AUTO-SPKR" "STANDPIPE" cast-in raised lettering.

.3 Exposed metal parts of Fire Department connection are to be chrome plated.

.4 At the low point near each fire department connection, install a 90-degree elbow with drain connection to allow for system drainage to prevent freezing.

.5 Basis of Design: Victaulic #10-DR.

2.08 SPRINKLER MAIN "LOSS OF PRESSURE" ALARM SENSORS

.1 Piping mounted adjustable pressure sensor designed to actuate an alarm upon sensing a loss of pressure in the fire protection main. Switch is to be low voltage or line voltage as required.

2.09 WATER FLOW ALARM SWITCHES

.1 Pipe mounting water flow alarm switch, minimum 1725 kPa (250 psi) rated, designed to actuate two 7 ampere rated (at 125/250 VAC) SPDT snap action switches when water flow exceeds 0.758 L/sec. (10 Imp gpm), complete with a tamper-proof cover with conduit connection opening, a piping saddle and U-bolt, and an automatic rest pneumatic retard device with field adjustable (0 to 70 second) switch actuation delay to reduce false alarms caused by a single or series of transient water flow surges.

2.10 [ALARM CHECK VALVES]

.1 [Equal to Victaulic Series 751 FireLock, enamelled cast iron check valve assembly designed for either vertical or horizontal mounting and to actuate alarms when wet type sprinkler system is activated. Assembly is to be minimum 1205 kPa (175 psi) cold water rated with all moving parts constructed of brass, bronze, stainless steel or EPDM, and is to be complete with:

.1 pipe, fittings and accessories for site connection of an excess pressure pump;

.2 basic trim including piping materials and check valve for an external by-pass, potable water supply and system water supply pressure gauges with gauge test ports and shut-off valves, an angle type main drain valve, and fittings for mounting an alarm test by-pass;

.3 alarm test by-pass piping with ball valve to permit alarm testing without operation of alarm valve;

.4 alarm trim with pipe and fittings for connection to a water motor alarm, and an adjustable pressure switch for electrical connection to an alarm system upon flow through valve.]

2.11 EXCESS PRESSURE PUMPS

.1 Close coupled, 1750 RPM, all bronze gear pump sized to maintain sufficient pressure in fire protection main to prevent alarm check valve(s) from initiating flow alarms during fluctuations in pressure of Municipal water supply. Pump is to be complete with:

.1 stainless steel shaft with maintenance free seal;

.2 lifetime lubricated carbon bearings;

.3 TEFC motor conforming to requirements specified in Section 20 05 00 – Common Work Results for Mechanical, and secured to a mounting base;

.4 accessory package consisting of flexible suction and discharge connection hoses, a Monel inlet strainer, relief valve factory set at 862 kPa (120 psi), and a steel mounting plate designed to mount pump to alarm check valve flange;

.5 power and control panel.

.2 Factory pre-wired power and control panel, CSA certified, designed to automatically start and stop pump in response to water pressure variations in the main and consisting of a surface wall mounting NEMA 2 enamelled steel panel with hinged front door equipped with Corbin catch, and following:

.1 door interlock fused disconnect with HRC fuses;

.2 protected type pump starter;

.3 door mounted H-O-A rotary selector switch;

.4 fused control transformer;

.5 115 volt adjustable pressure switch to suit the application;

.6 set of NO/NC dry contacts for connection of lack of power availability alarm;

.7 door mounted "POWER ON" LED.

2.12 WATER MOTOR ALARMS

.1 Surface wall mounting water motor driven alarm device consisting of a water motor assembly with 20 mm (¾") diameter inlet and 25 mm (1") or 32 mm (1-¼") diameter drain connections, inlet strainer, a red enamelled steel exterior wall mounting strike and gong assembly, a drive shaft sleeve with drive shaft to connect water motor and gong assembly and, at the exterior gong, identification to read "SPRINKLER FIRE ALARM - WHEN BELL RINGS CALL FIRE DEPARTMENT OR POLICE".

2.13 DRY PIPE VALVES

.1 Equal to a Victaulic Series 768-NXT:

.1 Series 746-LPA accelerator quick opening device;

.2 Series 757 regulated air maintenance trim assembly;

.3 Required air pressure shall be 90 kPa (13 psig);

.4 The valve shall be externally resettable;

.5 Provide valve complete with internal components that are replaceable without removing valve from installed position;

.6 Systems requiring a quick opening device must use a regulated, tank mounted air supply;

.7 Series 757 Regulated Air Maintenance Trim Assembly.

2.14 DRY PIPE ZONE AIR COMPRESSOR

.1 Equal to a Victaulic 7C7 CSA certified, oil-less, piston type direct driven compressor with a motor conforming to requirements specified in Section 20 05 00 – Common Work Results for Mechanical, and a mounting bracket.

.2 Equal to General Air Products OLT Series, package type, oil-free, piston type, tank mounted air compressor set complete with horizontal, ASME rated and stamped steel tank with support feet, pressure gauge with gauge cock, tank drain, flexible compressor to tank and tank to piping flexible connections supplied loose for field installation, and a motor conforming to requirements specified in Section 20 05 00 – Common Work Results for Mechanical.

.3 Compressor set capacity and performance must suit final dry pipe system design and reviewed piping and sprinkler head layout shop drawings. If a larger compressor set than that specified is required, provide larger set at no additional cost, and include any additional costs for a larger size motor starter and associated wiring.

2.15 PREACTION VALVE AND ACCESSORIES

.1 Equal to Series 745 FirePac - Provide a pre-assembled [Dry] [Preaction] [Deluge] fire protection valve mounted completely within a steel cabinet for sizes 1½" [DN 40] through 8" [DN 200]. Cabinet shall be coated with red ASA-61 electrostatically applied polyester powder coating. Cabinet shall have field removable access panels on three sides to allow for ease of valve maintenance, servicing, and

installation. Unit shall be UL Listed and FM-Global Approved with all materials and wiring conforming to NFPA requirements. Unit shall be provided with Series 728 ball valve or Series 705 butterfly shutoff valve with pre-wired supervisory switches, the sprinkler system fire protection valve, alarm line pressure switches, air supervisory pressure switches, alarm pressure switch and pressure gauges for proper operation and shall be pre-wired to Model RP-2001 control panel. All external electrical connections shall be able to be connected through a factory provided conduit connection to an enclosure inside of the cabinet. Water inlet, system supply, and drain connections shall be grooved for ease of installation. Victaulic FireLock® Series 745 Fire-Pac.

.2 [Dry] [Preaction] [or] [Deluge] valve [with specified configuration], valve shall be low differential, latched clapper design with a black enamel coated ductile iron body conforming to ASTM A536, aluminum bronze clapper, stainless steel spring and shaft, EPDM diaphragm and seal, brass seat with nitrile seat o-rings. Valve internal parts shall be replaceable without removing the valve from the installed position and shall be externally resettable. 300 psi pressure rating in sizes 1½" [DN 40] through 8" [DN 200] and shall be grooved ends for vertical installation only. Victaulic FireLock® NXT [Series 768N (Preaction)] [and] [or] [Series 769N Deluge].

.3 Trim configurations:

.1 Dry Valve: Pneumatic operation.

.2 Preaction Valve:

.1 Non-interlock; [Pneumatic] [and] [or] [Electric].

.2 Single interlock; [Pneumatic] [or] [Electric].

.3 Double interlock; [Pneumatic] [and] [Electric].

.3 Deluge Valve:

.1 Electric release.

.2 Wet pilot.

.3 Dry pilot.

.4 Electric Release Panel: Notifier Model RP-2001 is a compact single enclosure unit containing power supply, two 12 Amp-hr batteries and availability to have factory installed all accessory options.

.5 Options: Preassembled cabinet shall have factory options to have pipe penetrations sealed to meet NEMA 4 protection of equipment inside of the enclosure with respect to the ingress of water, whether rain, sleet, snow, splashing water or hose directed water.

.6 Options: Preassembled cabinet shall have nitrogen fill options as well as a factory installed low nitrogen pressure alarm to augment low air alarms as needed in certain trim applications.

.7 Manufacturers:

.1 Victaulic Co.;

.2 FireFlex System Inc.

.8 Smoke detectors, each complete with a red LED that pulses during normal standby conditions and illuminates steadily during an alarm condition.

.9 Surface wall mounting (to a recessed box) non-break glass pull station with test/reset key.

2.16 ZONE CONTROL RISER MODULES

.1 Equal to Victaulic Co. "FireLock" Series 747M factory assembled zone control riser modules, each complete with a painted cast ductile iron grooved end body, a ball type shut-off valve, a test and drain combination with properly sized orifice, a flow alarm switch, a pressure gauge with cock, and a pressure relief valve kit.

.2 Zone flow test and drain assembly cabinets are to be equal to National Fire Equipment Ltd. Model CV-200 recessed cold rolled steel cabinets, sized to suit assemblies, with a baked enamel finish, #18 gauge with universal knockouts for tubs, #14 gauge for doors and trim, with all metal edges ground and rounded. Doors are to be complete with:

.1 hollow channel reinforcement;

.2 full length semi-concealed piano hinge with paint stop feature and designed to permit 180° door opening;

.3 flush stainless steel door latch.

2.17 SPRINKLER HEADS

.1 Sprinkler heads, unless otherwise specified, are to be as scheduled in Part 3 of this Section.

.2 Sprinkler body shall be die-cast, with a hex-shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation. Wrenches shall be provided by the sprinkler manufacturer that directly engage the wrench boss.

.3 For locations where corrosive resistant coatings are required, body shall be coated with UL listed and FM approved anti-corrosion VC-250 coating (silver coloring).

.4 Sprinkler heads for healthcare facilities are to be quick response type.

.5 Provide quick response sprinkler heads unless standard response required to suit the hazard class.

.6 Recessed sprinkler heads in finished areas are to be chrome plated unless otherwise specified. Concealed sprinkler head ceiling plates are to match ceiling colour.

.7 Where exposed pendent heads occurs in areas with suspended ceilings, they are to be complete with [chrome plated] escutcheon plates. Similarly, sidewall heads with concealed piping are to be complete with [chrome plated] escutcheon plates.

.8 Sprinkler heads which are exposed in areas where they may be subject to damage are to be complete with wire guards, [chrome plated] where in finished areas.

.9 Escutcheons and guards shall be listed, supplied, and approved for use with the sprinkler by the sprinkler manufacturer.

.10 Sprinkler heads located in areas or over equipment where high ambient temperature is present are to be, unless otherwise specified, 74°C (165°F) heads. All other heads, unless otherwise specified or required, are to be 57°C (135°F) rated.

.11 Manufacturers:

.1 Victaulic Co.;

.2 Tyco Fire Suppression & Building Products;

.3 The Viking Corporation;

.4 The Reliable Automatic Sprinkler Co.

2.18 SPARE SPRINKLER HEAD CABINETS

.1 Surface wall mounting, red enamelled steel, identified cabinet with hinged door, shelves with holes for mounting sprinkler heads, a wrench or wrenches suitable for each type of sprinkler head, and a full complement of spare sprinkler heads.

.2 Cabinet is to be sized to accommodate a minimum of 4 spare heads for each type of head used on the project, however, each cabinet is to be full of spare heads.

2.19 INDICATOR POST AND VALVES

.1 Cast iron, bronze trim, resilient seat, OS&Y gate valve with non-rising stem in accordance with AWWA 200W, minimum 1380 kPa (200 psi) cold water rated and complete with a square operating nut and ends to suit connecting piping.

.2 Adjustable indicator post assembly with a cast iron valve box of a length to suit valve depth and flange bolted to the valve, a cast iron lower barrel bolted to the valve box and of a length to suit valve location, and a cast iron upper housing bolted to the lower barrel and complete with wrench and operating mechanism with steel extension shaft and coupling nut sized to suit, operating handle, and valve "OPEN" and "CLOSED" identification visible through a clear polycarbonate window.

3 Execution

3.01 MONITORING OF SYSTEMS

.1 Daily monitor and supervise existing sprinkler system serving renovated areas to ensure that each respective system is left in proper operating condition at end of each working day. Include for but not be limited to performing following:

.1 Under presence of Owner’s representative, check each morning and evening (start and end of work) of each day, sprinkler system to ensure that it is in proper working condition;

.2 If portions of sprinkler system is not in proper working order, provide temporary provisions subject to approval of local fire authority or local governing authority, to ensure that proper sprinkler coverage is provided and/or provide supervisory personnel to monitor areas where sprinkler system is not operational;

.3 Document and sign off with Owner’s representative signing off also, each respective daily check condition;

.4 Ensure that work to sprinkler system does not affect portion of system serving areas outside of renovation areas.

3.02 DEMOLITION

.1 Refer to demolition requirements specified in Section 20 05 05 – Selective Demolition for Mechanical.

3.03 PIPING INSTALLATION REQUIREMENTS

.1 Provide required sprinkler system piping.

.2 Perform piping work in accordance with requirements of NFPA 13, governing regulations, and "Reviewed" shop drawings.

.3 Piping, unless otherwise specified, is as follows:

.1 for underground piping inside or outside building – Class 200, DR14 rigid PVC, braced and secured at bends and tees with concrete blocks in accordance with Municipal standards and details;

.2 for piping inside building and above ground except as noted below – Schedule 40 grooved end black steel with Victaulic or equal fittings and coupling joints, or, for piping to and including 50 mm (2") diameter, screwed fittings and joints, or, for piping 65 mm (2-½") diameter and larger, welding fittings and welded joints;

.3 for wet system piping inside building and above ground – at your option, CPVC sprinkler pipe and fittings;

.4 for piping downstream of "head end" alarm valve(s) and equipment – Schedule 10 or "Lightwall" black steel pipe with Victaulic or equal fittings and coupling joints or screwed fittings and joints;

.5 for branch piping to heads in suspended ceilings, etc. – at your option, flexible piping installed in accordance with manufacturer's instructions;

.6 for branch piping to heads in MRI suites – copper pipe, fittings, and sprinkler head adapters with stainless steel hangers and support hardware.

.4 Exceptions to piping requirements specified above are as follows:

.1 dry pipe zone steel piping, fittings, unions, couplings and flanges are to be galvanized;

.2 wet zone steel piping, fittings, unions, couplings and flanges for sprinkler work exposed to weather either inside or outside building (including parking garages), are to be galvanized;

.3 PVC piping is not to be used above grade;

.4 ferrous pipe hangers, supports, and similar hardware used for galvanized steel piping are to be electro-galvanized.

.5 Pipe sizes, pipe routing, sprinkler head quantities and locations, and layout of work shown on drawings are to assist during the tendering period. Ensure adequate head coverage, head quantities and pipe sizing as specified in Part 1 of this Section. Do not reduce size of sprinkler main or re-route the main unless approved by Consultant.

.6 Pipe, fittings, couplings, flanges and similar components are to be clean after erection is complete. Wire brush clean any ferrous pipe, fitting, coupling, flange, hanger, support and similar component which exhibits rust and carefully coat with suitably coloured primer.

.7 Where sprinklers are not protected by a dry system and may be subject to freezing, provide non-freeze, glycol-water solution filled sprinkler piping. Install piping complete with a CSA certified reduced pressure backflow preventer, valves and glycol solution fill facilities in accordance with requirements of Chapter 3 of NFPA 13. Fill piping with a solution of 50% Union Carbide Canada Ltd. "UCAR THERMO-FLUID 17" or Dow Chemical Co. "Dowtherm SR1" propylene glycol with corrosion inhibitors, and 50% clean water. Prior to filling piping, check the specific gravity of the solution using a hydrometer with proper scale. Specific gravity is to be approximately 1.069 at 15.6°C.

.8 When sprinkler work is complete, test system components and overall system(s) and submit completed test certificate and other documentation in accordance with Chapter 8 of NFPA 13.

.9 Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks. Gaskets shall be molded and produced by the coupling manufacturer, and shall be verified as suitable for the intended service. A factory-trained field representative of the mechanical joint manufacturer shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. The factory-trained representative shall periodically review the product

installation and ensure best practices are being followed. Contractor shall remove and replace any improperly installed products.

3.04 INSTALLATION OF DOUBLE CHECK VALVE ASSEMBLY

.1 Provide a double check valve assembly in sprinkler main inside the building.

.2 Equip assembly with inlet and outlet shut-off valves with supervisory switches as specified below.

.3 Support each end of assembly from floor by means of flanged pipe supports with saddles.

3.05 INSTALLATION OF SHUT-OFF VALVES AND CHECK VALVES

.1 Provide shut-off valves and check valves in piping where shown and wherever else required.

.2 Locate valves for easy operation and maintenance.

.3 Confirm exact locations prior to roughing-in.

3.06 INSTALLATION OF SHUT-OFF VALVE SUPERVISORY SWITCHES

.1 Equip each shut-off valve with a supervisory switch.

.2 Identify each supervised valve with a 150 mm (6") square, engraved, laminated red-white plastic tag to correspond with supervised valve numbering specified and/or shown as part of the electrical work fire alarm system.

3.07 INSTALLATION OF FIRE DEPARTMENT CONNECTION

.1 Provide an exterior Fire Department connection. Confirm exact location prior to roughing-in. Confirm finish prior to ordering.

.2 Equip connection with a check valve. Equip check valve with a ball drip to drain piping between Fire Department connection and check valve, and extend drainage piping from outlet of ball drip to nearest suitable floor drain.

3.08 INSTALLATION OF LOSS OF PRESSURE SENSOR

.1 Supply and mount a pressure sensor in the fire protection piping main to activate a "LOSS OF PRESSURE" trouble alarm should Municipal water service pressure fall below the acceptable level.

.2 Locate sensor for easy access and maintenance, and set alarm pressure to suit site conditions. Confirm setting on site.

.3 Identify pressure sensor and its normal setting with a 150 mm (6") square red-white laminated plastic tag engraved to read "LOSS OF WATER PRESSURE SENSOR - NORMAL SETTING 210 kPa". Confirm wording prior to engraving.

3.09 INSTALLATION OF FLOW ALARM SWITCHES

.1 Provide water flow alarm switches in accessible locations in zone piping.

.2 Adjust to suit site water pressure conditions. Check and test operation.

.3 Identify each switch with a 150 mm (6") square red-white laminated engraved plastic tag. Confirm wording prior to engraving.

3.10 INSTALLATION OF ALARM CHECK VALVES

.1 Provide alarm check valves, complete with trim, for wet zone fire protection sprinkler piping.

.2 Check and test operation of each valve and adjust as required to suit site water pressure conditions.

.3 Identify each valve with a 150 mm (6") square red-white laminated engraved plastic tag. Confirm wording prior to engraving.

3.11 INSTALLATION OF EXCESS PRESSURE PUMP AND CONTROLS

.1 Provide an excess pressure pump in wet fire protection sprinkler system piping, arranged to prevent activation of alarm check valve water flow alarms during normal water pressure fluctuations in the main. Locate pump on a steel mounting plate assembly at alarm check valve(s) and install accessories supplied with pump. Provide a pressure gauge in valved tubing across pump suction and discharge connections.

.2 Supply a starter and control panel for pump and surface wall mount adjacent to pump. Connect panel pressure switch with copper tubing in accordance with pump manufacturer's instructions. Adjust pressure switch to suit site conditions.

.3 Start-up the pump, test operation and adjust as required.

3.12 INSTALLATION OF WATER MOTOR ALARMS

.1 Provide a water motor alarm. Secure gong on the exterior wall, impeller and motor assembly on the interior wall, and connect with drive assembly in accordance with manufacturer's instructions. Install inlet strainer supplied loose with assembly.

.2 Provide a galvanized steel drain pipe from impeller-motor assembly down the interior wall and terminate piping back out through the wall with a 45° piping elbow and wall plate located 600 mm (24") above finished grade.

.3 Confirm exact location of alarm gong prior to roughing-in.

.4 When installation is complete, check and test alarm operation and adjust as required.

3.13 INSTALLATION OF DRY PIPE VALVES

.1 Provide dry pipe valves for zones.

.2 Connect compressed air piping to each valve, as well as all compressed air piping trim.

.3 When installation is complete, check and test valve operation and adjust as required.

.4 Provide drum drips in dry type fire protection sprinkler zone piping where shown or required. Wherever possible locate drum drips in heated areas. Where drum drips are located in unheated areas ensure trades performing thermal insulation work and electric heating cable pipe tracing work are aware of the number of drum drips required, and the size and location. Identify each drum drip. Locate drum drips in heated areas wherever possible.

3.14 INSTALLATION OF DRY ZONE AIR COMPRESSORS

.1 Provide an air compressor with air maintenance device and pressure control for the dry pipe zone and dry pipe valve. Secure compressor to a piping main by means of a mounting bracket supplied with compressor. Adjust to suit site conditions.

.2 Provide an air compressor set with receiver and secure in place on rubber-steel-rubber vibration isolation pads on a concrete housekeeping pad.

.3 Install flexible piping connections supplied loose with set.

.4 Extend valved drain piping from receiver to a floor drain.

.5 Connect receiver and control panel pressure switch with copper tubing.

.6 When installation is complete, check and test air compressor set, including automatic operation, and adjust as required.

3.15 INSTALLATION OF PREACTION SPRINKLER SYSTEMS

.1 Provide a preaction sprinkler system.

.2 Install preaction deluge valve cabinet assembly with control panel and air compressor as indicated but confirm exact location prior to roughing-in.

.3 Provide required water supply, compressed air, sprinkler, and drain piping. Terminate drain piping over a funnel floor drain.

.4 Provide detection devices and install in accordance with manufacturer's instructions. Connect to control panel with wiring in conduit.

.5 Supply detection devices and hand to electrical trade on site for installation.

.6 Include for 4 hours of on-site operation demonstration and training session. Training is to be a full review of all components including but not limited to a full operation and maintenance demonstration, with abnormal events.

3.16 INSTALLATION OF ZONE CONTROL RISER MODULES

.1 Provide zone control riser modules with drain piping where required. Terminate drainage piping over a funnel floor drain unless otherwise shown or specified. Identify each assembly.

3.17 INSTALLATION OF ZONE CONTROL RISER MODULE CABINETS

.1 Provide flush wall mounting cabinets for zone control and inspector's test connection assemblies where required in finished areas. Confirm exact locations prior to roughing-in.

.2 Identify each cabinet with a nameplate in accordance with requirements of Section 20 05 00 – Common Work Results for Mechanical.

3.18 INSTALLATION OF SPRINKLER HEADS

.1 Provide required sprinkler heads in accordance with following schedule:

Application	Sprinkler Head Type
Healthcare Facility Type I rooms/areas as per CAN/CSA-Z317.2, Table 1, HVAC Design Criteria, first two columns	Victaulic V38/V39 or Tyco Series RFII "Royal Flush II" concealed pendent
Healthcare Facility Type II rooms/area as per CAN/CSA-Z317.2, Table 1, HVAC Design Criteria, first two columns	Victaulic V27 or Tyco Series TY-FRB recessed pendent
Healthcare Facility Type III rooms/areas as per CAN/CSA-Z317.2, Table 1, HVAC Design Criteria, first two columns	Victaulic V27 or Tyco Series TY-FRB recessed pendent
Healthcare patient unit without a suspended ceiling but with a ceiling bulkhead	Victaulic V27 or Tyco Series TY-FRB recessed horizontal sidewall Victaulic V38/V39 or Tyco Series RFII "Royal Flush II" concealed pendent or Victaulic V27 or Tyco Series TY-FRB recessed pendent in bottom of bulkhead if bulkhead is greater than 200 mm (8") deep

Application	Sprinkler Head Type
Healthcare Facility mental health room/areas	Tyco "RAVEN" institutional, tamper-resistant pendent or horizontal sidewall as required
Healthcare Facility MRI Suite	Reliable Model F4FR-NF non-ferrous concealed pendent
Rooms/areas with a suspended ceiling	Victaulic V38/V39 or Tyco Series RFII "Royal Flush II" concealed pendent Victaulic V27 or Tyco Series TY-FRB recessed pendent Victaulic V27 or Tyco Series TY-FRB pendent with escutcheon plates
Rooms/areas without a suspended ceiling	Victaulic V27 or Tyco Series TY-FRB pendent
Elevator shafts	Victaulic V27 or Tyco Series TY-FRB horizontal sidewall
Unheated exterior stairwells	Victaulic V36 or Tyco Series DS-1 dry pipe horizontal sidewall Victaulic V36 or Tyco Series DS-3 wet pipe horizontal sidewall
Air handling system outdoor air and relief air plenums (unheated)	Tyco Series DS-3 ECOH dry horizontal sidewalls in wet piping Victaulic V27 or Tyco Series TY-FRB upright or horizontal sidewall in dry pipe or anti-freeze piping
Unheated and unfinished areas	Victaulic V36 or Tyco Series DS-3 ECOH dry horizontal sidewall in wet piping Victaulic V27 or Tyco Series TY-FRB upright or horizontal sidewall in dry pipe or anti-freeze piping
Heated areas with overhead doors	Victaulic V27 or Tyco Series TY-FRB horizontal sidewall
Unheated parking garage	Victaulic V34 or Tyco Series EC-11 or EC-14 ECOH upright or Victaulic V27 or Series TY-FRB upright for dry piping
Heated parking garage	Victaulic V34 or Tyco Series EC-11 or EC-14 ECOH upright or Victaulic V27 or Series TY-FRB upright for wet piping
Parking garage ramp	Victaulic V34 or Tyco Series EC-11 or EC-14 ECOH upright or Series TY-FRB upright or Victaulic V27 or Series ELO SW-20 or SW-24 ECOH sidewall
At non-rated windows in rated walls	Tyco Model WS horizontal and pendent vertical sidewall

.2 Sprinkler head manufacturers indicated on schedule are for type indication purposes. Manufacturers are listed in Part 2 of this Section.

.3 Provide quick response type sprinkler heads for healthcare facilities.

.4 Coordinate sprinkler head locations with all drawings, including architectural reflected ceiling plan drawings, and, where applicable, electrical drawings. Coordinate sprinkler head locations in areas with suspended ceilings with the location of lighting, grilles, diffusers, and similar items recessed in or surface mounted on the ceiling as per the reflected ceiling plans. In areas with lay-in tile, centre the sprinkler head both ways in the lay-in tile wherever possible. Confirm locations prior to roughing-in.

.5 Maintain maximum headroom in areas with no ceilings.

.6 Provide guards for heads where they are subject to damage.

.7 Provide high temperature heads in equipment rooms and similar areas over heat producing or generating equipment.

3.19 INSTALLATION OF SPARE SPRINKLER HEAD CABINETS

.1 Supply a full complement (to fill cabinet) of spare sprinkler heads of types used (minimum 4 of each type) and place in a wall mounting storage cabinet located adjacent to sprinkler system "head end" equipment where later directed.

3.20 INSTALLATION OF INDICATOR POST VALVES

.1 Provide a shut-off valve in underground sprinkler main piping outside building. Equip valve with a valve box and an indicator post assembly.

.2 Confirm valve box length and steel shaft length prior to ordering and confirm exact location prior to roughing-in.

.3 When installation is complete, check and test operation of assembly and adjusts as required.

End of Section

1 General

1.01 SUBMITTALS

.1 Submit shop drawings/product data sheets for all products specified in Part 2 of this Section except for pipe, fittings, and chlorine solution.

1.02 CLOSEOUT SUBMITTALS

.1 Submit laboratory water purity test results indicating chlorine residual prior to application for Substantial Performance of the Work.

.2 Prior Substantial Performance of the Work, submit a minimum of 3 identified keys for key operated hydrants.

.3 Submit signed test results and inspection and test log cards for each backflow preventer as specified in Part 3 of this Section.

.4 Submit anchor drawing(s) to detail fabrication and installation of water piping anchors. Drawing(s) are to be prepared and stamped by a professional structural engineer registered and licensed in jurisdiction of the work.

.5 As specified in Part 3 of this Section, submit a letter from anchor design engineer stating anchor installation has been examined at site and anchors are properly fabricated and installed.

1.03 QUALITY ASSURANCE

.1 Domestic water piping and valves are to comply with following codes, regulations and standards (as applicable):

.1 applicable local codes and regulations;

.2 CAN/CSA B125.1, Plumbing Supply Fittings;

.3 CAN/CSA B125.3, Plumbing Fittings;

.4 CAN/CSA B137 Series, Thermoplastic Pressure Piping Compendium;

.5 NSF/ANSI 14, Plastics Piping System Components and Related Materials;

.6 NSF/ANSI 61, Drinking Water System Components – Health Effects;

.7 NSF/ANSI 372, Drinking Water System Components – Lead Content.

2 Products

2.01 PIPE, FITTINGS, AND JOINTS

.1 PVC

.1 ULC listed, rigid, Class 150, DR18, 1035 kPa (150 psi) pressure rated bell and spigot pattern PVC pipe to CAN/CSA B137.3, and CSA certified fittings to CAN/CSA B137.2, and AWWA C900, complete with gasket joints, and Ford "Uni-Flange" or equal restraint collars as per Part 3 of this Section.

.2 Soft Copper

.1 Type "K" soft copper to ASTM B88, supplied in a continuous coil with no joints if possible, and complete with, if joints are required, compression type flared joint couplings.

.3 Copper - Solder Joint

.1 Type "L" hard drawn seamless copper to ASTM B88, complete with copper solder type fittings to ASME/ANSI B16.18 and soldered joints using The Canada Metal Co. Ltd. "SILVABRITE 100" or equal lead-free solder for cold water pipe, and 95% tin / 5% Antimony or "SILVABRITE 100" solder for other services.

.4 Copper - Pressure Coupled Joint

.1 Type "L" hard drawn seamless copper to ASTM B88 with Viega "ProPress with Smart Connect feature" copper fittings with EDPM seals, and pressure type crimped joints made by use of manufacturer recommended tool.

.5 Copper - Grooved

.1 Type "L" hard drawn seamless copper to ASTM B88 with Victaulic QuickVic Style 607 non-reducing, bolted connection type suitable and approved for application intended, 2” - 8" for copper tubing consisting of ductile iron cast housings, complete with a Grade P fluoroelastomer gasket of a pressure-responsive design, with plated nuts and bolts to secure unit together.

.6 Semi-Rigid Polyethylene Tubing

.1 Versa Fittings and Mfg. Inc. 12 mm (½") dia., high density, semi-rigid polyethylene tubing, 1380 kPa (200 psi) rated.

.7 CPVC

.1 Ipex "Aquarise" CPVC pipe and fittings to CAN/CSA B137.6, 25/50 flame spread and smoke developed rated in accordance with CAN/ULC S102.2, and complete with primer/solvent weld joints.

.2 Option: Fittings equal to Victaulic PGS-300 grooved piping system for schedule 40 and schedule 80 CPVC pipe per ASTM F441, 23447 minimum cell classification per ASTM D1784. Sizes 50-300 mm (2” - 12") consisting of ductile iron cast housings, complete with a grade “EHP” EPDM gasket of a pressure-responsive design, with plated nuts and bolts to secure unit together (Viictaulic Style 357).

.8 Cross-Linked Polyethylene (PEX) Tubing

.1 Non-barrier type PEX piping in accordance with CAN/CSA B137.5, ASTM F876 and tested for compliance by an independent third-party agency, 25/50 flame spread/smoke developed rated when tested to CAN/ULC S102.2 and complete with brass inserts and crimp-ring or cold-expansion joint fittings and couplings.

2.02 SHUT-OFF VALVES

.1 Ball Valves

.1 Class 600, 4140 kPa (600 psi) WOG rated, lead-free, full port ball type valves, each complete with a forged brass body with solder ends, forged brass cap, blowout-proof stem, solid forged brass chrome plated ball, "Teflon" or "PTFE" seat, and a removable lever handle. Valves in insulated piping are to be complete with stem extensions.

.2 Acceptable products are:

.1 Toyo Valve Co. Fig. 5049A-LF;

.2 Milwaukee Valve Co. #UPBA485B;

.3 Kitz Corporation Code 859;

.4 Apollo Valves #77LF-200;

.5 Watts Industries (Canada) Inc. #LFFBVS-3C.

.2 Butterfly Valves - Flanged Joint

.1 Non-corrosive, minimum 1200 kPa (175 psi) cold water pressure rated, resilient seated butterfly valves, each complete with a coated cast ductile iron lug type body, stainless steel shaft, bronze disc, and EPDM seat, and each suitable for domestic water bubble-tight dead end service with valve in position and either side of connecting piping removed. Butterfly valves to and including 100 mm (4") dia. are to be equipped with lever handles. Butterfly valves larger than 100 mm (4") dia. are to be equipped with worm gear operators.

.2 Acceptable products are:

.1 DeZurik #632L Series;

.2 Kitz Corporation Code #6122EL/EG;

.3 Toyo Valve Co. #918BESL/EG;

.4 Bray Valve and Controls Canada Series 31;

.5 Apollo Valves #141 Series;

.6 Watts Industries (Canada) Inc. #BF-03.

.3 Butterfly Valves – Grooved End

.1 Equal to Victaulic Series 608N, for copper pipe rated to 300 psi and be both bi-directional and dead-end service capable to full rated pressure. Seat material shall be EPDM UL Classified in accordance with ANSI/NSF 61 for ambient +86°F and hot +180°F potable water service and ANSI/NSF 372.

.2 Victaulic Series 461, for stainless steel pipe rated to 300 psi and be both bi-directional and dead-end service capable to full rated pressure. Seat material shall be EPDM UL Classified in accordance with ANSI/NSF 61 for ambient +86°F and hot +180°F potable water service and ANSI/NSF 372.

2.03 DRAIN VALVES

.1 Minimum 2070 kPa (300 psi) water rated, 20 mm (¾") dia., straight pattern full port bronze ball valves, each complete with a threaded outlet suitable for coupling connection of 20 mm (¾") dia. garden hose, and a cap and chain.

.2 Acceptable products are:

.1 Toyo Valve Co. Fig. 5046;

.2 Dahl Brothers Canada Ltd. Fig. No. 50. 430;

.3 Kitz Corporation Code 58CC;

.4 Apollo Valves #78-104-01;

.5 Watts Industries (Canada) Inc. #B6000.

2.04 DOMESTIC HOT WATER THERMOSTATIC MIXING VALVES

.1 Lawler Manufacturing Co. Inc. 800 Series "High-Low Thermostatic Mixer" factory assembled rough bronze thermostatic mixing valve assembly complete with rotatable union end inlet piping with check stops and stainless steel strainer screens, union outlet piping with thermometer connection, all sized as shown, and following:

.1 mixing valve with liquid motor, stainless steel piston and liner, tamper-resistant control adjustment, and 3-way protection against runaway temperatures, thermal shock, and scalding;

.2 dial type thermometer conforming to requirement specified in Section 20 05 00 – Common Work Results for Mechanical;

.3 ball type outlet shut-off valve conforming to valve requirements specified in this section;

.4 surface wall mounting enamelled steel cabinet with hinged door, key lock, and permanent identification;

.5 recessed wall mounting type 304 stainless steel cabinet with a #4 finish, hinged door, key lock, and permanent identification.

.2 Acceptable manufacturers are:

.1 Lawler Manufacturing Co. Inc.;

.2 Leonard Valve Co.;

.3 Symmons Industries Inc.

2.05 FLOOR DRAIN TRAP SEAL PRIMERS

.1 Primer Valve Type

.1 Precision Plumbing Products Inc. Model P2-500 trap primer valve, constructed of brass, adjustable to high or low water pressures and complete with "O" ring seals, 12 mm (½") threaded inlet and outlet connections, and, for priming two traps from the same primer, a DU-2 dual outlet distribution unit.

.2 Primer Valve Type with Manifold

.1 Precision Plumbing Products Inc. Model P1-500 trap primer valve constructed as specified above for the Model P2-500 primer valve, complete with a Model DU-3 or DU-4, 3 or 4 outlet distribution unit for priming 3 or 4 traps, and at Model "YS-8" supply tube with combinations of Model DU-3 and DU-4 distribution units for priming from 5 to 6 traps.

.3 Electronic Type

.1 Precision Plumbing Products #PT Series surface wall mounting, CSA certified, 115 volt, 1-phase, 60 Hz., electronic, automatic trap priming manifolds, each sized to suit the number of drain traps or interceptors serviced, and each complete with:

.1 galvanized steel cabinet with door;

.2 20 mm (¾") dia. NPT copper pipe inlet with shut-off valve and water hammer arrestor;

.3 solenoid valve, an atmospheric vacuum breaker, and a discharge manifold with 12 mm (½") dia. compression type copper tube connections on 40 mm (1-½") centres with quantity to suit the number of items to be primed;

.4 control panel with circuit breaker, 5 ampere fuse, 24 hour timer, and manual override toggle switch.

2.06 PIPE ANCHORS

.1 Welded structural black steel anchors of a design, size, and type to securely anchor pipe at point shown. Each anchor is to withstand 150% axial thrust, and is to be designed and detailed by a professional structural engineer registered and licensed in jurisdiction of the work. Submit anchor design and fabrication shop drawings, stamped by design engineer.

2.07 LAVATORY SUPPLY FITTING TEMPERING VALVES

.1 Equal to Powers "HydroGuard" Series 490, model LM490 12 mm (½") dia. or model LM491 20 mm (¾") dia. as required, each CSA B125 certified, forged brass, tamper-proof thermostatic mixing valves, adjustable for water supply between 29°C and 49°C (85°F and 120°F), sized to suit number of lavatories in grouping, and complete with a stop and check valve and a lockable handle.

.2 Each mixing valve is to be complete with a stainless steel flush wall mounting cabinet with vandal-proof hinged door.

2.08 AIR VENTS

.1 Equal to ITT Hoffman Specialty No. 78 cast brass, 1035 kPa (150 psi) rated, 20 mm (¾") straight water main vent valves, each tapped at the top for a 3.2 mm (1/8") safety drain connection.

3 Execution

3.01 DEMOLITION

.1 Refer to demolition requirements specified in Section 20 05 05 – Selective Demolition for Mechanical.

3.02 PIPING INSTALLATION REQUIREMENTS

.1 Provide required domestic water piping.

.2 Piping, unless otherwise specified, is as follows:

.1 for underground piping 100 mm (4") dia. and larger outside and/or inside the building – rigid PVC;

.2 for underground piping less than 100 mm (4") dia. inside building – Type "K" soft copper;

.3 for pipe 100 mm (4") dia. and larger inside building and above ground – Schedule 10 stainless steel;

.4 for 12 mm (½") dia. trap seal primer tubing located underground or in concrete or masonry construction – semi-rigid polyethylene;

.5 for pipe inside building and aboveground in sizes to 100 mm (4") dia., except in vertical shafts and through fire barriers – rigid CPVC;

.6 for branch hot and cold piping aboveground from mains and risers to fixtures, fittings, and equipment where fire rated construction is not penetrated – at your option, PEX tubing installed and joined in strict accordance with manufacturer’s instructions;

.7 for underground piping outside building to fixtures/outlets at grade level – flexible polyethylene, snaked in the trench and in a continuous length wherever possible;

.8 for pipe inside building and aboveground in sizes to 100 mm (4") dia. – Type "L" hard copper with solder joints.

.1 Option: Type "L" hard copper with pressure coupled mechanical joints.

.2 Option: Type “L” hard copper with grooved end mechanical joints.

.1 Grooved pipe ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove for proper gasket sealing. All couplings will meet Victaulic standards for visual inspection sizes 2” to 8”. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Install in accordance with manufacturer’s latest recommendations. A Victaulic factory trained representative shall periodically visit the job site and review the installation for best practices. The installing Contractor shall correct any identified deficiencies. Victaulic product that has been examined and has not met the visual inspection criteria for proper installation must be corrected and re-examined by Victaulic prior to the completion of the project.

.3 Brace and secure underground water service pipe at bends, tees and similar fittings with restraint devices, and provide concrete thrust blocks in accordance with Municipal standards and details. Regardless of what is specified elsewhere in this Specification regarding provisions of concrete, provide thrust block concrete. Paint restraint devices with 2 coats of corrosion resistant black asphalt base coating prior to backfilling.

.4 Lay pipes true to line and grade with bells upgrade. Fit sections together so that, when complete, pipe has a smooth and uniform invert. Keep pipe thoroughly clean so jointed compound will adhere. Inspect pipe for defects before being lowered into trench.

.5 Slope piping so it can be completely drained.

.6 Provide cast brass dielectric type adapters/unions at connections between ferrous and copper pipe or equipment.

3.03 INSTALLATION OF SHUT-OFF AND CHECK VALVES

.1 Refer to Part 3 of Section 20 05 00 – Common Work Results for Mechanical.

.2 For shut off valves installed on solder joint copper piping up to and including 75 mm (3") diameter, provide ball type valves, and for flanged joints copper or stainless steel piping larger than 75 mm (3") diameter provide butterfly type valves.

3.04 INSTALLATION OF DOMESTIC HOT WATER THERMOSTATIC MIXING VALVES

.1 Provide a domestic hot water thermostatic mixing valve assembly and wall mount.

.2 Adjust each valve to design requirements and check and test operation. Set maximum temperature limit stops.

.3 Identify each valve and its water temperature delivery setting with an engraved nameplate.

3.05 INSTALLATION OF TRAP SEAL PRIMERS

.1 Provide required accessible trap seal primers to automatically maintain a water seal in floor drain traps, whether shown on drawings or not.

.2 Water closet flush valves may be used for priming washroom floor drain traps if flush tube is properly tapped and primer tubing exposed in washroom is chrome plated.

.3 Provide trap primer valves to prime single or multiple (1 to 6) traps. Install trap primer valves in domestic cold water piping to frequently used plumbing fixtures. Where from 2 to 6 traps are to be primed from

same primer valve, provide appropriate supply and distribution tube assemblies. Ensure primer valves are accessible.

.4 Provide 115 volt, electronic, surface wall mounting trap primer assemblies for multiple (4 to 30) traps. Include for a 115 volt 15 ampere panel breaker and wiring in conduit from closest panelboards to primer assembly, all to wiring standards of Electrical Division. Adjust primer water flow and timing to suit number of traps served.

.5 Ensure trap primer piping is secured to floor drain primer tappings and not terminated through the tapping in the throat of the drain.

3.06 INSTALLATION OF EXPANSION COMPENSATORS, GUIDES, AND ANCHORS

.1 Provide expansion compensators in domestic water piping.

.2 Ensure pipe ends are properly aligned. Provide alignment guides on each side of expansion compensators, properly secured to building structure.

.3 Provide anchors to secure domestic water piping to structure. Locate anchors generally where shown but with exact locations to suit piping as installed and requirements of reviewed anchor shop drawings.

.4 When installation of anchors is complete, arrange, and pay for anchor design engineer to visit site to review anchor installation. Submit a letter from design engineer confirming each anchor is properly installed.

3.07 INSTALLATION OF LAVATORY SUPPLY FITTING TEMPERING VALVES

.1 Provide thermostatic water tempering valves for hot water supply to public washroom lavatory supply fittings. Conceal valves and piping.

.2 Provide a flush wall mount panel for each valve. Confirm exact location prior to roughing-in.

.3 Install in accordance with manufacturer’s instructions and set mixing valves to deliver 32°C (90°F) tempered water.

3.08 INSTALLATION OF AIR VENTS

.1 Provide accessible air vents in domestic water piping to prevent air binding.

.2 Extend copper indirect drain piping from top drain connection of each vent to nearest suitable drain.

.3 Locate exact vent locations on as-built record drawings.

3.09 FLUSHING AND DISINFECTING PIPING

.1 Flush and disinfect all new and/or reworked domestic water piping after leakage testing is complete.

.2 Isolate new piping from existing piping prior to flushing and disinfecting procedures.

.3 Flush piping until all foreign materials have been removed and flushed water is clear. Provide connections and pumps as required. Open and close valves, faucets, hose outlets, and service connections to ensure thorough flushing.

.4 When flushing is complete, disinfect the piping with a solution of chlorine in accordance with AWWA C601.

.5 When disinfecting is complete, submit water samples to a certified laboratory for purity testing and, when testing indicates pure water in accordance with governing standards, submit a copy of test results and fill the systems.

End of Section

1 General

1.01 SUBMITTALS

.1 Submit shop drawings/product data sheets for all products specified in this Section except pipe and fittings.

1.02 CLOSEOUT SUBMITTALS

.1 Submit a copy of plumbing inspection certificate prior to application for Substantial Performance of the Work.

.2 Submit letters from product manufacturers/suppliers to certify correct installation of products as specified in Part 3 of this section.

2 Products

2.01 PIPE, FITTINGS, AND JOINTS

.1 PVC Sewer

.1 DR35 rigid, green PVC hub and spigot pattern sewer pipe and fittings to CAN/CSA B182.2, with gasket joints assembled with pipe lubricant.

.2 DR35 rigid, PVC sewer pipe and fittings, with solvent weld joints, all certified to CSA B182.1 and colour-coded as per local governing codes, regulations and standards.

.2 PVC - DWV

.1 Equal to Ipex System XFR 15-50 rigid PVC drain, waste and vent pipe and fittings to CAN/CSA B181.2, complete with a flame spread rating less than 25 and a smoke developed rating less than 50 when tested to CAN/ULC S102.2, solvent weld joints, and, for fire barrier penetration, approved firestop conforming to CAN/ULC S115.

.3 Copper - Solder Joint

.1 Type DWV hard temper to ASTM B306, with forged copper solder type drainage fittings and 50% lead - 50% tin solder joints.

.4 Cast Iron

.1 Class 4000 cast iron pipe, fittings, and mechanical coupling joints to CAN/CSA B70.

.5 Copper-Victaulic Coupling Joint

.1 Type DWV hard temper to ASTM B306, with factory or site rolled grooved ends (with grooving rolls designed for copper) and Victaulic "Copper Connection" wrought copper or cast bronze fittings and Style 606 gasket type couplings.

.6 Galvanized Steel - Victaulic Coupling Joint

.1 Schedule 40 mild steel, galvanized, ASTM A53, factory or site rolled grooved, complete with Victaulic galvanized ductile iron grooved end fittings and, unless otherwise specified, Victaulic Style 77 hot dip galvanized mechanical joint couplings with Grade M gaskets.

.7 PVC Weeper Piping

.1 150 mm (6") dia. corrugated perforated PVC pipe with an integral geodesic sock, supplied in coils.

2.02 SHUT-OFF AND CHECK VALVES

.1 Shut-off Valves

.1 Class 600, 4140 kPa (600 psi) WOG rated full port ball valves, each complete with a forged brass body, blowout-proof stem, chrome plated solid brass ball, solder or screwed ends as required, and removable lever handle.

.2 Acceptable products are:

.1 Toyo Valve Co. Fig. 5049A or Fig. 5044A;

.2 Milwaukee Valve Co. #BA-155 or #BA -125;

.3 Kitz Corporation Code 58 or Code 59;

.4 Victaulic Co. of Canada Ltd. Series 722;

.5 Apollo Valves # 77-100 or # 77-200;

.6 Watts Industries (Canada) Inc. #FBVS-3C.

2.03 VENT STACK COVERS

.1 Equal to Lexcor Model "Flash-Tite" seamless, spun aluminum, insulated vent stack covers with caps and a factory applied asphalt primer coating on top and bottom of flange.

.2 Each vent stack cover is to be complete with a vandal-proof cap.

2.04 CLEANOUTS

.1 Horizontal Piping

.1 TY pipe fitting with an extra heavy brass plug screwed into the fitting.

.2 Vertical Piping

.1 Bronze or copper cleanout tees in copper piping, each complete with a bronze ferrule, and, for cast iron piping, "BARRETT" type cast iron cleanout tees, each gas and water-tight and complete with a bolted cover.

.3 Urinal(s)

.1 Wall access cleanout assemblies, each complete with a tapered plug, threaded brass insert, urethane rubber seal, and polished stainless steel access cover with vandal-proof stainless steel securing screw.

.2 Acceptable products are:

.1 Watts Industries (Canada) Ltd. #CO-590-RD.

.2 Jay R. Smith #SQ4-1819;

.3 Zurn #ZSS-1666-1;

.4 Mifab #C1440-RD;

2.05 FLOOR CLEANOUT TERMINATIONS

.1 Factory finished cast iron terminations, each adjustable and complete with a cast iron body with neoprene sleeve, solid, gasketed, polished nickel-bronze scoriated top access cover to suit floor finish, a seal plug, and captive, vandal-proof, stainless steel securing hardware.

.2 Acceptable products are:

.1 Watts Industries (Canada) Ltd. # CO-200-R-1.

.2 Jay R. Smith #4020-F-C Series;

.3 Zurn # ZN-1602-SP Series;

.4 Mifab # C1100-XR-1 or #C1000-R-3;

.3 Cleanout terminations in areas with a tile or sheet vinyl floor finish are to be as above but with a square top in lieu of a round top.

2.06 FLOOR DRAINS, FUNNEL FLOOR DRAINS, AND HUB DRAINS

.1 Unless otherwise specified or indicated, floor drains are to be vandal-proof drains in accordance with drawing symbol list, each complete with a cast iron body and a trap seal primer connection. Cast iron components are to be factory finished with latex based paint coating.

.2 Floor drains in areas with a tile or sheet vinyl floor finish are to be as above but with a square grate in lieu of a round grate.

.3 Acceptable manufacturers are:

.1 Watts Industries (Canada) Ltd.;

.2 Jay R. Smith Manufacturing Co.;

.3 Zurn Industries Ltd.;

.4 Mifab Inc.

3 Execution

3.01 DEMOLITION

.1 Refer to demolition requirements specified in Section 20 05 05 – Selective Demolition for Mechanical.

3.02 DRAIN AND VENT PIPING INSTALLATION REQUIREMENTS

.1 Provide required drainage and vent piping. Pipe, unless otherwise specified, as follows:

.1 for underground pipe inside building and to points 1.5 m (5') outside building lines – rigid PVC sewer pipe, minimum 75 mm (3") dia.;

.2 for pipe inside building and aboveground in sizes less than or equal to 65 mm (2-½") dia. – type DWV copper;

.3 for pipe inside building and aboveground in sizes greater than or equal to 75 mm (3") dia. – Class 4000 cast iron;

.4 for pipe inside building and aboveground in lieu of type DWV copper and cast iron, at your option and where permitted by governing Codes and Regulations – rigid PVC DWV;

.5 for drainage pump discharge pipe connections from pump to and including shut-off and check valve connections – Type "DWV" copper with Victaulic "Copper Connection" fittings and couplings, or Schedule 40 galvanized steel with Victaulic fittings and couplings.

.2 Unless otherwise specified, slope horizontal drainage piping aboveground in sizes to and including 75 mm (3") dia. 25 mm (1") in 1.2 m (4'), and pipe 100 mm (4") dia. and larger 25 mm (1") in 2.4 m (8').

.3 Install and slope underground drainage piping to inverts or slopes indicated on drawings to facilitate straight and true gradients between points shown. Verify available slopes before installing pipes.

.4 Unless otherwise specified, slope horizontal branches of vent piping down to fixture or pipe to which they connect with a minimum pitch of 25 mm (1") in 1.2 m (4').

.5 Extend vent stacks up through roof generally where shown but with exact locations to suit site conditions and in any case a minimum of 3 m (10') from fresh air intakes. Terminate vent stacks a minimum of 330 mm (13") above roof (including roof parapets) in vent stack covers. Where not shown on drawings, route vent piping from source to building exterior as required in order to satisfy local governing codes and authority. Coordinate vent routing with other building services and ensure there is no architectural impact.

.6 Provide cast brass dielectric unions at connections between copper pipe and ferrous pipe or equipment.

3.03 INSTALLATION OF SHUT-OFF AND CHECK VALVES

.1 Provide a shut-off valve and a check valve in discharge piping of each drainage pump.

.2 Locate valves so they are easily accessible without the use of ladders or other such devices.

3.04 SUPPLY OF VENT STACK COVERS

.1 Supply a properly sized vent stack cover for each vent stack penetrating roof.

.2 Hand vent stack covers to roofing trade at site for installation and flashing into roof construction as part of roofing work. Coordinate installation to ensure proper locations. Provide waterproofing caps over vent stacks.

3.05 INSTALLATION OF CLEANOUTS

.1 Provide cleanouts in drainage piping in locations as follows:

.1 in building drain or drains as close as possible to inner face of outside wall, and, if a building trap is installed, locate cleanout on downstream side of building trap;

.2 at or as close as practicable to the foot of each drainage stack;

.3 at maximum 15 m (50') intervals in horizontal pipe 100 mm (4") dia. and smaller;

.4 at maximum 30 m (100') intervals in horizontal pipe larger than 100 mm (4") dia.;

.5 in the wall at each new urinal or bank of urinals in a washroom;

.6 wherever else shown on drawings.

.2 Cleanouts are to be same diameter as pipe in piping to 100 mm (4") dia., and not less than 100 mm (4") dia. in piping larger than 100 mm (4") dia.

.3 Where cleanouts in vertical piping are concealed behind walls or partitions, install cleanouts near floor and so cover is within 25 mm (1") of the finished face of the wall or partition.

3.06 INSTALLATION OF FLOOR CLEANOUT TERMINATIONS

.1 Where cleanouts occur in horizontal inaccessible underground piping, extend cleanout TY fitting up to floor, and provide a cleanout termination set flush with finished floor.

.2 In waterproof floors, ensure each cleanout termination is equipped with a flashing clamp device. Cleanout terminations are to suit floor finish.

.3 Where cleanout terminations occur in finished areas, confirm locations prior to rough-in and arrange piping to suit.

.4 Ensure cleanout termination covers in tiled floor are square in lieu of round.

3.07 INSTALLATION OF FLOOR DRAINS, FUNNEL FLOOR DRAINS AND HUB DRAINS

.1 Provide floor drains, funnel floor drains and hub drains.

.2 Coordinate location of floor drains, funnel floor drains and hub drains with equipment provided by Mechanical Division and Owner's supplied equipment. Install in accordance with manufacturer's instructions.

.3 Equip each drain with a trap.

.4 In equipment rooms and similar areas, exactly locate floor drains to suit location of mechanical equipment and equipment indirect drainage piping. In washrooms, exactly locate floor drains to avoid interference with toilet partitions.

.5 Confirm exact location of drains prior to roughing in. Where floor drains occur in washrooms coordinate locations with toilet partition installations.

.6 Temporarily plug and cover floor drains during construction procedures. Remove plugs and covers during final clean-up work and when requested, demonstrate free and clear operation of each drain. Replace any damaged grates, and refinish any areas of the drain where cast iron finish has been damaged or removed, including rusted areas.

End of Section

1 General

1.01 SUBMITTALS

.1 Submit shop drawings/product data sheets for all equipment and associated hardware specified in this Section.

.2 Include pump motor product data sheets and pump performance curves with shop drawing/product data sheet submission.

.3 Include design and fabrication shop drawings for shop fabricated heat exchanger support assemblies.

.4 Submit with delivery of heater(s) a copy of the factory inspection and test report for each heater, and include a copy of each report with O&M Manual project close-out data.

.5 Submit manufacturer/supplier installation certification letters as specified in Part 3 of this Section.

.6 Submit spare softener salt and a soap hardness test set and hand to Owner at site. Store salt where directed.

.7 Submit influent water analysis of municipal water supply for the following minimum criteria and anticipated softening results in parts per million (ppm): Calcium, Iron, Manganese, Magnesium, Total Hardness, Total Dissolved Solids, Turbidity, Colour, PH.

.8 After installation is complete, submit a written report verifying that the installation provides softening based on influent water analysis, signed by manufacturer's technical representative.

.9 Submit sufficient granular salt for 12 complete regenerations

.10 Submit a copy of a letter from the domestic cold water booster pump set supplier certifying proper installation, and a copy of pump supplier's start-up report, all as specified in Part 3 of this Section.

.11 Submit, prior to Substantial Performance of the Work, start-up or test data specified in Part 3 of this Section.

2 Products

3 Execution

3.01 DRAINAGE COORDINATION

.1 Coordinate drain requirements of plumbing equipment provided by Mechanical Division and or Owner with location of drains specified in Section 22 13 00.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Plumbing fixtures and related components.

1.02 SUBMITTALS

.1 Submit product data sheets (fixture cuts) for all plumbing fixtures and fittings, including accessories.

.2 Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.

.3 Wiring Diagrams: Power, signal, and control wiring.

.4 Submit fixture manufacturer's standard colour charts for all fixtures where colours are available but a particular colour is not specified.

1.03 CLOSEOUT SUBMITTALS

.1 Operation and maintenance data.

2 Products

2.01 GENERAL RE: PLUMBING FIXTURES AND FITTINGS

.1 Fixtures and fittings, where applicable, are to be in accordance with requirements of CAN/CSA B45 Series, General Requirements for Plumbing Fixtures, including supplements, ASME A112.1.18.1/CSA B125.1, Plumbing Supply Fittings, and CSA B125.3, Plumbing Fittings.

.2 Barrier-free fixtures and fittings are to be in accordance with governing Code requirements.

.3 Unless otherwise specified, vitreous china, porcelain enamelled, and acrylic finished fixtures are to be white.

.4 Unless otherwise specified, fittings and piping exposed to view are to be chrome plated and polished.

.5 Fittings located in areas other than private washrooms are to be vandal-proof.

.6 Fixture carriers are to be suitable in all respects for the fixture they support and construction in which they are located.

.7 Floor flanges for floor mounted water closets are to be cast iron or brass, secured to floor to prevent movement and complete with a wax seal and brass or stainless steel bolts, nuts, and washers. Plastic floor flanges will not be acceptable.

.8 Proper seal to mate with fixture carrier flange and produce a water-tight installation.

.9 Exposed traps for fixtures not equipped with integral traps, such as lavatories, are to be adjustable chrome plated cast brass "P" traps with cleanouts, minimum #17 gauge chrome plated tubular extensions, and chrome plated escutcheons, all to suit fixture type and drain connection.

.10 Concealed traps for fixtures not equipped with integral traps, such as counter sinks, are to be adjustable cast brass with cleanout plugs, all to suit fixture type and drain connection.

.11 Exposed supplies for fixtures which do not have supply trim/fittings with integral stops, i.e. lavatories, are to be solid chrome plated brass angle vales with screwdriver stops for public areas, wheel handle stops

for private areas, flexible stainless steel risers, and stainless steel or chrome plated steel escutcheons, all arranged and sized to suit fixture.

.12 Water piping as specified, complete with ball type shut-off valves as specified with water piping, or Dahl Bros. Canada Ltd. ¼ turn Mini Ball Valves.

2.02 PLUMBING FIXTURES AND FITTINGS

.1 Plumbing fixtures and fittings are to be in accordance with the following:

.1 LAV-1 Wall Hung Basin – Single Handle Faucet

.1 American Standard Lucerne with EverClean #356.028, Basin, 3 holes, 4" (102 mm) center, 540 mm x 520 mm x 165 mm (21-1/4" x 20-1/2" x 6-1/2") high, Wall hung, Vitreous china, White Finish, for carrier with concealed arms, Front overflow, Self-draining deck area faucet ledge with contoured back and side splash shields. American Standard 0059.020EC.020 Semi-pedestal P-trap cover. Complies with ASME A112.19.2 and CSA B45.1 for Vitreous China Fixtures, ADA and ANSI a117.1 Accessible and useable building and facilities

.2 Delta Lavatory Faucet 591T1258TR, Cast Brass, Electronic, One-piece body with integral waterproof sensor and connector, Hardwired, Recess control box, Metal hold-down package 102mm (4") Chrome-plated finish, Vandal Resistant 0.5gpm (1.9 L/min) Laminar Outlet, H2Optics technology, 3 Faucet holes, Adjustable sensing range and time out, CSA certified, Complies with ASME A112.18.1 and CSA B125.1, ICC/ANSI A117.1

.3 Delta ELAVT0008ARI Electronic Faucet Control Box Rough-In, For recessed wall mounting, 10" square metal box with cover, Hot and Cold inlet supplies, Point of use thermostatic mixing valve, Integral check valves in hot and cold inlets to prevent crossflow, Outlet temperature range 95-120°F (35-49°C), Maximum flow 11 gpm (42 L/min) @ 45 psi pressure loss, minimum flow 0.34 gpm (1.36 L/min), Factory assembled waterway components with stops. CSA Certified, Complies with NSF61 section 9

.4 Lawler #TMM-1070, Below Deck Mechanical Water Mixing Valve, Bronze body, temperature adjusting dial, 10 mm (3/8") inlets and outlet compression fittings, high temperature thermostatic limit stop, shut-off with automatic reset when temperature exceeds 120 ºF (48.8 ºC), Integral checks, offer temperature range from full cold through 46 °C (114.8 °F). Provide tee, adaptors and flex. copper tubing to suit installation. Provide tempered water to hot side of faucet.

.5 McGuire #155A Open Grid Drain, cast brass one piece top, 17 GA. (1.5 mm) tubular 32 mm (1-1/4") tailpiece.

.6 McGuire #LFH170BVRB Faucet Supplies, Chrome plated finish polished brass, commercial duty 1/4 turn ball valve angle stops, 13 mm (1/2") I.D. Inlet x 127 mm (5") horizontal extension tubes, convertible 1/4 turn/loose key handles, Escutcheon and stainless steel braided flexible risers.

.7 McGuire #8872C P-Trap, Heavy cast brass adjustable body, with slip nut, 32 mm (1-1/4") size, Shallow wall flange and Seamless tubular wall bend.

.8 Watts #WCA-411-CA-481 Basin Carrier, concealed arms, wall flanges to attach to backing plate secured in wall with locking device and levelling screws, heavy gauge steel uprights with integral welded feet. For one unit: 102 mm (4") for two to six units in a row: 152 mm (6") finished metal stud wall to back of pipe space.

.2 LAV-2 Wall Hung Basin – Barrier Free

.1 American Standard Murro with EverClean #0954.004EC.020 Basin, 3 holes, 4" (102 mm) center, 540 mm x 520 mm x 165 mm (21-1/4" x 20-1/2" x 6-1/2") high, Vitreous china, White Finish, for carrier with concealed arms, Rear overflow, recessed self-draining faucet ledge. American Standard 0059.020EC.020 Semi-pedestal P-trap cover. Complies with ASME A112.19.2 for Vitreous China Fixtures, and ADA and ANSI A117.1 Accessible and usable buildings and facilities.

.2 Delta Lavatory Faucet 591T1258TR, Cast Brass, Electronic, One-piece body with integral waterproof sensor and connector, Hardwired, Recess control box, Metal hold-down package 102mm (4") Chrome-plated finish, Vandal Resistant 0.5gpm (1.9 L/min) Laminar Outlet, H2Optics technology, 3 Faucet holes, Adjustable sensing range and time out, Serviceable filter screen upstream of the solenoid valve, CSA certified, Complies with ASME A112.18.1 and CSA B125.1, ICC/ANSI A117.1

.3 Delta ELAVT0008ARI Electronic Faucet Control Box Rough-In, For recessed wall mounting, 10" square metal box with cover, Hot and Cold inlet supplies, Point of use thermostatic mixing valve, Integral check valves in hot and cold inlets to prevent crossflow, Outlet temperature range 95-120°F (35-49°C), Maximum flow 11 gpm (42 L/min) @ 45 psi pressure loss, minimum flow 0.34 gpm (1.36 L/min), Factory assembled waterway components with stops, CSA Certified, Complies with NSF61 section 9

.4 Lawler #TMM-1070, Below Deck Mechanical Water Mixing Valve, Bronze body, temperature adjusting dial, 10 mm (3/8") inlets and outlet compression fittings, high temperature thermostatic limit stop, shut-off with automatic reset when temperature exceeds 120 ºF (48.8 ºC), Integral checks, offer temperature range from full cold through 46 °C (114.8 °F). Provide tee, adaptors and flex. copper tubing to suit installation. Provide tempered water to hot side of faucet.

.5 McGuire #155A Open Grid Drain, cast brass one piece top, 17 GA. (1.5 mm) tubular 32 mm (1-1/4") tailpiece.

.6 McGuire #LFH170BVRB Faucet Supplies, Chrome plated finish polished brass, commercial duty 1/4 turn ball valve angle stops, 13 mm (1/2") I.D. Inlet x 127 mm (5") horizontal extension tubes, convertible 1/4 turn/loose key handles, Escutcheon and stainless steel braided flexible risers.

.7 McGuire #8872C P-Trap, heavy cast brass adjustable body, with slip nut, 32 mm (1-1/4") size, Shallow wall flange and Seamless tubular wall bend.

.8 Watts #WCA-411-CA-481 Basin Carrier, concealed arms, wall flanges to attach to backing plate secured in wall with locking device and levelling screws, heavy gauge steel uprights with integral welded feet. For one unit: 102 mm (4") for two to six units in a row: 152 mm (6") finished metal stud wall to back of pipe space.

.3 WC-1 Floor Mounted, Flush Valve

.1 Bowl - American Standard #3461.001.020 Madera FloWise Elongated' Flushometer Toilet, vitreous china, floor mount, Fully glazed 2-1/8" trapway, 10"x 12" water surface area, 1,000 grams of miso @1.1gpf, 1.28gpf, and 1.6gpf when used with an American Standard flush valve., 718 x 356 x 419 mm (28-1/4" x 14" x 16-1/2") , 16-1/2" rim height for accessible application, 2 bolt caps, High Efficiency, Low Consumption. Operates in the range of 1.1 gpf to 1.6 gpf (4.2 Lpf to 6.0 Lpf), Meets definition of HET (High Efficiency Toilet) when used with a high efficiency flush valve (1.28 gpf or 1.6/1.1 gpf dual flush), Permanent EverClean® surface inhibits the growth of stain and odor-causing bacteria, mold, and mildew on the surface

.2 Flush Valve – Delta 81T201, Quiet action, Teck exposed, Chloramine resistant diaphragm flush valve, diaphragm retainer, renewable seat, Polished chrome plated finish, right or left-hand supply installation, 6.0 LPF (1.6 GPF) adjustable flow, Vacuum breaker flush connection, 1" inlet, ADA lever handle. Complies with ADA, APMO listed to ASSE 1037/ASME A112.1037/CSA B125.37

.3 Seat – Centoco #1500STSCC-001, Elongated bowl, Open front, Extra heavy duty, Polypropylene, Less seat cover, Stainless steel check hinge with gasket, Stainless steel hardware, White finish

.4 WC-2 Floor Mounted, Flush Valve – Barrier Free

.1 Bowl - American Standard #3461.001.020 Madera FloWise Elongated' Flushometer Toilet, vitreous china, floor mount, Fully glazed 2-1/8" trapway, 10"x 12" water surface area, 1,000 grams of miso @1.1gpf, 1.28gpf, and 1.6gpf when used with an American Standard flush valve., 718 x 356 x 419 mm (28-1/4" x 14" x 16-1/2") , 16-1/2" rim height for accessible application, 2 bolt caps, High Efficiency, Low Consumption. Operates in the range of 1.1 gpf to 1.6 gpf (4.2 Lpf to 6.0 Lpf), Meets definition of HET (High Efficiency Toilet) when used with a high efficiency flush valve (1.28 gpf or 1.6/1.1 gpf dual flush), Permanent EverClean® surface inhibits the growth of stain and odor-causing bacteria, mold, and mildew on the surface

.2 Flush Valve – Delta 81T201, Quiet action, Teck exposed, Chloramine resistant diaphragm flush valve, diaphragm retainer, renewable seat, Polished chrome plated finish, right or left-hand supply installation, 6.0 LPF (1.6 GPF) adjustable flow, Vacuum breaker flush connection, 1" inlet, ADA lever handle. Complies with ADA, APMO listed to ASSE 1037/ASME A112.1037/CSA B125.37

.3 Seat – Centoco #1500STSCC-001, Elongated bowl, Open front, Extra heavy duty, Polypropylene, Less seat cover, Stainless steel check hinge with gasket, Stainless steel hardware, White finish

.4 Backrest – Franke Commercial #CM-16104, wall mount back rest, solid core plastic laminate panel back, Antique white, 305 mm (12") wide x 102 mm (4") high x 8" (204 mm), 18 gauge stainless steel bar with gloss with flanges and covers, concealed snap flanges and mounting hardware included, Provide adequate backing in wall for support and comply to local codes for barrier free requirements

.5 S-1 Single Bowl Stainless Steel Sink

.1 Franke Commercial #LBS7310P-1 Single Bowl Countertop Mount Sink, 1 faucet hole, self rimming with faucet ledge, 560 mm (22-1/16") wide x 651 mm (25-5/8") long x 254 mm (10") deep overall, Counter mounted, Grade 18 gauge (1.2 mm) type 304 stainless steel, Satin finish, Mounting kit provided, Fully undercoated to reduce condensation and resonance, factory applied rim seal, 3-1/2" (89 mm) crumb cup waste assembly with 1-1/2" (38 mm) tailpiece. Certified to ASME A112.19.3-2008 and CSA B48.4-08

.2 Chicago Faucets #431-E34VPABCP Faucet - Counter mounted, Manual, Single handle, Sink faucet, Polished chrome finish, 203 mm (8") centerset, Lead Free ANSI/NSF 61 compliant, ECAST® brass construction, Less supply, Ceramic cartridge, 5.7 LPM (1.5 GPM) maximum flowrate, Pressure compensating non-aerated laminar spray outlet, Tubular cast brass spout, 241 mm (9-1/2") spout reach, 152 mm (6") high, Lever handle, Less drain, 13 mm (1/2") NPSM supply inlet.

.3 **Lawler #TMM-1070, Below Deck Mechanical Water Mixing Valve, Bronze body, temperature adjusting dial, 10 mm (3/8") inlets and outlet compression fittings, high temperature thermostatic limit stop, shut-off with automatic reset when temperature exceeds 120 ºF (48.8 ºC), Integral checks, offer temperature range**

from full cold through 46 °C (114.8 °F). Provide tee, adaptors and flex. copper tubing to suit installation. Provide tempered water to hot side of faucet.

.4 McGuire **#LFCK170** Supply - Lead free, Sweat to compression, Integral check supply kit w/5" sweat extension, Chrome-plated finish, 1/2" Sweat w/5" Sweat extension x 3/8" O.D, 305 mm (12") chrome-plated risers, Wheel handle, Faucet, Deep bell wall flange

.5 McGuire 8912CB P-Trap - Heavy cast brass, Adjustable p-trap, 292 mm (11-1/2") length, With cleanout plug, Steel box flange, Neoprene gasket, Seamless tubular brass bend, Slipnuts

2.03 MANUFACTURERS

.1 Subject to compliance with requirements, manufacturers that may be incorporated into the Work include, but are not limited to, following:

.1 Flush Valves:

.1 Sloan;

.2 Delta Commercial;

.3 Zurn Industries;

.4 Moen Commercial.

.2 Plumbing Brass:

.1 Sloan;

.2 Acorn Engineering;

.3 American Standard;

.4 Delta Commercial;

.5 Chicago Faucet;

.6 Moen Commercial.

.3 Stainless Steel Sinks:

.1 Franke Commercial;

.2 Novanni Commercial;

.3 Aristaline;

.4 Arch Metal Ind.

.4 Mop Sinks:

.1 Stern Williams;

.2 Acorn Engineering;

.3 Zurn Industries.

.5 Emergency Eye Wash and Emergency Showers:

.1 Haws;

.2 Speakman;

.3 Bradley.

.6 Drain Fittings, Angle Supplies, and Traps:

.1 McGuire;

.2 American Standard;

.3 Delta Commercial;

.4 Zurn Industries.

.7 Fixture Carriers:

.1 Watts Industries;

.2 Jay R. Smith;

.3 Zurn Industries.

.8 Hose Bibbs:

.1 Jay R. Smith;

.2 Zurn Industries.

.9 Water Closets, Lavatories, and Urinal:

.1 American Standard;

.2 Zurn Industries;

.3 Kohler.

.10 Thermostatic Mixing Valves:

.1 Lawler;

.2 Delta Commercial;

.3 Leonard.

.11 Shower and Associated Trim:

.1 American Standard;

.2 Delta Commercial;

.3 Zurn Industries;

.4 Moen Commercial.

.12 Toilet Seats:

.1 Olsonite;

.2 Centoco;

.3 Bemis Commercial.

.13 Electronic “No Touch” Flush Valves:

.1 Sloan;

.2 Delta Commercial;

.3 Zurn Industries;

.4 Moen Commercial.

.14 Electronic “No Touch” Faucets:

.1 Sloan;

.2 Delta Commercial;

.3 Zurn Industries;

.4 Moen Commercial.

2.04 CAULKING

.1 General Electric Series SCS-1200 Silicone Construction Sealant or Dow Corning 780 silicone rubber sealant with primers as recommended by sealant manufacturer. Caulking colour(s) for coloured fixtures other than white, if any, will be selected by the Consultant from sealant manufacturer’s standard colour range.

3 Execution

3.01 DEMOLITION

.1 Refer to demolition requirements specified in Section 20 05 05 – Selective Demolition for Mechanical.

3.02 INSTALLATION OF PLUMBING FIXTURES AND FITTINGS

.1 Provide required plumbing fixtures and fittings.

.2 Where new fixtures and fittings are to be connected to existing piping, include for required piping revisions.

.3 Connect plumbing fixtures and fittings with piping sized in accordance with drawing schedule. Refer to manufacturer's published connection (rough-in) requirements. Where manufacturer requires piping connection larger than shown below, provide piping accordingly:

Fixture and/or Fitting	Drain Size mm (IN)	Vent Size mm (in)	DHW Size mm (in)	DCW Size mm (in)	Temp Water Size mm (in)
Water Closets Flush Valve Type	100 (4)	38 (1-½)	-	25 (1)	-
Urinals	75 (3)	38 (1-½)	-	25 (1)	-
Lavatories	32 (1-¼)	32 (1-¼)	12 (½)	12 (½)	-

Fixture and/or Fitting	Drain Size mm (IN)	Vent Size mm (in)	DHW Size mm (in)	DCW Size mm (in)	Temp Water Size mm (in)
Lavatories (Electronic Faucet)	32 (1-¼)	32 (1-¼)	12 (½)	12 (½)	12 (½)
Counter Sinks	38 (1-½)	32 (1-¼)	12 (½)	12 (½)	-
Shower Valves and Heads	-	-	12 (½)	12 (½)	12 (½)
Shower Stalls	50 (2)	38 (1-½)	12 (½)	12 (½)	12 (½)
Prefab. Mop Sinks with Drain	75 (3)	38 (1-½)	20 (¾)	20 (¾)	-
Emergency Eye Wash	-	-	-	-	12 (½)
Emergency Shower	-	-	-	-	25 (1)

.4 Confirm exact location of plumbing fixtures and trim prior to roughing-in. Refer to architectural plan and elevation drawings.

.5 When installation is complete, check, and test operation of each fixture and fitting. Adjust or repair as required.

.6 For barrier-free fixtures, comply with mounting height and other requirements of governing Code(s).

.7 For barrier-free water closets utilizing manual flush controls, controls to be installed so that it is operable from the transfer side of the fixture.

.8 Supply templates for counter mounted fixtures and trim and hand to trades who will cut the counter. Ensure openings in counter are properly located.

.9 Locate control panels for electronic faucets under lavatories and recessed into wall. Coordinate panel installations with electrical trade who will provide 115 volt power wiring to panels. Install flexible conduit (supplied with box) and extend cord from faucet through the flexible conduit to control box. Connect hot and cold water piping to mixing valve in each box, and tempered water piping from each mixing valve to faucet. Set mixing valve maximum temperature limit stops to 43°C (110°F) after domestic water systems (hot and cold) are complete. Ensure each programmable controller is properly programmed and water off after deactivation is set for 3 seconds.

.10 For electronic flush valves, locate transformer in ceiling space above electronic units to be served. Coordinate locations with electrical trade who will provide 120 volt line supply to transformers. Provide low voltage wiring from transformers to each electronic flush valve terminal point. Electrical line supply and low voltage wiring is to be concealed and access to transformer must be provided for servicing.

.11 Protect baths from damage during construction and finishing work. Unless otherwise specified, pack concealed voids under baths with batt type glass fibre insulation as baths are installed.

.12 Protect shower bases from damage during construction and finishing work.

.13 Confirm exact mixing valve and shower head locations prior to roughing-in.

.14 Install refrigerated drinking fountains in accordance with manufacturer’s instructions. Plug into a wall receptacle provided as part of electrical work. Coordinate receptacle installation with electrical trade on site.

.15 For emergency showers, install so bottom of shower head is approximately 2 m (82") above floor, and approximately 400 mm (16") out from the wall. Wall mount mixing valve approximately 1.5 m (5') above floor and adjacent shower head. Set valve temperature limit stop to 35°C (95°F). Ensure valve is open and exposed piping is chrome plated or stainless steel.

.16 Install eye wash fixtures in accordance with manufacturer's instructions. Ensure exposed piping is painted.

.17 Wall mount mixing valves for emergency fixtures approximately 1.5 m (5') above floor and secure in place. Check and confirm valve operation and temperature of tempered water supply. Provide cabinets. Identify each cabinet and hand 3 identified cabinet keys to Consultant prior to Substantial Performance of the Work.

.18 Set mop service basins on floor over drain piping and connect to roughed-in service. Install wall supply trim and any accessories specified.

3.03 CAULKING AT PLUMBING FIXTURES AND FITTINGS

.1 Caulk around plumbing fixtures and fittings where they contact walls, floors, and any other building surface.

.2 Clean areas/surfaces to be caulked and prime in accordance with sealant manufacturer's instructions. Where damage to a building surface may occur, mask surface to prevent damage and ensure a clean exact edge to the caulking bead.

.3 Apply caulking using a gun with proper size and shape of nozzle and force sealant into joints to ensure good surface contact and a smooth and even finished bead of sealant.

.4 If joints have been masked sealant may be tooled in a continuous stroke to obtain complete void filling. Remove masking tape immediately after tooling and before sealant begins to skin.

3.04 DISHWASHER CONNECTIONS

.1 Provide roughed-in water and drain connections for Owner supplied dishwasher consisting of:

.1 15 mm (½") dia. domestic hot water connection with a Dahl "Mini-Ball" valve with hose end and water hammer arrestor;

.2 40 mm (1-½") dia. DWV copper drain connection with "P" trap and cleanout plug.

3.05 CLOTHES WASHER CONNECTIONS

.1 Provide roughed-in water and drain connections for Owner supplied clothes washer consisting of:

.1 15 mm (½") dia. piping connection for both hot and cold water, each terminated in a Dahl "Mini-Ball" Valve with hose end and water hammer arrestor;

.2 50 mm (2") dia. standing waste with a height to suit the washer drain and complete with a "P" trap.

End of Section

1 General

1.01 SUBMITTALS

.1 Submit shop drawings/product data sheets for all products specified in this section except shop fabricated ductwork and fittings.

.2 Include capacity, throw and terminal velocity, noise criteria, and pressure drops with grille and diffuser shop drawing/product data sheet submission.

.3 With shop drawing/product data sheet submission, supply evidence that fire rated duct manufacturer is ULC listed to size requirements shows on drawings.

.4 Submit duct leakage test data prior to ductwork being covered from view.

.5 Submit manufacturer's colour chart(s) for all items for which a finish colour is to be selected.

.6 Submit proper installation certification from fire rated duct manufacturer as specified in Part 3 of this section.

.7 Submit a site inspection and start-up report from fan filter diffuser manufacturer's representative as specified in Part 3 of this section.

.8 Supply and hand to Owner at Substantial Performance of the Work, a minimum of 10 identified (with tags) grille/diffuser volume control damper adjustment keys.

.9 Supply reviewed copies of ventilator/curb assembly shop drawings or product data sheets to trade who will cut roof openings for ventilators, and ensure openings are properly sized and located.

1.02 QUALITY ASSURANCE

.1 Grilles and diffusers are to be tested and performance certified to ANSI/ASHRAE 70, Method of Testing the Performance of Air Outlets and Air Inlets.

2 Products

2.01 GALVANIZED STEEL DUCTWORK

.1 Galvanized steel sheet is to be hot dipped in accordance with requirements of ASTM A653. G60 galvanizing for bare uncovered duct to be finish painted. G90 for all other galvanizing.

.2 Rectangular

.1 Lock forming grade hot dip galvanized steel, ASTM A653, shop fabricated, minimum #26 gauge.

.3 Round

.1 Factory machine fabricated, spiral, mechanically locked flat seam, single wall duct, fittings and couplings.

.4 Flat Oval

.1 Factory machine fabricated, single wall, 4-ply spiral lock seam duct, fittings and couplings.

2.02 FLEXIBLE METALLIC DUCTWORK

.1 Bare

.1 Spirally wound, semi-rigid, self-supporting corrugated aluminum duct with continuous triple lock seams, SMACNA Form "M-UN", ULC S110 listed and labelled as a Class 1 Air Duct, constructed of dead soft aluminum strip, and supplied in 3 m (10') lengths.

.2 Insulated

.1 Spirally wound, semi-rigid, self-supporting corrugated aluminum duct with continuous triple lock seams, SMACNA Form "M-I", ULC S110 listed and labelled as a Class 1 Air Duct, constructed of dead soft aluminum strip, supplied in 3 m (10') lengths and factory covered with 40 mm (1-½") thick, 12 kg/m3 (0.75 lb/ft³) density fibreglass insulation with a vinyl jacket meeting 25/50 flame spread and smoke developed requirements tested in accordance with CAN/ULC S102.

2.03 FLEXIBLE FABRIC DUCTWORK

.1 Equal to DuctSox Corp. round fabric air duct, 25/50 flame spread/smoke developed rated when tested in accordance with CAN/ULC S102, white or coloured (to manufacturer's standards), and complete with 3 x 1 tension cable suspension system.

2.04 FLEXIBLE CONNECTION MATERIAL

.1 Waterproof, indoor-outdoor type flexible connection material meeting requirements of NFPA 90A, consisting of woven glass fibre fabric coated on both sides with synthetic rubber. Acceptable products are:

.1 Duro Dyne Canada Inc. "DUROLON";

.2 Dyn Air Inc. "HYPALON".

.2 Waterproof, flameproof, high temperature flexible connection material meeting requirements of NFPA 90A, consisting of a woven glass fibre fabric coated on both sides with silicone rubber. Acceptable products are:

.1 Duro-Dyne Canada Inc. "THERMAFAB";

.2 Dyn Air Inc. "SILICON HI-T".

2.05 METAL DUCT SYSTEM JOINT SEALANT

.1 ULC listed and labelled, premium grade, grey colour, water base, non-flammable duct sealer, brush, or gun applied, with a CAN/ULC S102 tested maximum flame spread rating of 5 and smoke developed rating of 0.

.2 Acceptable manufacturers are:

.1 Johns Manville;

.2 Manson Insulation;

.3 Knauf Insulation.

2.06 ACOUSTIC LINING

.1 Minimum 25 mm (1") thick acoustic lining material meeting 25/50 flame spread and smoke developed ratings tested in accordance with CAN/ULC S102, meeting NFPA 90A, ASTM C1071, and ASTM G21 requirements, not supporting microbial growth, flexible for round ducts, board type for rectangular ducts, consisting of a bonded fiberglass mat coated on inside (airside) face with a black fire-resistant coating.

.2 Acceptable manufacturers are:

.1 Johns Manville;

.2 Manson Insulation;

.3 Knauf Insulation.

2.07 KITCHEN EXHAUST DUCT EXPANSION JOINT

.1 Hyspan Precision Products Inc. Series 2500 flanged, carbon steel, rectangular expansion joints sized to suit ductwork.

2.08 UNINSULATED KITCHEN GREASE EXHAUST DUCT

.1 Minimum #16 gauge black sheet steel liquid-tight ductwork with welded joints or listed in accordance with CAN/ULC S662.

.2 Grease-tight access doors in accordance with requirements of NFPA 96, constructed of same material as duct and as large as possible, up to 600 mm (24") in any dimension, located in the sides of the duct for ease of inspection and cleaning at each change in duct direction, at not less than 3 m (10') in straight duct including risers, and not less than 40 mm (1-½") from bottom of duct.

2.09 FACTORY INSULATED ROUND KITCHEN GREASE EXHAUST DUCT

.1 Equal to Selkirk ZeroClear kitchen exhaust duct, 2 hour fire rated to UL 2221, constructed, listed and labelled to UL/ULC 1978, and meeting requirements of NFPA 96. Duct is constructed of a type 304 stainless steel inner liner, 75 mm (3") of high temperature fibre insulation, and a stainless steel outer jacket, and is complete with all required fittings and accessories, including access and cleanout fittings where required.

2.10 FACTORY INSULATED RECTANGULAR/SQUARE KITCHEN GREASE EXHAUST DUCT

.1 Equal to DuraSystems "DuraDuct KEX" kitchen exhaust duct, 2 hour rated kitchen exhaust listed and labelled to CAN/ULC S144, and meeting requirements of NFPA 96. Duct is constructed of minimum #16 gauge black sheet steel inner liner, high temperature fibre insulation and a minimum #24 gauge galvanized steel outer jacket, and complete with required fittings and accessories, including access and cleanout fittings where required. Factory-fabricated grease duct assembly is to not require additional wraps or enclosures to achieve required fire resistance rating.

2.11 FACTORY INSULATED FIRE RATED DUCTWORK

.1 Equal to DuraSystems Barriers Inc. "DuraDuct HP" or "DuraDuct GNX" duct, 2 hour fire rated, constructed, ULC listed and labelled for fire rated ventilation applications. Duct is constructed of a galvanized steel inner liner, a galvanized steel outer jacket, and all required fittings and accessories, including support hardware.

2.12 CASING AND PLENUM MATERIAL AND ACCESSORIES

.1 Unless otherwise specified, casing and plenum material is to be same as connecting duct material.

.2 Accessories such as access doors and drain pans are to be constructed of same material as casing and plenum and are to be in accordance with Chapter 6 of SMACNA HVAC Duct Construction Standards Metal and Flexible.

2.13 ACOUSTIC PLENUM PANELS

.1 Vibro-Acoustics Ltd. type "AP", 100 mm (4") thick panels with acoustic media meeting NFPA 90A requirements sandwiched between minimum #24 gauge galvanized sheet steel, with airside face perforated, access doors where shown, and with acoustic performance as follows:

Octave Bands, (Hz)	125	250	500	1000	2000	4000
Transmission Loss	21	28	39	50	53	56

Absorption Coefficient	0.7	0.9	.99	.99	0.9	0.9

.2 Acoustic plenum media factory encapsulated in sealed DuPont "Tedlar" polyvinyl fluoride film to ensure no media enters the airstream.

.3 Acceptable manufacturers are:

.1 Vibro-Acoustics Ltd.;

.2 Kinetics Noise Control Inc.;

.3 Carrier Corp. – Racan;

.4 Haakon Industries;

.5 Price Industries Inc.

2.14 PLENUM ACCESS DOORS

.1 Factory fabricated, double wall insulated access doors, sized as indicated on drawings, and constructed of same material as connecting ductwork in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible to suit operating pressure of the system.

2.15 ROUND TO RECTANGULAR DUCT CONNECTIONS

.1 Equal to Flexmaster Canada Ltd. galvanized steel, flared, flanged or notched "Spin-On" round duct take-off collars with locking dampers in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

2.16 SPLITTER DAMPERS

.1 Minimum #20 gauge damper blade constructed of same material as duct, reinforced as required to suit blade size, system velocity, and to prevent "chatter", and complete with operating hardware equal to DynAir Inc. #Q-50 "DYN-A-QUAD S-S" quadrant regulator with RW-50 backup washers to prevent leakage, long square bearing pin, and slide pin.

2.17 AIR TURNING VANES

.1 For square elbows, multiple-radius turning vanes interconnected with bars, adequately reinforced to suit pressure and velocity of system, constructed of same material as duct they are associated with, and in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

.2 For short branch ducts at grille and diffuser connections, air extractor type each equipped with a matching bottom operated 90° opposed blade volume control damper, constructed of same material as duct it is associated with and in accordance with requirements and details in ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

2.18 MANUAL BALANCING (VOLUME) DAMPERS

.1 Flanged and drilled, single or parallel blade (depending on damper size) manual balancing dampers, each constructed of same material as connecting ductwork unless otherwise specified, each designed to maintain internal free area of connecting duct, and each complete with:

.1 hexagonal or square shaft extension through frame;

.2 non-stick, non-corrosive synthetic bearings for rectangular dampers, flange stainless steel bearings for round dampers;

.3 blade stops for single blade dampers, designed to prevent blade from moving more than 90°;

.4 linkage for multiple blade dampers;

.5 locking hand quadrant damper operator with, for insulated ducts 50 mm (2") standoff mounting.

.2 Rectangular Dampers: Nailor Industries Inc. 1800 Series, maximum size 1.2 m x 1.2 m (4' x 4') for a single damper.

.3 Round Dampers: Nailor Industries Inc. Model 1890, maximum 600 mm (24") diameter, equipped with a minimum 200 mm (8") deep frame, and blade stiffeners where required.

.4 Multiple Rectangular Damper Section Assembly: Rectangular assembly supplied with the dampers or site constructed, of same material as damper and designed for tight and secure mounting of individual dampers.

.5 Acceptable manufacturers are:

.1 Nailor Industries Inc.;

.2 T.A. Morrison & Co. Inc. "TAMCO";

.3 NCA Manufacturing Ltd.;

.4 Greenheck Fan Corp.;

.5 Ruskin Co.

2.19 BACKDRAFT DAMPERS

.1 Nailor Industries Model 1370CB counterbalanced backdraft dampers, vertical or horizontal mounting, 50 mm (2") wide, sized as shown and complete with:

.1 extruded 6063-T5 aluminum frame, 2.3 mm (0.090") nominal wall thickness, with mitred corners;

.2 extruded 6063-T5 aluminum blades, 1.3 mm (0.050") nominal wall thickness on 92 mm (3-5/8") centres, and with extruded PVC blade seals;

.3 corrosion-resistant synthetic bearings;

.4 adjustable plated steel counterweights mounted internally in the airstream;

.5 concealed blade linkage located out of the airstream.

.2 Acceptable manufacturers are:

.1 Nailor Industries Inc.;

.2 T.A. Morrison & Co. Inc. "TAMCO";

.3 NCA Manufacturing Ltd.;

.4 Greenheck Fan Corp.;

.5 Ruskin Co.

2.20 COMBINATION FIRE/SMOKE DAMPERS

.1 Nailor Industries Series 1220, ULC listed to CAN/ULC S112 and CAN/ULC S112.1, meeting requirements of NFPA 80, 90A, 92, 101 and 105, consisting of type A, B, or C fusible link fire dampers as required and a fail-safe, opposed blade, normally closed, motor operated smoke damper complete with factory installed and tested 120 V electric actuator.

.2 ULC 1-1/2 hour fire rated and ULC Class I leakage rated for smoke, and equipped with a 74°C (165°F) ULC classified fusible link that will cause damper to close and lock independent of actuator when duct temperature reaches maximum temperature of damper assembly.

.3 Supply damper with factory installed sleeves of minimum 400 mm (16") length, field verified by contractor dependent on wall thickness. Caulk sleeves to ULC requirements and constructed of 20 gauge for sizes up to 2.1 m (84") wide and 18 gauge for sizes greater than 2.1 m (84") wide.

.4 Dampers in ductwork other than galvanized steel are to be as specified above but constructed of type 316 stainless steel.

.5 Acceptable manufacturers are:

.1 Nailor Industries Inc.;

.2 Greenheck Fan Corp.;

.3 NCA Manufacturing Ltd.;

.4 Ruskin Co.;

.5 Price Industries (E.H. Price).

2.21 SMOKE DAMPERS

.1 Multi-blade type, fail-safe, dynamic, galvanized steel (unless otherwise specified) smoke dampers, ULC classified to CAN/ULC S112.1, ULC Class I leakage rated for smoke, meeting requirements of NFPA 90A, 92, 101 and 105, normally closed, low pressure drop design, dynamically tested, each complete with jamb and blade seals, linkage concealed in the frame, a steel sleeve to suit the opening, and an electric actuator to automatically close damper upon receiving an external signal, and to automatically open damper when system is reset.

.2 Dampers in ductwork other than galvanized steel are to be as specified above but constructed of type 316 stainless steel.

.3 Acceptable manufacturers are:

.1 Nailor Industries Inc.;

.2 Greenheck Fan Corp.;

.3 NCA Manufacturing Ltd.;

.4 Ruskin Co.;

.5 Price Industries (E.H Price).

2.22 ROOF DUCT SUPPORTS

.1 Equal to PHP Systems Design Model PHP-D adjustable duct support assemblies sized to suit duct size, each assembly complete with injection moulded recycled plastic and carbon black bases and tubular hot dip galvanized steel framing.

2.23 DUCT ACCESS DOORS

.1 In accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, with sizes suitable in all respects for purpose for which they are provided, and, unless otherwise specified, constructed of same material as duct they are associated with.

2.24 DUCTWORK DRAIN POINTS

.1 Equal to Ductmate Canada Ltd. "Moisture Drain", 20 mm (¾") diameter moisture drains with galvanized sheet metal funnel, and chrome plated brass threaded drain, nut and cap.

2.25 INSTRUMENT TEST PORTS

.1 Equal to Duro-Dyne of Canada Ltd. #IP1 or #IP2 (to suit insulation thickness where applicable) gasketed, leakproof instrument test ports for round or rectangular ducts as required, each complete with a neoprene expansion plug and a plug securing chain.

2.26 WIRE MESH (BIRDSCREEN)

.1 Heavy-gauge galvanized steel or aluminum mesh, 12 mm x 12 mm (½" x ½") secured in a rigid galvanized steel or aluminum framework, sized as indicated on drawings, and constructed so as to be removable.

2.27 LOUVRES

.1 Price Industries Inc. DE439 or DE635, 100 mm (4") or 150 mm (6") deep (to suit wall thickness) factory assembled stationary, drainable, louvres sized as indicated on drawings, each AMCA water penetration and air performance certified, constructed of welded, extruded, alloy 6063-T5 aluminum with drainable blades, mounting and securing hardware to suit the application, and 12 mm (½") mesh aluminum birdscreen in an aluminum frame.

.2 Acoustical Louvres: Price Industries Inc. Model QA1245 300 mm (12") deep, welded, extruded alloy 3003-H14 aluminum, storm-proof, stationary, drainable acoustical louvers, AMCA water penetration and air performance certified, with high density mineral wool acoustic media secured to blades and protected by perforated aluminum, sound ratings in accordance with ASTM E90 and ASTM E413, and mounting and securing facilities as required.

.3 Louvres are to be factory finished with a finish equal to PPG Industries "Duranar" fluoropolymer powder coating over primer with colour as selected from manufacturer’s standard colour range.

.4 Acceptable manufacturers are:

.1 Price Industries Inc.;

.2 The Airolite Co. LLC;

.3 Construction Specialities;

.4 Nailor Industries Inc.;

.5 Ventex

.6 Ruskin

2.28 LOUVRE BLANK-OFF PANELS

.1 Insulated, framed, sandwich construction panels consisting of 40 mm (1-½") thick rigid insulation (meeting NFPA 90A requirements) between minimum #20 gauge galvanized sheet steel with exterior face of panels finished to match finish of exterior wall louvres.

2.29 BRICK AND BLOCK VENTS

.1 Equal to Price Industries Inc. vents constructed of 6063-T5 alloy extruded aluminum, sized as shown, complete with stainless steel fasteners, aluminum rod vertical supports on minimum 300 mm (12") centres, #2 mesh fixed aluminum screen, and all required accessories to suit the application.

.2 Vent(s) to be factory finished with a finish equal to a baked "Kynar 500-XL" colour coat and a clear coat over cleaned and primed metal with colour as selected from manufacturer's standard colour range.

.3 Acceptable manufacturers are:

.1 Price Industries Inc.;

.2 The Airolite Co. LLC;

.3 Construction Specialities;

.4 Nailor Industries Inc.;

.5 Ventex

.6 Ruskin

2.30 FIRE STOP FLAPS AND THERMAL BLANKET MATERIAL

.1 Rectangular or round, ULC listed and labelled, blade type galvanized steel fire stop flaps in accordance with CAN/ULC S112, Standard Methods of Fire Test of Fire-Damper Assemblies and CAN/ULC S112.2, Standard Method of Fire Test of Ceiling Firestop Flap Assemblies, each complete with #22 gauge G60 galvanized steel blade(s) and frame, a 74°C (165°F) fusible link, and, for dampers 300 mm (12") and larger, ceramic fibre insulation on both sides of the blades.

.2 Ceramic fibre material in accordance with 25/50 flame spread/smoke developed ratings when tested to CAN/ULC S102 and of a thickness to suit required fire rating.

2.31 GRILLES AND DIFFUSERS

.1 Grilles and diffusers of type, size, capacity, finish, and arrangement as shown on drawings and in accordance with drawing schedule, each equipped with all required mounting and connection accessories to suit mounting location and application.

.2 Acceptable manufacturers are:

.1 Price Industries Inc.;

.2 Carnes;

.3 Krueger Division of Air System Components Inc.;

.4 Titus;

.5 Nailor Industries Inc.;

.6 Metalaire;

2.32 LOUVRED PENTHOUSE TYPE VENTILATORS

.1 Low silhouette, rectangular, roof mounting louvred penthouse type hoods in accordance with drawing schedule, each constructed of aluminium, supplied in knock-down form for site assembly, and each complete with:

.1 extruded aluminium, welded storm-proof louver blades with mitred corners and stainless steel securing screws;

.2 removable cover for internal access, lined with glass fibre insulation material and equipped with stainless steel fasteners;

.3 12 mm x 12 mm (½" x ½") aluminium mesh birdscreen;

.4 welded aluminium, minimum 300 mm (12") high insulated roof mounting curb with damper tray and curb seal;

.5 aluminium backdraft damper supplied loose, for site installation in roof curb damper tray;

.6 non-corrosive motorized damper supplied loose for site installation in roof curb damper tray, equal to T. A. Morrison TAMCO Series 9000 insulated damper with linkage, end switch, and a Belimo or equal motor with voltage to suit site control voltage requirements;

.2 Acceptable manufacturers are:

.1 Greenheck Fan Corp.;

.2 Twin City Fan and Blower;

.3 PennBarry.

3 Execution

3.01 CLEANLINESS REQUIREMENTS FOR HANDLING AND INSTALLATION OF DUCTWORK

.1 Handle and install ductwork in accordance with CSA Z317.2, Special Requirements for Heating, Ventilation, and Air-Conditioning (HVAC) Systems in Healthcare Facilities and SMACNA's Duct Cleanliness for New Construction Guidelines at the Advanced Level.

.2 Handle and install ductwork in accordance with SMACNA's Duct Cleanliness for New Construction Guidelines at the Advanced Level.

3.02 FABRICATION AND INSTALLATION OF GALVANIZED STEEL DUCTWORK

.1 Provide required ductwork, rectangular, round and/or flat oval. Where rectangular ductwork is shown, round or flat oval ductwork of equivalent cross-sectional area is acceptable.

.2 It is to be understood that all duct dimensions shown on drawings are clear internal dimensions.

.3 Unless otherwise specified, construct and install ductwork in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible to suit duct pressure class designation of minimum 500 Pa (2" w.c.) positive or negative as applicable, a minimum velocity of 10 m/s (2000 fpm), and so ductwork does not "drum". Flat surfaces of rectangular ductwork are to be cross-broken. Duct system sealing is to meet ANSI/SMACNA Seal Class A requirements.

.4 Variable air volume ductwork from supply fans to boxes is as above but rectangular duct take-offs are double side straight taper type with a take-off length equal to 0.5 times the branch duct width but minimum 150 mm (6") length, and double taper side is to have an included angle of minimum 60°.

.5 Confirm routing of all ductwork at site and site measure ductwork prior to fabrication. Duct dimensions may be revised to suit site routing and building element requirements, if dimension revisions are reviewed with and approved by Consultant. Duct routing and/or dimension revisions to suit conditions at site are not grounds for a claim for an extra cost.

.6 Refer to structural drawings. Where ductwork is to be run within or through open web steel joists, ductwork shown on mechanical drawings is schematic only and is to be altered as required to suit steel joist configuration, spacing, panel points, and cross-bridging at no additional cost.

.7 Wherever ductwork is required at locations where sprayed fireproofing is applied to building construction, install ductwork only after fireproofing work is complete and do not compromise fire rating of sprayed fireproofing.

.8 Install (but do not connect) duct system mounted automatic control components supplied as part of the automatic control work.

.9 Where indicated, provide duct connections to fan powered heat transfer equipment with integral coils.

.10 Flange connect ductwork to hot water reheat coils in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible. Coils will be suspended independent of connecting ductwork as part of the heat transfer work.

.11 Support horizontal rectangular ducts inside building in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, but use trapeze hangers with, unless otherwise specified, galvanized steel channels, and galvanized steel hanger rods for exposed ducts and concealed ducts wider than 500 mm (20"). Support hardware constructed of same material as duct for metal duct, and, unless otherwise specified, type 316 stainless steel for non-metal duct. Supports for "heavy" duct such as cementitious core duct is to be suitable in all respects for the application and approved by Consultant.

.12 Support round and flat oval ducts inside building in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, but, unless otherwise specified, for both uninsulated and insulated ducts exposed in finished areas, use bands and secure at top of duct to a hanger rod, all similar to Ductmate Canada Ltd. type "BA". If duct is insulated, size strap to suit diameter of insulated duct. Unless otherwise specified, duct support hardware for metal duct is constructed of same material as duct, and for non-metal duct, type 316 stainless steel.

.13 Where flanged duct joints are used, do not locate joints in wall or slab openings, or immediately at wall or slab openings. Do not use flanged joints for exposed uninsulated ducts in finished areas.

.14 Where watertight horizontal ductwork is required, construct ducts without bottom longitudinal seams. Solder or weld joints of bottom and side sheets. Seal all other joints with duct sealer. Slope horizontal duct to hoods, risers, or drain points. Provide drain points. Provide watertight ductwork for:

.1 ductwork outside building or otherwise exposed to the elements;

.2 shower exhaust ducts from grilles to duct main or riser;

.3 fresh air intakes;

.4 wherever else shown.

.15 Leakage Testing:

.1 Ductwork leakage is not to exceed following:

.1 ductwork to 2" W.C. Class, 1% of total air quantity handled by respective fans;

.2 ductwork exceeding 2" W.C. Class, 2% of total air quantity handled by respective fans.

.2 Leakage testing is to be performed by the Testing, Adjusting and Balancing (TAB) agency in accordance with SMACNA HVAC Air Duct Leakage Test Manual and is to be witnessed by Consultant.

.3 Be responsible for following:

.1 preparing duct systems for leakage testing prior to installation of external insulation including capping duct runouts and provision of final tap-in for test equipment;

.2 schedule testing with TAB agency in advance, be present for all testing and ensure notice is given to Consultant so they may witness testing;

.3 resealing and/or replacement of defective ductwork;

.4 bearing all costs associated with retesting ductwork which has failed to pass leakage testing.

.16 Seal all ductwork in accordance with SMACNA Seal Class "A", except for round duct with self-sealing gasketed fittings and couplings which does not require site applied sealant. Apply sealants by brush or gun to cleaned metal surfaces. Where bare ductwork is exposed apply neat uniform lines of sealant. Randomly brushed, sloppy looking sealant applications will be rejected and must be repaired or replaced with a neat application of sealant.

.17 Apply sealants by brush or gun to cleaned metal surfaces. Where bare ductwork is exposed apply neat uniform lines of sealant. Randomly brushed, sloppy looking sealant applications will be rejected and must be repaired or replaced with a neat application of sealant.

.18 Clean exterior exposed (uninsulated) ducts and coat with a heavy full coverage of Bakor #410-02 black metal paint.

.19 Where dissimilar metal ducts are to be connected, isolate ducts by means of flexible duct connection material.

.20 Round exposed ductwork in Gymnasium is to be 2 metal gauges heavier than standard metal gauge for same size duct, and duct hangers are to be pairs of 9.5 mm (⅜") diameter hanger rods secured to 40 mm (1-½") wide #12 gauge galvanized steel split clamps around full circumference of duct at maximum 1.8 m (72") centres. Provide double nuts and lock washers on each hanger rod above and below each clamp.

3.03 INSTALLATION OF FABRIC DUCTWORK

.1 Provide fabric ductwork.

.2 Secure duct from structure by means of tension cable and suspension components supplied with ductwork.

.3 Install tension cable and suspension components in accordance with duct manufacturer’s instructions.

.4 Provide metal duct connection collars as required.

.5 Start-up fabric duct system in accordance with manufacturer’s instructions.

.6 Do not penetrate fire barriers with fabric duct.

3.04 INSTALLATION OF FLEXIBLE DUCTWORK

.1 Provide maximum 3 m (10') long lengths of flexible ductwork for connections between galvanized steel duct mains and branches, and necks of ceiling grilles and diffusers. Do not install flexible ductwork through walls, even if shown on drawings.

.2 At rectangular galvanized steel duct, accurately cut holes and provide flanged or "Spin-in" round flexible duct connection collars. Seal joints with duct sealer.

.3 Install flexible ducts as straight as possible and support in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, and secure at each end with nylon or stainless steel gear type clamps, and seal joints. Provide long radius duct bends where they are required.

.4 Do not penetrate fire barriers with flexible duct.

3.05 INSTALLATION OF ACOUSTIC LINING

.1 Provide acoustic lining in ductwork in locations as follows:

.1 wherever shown and/or specified on drawings;

.2 supply ductwork downstream of air terminal boxes for a distance of 2.4 m (8') measured along duct and outward from box in all directions;

.3 all transfer air ducts.

.2 Install lining in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, however, for all installations regardless of velocity, at leading and trailing edges of duct liner sections, provide galvanized steel nosing channel in accordance with detail entitled Flexible Duct Liner Installation found in the ANSI/SMACNA manual referred to above.

3.06 INSTALLATION OF FIRE RATED DUCTWORK

.1 Provide 2 hour fire rated ductwork.

.2 Install ductwork in strict accordance with duct manufacturer's instructions using support hardware supplied with duct.

.3 When installation is complete, arrange, and pay for duct manufacturer to visit site and examine duct installation. Make any revisions requested by manufacturer, and when manufacturer is satisfied with installation, obtain and submit a letter certifying proper installation in accordance with ULC requirements.

3.07 INSTALLATION OF SHEET STEEL KITCHEN GREASE EXHAUST DUCTWORK

.1 Provide welded sheet steel kitchen grease exhaust ductwork from exhaust hood(s) to roof mounted exhaust fans, all in accordance with requirements of NFPA 96. Construct ductwork watertight with continuous externally welded seams and joints, cleanouts, duct expansion provisions, riser residue traps, etc.

.2 Clean and prime coat ground welds in black steel ducts.

.3 Support ductwork at not greater than 1.5 m (5') intervals and ensure fasteners at hangers do not penetrate duct. Install without forming dips, sags or traps where grease reside might collect, and locate access door/cleanouts for ease of maintenance.

.4 Slope horizontal ductwork 25 mm per 300 mm (1" per foot) back to exhaust hood.

3.08 INSTALLATION OF CASINGS AND PLENUMS

.1 Provide required shop or site fabricated casings and plenums. Unless otherwise specified or shown, construct casings and plenums of same material as connecting duct system.

.2 Construct and install casings and plenums in accordance with Chapter 6 of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible to suit systems' pressure classification. Ensure plenums and casings secured to building structure are gasketed air-tight and equipped with angle reinforcing.

.3 Provide drain pans with accessible trapped drains for fresh air intake plenums, and wherever else shown.

.4 In addition to SMACNA duct construction standards specified above, casings and plenums are to be constructed and installed to meet seismic requirements of British Columbia Building Code and ANSI/SMACNA - The Seismic Restraint Manual: Guidelines for Mechanical Systems.

3.09 INSTALLATION OF ACOUSTIC PANELS

.1 Provide acoustic panels for plenums. Integrate acoustic plenums with standard casings and plenums. Install acoustic panels in strict accordance with manufacturer's instructions. Seal panels with acoustic caulking where pipes, ducts or conduit penetrate and make air and watertight.

.2 Provide floor to ceiling high acoustic plenums where shown, each complete with required framing, including framing for access doors and other openings, each structurally designed to resist excessive deflection or bowing, constructed to be air-tight when subjected to a pressure differential of 2.48 kPa (0.36 psi), and designed so any one panel can be removed without dismantling entire plenum.

.3 Provide acoustic type access doors where shown, and provide acoustic caulking at all locations where acoustic plenums abutt building walls or slabs, and at all points where pipe, ducts or conduit penetrate acoustic panels.

.4 In addition to SMACNA duct construction standards specified above, acoustic plenums are to be constructed and installed to meet seismic requirements of British Columbia Building Code and ANSI/SMACNA, The Seismic Restraint Manual: Guidelines for Mechanical Systems.

3.10 INSTALLATION OF CASING AND PLENUM ACCESS DOORS

.1 Provide access doors into all site or shop fabricated casings and plenums requiring access, and wherever shown.

.2 Construct access doors to open in or out to suit positive and negative pressures of system.

.3 Provide pitot tube openings in access doors where required for system air quantity balancing purposes.

.4 Provide suitably sized, engraved, red-white laminated Lamacoid warning nameplates on access doors into casings and plenums where equipment is located, i.e. fans.

3.11 INSTALLATION OF ROUND TO RECTANGULAR DUCT CONNECTIONS

.1 Cut round holes in rectangular ducts and provide round to rectangular lock-in fittings with dampers for connection of flexible round ductwork.

3.12 INSTALLATION OF SPLITTER DAMPERS

.1 Provide splitter dampers in supply ductwork at branch duct connections off supply air mains, and wherever else shown and/or specified on drawings. Install splitter dampers so they cannot vibrate and rattle and so damper operation mechanisms are in an easily accessible and operable location. Ensure operators for dampers in insulated ducts are equipped with stand-off mounting brackets.

3.13 INSTALLATION OF TURNING VANES

.1 Provide turning vanes in ductwork elbows where shown on drawings and wherever else required where, due to site installation routing and duct elbow radius, turning vanes are recommended in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

.2 Provide volume extractor type turning vanes in short branch supply duct connections off mains to grilles and diffusers where shown and/or specified.

3.14 INSTALLATION OF MANUAL BALANCING (VOLUME) DAMPERS

.1 Provide manual balancing dampers as required to provide a fully balanced system, including but not limited to in all open end ductwork, in all duct mains, and wherever else shown and/or specified.

.2 Install dampers so operating mechanism is accessible and positioned for easy operation, and so dampers cannot move or rattle. Ensure operating mechanisms for dampers in insulated ducts are complete with stand-off mounting brackets.

.3 Where a duct for which a balancing damper is required has dimensions larger than dimensions of maximum size volume damper available, provide multiple dampers bolted together in a properly sized

assembly, or bolted to a heavy-gauge black structural steel angle or channel framework which is properly sized. Seal to prevent air by-pass, and provide connecting linkage.

.4 Confirm exact damper locations with personnel doing air quantity balancing testing work and install dampers to suit. Include for providing 5 additional dampers at no additional cost.

3.15 INSTALLATION OF BACKDRAFT DAMPERS

.1 Provide backdraft dampers.

.2 Install and secure dampers so they cannot move or rattle.

3.16 INSTALLATION OF FUSIBLE LINK DAMPERS

.1 Provide fusible link dampers. Ensure damper rating (1-½ or 3 hr.) is suitable for fire barrier it is associated with.

.2 Install dampers with retaining angles on all 4 sides of sleeve on both sides of damper and connect with ductwork in accordance with damper manufacturer’s instructions and details, and Code requirements.

.3 Provide expansion clearance between damper or damper sleeve and opening in which damper is required. Ensure openings are properly sized and located, and all voids between damper sleeve and opening are properly sealed to maintain rating of fire barrier.

.4 Where size of fire barrier opening requires use of a sectionalized fire damper assembly, provide multiple fusible link dampers (sized to CAN/ULC S112) bolted together in a properly sized assembly or bolted to a heavy-gauge black structural steel angle or channel framework.

3.17 INSTALLATION OF COMBINATION FIRE/SMOKE DAMPERS

.1 Provide combination fire/smoke dampers. Install dampers with retaining angles on all 4 sides of each side of damper, and, where required, connect with ductwork, all in accordance with damper manufacturer’s instructions and details, and Code requirements.

.2 Coordinate damper installation with electrical work where electrical connections to damper actuators are specified.

3.18 INSTALLATION OF SMOKE DAMPERS

.1 Provide smoke dampers. Install dampers with retaining angles on all 4 sides of sleeve on both sides of damper and connect with ductwork in accordance with damper manufacturer’s instructions and details, and Code requirements.

.2 Coordinate damper installation with electrical work where electrical connections to damper actuators are specified.

3.19 INSTALLATION OF FLEXIBLE CONNECTION MATERIAL

.1 Provide a minimum of 100 mm (4") of flexible connection material where ducts, plenums, and/or easings connect to fans, and wherever else shown or specified.

.2 Rigidly secure a minimum of 75 mm (3") of duct material (minimum #24 gauge) to each edge of flexible fabric and to fan, duct, plenum, etc., in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible. Ensure connections to flexible fabric material are arranged and supported so as to not impose any external forces on the fabric.

3.20 INSTALLATION OF ROOF MOUNTED DUCT SUPPORTS

.1 Supply supports for roof mounted ductwork.

.2 For new roof construction, hand adjustable structural supports to roofing trade on roof for installation and flashing into roof construction as part of roofing work. Accurately mark exact locations and spacing of structural supports and supervise installation. Provide properly sized hot dip galvanized structural steel angles between structural supports and secure in place on support studs. Support ductwork on the angles and provide galvanized steel banding to secure ducts to the angles.

.3 For installations on existing roof, accurately mark location and spacing of roof support assemblies. At each plastic base location, carefully scrape away loose roof ballast (gravel) and all other debris and dirt. Prime existing membrane with a primer which is compatible with existing roofing components. Set bases in adhesive in accordance with manufacturer's installation instructions. Scrape loose ballast back around and on bases. Install framing, and install ductwork on the cross-members. Secure ductwork to cross-members with galvanized steel banding.

3.21 INSTALLATION OF DUCT ACCESS DOORS

.1 Provide access doors in ductwork for access to all components which will or may need maintenance and/or repair, including reheat coils. Install in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

.2 Identify access doors provided for fusible link damper maintenance with "FLD" stencil painted or marker type red lettering and ensure doors are properly located for damper maintenance.

.3 When requested, submit a sample of proposed duct access doors for review.

.4 Where sectionalized fusible link dampers and/or balancing dampers are provided in large ducts, provide a plenum type access door to suit, and adequately reinforce ductwork to suit access door installed.

3.22 INSTALLATION OF INSTRUMENTS TEST PORTS

.1 Provide instrument test ports in all main ducts at connections to fans, plenums or casings, in all larger branch duct connections to mains, and wherever else required for proper air quantity balancing and testing.

.2 Locate test ports where recommended by personnel performing air quantity testing and balancing work.

3.23 INSTALLATION OF WIRE MESH (BIRDSCREEN)

.1 Provide framed, removable wire mesh panels over openings in ducts and/or walls where shown and/or specified on drawings. Rigidly secure in place but ensure panels are removable.

.2 Provide wire mesh panels for open-end return air ducts in ceiling spaces whether shown on drawings or not.

3.24 INSTALLATION OF LOUVRES

.1 Provide louvres for wall openings.

.2 Install louvre assemblies and secure in place in accordance with manufacturer's instructions and details.

.3 Confirm exact louvre sizes and finish prior to ordering.

.4 Intake outdoor air louvres to be at a minimum of 3m/10ft distance of washroom exhausts, gas fired equipment flues or other contaminants to prevent cross contamination.

3.25 INSTALLATION OF LOUVRE BLANK-OFF PANELS

.1 Provide blank-off panels for inactive portions of exterior wall louvres.

.2 Secure panels in place with non-ferrous hardware so they cannot move or rattle, yet are easily removable.

.3 Confirm exact finish of panels prior to fabrication.

3.26 INSTALLATION OF BRICK AND BLOCK VENTS

.1 Supply brick or block vents for installation in exterior walls.

.2 Hand assemblies to masonry trade for installation.

.3 Accurately mark exact locations and coordinate installation.

3.27 INSTALLATION OF FIRE STOP FLAPS AND THERMAL BLANKETS

.1 Provide fire stop flaps in duct connection necks of grilles and diffusers installed in ULC fire rated suspended ceiling systems where shown on drawings.

.2 Provide thermal blanket material to completely cover grille and/or diffuser pans above suspended ULC fire rated ceilings. Cut, install, and secure in place in accordance with manufacturer's instructions and ULC requirements.

3.28 INSTALLATION OF GRILLES AND DIFFUSERS

.1 Provide grilles and diffusers. Wherever possible, grilles and diffusers are to be product of same manufacturer.

.2 Unless otherwise specified connect grilles and diffusers in accordance with requirements of SMACNA HVAC Duct Construction Standards Metal and Flexible.

.3 Exactly locate grilles and diffusers to conform to final architectural reflected ceiling plans and detailed wall elevations, and to conform to final lighting arrangement, ceiling layout, ornamental and other wall treatment.

.4 Equip supply diffusers having a basic 4-way or all round air pattern for operation in 1-, 2-, or 3-way pattern where indicated on drawings.

.5 Provide sheet metal plenums, constructed of same material as connecting duct, for linear grilles and/or diffusers where shown. Construct and install plenums in accordance with requirements of SMACNA HVAC Duct Construction Standards Metal and Flexible. Where individual sections of linear grilles or diffusers are not equipped with a volume control device, equip duct connection collar(s) with volume control device(s).

.6 Where linear type diffusers/grilles are installed in suspended T-bar ceilings, clip diffusers/grilles in place using clip supplied by diffuser/grille manufacturer.

.7 Confirm grille and diffuser finishes prior to ordering.

3.29 SUPPLY OF DOOR GRILLES

.1 Supply door grilles as shown and scheduled.

.2 Hand grilles to appropriate trade at site for installation.

3.30 INSTALLATION OF ROOF MOUNTED GRAVITY VENTILATORS

.1 Provide roof mounted gravity ventilators.

.2 Supply a roof mounting curb with each ventilator and hand curbs to roofing trade on roof for mounting and flashing into roof construction as part of the roofing work. Site assemble gravity ventilators as required, and secure in place on curbs.

.3 Brace and secure each unit in accordance with requirements specified in Section 20 05 48.16 – Seismic Controls for Mechanical Systems.

.4 Install dampers in curb damper tray and secure in place.

3.31 DUCT SYSTEM PROTECTION, CLEANING AND START-UP

.1 Temporarily cover all open ends of ducts during construction.

.2 Remove all dirt and foreign matter from entire duct systems and clean duct system terminals and interior of air handling units prior to operating fans.

.3 Prior to starting any supply air handling system provide 50 mm (2") thick glass fibre construction filters at fan equipment in place of permanent filters.

.4 Provide cheesecloth over duct system inlets and outlets and run system for 24 hours, after which remove cheesecloth and construction filters, and install new permanent filters.

.5 Include all labour for a complete site walk-through with testing and balancing personnel following route of all duct systems to be tested, adjusted and balanced for the purpose of confirming proper position and attitude of dampers, location of pitot tube openings, and any other work affecting testing and balancing procedures. Perform corrective work required as a result of this walk-through.

End of Section

1 General

1.01 SUBMITTALS

.1 Submit shop drawings/product data sheets for fans and accessories. Include following:

.1 certified fan performance curves at specified operating point with flow, static pressure and HP clearly plotted;

.2 certified sound power data that conforms to specified levels;

.3 product data sheets for all accessories;

.4 product data sheets for fan motors.

.2 Submit with delivery of each unit a copy of the factory inspection report, and include a copy of each report with O&M Manual project close-out data.

.3 Submit a site inspection and start-up report from manufacturer's representative as specified in Part 3 of this section.

.4 Supply reviewed copies of fan/curb assembly shop drawings or product data to trade who will cut roof openings for fans, and ensure openings are properly located.

.5 Supply reviewed copies of fan assembly shop drawings or product data to trade who will form/prepare wall openings for fans, and ensure openings are properly located.

.6 Submit a signed copy of destratification fan manufacturer's 5 year extended parts and labour warranty.

.7 Submit a signed copy of ceiling mounted fan manufacturer's extended 3 year warranty.

1.02 QUALITY ASSURANCE

.1 Fan manufacturers, as applicable, are to be current members of the Air Movement and Control Association International Inc. (AMCA), and fans are to be rated (capacity and sound performance) and certified in accordance with requirements of following standards:

.1 ANSI/AMCA Standard 210, Laboratory Method of Testing Fans for Certified Aerodynamic Performance Rating;

.2 AMCA Standard 211, Product Rating Manual for Fan Air Performance;

.3 ANSI/AMCA Standard 300, Reverberant Room Method for Sound Testing of Fans;

.4 AMCA Standard 311, Product Rating Manual for Fan Sound Performance;

.5 AMCA Standard 99-2408, Operating Limits for Centrifugal Fans.

2 Products

2.01 UTILITY FANS

.1 Centrifugal, single width and inlet, factory run tested utility fans in accordance with drawing schedule, and capable of operating over complete pressure class limits as specified in AMCA Standard 2408.

.2 Rotatable, continuously welded heavy-gauge steel housing, braced and reinforced as required to prevent vibration or pulsation, equipped with a spun, aerodynamically designed inlet cone, and an attached welded steel bearing and motor support platform.

.3 Riveted aluminum or welded steel wheel, statically and dynamically balanced.

.4 For belt driven fans only, AISI C1040 or C1045 hot rolled steel shaft, accurately turned, ground, polished, and ring gauged for accuracy, and sized for a first critical speed of at least 1.43 times maximum rated speed for fan, equipped with heavy-duty, grease lubricated, ball, pillow block type bearings, selected for a minimum average AFBMA L-50 bearing life of 200,00 hours at the maximum fan RPM, and secured to bearing support platform, and an adjustable V-belt drive with OHSA guard (weather cover) in accordance with requirements of Section 20 05 00 – Common Work Results for Mechanical.

.5 NEMA Premium TEFC motor conforming to requirements of Section 20 05 00 – Common Work Results for Mechanical.

.6 Unless otherwise specified, the finish is to consist of rust inhibiting primer applied to cleaned and deburred metal surfaces prior to assembly, then a second coat of primer after assembly and an air dried epoxy enamel finished coat both inside and outside to a 3 mm dry film thickness.

.7 Factory secured seismic restraint connection hardware.

.8 Acceptable manufacturers are:

.1 Carnes Company Inc.

.2 Loren Cook Co.;

.3 Delhi (complete with direct Drive EC motor);

.4 Greenheck Fan Corp.;

.5 PennBarry.

2.02 CENTRIFUGAL INLINE FANS

.1 Centrifugal, ULC listed, factory run tested rectangular inline fans in accordance with drawing schedule.

.2 Heavy-gauge galvanized steel housing with removable side panels to permit removal of power assembly without disturbing duct connections, universal mounting brackets and hardware including spring vibration isolators to accommodate horizontal or vertical mounting as required, a flanged inlet panel with inlet venturi, a flanged outlet panel, both with duct connection collars, and galvanized steel wire grid fan inlet/outlet guard(s).

.3 Non-overloading aluminium wheel with backward inclined blades with matching inlet venturi, statically and dynamically balanced as an assembly.

.4 For belt-drive fans only, hot rolled steel shaft, accurately turned, ground, and polished, and sized for a first critical speed of at least 1.25 times maximum rated speed for fan, and heavy-duty, self-aligning pillow block type bearings selected for an AFBMA L-50 minimum average life in excess of 500,000 hours and equipped with lubrication line and fitting, and an adjustable V-belt drive with guard conforming to requirements of Section 20 05 00 – Common Work Results for Mechanical.

.5 TEFC motor conforming to requirements specified in Section 20 05 00 – Common Work Results for Mechanical, mounted out of the airstream, complete with a cover, and factory pre-wired to a NEMA 4 disconnect switch.

.6 For fans as scheduled, factory supplied accessories as follows:

.1 for fans as scheduled, housing insulation (lining), consisting of neoprene spray coated glass fibre semi-rigid insulation meeting NFPA 90A requirements and 25/50 flame spread/smoke developed ratings when tested in accordance with CAN/ULC S102, permanently secured in place with no exposed edges;

.2 for fans as scheduled, a galvanized steel filter box with frame suitable for 25 mm (2") thick disposable panel type filters;

.3 factory secured seismic restraint connection hardware.

.7 Acceptable manufacturers are:

.1 Carnes Company Inc.

.2 Loren Cook Co.;

.3 Delhi (complete with direct Drive EC motor);

.4 Greenheck Fan Corp.;

.5 PennBarry.

2.03 ROOF MOUNTED EXHAUST FANS

.1 Centrifugal, ULC listed, factory run tested roof mounted exhaust fans in accordance with drawing schedule.

.2 Spun aluminium housing with deep venturi inlet, aluminium curb cap with continuously welded corners, pre-punched mounting holes, galvanized steel or aluminium birdscreen, and EMT conduit chase to the motor compartment.

.3 Centrifugal, non-overloading aluminum wheel with backward inclined blades matched to inlet venturi, statically and dynamically balanced as an assembly.

.4 For belt-drive fans only, hot rolled steel shaft, accurately turned, ground, and polished, and sized for a first critical speed of at least 1.25 times maximum rated speed for fan, and one-piece grease lubricated pillow block type bearings selected for an AFBMA L-50 minimum average life in excess of 500,000 hours at maximum catalogue operating speed and equipped with a lubrication fitting, and a heavy-gauge galvanized steel adjustable V-belt drive with guard conforming to requirements of Section 20 05 00 – Common Work Results for Mechanical.

.5 Motors are to conform to requirements specified in Section 20 05 00 – Common Work Results for Mechanical, mounted on vibration isolation in a compartment outside of the airstream, and factory pre-wired to a NEMA 4 disconnect switch.

.6 Prefabricated, minimum 300 mm (12") high heavy-duty aluminum roof mounting curb with factory installed wood nailer, 40 mm (1-½") thick insulation, continuously welded seams, and damper tray.

.7 For fans as scheduled, factory supplied accessories as follows:

.1 gravity backdraft damper with #20 gauge galvanized steel frame and #26 gauge aluminum blades with felt edge blade seals;

.2 non-corrosive motorized damper with linkage, end switch, and motor with voltage to match fan motor;

.3 continuous non-corrosive piano type curb hinge to permit access to fan, damper and connecting duct, complete with retaining chain and a security hasp to prevent removal of unit from curb cap and prevent building entry through connecting ductwork;

.4 2-speed switch and 2-speed double winding 1-phase motor in accordance with Section 20 05 00 – Common Work Results for Mechanical;

.8 Acceptable manufacturers are:

.1 Carnes Company Inc.

.2 Loren Cook Co.;

.3 Delhi (complete with direct Drive EC motor);

.4 Greenheck Fan Corp.;

.5 PennBarry;

.6 ACME.

2.04 CEILING MOUNTED DESTRATIFICATION FANS

.1 Northwest Envirofan "Gold Line" white, down-blowing, extra heavy-duty industrial grade, CSA certified direct drive ceiling mount destratification fans in accordance with drawing schedule, each complete with:

.1 curved aluminum fan blades secured to a steel hub;

.2 permanent magnet, brushless, non-ventilated, heat sink design motor rated for continuous operation at maximum speed in a 55°C (130°F) ambient temperature and capable of modulating fan speed from 0 to 100% without the use of a gearbox or other mechanical means of control, and a factory programmed controller housed in an enclosure independent of motor to minimize starting and braking torques, with a simple diagnostic program and a LED to identify and relay faults in system;

.3 250 mm (10") long down rod, a 330 mm (13") long galvanized steel safety chain, and all other required mounting and securing hardware;

.4 400 mm (16") long power cord with 3-prong plug, factory pre-wired to motor;

.5 "Protecto-Guard" welded wire fan guard sized to suit fan blade size;

.6 120 volt variable speed (Off-High-Low) solid-state infinite speed fan controller with stainless steel faceplate designed to mount to a 100 mm (4") outlet box and to control fan groupings as indicated on drawings;

.7 factory secured seismic restraint connection hardware.

.2 Acceptable manufacturers are:

.1 Northwest Envirofan;

.2 Big Ass Fan Co.;

.3 Marley Engineered Products "Leading Edge".

2.05 CEILING MOUNTED FANS

.1 ULC listed and labelled ceiling mounted centrifugal, AMCA rated and certified (capacity and sound to AMCA Standards 211 and 311), exhaust fans in accordance with drawing schedule, complete with:

.1 minimum #20 gauge galvanized steel housing equipped with duct connection collar(s), integral spring loaded aluminum backdraft damper, 12 mm (½") thick acoustic insulation meeting 25/50 flame spread/smoke developed ratings when tested in accordance with CAN/ULC S102, multi-position mounting brackets, and an integral CSA certified electrical receptacle in an outlet box for plug-in connection of fan motor;

.2 low RPM, resiliently mounted, direct connected fan wheel and motor assembly with a forward curved, statically and dynamically balanced galvanized steel or calcium carbonate filled

polypropylene centrifugal wheel direct connected to a 1-phase motor conforming to requirements specified in Section 20 05 00 – Common Work Results for Mechanical, and equipped with a length of power cord and plug;

.3 for fans as indicated and/or scheduled, a white calcium carbonate exhaust grille;

.4 factory supplied accessories in accordance with drawing schedule, as follows:

.1 rectangular to round duct transitions;

.2 roof cap with backdraft damper and birdscreen;

.3 wall cap with backdraft damper and birdscreen.

.2 Acceptable manufacturers are:

.1 Broan-NuTone;

.2 Panasonic;

.3 Carnes Company Inc.

.4 Loren Cook Co.;

.5 Delhi;

.6 Greenheck Fan Corp.;

.7 PennBarry.

3 Execution

3.01 INSTALLATION OF UTILITY FANS

.1 Provide utility fans.

.2 Secure each fan in place, level, and plumb, on vibration isolation on a concrete housekeeping pad or base as indicated.

.3 Secure suspended units in place from structure, level, and plumb, by means of vibration isolation spring hangers, properly sized galvanized steel hanger rods, and galvanized structural steel angle or channel trapeze supports.

.4 Refer to Section 20 05 00 – Common Work Results for Mechanical for equipment/system manufacturer certification requirements.

.5 Refer to Section 20 05 00 – Common Work Results for Mechanical for equipment/system start-up requirements.

.6 Include for a 4 hour on-site operation demonstration and training session. Training is to be a full review of all components including but not limited to a full operation and maintenance demonstration, with abnormal events.

3.02 INSTALLATION OF CENTRIFUGAL INLINE FANS

.1 Provide inline centrifugal fans.

.2 Secure each fan in place from structure with vibration isolation, independent of connecting ductwork and in accordance with fan manufacturer’s instructions.

.3 Ensure duct connections are made using flexible connection material.

.4 Refer to Section 20 05 00 – Common Work Results for Mechanical for equipment/system manufacturer certification requirements.

.5 Refer to Section 20 05 00 – Common Work Results for Mechanical for equipment/system start-up requirements.

.6 Include for a 4 hour on-site operation demonstration and training session. Training is to be a full review of all components including but not limited to a full operation and maintenance demonstration, with abnormal events.

3.03 INSTALLATION OF ROOF MOUNTED EXHAUST FANS

.1 Provide roof mounted exhaust fans.

.2 Supply a roof mounting curb with each fan and hand curbs to roofing trade on roof for mounting and flashing into roof construction as part of roofing work. Secure fans in place on curbs.

.3 Install dampers in curb damper tray and secure in place.

.4 Install tamper proof or lockable access panel.

.5 Refer to Section 20 05 00 – Common Work Results for Mechanical for equipment/system manufacturer certification requirements.

.6 Refer to Section 20 05 00 – Common Work Results for Mechanical for equipment/system start-up requirements.

.7 Include for a 4 hour on-site operation demonstration and training session. Training is to be a full review of all components including but not limited to a full operation and maintenance demonstration, with abnormal events.

3.04 INSTALLATION OF CEILING DESTRATIFICATION FANS

.1 Provide ceiling destratification fans.

.2 Secure each fan in place at the ceiling from structure in accordance with manufacturer’s instructions and drawing details. Confirm exact locations prior to roughing-in. Install safety chains and fan blade guards.

.3 Plug each fan motor into an adjacent receptacle.

.4 Supply a fan speed controller for fans as indicated and hand to electrical trade at site for wall mounting and connection to fan motor controllers. Confirm exact speed controller locations prior to installation, and include for identification of each speed controller.

.5 Refer to Section 20 05 00 – Common Work Results for Mechanical for equipment/system manufacturer certification requirements.

.6 Refer to Section 20 05 00 – Common Work Results for Mechanical for equipment/system start-up requirements.

.7 Include for a 1/2 day on-site operation demonstration and training session. Training is to be a full review of all components including but not limited to a full operation and maintenance demonstration, with abnormal events.

3.05 INSTALLATION OF CEILING FANS

.1 Provide ceiling exhaust fans.

.2 Secure each ceiling mounted fan housing in place in ceiling space, flush with suspended ceiling.

.3 Secure suspended units in place from structure, level, and plumb, by means of vibration isolation spring hangers and galvanized steel hanger rods.

.4 Plug fan motors into housing receptacles.

.5 Supply exterior wall/roof discharge caps as indicated.

.6 Hand roof caps to roof trade for installation and flashing into roof construction as part of roofing work.

.7 Install wall caps and secure in place. Caulk perimeter of each wall cap in accordance with caulking requirements specified in Division 07.

.8 Connect fan housings and discharges with ductwork.

.9 Refer to Section 20 05 00 – Common Work Results for Mechanical for equipment/system start-up requirements.

End of Section

1 General

.1 General Requirements

.1 Conform to General Conditions for Mechanical Trades

.2 Related Work Specified Elsewhere

(1) General Conditions for Mechanical Trades
(2) Heating, Ventilation & Air Conditioning
(3) Heating, Ventilation & Air Conditioning Equipment
(4) Electrical

.2 Description of System

.1 Furnish and install all components, devices and control wiring for a fully integrated Energy Management and Environmental Control System incorporating Direct Digital Control (DDC), and equipment monitoring. The system shall control/monitor HVAC and plumbing equipment and systems as specified in this section. The work shall include but is not limited to the following:

(1) All necessary hardware, software, control panels, web access modules, control wiring, field devices, installation, documentation and owner training as specified.
(2) The installed system shall incorporate electronic and digital control devices to perform the control sequences and monitoring outlined herein. Specific control sequence requirements are as detailed elsewhere in this Section of the specification.
(3) VVT zone control dampers shall be installed in the duct system by the Sheet Metal Trade complete with necessary duct transitions, access doors, etc. The Temperature Control Contractor shall be responsible for coordination with the HVAC Contractor and the installation of the actuators.
(4) Control valves shall be installed in the piping system by the Mechanical Trade complete with transitions and unions as required.
(5) Testing, debugging, calibrating, adjustment, programming and confirmation of total system operation.

.3 Manufacturer and Installing Contractor

.1 The temperature control manufacturer shall be Distech Controls – local rep 519-893-2638.

.2 Any new building must be a seamless extension of the current Energy Management and Building Control System.

(1) The existing TAC Vista software is, and shall continue to be, the only head-end BAS server for the entire School Board.
(2) The head-end server contains the secure Energy Management Settings (i.e. Master Setpoints & Schedules) that are sent to all schools in real-time. The control system must be an extension of the head-end server and be able to be managed exclusively through the Vista head-end server.
(3) Monitoring of all school board control systems are done in real-time and must be presented at the exclusive Vista head-end server as first-priority data.
(4) The Vista head-end server has all the required controller databases and software to be able to centrally maintain and modify network configuration and controller software for the entire School Board. The Vista head-end server is the only system that can access the LacNet programming variables inside the controllers for real-time configuration of setpoint and time scheduling parameters.
(5) The graphics and controller database must be presented inside the Vista head-end server in its native format in order to preserve the real-time speed, integrity and multi-site administration of the entire system.

.3 The controls company shall have a service office and maintenance facility with in 6 kilometers of the Waterloo Region District Public School Board main office. The controls company shall be able to provide service to any school within 4 hours during normal working hours.

.4 Quality Assurance

.1 The system components shall be listed by Underwriters Laboratories Inc. and Canadian Standards Association.

.2 The system control products shall be stored and handled according to manufacturer's recommendations.

.3 The work shall be performed by skilled technicians all of whom shall be properly trained and qualified for this work.

2 PRODUCTS

.1 General

.1 The system shall integrate the operation of intelligent building management controllers distributed into the network.

.2 Provide web based access. Two Ethernet connections for communication shall be provided by the Electrical Division.

.3 The DDC System shall be generally comprised of the following devices to achieve the control functions described in this section:

(1) Distech Controls programmable controllers.
(2) Network repeaters as required by network lengths.
(3) Control relays.
(4) Control dampers and valves.
(5) Sensors, actuators and other input/output devices.

.4 Controllers shall execute the application programs, calculations, and commands to provide the control function specified for that unit. Each controller shall include its own micro-computer controller, power supply, input/output modules, termination modules and real time clock.

.5 Controllers shall be capable of full control functionality and alarm reporting independently or as a part of the DDC network.

.6 The system shall be stored in flash ram so no batteries are required.

.7 Each control device shall be modular and expandable to provide additional inputs and outputs and control functionality for that device

.8 Each controller shall be able to transfer and receive data via the network for performance of control functions.

.9 The system shall be modular, permitting expansion by adding hardware and software without changes in communication or processing equipment.

.10 The complete system shall be capable of communication over a LonWorks and/or BACnet network.

.11 The controllers shall monitor the status of all overrides and include this information in logs and summaries to inform the operator that automatic control has been inhibited.

.12 Controllers shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all subsidiary equipment and provide both local and remote annunciation of any component failures.

.13 Controllers shall activate an orderly shutdown of their operation in the event of loss of normal electrical power. Non-volatile memory shall be incorporated for all controller configuration data. The controllers shall automatically resume full operation without manual intervention.

.14 The controllers shall have sufficient memory to support their own operating system and data bases including:

(1) control processes
(2) energy management applications
(3) alarm management
(4) trend data
(5) operator input/output
(6) remote communications
(7) manual override monitoring

.15 Controllers shall incorporate the following software features:

(1) Energy management:
  (a) Time of Day Scheduling
  (b) Calendar Based Scheduling
  (c) Holiday Scheduling
  (d) Optimal Start and Stop
  (e) Demand Limiting
  (f) Heating/Cooling Interlock

(2) Alarm Management:
  (a) Alarm Management shall be provided to monitor, buffer and direct alarm reports to operator devices and memory files. The controllers shall perform alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic and prevent alarms from being lost.
  (b) All alarm or point change report shall include the points' English language description and the time and date of occurrence.
  (c) The user shall be able to define the specific reaction for each point, the priority level (3 in total) and ability to inhibit alarm reporting for each point.
  (d) The user shall be able to define conditions under which point changes need to be acknowledged by an operator and logged for analysis at a later date.
  (e) The user shall be able to print, display or store a unique 60 character alarm message to more fully describe the alarm condition or direct operator response. The message shall be customizable to describe each individual alarm.
  (f) In web access applications only critical alarms shall initiate a call to a remote operator device, otherwise call activity shall be minimized by time stamping and saving reports until a manual request is received or until the buffer space (minimum 50 alarms) is full.

(3) Trend Logs:
  (a) Controllers shall provide an automatic roll-over trend log, which stores records up to an operator-selected number at an operator-selected sampling rate and then overwrites the oldest record with each new record.
  (b) Sample intervals shall be from 1 minute to 24 hours.
  (c) Provide graphical and tabular displays

(4) Runtime Totalization:
  (a) The controllers shall automatically accumulate and store runtime hours for binary points with a sampling resolution of 1 minute. The user shall have the ability to define a warning limit to trigger maintenance or user-defined messages.

(5) Event Totalization:
  (a) Controllers shall have the ability to count events (such as on/off) and store up to 10 million events before reset with a user-defined limit used to trigger a user-defined message.

(6) Custom Programming:
  (a) The controllers shall permit user defined custom control processes based on:
    (i) any system measured data or status
    (ii) any calculated data
    (iii) any results from other processes
    (iv) Boolean logic
  (b) The custom processes may be triggered by:
    (i) Time-of-day
    (ii) calendar date
    (iii) events (point alarm etc.)

.16 The control strategy for each control loop shall be performed by software within the controller. The sequence of events required for each control loop is described for each system in the control sequence.

.17 Outdoor air temperature indication shall be available at each controller as an integral part of the control strategies for that controller. Should the network transmission of the common outdoor air temperature (or any other common value) fail, then each controller shall use the last good value received.

.18 Controls and Requirements for VVT Systems

(1) Where VVT controls are specified, units are to operate as part of a Variable Volume/Variable Temperature System complete with all necessary controls including zone dampers, temperature sensors, static pressure sensor probes and bypass damper.

(2) There shall be no zone controllers for the room control. Control shall be from a designated programmable controller for each air handling unit to ensure information transfer is fast enough to react to the changes in the environment.
(3) The VVT Control System shall include but not be limited to individual DDC room/zone sensors, corresponding zone dampers, bypass damper, connecting communication network, all required duct sensors, all required relays and other required control components and algorithms for complete control of the HVAC system according to the sequence of operation.
(4) Each VVT system shall be capable of operating as a stand alone system. Note that each VVT rooftop unit shall have its own designated controller that controls all zones directly in order to keep information exchange quicker and more efficient.

.2 Network Architecture

.1 The controllers on the local network shall communicate via a two wire LonTalk TP/FT-10 network.

.2 The control network shall be able to expand to match the requirements of the facility, including any future building additions.

.3 The control network shall be able to support a total developed length of 305 meters without using a network repeater.

.3 Control Panels

.1 Control panels shall be fully enclosed cabinets with all steel construction. Cabinets shall have a hinged door with locking latch or bolt-on cover plate. All cabinet locks shall be common keyed. Cabinets shall be finished with two coats of paint.

.4 Temperature Sensors

.1 Provide thermistor temperature sensors, not requiring transmitters, to measure temperature.

.2 Accuracy shall be +/-0.2°C from 0 to 70°C.

.3 Space sensors in occupied areas shall be Greystone TE200 series, type AE or Distech Smart Comfort SO having an integral push button for unoccupied override and an integral slider to adjust set point (LED display not required).

.4 In corridors and where noted on the drawings, provide stainless steel plate type sensors (push button override and LED display not required), Greystone TE200 series, type AS or equal.

.5 Duct temperature sensors shall be Greystone TE200 series, type B or equal having a stainless steel probe length to suit application and ABS enclosure. Duct averaging temperature sensors shall be Greystone TE200 series, type FD or equal having an element length to suit application, copper probe and ABS enclosure.

.6 Immersion temperature sensors shall be Greystone TE200 series, type C or equal having a ¼" OD stainless steel probe, 4" long and ABS enclosure. Immersion sensors shall be complete with thermowells. Thermal conductive compound shall be added inside the thermowell to provide optimum thermal transfer from the fluid to sensor. Stainless steel thermowells shall be used for steel pipe and brass thermowells shall be used in copper pipe.

.7 Outdoor temperature sensors shall be Greystone TE200 series, type F or equal having an ABS gasketed cover. A thermal radiation cover shall limit the sensor to solar radiation exposure.

.5 Carbon Dioxide Sensors

.1 Sensors shall Greystone CDD series or equal having the following features:

(1) 0-2000 ppm factory default detection range, field adjustable.
(2) Non-dispersive infrared sensing element with self-calibration algorithm.
(3) Guaranteed 5 year calibration interval.
(4) Powered by either AC or DC source.
(5) Accuracy: within 50 ppm or 3% of reading (whichever is greater).
(6) Operating humidity range: 0-95% RH.
(7) Operating temperature range: 0 to 50°C or greater.
(8) Stability: less than 2% full scale in 15 years
(9) Response time: less than 2 minutes for 90% step change.

.2 Duct mounted sensors shall be complete with ABS enclosure complete with sampling tube.

.3 Space mounted sensors shall be executive space type without LCD display.

.6 VVT System Dampers and Operators

.1 Rectangular dampers shall be Nailor 1010 or equal, parallel blade type complete with blade and edge seals. Use low profile dampers for heights less than 12" (300 mm). Dampers with heights less than 10" (250 mm) shall be single blade.

.2 Round dampers shall be Nailor 1090 or equal complete with blade gaskets and mounting bracket.

.3 Actuators shall be Belimo LMB24-SR-T or equal, proportional control, non-spring return, direct coupled, 24 V for 2-10 VDC or 4-20 mA, 45 in-lb torque, suitable for a maximum damper size of 6 square feet.

.7 Water Control Valves

.1 Heating and cooling control valves shall be Belimo CCV series characterized ball valves, complete with chrome plated brass trim and NPT female pipe connections. Radiation valves shall be complete with non-spring return modulating actuators. Control valves for coils heating a portion of outdoor air shall have spring return modulating actuators.

.2 Control valves shall be sized to provide approximately one half the circuit branch pressure drop to obtain good modulation control but they shall be no smaller than two pipe sizes less than the pipe they are installed in.

.3 Control valves in contact with domestic water (domestic flush valve) shall be Belimo HTCCV high temperature characterized ball valve with stainless steel ball and stem, NPT female pipe connections and TFX24 spring return to closed position actuator.

.8 Differential Pressure sensors

.1 Differential pressure sensors shall be provided for liquid or air differential pressure applications. The differential pressure range shall be selected to match the application. Select materials suitable for the measured variable, i.e.: water or air, and to withstand a minimum of two times the maximum pressure of the highest pressure range.

.2 Each sensor shall be provided with an industry standard, 0 to 10 Vdc output signal mounted at the sensor. The transmitter and sensor shall have a combined accuracy and repeatability of 1.0% of the differential pressure range. A pushbutton zero adjustment shall be provided.

.9 Freezestats

.1 Freezestats shall be complete with a vapour filled 20 foot bulb and 4 foot capillary. Wire freezestats to shut down the respective fans should temperature over any 12 in. of sensor length drop below the adjustable setpoint (2°C). Freezestats shall have manual reset.

3 EXECUTION

.1 Installation

.1 All controllers and components in the system and on the network shall be installed according to manufacturer recommendations, general installation standards for digital controls and in accordance with the approved shop drawings.

.2 Locate room sensors in the locations shown on the mechanical drawings. All sensors shall be mounted at barrier free height (3'-11" (1175 mm) above finished floor).

.3 All control components for off site system access shall be located where noted on the drawings. The Electrical Contractor shall provide all required connections / cabling for off site access to the web access components.

.4 All programmable controllers, web access components, relays and other control components shall be located within control panels. Control Panels shall be wall mounted and shall be located within suspended ceiling spaces or other locations approved by the Consultant.

.5 The Electrical Contractor will provide hand-off-auto switches in all starters controlled by the BAS.

.6 The Electrical Contractor will provide dedicated 120 VAC, 15 ampere power circuits wired to junction boxes on each floor for controls transformers.

.7 The supply of all motorized temperature control dampers complete with actuators shall be by this Section, except for dampers and actuators supplied with packaged air handlers. All dampers shall be installed into the duct system by the HVAC Trade complete with necessary duct transitions, access doors, etc. The Temperature Control Contractor shall be responsible for the actuators and all coordination with the HVAC Contractor.

.8 The supply of all automatic control valves shall be by This Section. All valves shall be installed into the piping system by Plumbing Trade complete with necessary fittings, etc. The Temperature Control Contractor shall be responsible for all coordination with the Plumbing Contractor.

.2 Generally duct mount carbon dioxide sensors shall be used where specified for air handling units; but, for gyms and single zone libraries, a wall mount carbon dioxide sensor shall be mounted next to the room temperature sensor.

.3 All carbon dioxide levels which are measured by the carbon dioxide sensors shall be made available to the Owner in the form of trend logs. Record readings at 10 minute intervals and keep them for at least 30 days.

.4 Freezestats shall be installed so that their sensing element runs horizontally across the coil face (not diagonally) with no more than 12" vertical drops at the outside coil frame. The full face of the coil shall be covered with no horizontal runs being more than 12" apart. The top and bottom horizontal run shall be within 6" of the coil frame. If more than one freezestat is required they shall be wired in series in order to detect a low temperature in portion of the coil. The sensing elements shall be firmly secured in place to avoid vibration without added air restriction.

.5 System Start-up and Acceptance

.1 Upon completion of installation, test, adjust and calibrate controls provided under this Section.

.2 On system completion, a demonstration of complete system operation shall be made to the Owner's authorized representative and Consultant.

.3 The Consultant shall verify through the Owners representatives that the entire system is complete and operating to the satisfaction of the Owner before final acceptance is approved.

.6 Training

.1 The Contractor shall provide competent instructors to give full instruction to designated personnel in the adjustment, operation and maintenance of the system installed rather than a general training course. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach. All training shall be held during normal work hours of 8:00 a.m. to 4:30 p.m. weekdays as follows:

.2 Provide 4 hours of training for Owner's operating personnel. Training shall include:

(1) Explanation of drawings, operations and maintenance manuals
(2) Explanation of web access program
(3) Explanation of adjustment procedures
(4) Trend Analysis

.7 Identification

.1 Provide system identification and provide nameplates identifying the following (nameplates shall be keyed to the wiring diagrams):

(1) Duct mounted sensors.
(2) Control panels (identify as to equipment / systems controlled). Each panel shall include an as-built drawing showing all the connected control points.
(3) Identify the emergency ventilation control switch with 'GLOBAL ROOFTOP UNIT CONTROL - VENTILATION LOCKOUT'

.8 Testing and Balancing

.1 During the system testing and balancing by the Testing and Balancing Agency, demonstrate the operation of all controls. During balancing procedures, set controls to a fixed mode (bypass damper locked fully closed and all zone dampers locked fully open) to prevent any changes during the balancing procedure.

.2 To ensure excessive noise is not generated by the VVT systems, the following shall be performed:

(1) For each VVT system, the Test and Balance Agency shall measure the static pressure in the main duct at the location of the bypass damper using a manometer when the system has been stabilized (all zone dampers are full open and the bypass damper is full closed). This information shall be given to the Temperature Control Contractor for verification that the VVT system is properly calibrated.

(2) For each VVT system, 10% of the dampers shall be set to the full open position and 90% shall be set at their minimum position (fully closed). When operating with these damper positions, the static pressure in the main duct at the location of the bypass damper shall again be measured by the Test and Balance Agency using a manometer to ensure it remains at the value measured when in the stabilized mode. This information shall be given to the Temperature Control Contractor for verification that the VVT system is operating correctly and is properly calibrated.

.9 Electrical Wiring

.1 Control transformers for the building automation / VVT temperature control systems shall be supplied and wired by the Temperature Control Trade from 120 V power sources in junction boxes provided by the Electrical Contractor. (At least one at each end of each floor accessible above ceiling tile in a corridor). All low voltage wiring (below 50 V) to the building automation / VVT temperature control systems shall be by the Temperature Control Contractor.

.2 The electrical contractor will rough-in thermostats in new concrete block walls.

.3 All wiring shall be installed to the standards specified in the Electrical Division.

.4 Use Echelon recommended orange jacket cable for all network wiring.

.5 Run all wiring in EMT conduit where exposed, where running within concrete block walls and where required by the Ontario Electrical Code (conduit supplied and installed by the Temperature Control Contractor). Plenum rated cable shall be used in return air ceiling plenums.

.6 Where wiring runs through Corridor suspended ceiling spaces, run in wall hooks where possible. The wall hooks shall be provided by the Electrical Contractor where indicated on the electrical drawings.

.7 Control relays necessary for BAS operation shall be provided by the Temperature Control Contractor but all contactors and their power supplies handling power wiring to the equipment shall be by the Electrical Contractor.

.10 General Requirements for VVT Systems

.1 Each VVT system shall be capable of maintaining an independent setback schedule. If any over-ride pushbutton in the associated system is activated, the complete VVT system shall reset to occupied mode for a pre-set time period. At the end of the override time period, setback mode will resume.

.2 Each zone thermostat shall be capable of maintaining independent comfort setpoints, adjustable by the zone occupants. The upper and lower limits of the permissible setpoint range shall be adjustable by the operator.

.3 When the HVAC unit is not in the heating or the cooling mode, the system shall go to ventilation mode. Ventilation mode is automatically sequenced every 20 minutes to avoid stale air in the space. The duration of ventilation mode is 5 minutes, after which the system resumes heating / cooling mode as required.

.4 Zone damper control shall be proportional modulation, not two- position control. Each zone thermostat shall be capable of initiating a heating or cooling mode. Averaging zone systems are not acceptable.

.5 The pressure control system must display duct static pressure and modulate the bypass damper or supply fan speed to maintain the desired system static pressure. During changeover from heating to cooling or cooling to heating the bypass controller will take control of all dampers in order to purge the duct system of extreme temperature air. Systems that use a time delay during system mode changeover are not acceptable.

4 Sequence of Operation

.1 General:

.1 All setpoints shall be adjustable.

.2 Outdoor air temperature shall be broadcasted to all controllers.

.3 A new outdoor air sensor shall be provided on a different north face and the minimum of this sensor and the original will be used for this building.)

.4 Heating mode: Heating is enabled between October 15 and April 15 or if the outdoor air temperature is below 10°C. This heating mode is used in all controllers for the building.

.5 Cooling Mode: Mechanical cooling is enabled if the outdoor air temperature is above 14°C.

.6 Carbon Dioxide Damper Override: In any air handling system with a return air or room air carbon dioxide sensor, it shall override the minimum position of the outdoor air damper during occupied mode. It shall override the minimum outdoor air damper between 0 and 40 % as the carbon dioxide varies between 1000 and 1200 ppm. All limit controls shall take priority to maintain safe supply air temperatures. An alarm shall be generated if the carbon dioxide level is higher than 1700 ppm or lower than 200 ppm.

.7 Occupancy mode shall be determined by a weekly schedule with an annual holiday schedule. Each system shall have this schedule but there shall be provision for operating under a general (to the building) schedule as well. An adjustable parameter shall be available to select the local or general schedule for each system.

.8 Lead/lag: Devices designed for lead lag operation shall operate in automatic lead/lag mode to equalize run time. If the lead unit fails the lag shall automatically start and an alarm shall be generated. The lead unit shall be advanced through the series of devices in sequence every Tuesday at noon.

.2 See the graphical sequences at the end of this specification.

END OF SECTION

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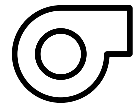

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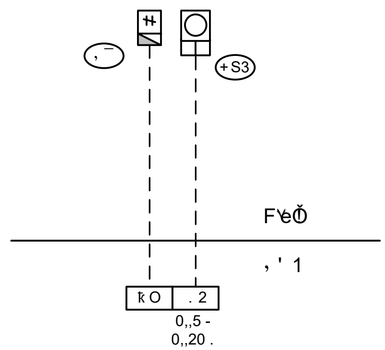

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1 General

1.01 SECTION INCLUDES

.1 Common requirements for electrical work.

.2 Mounting heights for electrical equipment and devices.

1.02 RELATED REQUIREMENTS

.1 Provisions of this section apply to all sections of Division 26, Division 27, Division 28, and sections related to electrical utilities in Division 33.

.2 Document 00 64 01 – Request for Electronic Files Form.

.3 Section 07 60 00 – Flashing and Sheet Metal.

.4 Section 07 84 00 – Firestopping.

.5 Section 08 31 00 – Access Doors and Panels.

.6 Section 09 91 00 – Painting.

.7 Building Automation System integration requirements for Electrical Systems as described in Section 25 96 00.

.8 This section is to be read in conjunction with Division 00 documents, and Division 01 specification sections, which take precedence as described in CCDC 2-2020.

.1 General Conditions.

.2 Supplementary General Conditions.

.3 General Requirements.

1.03 INTENT

.1 Include all material, labour, equipment, and plant construction as necessary to make a complete installation as shown and specified hereinafter.

.2 Leave complete systems ready for continuous and efficient satisfactory operation.

.3 Discipline and Trade Jurisdiction:

.1 In accordance with CCDC 2-2020 GC 1.1.9: Neither the organization of the Specifications nor the arrangement of Drawings shall control the Contractor in dividing the work among Subcontractors and Suppliers.

.2 MasterFormat's organizational structure used in a project manual does not imply how the work is assigned to various design disciplines, trades, or subcontractors. MasterFormat is not intended to determine which particular elements of the project manual are prepared by a particular discipline. Similarly, it is not intended to determine what particular work required by the project manual is the responsibility of a particular trade. A particular discipline or trade is likely to be responsible for subjects from multiple Divisions, as well as from multiple Subgroups.

1.04 DRAWINGS AND SPECIFICATIONS

.1 The drawings and specifications are complementary each to the other and what is called for by one to be binding as if called for by both. Should any discrepancy appear between the drawings and specifications, which leaves the Contractor in doubt as to the true intent and meaning of plans and specifications, a

ruling is to be obtained from the Consultant in writing before submitting Bid. If this is not done, the maximum, the most expensive alternate or option will be provided in base tender bid.

.2 All drawings and all Divisions of these specifications shall be considered as a whole, and work of this Division shown anywhere therein shall be furnished under this Division.

.3 Drawings are diagrammatic and indicate the general arrangement of equipment and pathways. Most direct routing of conductors and wiring is not assured. Exact requirements are governed by architectural, structural, and mechanical conditions of the job. Consult all other drawings in preparation of the bid. Extra lengths of wiring or addition of pull and junction boxes, etc. necessitated by such conditions are to be included in the bid. Check all information and report and apparent discrepancies before submitting the bid.

.4 Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of pathways so as to best fit the layout of the job. Plan, coordinate, and establish exact locations and routing of services with affected trades prior to installation such that services clear each other, as well as other obstructions.

.5 Determine final locations of major work within ceiling spaces based on the largest equipment first.

.6 Unless otherwise shown or specified, conceal work in finished areas, and conceal work in partially finished and/or unfinished areas to extent made possible by the area construction. Install services as high as possible to conserve headroom and/or ceiling space. Notify the Consultant where headroom or ceiling space appears to be inadequate prior to installation of the work.

.7 Scaling off the drawings will not be sufficient or accurate for determining these locations. Where job conditions require reasonable changes in indicated arrangement and locations, such changes shall be made at no additional cost to the Owner.

.8 Because of the scale of the drawings, certain basic items, such as junction boxes, pull boxes, conduit fittings, etc. may not be shown, but where such items are required by other sections of the specifications of where there are required for proper installation of the work, such items are to be furnished and installed.

.9 Before ordering any conduit, cable tray, conductors, wireways, raceway bus duct, fittings, etc., verify all pertinent dimensions at the job site and be responsible for their accuracy.

.10 If obvious ambiguities or omissions are noticed when tendering refer same to the Consultant for a ruling and obtain the ruling in writing in the form of an Addendum. Claims for extras for ambiguities or omission of items brought to the attention of the Consultant after the award of a contract which, due to the nature of the ambiguity or omission, should have been brought to the attention of the Consultant during the tendering period, will not be allowed.

.11 The drawings are performance drawings, diagrammatic, and show locations for apparatus and materials. The drawings are intended to convey the scope of work and do not intend to show Architectural and Structural details. The locations shown are approximate, and may be altered, when approved by the Consultant, to meet requirements of the material and/or apparatus, other equipment and systems being installed, and of the building. Do not scale drawings.

.12 Control devices, equipment requiring maintenance, junction boxes, and similar products, particularly such products located above suspended ceilings must be located for easy access for servicing and/or removal. Products which do not meet this location requirement are to be relocated to an accessible location at no additional cost.

.13 Be responsible for making necessary changes, at no additional cost, to accommodate structural and building conditions that were foreseeable by a review of existing conditions or a review of drawings prepared by other disciplines.

.14 Where drawings indicate that acoustic tile ceiling is being suspended below existing plaster ceilings, coordinate the design of framework used to support this suspended ceiling, lighting, diffusers, and other components that are mounted within or through ceiling. Do not mount devices to suspended ceilings. Secure and mount to ceiling slab above. Seal ceiling openings to maintain required fire rating.

.15 Provide any fitting, offset, transformation, etc., required to suit architectural and structural details but not shown.

1.05 WORK RESTRICTIONS

.1 Refer to Section 01 14 00.

.2 Existing buildings:

.1 Examine the existing building, the site and surrounding areas and by fully informed as to the conditions and limitations under which the work has to be executed. Claims for additional costs will not be entertained with respect to conditions which could reasonably been ascertained by an inspection prior to Tender closing.

.2 All work in the existing building, other than minor works required to permit construction of the new addition, is to be performed in such a manner as to not disrupt the building operations.

.3 All systems are to be kept in full operation during normal building hours.

.4 Note that any noise generating works that disrupt the building operation shall be coordinated accordingly and carried out after/before normal operating hours.

.5 Cut, modify, or extend as necessary or as directed by the Consultant, the existing material or equipment to be reused or relocated to suit work under this contract.

.6 Existing materials and equipment which are to be used in new work shall be repaired and refinished as necessary. Provide additional new materials and components as required to facilitate reinstallation of such existing materials and equipment.

.7 Co-ordinate with the Owner, and refer to General Conditions.

.8 Do work in existing areas to best suit available space and not interfere with or obstruct use of existing facilities.

.9 Where disruptions of existing services are required, coordinate shut down with the Owner's operating staff and do the work at a time and in a manner mutually acceptable. Carefully schedule disruptions to keep "down time" to a minimum.

.3 Do all cutting, patching, and making good to leave in a finished condition and to make the several parts of the Work come together properly. Co-ordinate work to keep cutting and patching to a minimum.

.4 Quality of workmanship and materials used in patching, making good and refinishing of existing construction and/or compartments shall be of a standard equal to that specified for new construction and if not specified, equal to or exceeding that of original existing work.

.5 Prior to cutting openings, examine wall, floor, and ceiling construction for buried electrical cables and pipes; and take adequate protection. Conduct cable locating tests to locate buried cables in existing work.

1.06 ALLOWANCES

.1 Cash allowances are to be carried as indicated in Section 01 21 00 for the items indicated, each including all equipment, wiring material, labour, incidentals, profit, overhead, taxes, etc.

.1 [Access Control and Intrusion Detection Systems.]

.2 [Integrated Telephone/Public Address (PA) System.]

.3 [Communications structured cabling.]

.4 [Electric utility requirements for new service.]

.5 [Supply of temporary generator, fuel, and equipment as described in Section 26 01 21.81.]

.2 Conduit and wireway rough-in for the above systems is part of this contract, and is excluded from the above allowances.]

1.07 SUBSTITUTION PROCEDURES

.1 Refer to Section 01 25 00 and General Provisions of the Contract.

.2 Additionally, "Approved equal" shall be defined as a substitution approved by the Consultant.

.3 If during the tender bid process, the bidding contractor wishes to substitute the specified equipment for an "Approved equal", the bidding contractor must submit shop drawings to the Consultant before the tender close for approval. If no substitution request is made, the as-specified equipment is that to be provided.

.4 Where several manufacturers' names are given, the first named manufacturer constitutes the basis for job design and establishes the equipment quality required to be used in this contract.

.5 This contractor, at his option, may use equipment as manufactured by any of the listed manufacturers. This Contractor is responsible to ensure that all items submitted by these other manufacturers meets are requirements of the drawings and specification and fits in the allocated space. The final determination of a product being equivalent is to be determined by the Consultant when a catalog number is not listed, or listed in part.

.6 Any material, article or equipment of other unnamed manufacturers which will adequately perform the services and duties imposed by the design and is of a quality equal to or better than the material, article or equipment identified by the drawings and specifications may be used if approval is secured in writing from the Consultant as described in the General Provisions of the Contract for Submittals. The Contractor bears full responsibility for the unnamed manufacturers' equipment adequately meeting the intent of the design. The Owner or the Consultant may reject manufacturer at time of shop drawing submittal.

.7 In addition to manufacturer's products base specified or named as acceptable, other manufacturers of products may be proposed as substitutions to the Consultant for review and consideration for acceptance, listing in each case a corresponding credit for each substitution proposed. However, base Bid Price on products base specified or named as acceptable. Certify in writing to the Consultant that proposed substitution meets space, power, design, energy consumption, and other requirements of base specified or acceptable product. It is understood that there will be no increase in Contract Price by reason of any changes to associated equipment, mechanically, electrically, structurally, or architecturally, required by acceptance of proposed substitution. The Consultant has sole discretion in accepting any such proposed substitution of product. Indicate any proposed substitutions in areas provided on Bid Form. Do not order such products until they are accepted in writing by the Consultant.

1.08 CONTRACT MODIFICATION PROCEDURES

.1 Refer to Section 01 26 00.

.2 Whenever the Consultant proposes in writing to make a change or revision to design, arrangement, quantity, or type of work from that required by Contract Documents, prepare, and submit to the Consultant for review, a quotation being proposed cost for executing change or revision.

.3 Quotation is to be a detailed and itemized estimate of product, labour, and equipment costs associated with change or revision, plus overhead and profit percentages and applicable taxes and duties.

.4 Unless otherwise specified in Division 00, Division 01, or as identified in the Owner/Contractor agreement, allowable maximum percentages for overhead and profit are to be 7% and 5% respectively.

.5 Unless otherwise specified in Division 00, or Division 01, following additional requirements apply to all quotations submitted:

.1 When change or revision involves deleted work as well as additional work, cost of deleted work (less overhead and profit percentages but including taxes and duties) is to be subtracted from cost of additional work before overhead and profit percentages are applied to additional work.

.2 Electrical material labour unit costs are to be in accordance with National Electrical Contractors Association (NEMA) Manual of Labor Units (MLU), less 25%.

.3 Costs for journeyperson and apprentice labour must not exceed prevailing rates at time of execution of Contract and must reflect actual personnel performing work.

.4 Cost for site superintendent must not exceed 10% of total hours of labour estimated for change or revision, and change or revision must be such that site superintendent's involvement is necessary.

.5 Overhead percentage will be deemed to cover quotation costs other than actual site labour and materials, and rentals.

.6 Quotations, including those for deleted work, to include a figure for any required change to Contract time.

.6 The Consultant reserves the right to request backup quotations for any materials and/or rentals included within the quotation.

.7 Quotations submitted that are not in accordance with requirements specified above will be rejected and returned for re-submittal. Failure to submit a proper quotation to enable Consultant to expeditiously process quotation and issue a Change Order will not be grounds for any additional change to Contract time.

.8 Make requests for changes or revisions to work to Consultant in writing and, if Consultant agrees, will issue Notice of Change.

.9 Do not execute any change or revision until written authorization for the change or revision has been obtained from the Consultant.

1.09 COORDINATION

.1 Refer to Section 01 31 00.

.2 Coordinate work with other trades to avoid conflict and to provide correct rough-in and connection for equipment furnished under other trades that require electrical connection. Inform Contractors of other trades of the required access to and clearances around electrical equipment to maintain serviceability and code compliance.

.3 Verify equipment dimensions and requirements with provision specified under this Section. Check actual job conditions before fabricating work. Report necessary changes in time to prevent needless work. Changes or additions subject to additional compensation, which are made without written authorization and an agreed price, shall be at Contractor's risk and expense.

.4 Read specifications and drawings of other trades and conform with their requirements before proceeding with any work specified in this Division related to other trades. Co-operate with all other trades on the job, so that all equipment can be satisfactorily installed, and so that no delay is caused to any other trades.

.5 Coordinate utility service outages with the owner. Obtain permission from Owner at least 24 hours before partially or completely disabling system. Minimize outage duration.

.6 Existing Fire Alarm System: Maintain existing system in service. Disable system only to make switch overs and connections. Notify Owner at least 24 hours before partially or completely disabling system. Minimize outage duration.

.7 Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

.8 Co-ordinate work with all trades to ensure a proper and complete installation. Notify all trades concerned of the requirement for openings, sleeves, insets and other hardware necessary for the installation and, where work is to be integrated with the work of other trades or is to be installed in close proximity with the work of other trades, carefully co-ordinate the work prior to installation.

.9 Working Detail Drawings

.1 The contractor is to prepare working detail drawings supplementary to the contract drawings, when deemed necessary by the Consultant, for all areas where a multiplicity of materials and or apparatus occur, or where the work due to architectural and structural considerations involves special study and treatment. Such drawings may be prepared jointly by all trades affected, or by the one trade most affected with due regard for and approval of the other trades, all as the Consultant will direct in each instance. Such drawings must be reviewed by the Consultant before the affected work is installed.

.2 Carry out all alterations in the arrangement of work which has been installed without proper study and approval, even if in accordance with the contract documents, in order to make such work come within the finished lines of walls, floors and ceilings, or to allow the installation of other work, without additional cost. In addition, make any alterations necessary in other work required by such alterations, without additional cost.

1.10 SUBMITTAL PROCEDURES

.1 Refer to Section 01 33 00.

.2 Before delivery to site of any item of equipment, submit shop drawings complete with all data, pre-checked and stamped accordingly, for review by the Consultant. Indicate project name on each brochure or sheet, make reference to the number and title of the appropriate specification section, type identifier such panelboard ID or luminaire type as indicated on appropriate schedule, and provide adequate space to accommodate the Consultant’s review stamp(s).

.3 Verify field measurements and affected adjacent Work are coordinated, including passageway clearances for movement of equipment into location.

.4 Submit shop drawings to the Consultant in electronic (PDF) format, as coordinated after award of contract. Where submittals are derived from digital originals, do not print and rescan documents; submittals made as such will be immediately rejected.

.5 Submit a schedule of shop drawings within one week after award of contract. Group submittals by specification division as appropriate.

.6 Shop Drawings

.1 Submit for review, properly identified shop drawings showing in detail the design and construction of all equipment and materials as requested in sections of the specification governed by this Section.

.2 Obtain and comply with the manufacturer's installation instructions.

.3 Endorse each shop drawing copy "CERTIFIED TO BE IN ACCORDANCE WITH ALL REQUIREMENTS", stamp each copy with your company name, date each copy with the submittal date, and sign each copy. Shop drawings which are received and are not endorsed, dated, and signed will be returned for re-submittal.

.4 The Consultant will stamp shop drawings as follows:

.1 Reviewed ( )

.2 Reviewed as Modified ( )

.3 Revise and Re-Submit ( )

.4 Not Reviewed ( )

.5 If "REVIEWED" is checked-off, the shop drawing is satisfactory. If "REVIEWED AS MODIFIED" is checked-off, the shop drawing is satisfactory subject to requirements of remarks put on shop drawing copies. If "REVISE AND RE-SUBMIT" is checked-off, the shop drawing is entirely unsatisfactory and must be revised in accordance with comments written on shop drawing copies and resubmitted. If "NOT REVIEWED" is checked-off, the shop drawing is in error of submission, not applicable for this project.

.6 This 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 approved the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor, and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the contract documents. Be 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 co-ordination of the work as well as compliance with codes and inspection authorities such as CSA, etc.

.7 Confirm layouts of major electrical equipment rooms with the dimensions of as-procured equipment, and submit a layout sketch to the Consultant showing the major equipment and required clear spaces. The contractor may, at their option, revise the layout of the major electrical equipment rooms, but take responsibility for these new layouts and meeting the requirements of the local electrical utilities. Capture final room layouts on as-built drawings.

1.11 SAFETY REQUIREMENTS

.1 Refer to Section 01 35 29.

.2 Be responsible for the safety of workers and the equipment on the project in accordance with all applicable safety legislation passed by Federal, Provincial, and local authorities governing construction safety. The more stringent regulations prevail.

1.12 REGULATORY REQUIREMENTS

.1 Refer to Section 01 41 00.

.2 Codes and Standards

.1 Ontario Electrical Safety Code including all bulletins and amendments.

.2 Ontario Building Code and its referenced standards.

.3 Applicable CSA and ULC standards.

.4 [All work shall be in accordance with Owner’s Design Guidelines.]

.3 Permits and Fees

.1 Obtain and pay for all permits and fees required for the execution and inspection of the electrical work and pay all charges incidental to such permits. Submit to Electrical Inspection Department and Supply authority necessary number of drawings and specifications for examination and approval prior to commencement of work. Arrange and pay for any special inspection of equipment specified if and when required.

.2 Apply, pay and obtain all permits as required for the electrical work.

.3 Upon substantial completion of your work, supply and turn over to the Consultant all required inspection certificates from governing authorities to certify that the work as installed conforms to the rules and regulations of the governing authorities.

.4 Patents

.1 Pay all royalties and licence fees, and defend all suits or claims for infringement of any patent rights, and save the Owner, Architect, Project Manager and Consultants harmless of loss or annoyance on account of suit, or claims of any kind for violation or infringement of any letters patent or patent rights, by this Subcontractor or anyone directly or indirectly employed by him or by reason of the use by him or them of any part, machine, manufacture or composition of matter on the work, in violation or infringement or such letters patent or rights.

1.13 REFERENCES

.1 CSA Group:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 CSA C235:19, Preferred voltage levels for AC Systems up to 50 000 V.

.3 Do underground systems in accordance with CSA C22.3 No. 7-15, Underground systems, except where specified otherwise.

.4 Ontario Electrical Safety Code (28th edition/2021), and all bulletins.

.2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)

.1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.

.3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.4 Electrical utility requirements and local applicable codes and regulations.

.5 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

.6 2012 Ontario Building Code.

.7 CAN/ULC-S1001-11, Integrated Systems Testing of Fire Protection and Life Safety Systems.

1.14 DEFINITIONS

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.15 QUALITY ASSURANCE

.1 Refer to Section 01 43 00.

.2 The specifications contained herein are set forth as the minimum acceptable requirements. This does not relieve the Contractor from executing other quality assurance measures to obtain a complete operating system within the scope of this project.

.3 Ensure that all workmanship, all materials employed, all required equipment and the manner and method of installation conforms to accepted construction and engineering practices, and that each piece of equipment is in satisfactory working condition to satisfactorily perform its functional operation.

.4 Provide quality assurance tests and operational check on all components of the electrical distribution system, all lighting fixtures, and communication systems.

.5 Only first class workmanship will be accepted, not only in regards to durability, efficiency and safety, but also in regards to neatness of detail. Present a neat and clean appearance on completion to the satisfaction of the Consultant. Any unsatisfactory workmanship will be replaced at no extra cost.

.6 Conform to the best practices applicable to this type of work. Install all equipment and systems in accordance with the manufacturer's recommendations, but consistent with the General Requirements of this specification. Electrical Contractor will be held responsible for all damage to the work of his own or any other trade, resulting from the execution of his work. Store all electrical equipment and materials in dry locations.

.7 Provide foreman in charge of this work at all times.

.8 The contractor shall be fully liable to provide and maintain in force during the life of this Contract, such insurance, including Public Liability Insurance, Product Liability Insurance, Auto Liability Insurance, Worker’s Compensation, and Employer’s Liability Insurance.

.9 Governing Federal, Provincial and Municipal codes and regulations will be considered minimum standards for the work and where these are at variance with the drawings and specification, the more stringent ruling will apply.

.10 Where any code, regulation, bylaw, or standard is quoted it shall mean the current edition including all revisions or amendments at the time of the tender.

.11 In case of conflict, the codes and regulations take precedence over the Contract Documents. In no instance reduce the standard or scope of work or intent established by the drawings and specifications by applying any of the codes referred to herein.

1.16 QUALITY CONTROL

.1 Refer to Section 01 45 00.

.2 Provide a full time Superintendent to oversee and coordinate all sub-trades in these divisions.

1.17 TEMPORARY UTILITIES

.1 Refer to Section 01 51 00.

.2 Do not use any of the permanent facility systems during construction except as may be specified, or unless written approval is obtained from the Consultant.

.3 The use of permanent facilities for temporary construction service will not affect in any way the commencement day of the warranty period.

.4 Temporary heating during the construction period will be provided as described in Division 01.

1.18 TEMPORARY FACILITIES AND CONTROLS

.1 Refer to Section 01 56 00.

.2 Prior to start of each work period in occupied area, install temporary protection to prevent damage to any personal property or furnishing. Coordinate with Owner's representative if any furniture must be relocated to facilitate work.

.3 [Submit temporary protection plan to Owner's Representative for approval prior to use.]

.4 Take necessary steps to ensure that required firefighting apparatus is accessible at all times. Flammable materials shall be kept in suitable places outside the building.

1.19 PRODUCT REQUIREMENTS

.1 Refer to Section 01 61 00.

.2 The design, manufacture and testing of electrical equipment and materials shall conform to or exceed the latest applicable CSA, IEEE, and ANSI standards.

.3 All materials must be new and be ULC or CSA listed. Any materials not covered by the aforementioned listing standards shall be tested and approved by an independent testing laboratory, Technical inspection Services, or other government agency.

.4 Materials and equipment are specifically described and named in this Specification in order to establish a standard of material and workmanship.

.5 Materials required for performance of work shall be new and the best of their respective kinds and of uniform pattern throughout work.

.6 Materials shall be of Canadian manufacture where obtainable. Materials of foreign manufacture, unless specified, shall be approved before being used.

.7 Equipment items shall be standard products of approved manufacturers. Identical units of equipment shall be of same manufacturer. In any unit of equipment, identical component parts shall be of same manufacturer, but the various component parts comprising the unit need not be of one manufacturer.

.8 Chemical and physical properties of materials and design performance characteristics and methods of construction and installation of items of equipment, specified herein, shall be in accordance with latest issue of applicable Standards or Authorities when such are either mentioned herein, or have jurisdiction over such materials or items of equipment.

.9 Materials shall bear approval labels as required by Code and/or Inspection Authorities.

.10 Install materials in strict accordance with manufacturer's recommendations.

.11 Include items of material and equipment not specifically noted on Drawings or mentioned in Specification but which are necessary to make a complete and operating installation.

.12 Remove materials, condemned as not approved for use, from job site and deliver and install suitable approved materials in their place.

.13 Unless otherwise noted, equipment and material specifications in Sections of the Specification governed by this Section are based on products of a manufacturer selected by the Consultant for the purpose of setting a standard of quality, size, performance, capacity, appearance, and serviceability.

.14 In most instances the names of acceptable manufacturers are also stated for materials and equipment, and you may base your tender price on equipment and materials produced by either the specified manufacturer or a manufacturer listed as acceptable.

.15 For any items of equipment, material, or for any system where acceptable manufacturers are not stated, you must provide only the equipment, material or system specified.

.16 If materials or equipment manufactured and/or supplied by a manufacturer named in the specifications are used in lieu of products of the manufacturer noted as “basis of design”, be responsible for ensuring that the substituted material or equipment is equivalent in size, performance and operating characteristics to the specified materials or equipment, and it shall be understood that all costs for larger starters, additional space, larger power feeders, and changes to associated or adjacent work required as a result of providing materials and equipment named as acceptable in lieu of the specified product will be borne by the Contractor.

.17 In addition to the manufacturers specified or named as acceptable, the Contractor may propose substitute manufacturers of equipment and/or apparatus to the Consultant for acceptance, listing in each case a corresponding credit for each substitute proposed, however, the tender price must be based on apparatus or materials specified or named as acceptable. Certify in writing to the Consultant that the substitute meets all space, power, design, and all other required of the specified or equivalent material or apparatus. In addition, it shall be understood that all costs for larger starters, space, power feeders, and changes to associated equipment, mechanical and/or electrical, required by acceptance of proposed substitutions, will be borne by the party making the proposal. Substitute equipment requiring greater than specified energy requirements or unduly limiting service space requirements will not be accepted.

.18 Where a manufacturer is not listed for a particular product, it will be deemed to mean that the Contractor will provide the specified manufacturer's product.

1.20 EXAMINATION AND PREPARATION

.1 Refer to Section 01 71 00.

.2 Examine the existing equipment, the site and surrounding areas and be fully informed as to the conditions and limitations under which the work has to be executed. Claims for additional costs will not be entertained with respect to conditions which could reasonably have been ascertained by an inspection prior to Tender closing.

.3 Examine work upon which your work depends. Report in writing defects in such work. Application of your work shall be deemed acceptance of work upon which your work depends.

.4 Drawings are, in part, diagrammatic and are intended to convey scope of work and indicate general and approximate location, arrangement and sizes of equipment, piping, and similar items. Obtain more accurate information about locations, arrangement and sizes from study and coordination of drawings, including shop drawings and manufacturers’ literature and become familiar with conditions and spaces affecting these matters before proceeding with work.

.5 Where job conditions require reasonable changes in indicated locations and arrangements, make such changes with approval of the Consultant at no additional cost to the Owner. Similarly, where existing conditions interfere with new installation and require relocation, such relocation is included in work.

1.21 CUTTING AND PATCHING

.1 Refer to Section 01 73 29.

.2 The Electrical Contractor will be responsible for all cutting and patching required for the electrical installation. Structural members are not to be cut without the consent of the Consultant.

.3 All cutting and patching required under Division 26, Division 27, and Division 28 shall be in accordance with Division 01. Layout such work for approval before undertaking same.

.4 Cutting shall be kept to an absolute minimum and performed in a neat and workmanlike manner using the proper tools and equipment. Caution shall be exercised in all cutting and procedures to ensure that

concealed services are not affected. Do not cut if in doubt. Request the Consultant's presence to determine if concealed services exist.

.5 Assume responsibility for prompt installation of Work in advance of concrete pouring or similar Work. Should any cutting or repairing of finished/unfinished Work be required because such installation was not done, employ the particular trade, whose Work is involved, to do such cutting and patching. Pay for any resulting costs. Layout such Work for approval before undertaking same.

1.22 CLEANING AND WASTE MANAGEMENT

.1 Refer to Section 01 74 00.

.2 The Contractor and associated sub trades, at all times during construction, to keep the site free of all debris, boxes, packing, etc., resulting from work of this trade. At the completion of this work, the electrical installation is to be left in a clean and finished condition to the satisfaction of the Consultant.

.3 Clean and repair existing materials and equipment which remain or are to be reused.

.4 Luminaires to be reinstalled: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

.5 Assume responsibility for removing tools and waste materials on completion of Work, and leave Work in clean and perfect condition.

1.23 STARTING AND ADJUSTING

.1 Refer to Section 01 75 00.

.2 Conduct acceptance tests to demonstrate that the equipment and systems actually meet the specified requirements. Tests may be conducted as soon as conditions permit, and consequently make all changes, adjustments, or replacements required as the preliminary tests may indicate prior to the final tests. Tests shall be as specified in various sections of this Division. Carry out tests in the presence of the Consultant. Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project. The Electrical Contractor shall be in charge of the plant during tests. He shall assume responsibility for damages in the event of injury to the personnel, building, equipment, and shall bear all costs for liability, repairs, and restoration in this connection. Submit test results.

.3 Make tests of equipment and wiring at times requested.

.4 Tests shall include meggered insulation values, voltage and current readings to determine balance of panels and feeders under full load, and operation of each piece of equipment for correct operation.

.5 Supply meters, materials and personnel as required to carry out these tests.

.6 Test electrical work to standards and function of Specification and applicable codes in an approved manner. Replace defective equipment and wiring with new material and leave entire system in complete first class operating condition.

.7 Connect single phase loads so that there is the least possible unbalance of the supply phases.

.8 Submit all test results in report format.

.9 Trial Usage

.1 The Consultant reserves the right to use any system, piece of equipment, device, or material for such reasonable lengths of time and at such times as may be required to make a complete and thorough test of the same, or for the purpose of learning operational procedures, before the final completion and acceptance of the work. Such tests shall not be construed as evidence of

acceptance of the work, and it is agreed and understood that no claim for damage will be made for injury or breakage to any part or parts of the above due to the aforementioned tests, where such injuries or breakage are caused by a weakness or inaccuracy of parts, or by defective materials or workmanship of any kind. Supply all labour and equipment required for such tests.

.2 Perform and pay for all costs associated with any testing required on the system components where, in the opinion of the Consultant the equipment manufacturer's ratings or specified performance is not being achieved.

1.24 CLOSEOUT PROCEDURES

.1 Refer to Section 01 77 00.

.2 The Consultant will carry out inspections and prepare deficiency list for action by the Contractor, during and on completion of project.

.3 Building Permit Compliance

.1 Provide a minimum of 10 business days notice to the Consultant for scheduling of Consultant’s occupancy inspection.

.2 Prior to requesting the Consultant’s letter “Review of General Conformance” for submission to the municipal building department to allow occupancy, the following items must be complete and submitted to the Consultant, as applicable:

.1 General

.1 Submit all applicable inspection reports from Authorities Having Jurisdiction.

.2 Continuity of fire separations at service penetrations must be complete.

.3 All seismic restraint requirements as described in Section 26 05 48 must be complete.

.2 Electrical

.1 Provide Certificate of Acceptance from Electrical Inspection Department.

.2 Any devices not installed must have the wiring made safe and terminated in an outlet box complete with cover.

.3 All outlets must have cover plates installed. All electrical equipment not located in service rooms must have covers and/or doors installed complete.

.4 Emergency lighting system must be operational and tested by the Contractor. Where battery units and remote heads are indicated on the drawing, provide certification letter from equipment manufacturer indicating the system meets code requirements.

.5 Simulate normal power failure within the premises in the presence of the consultant and the owner’s representative. Test and verify exit lights and emergency lighting operations under emergency conditions. Submit letter of certification copy to the Consultant stating that the systems have been tested, witnessed by the Consultant or the Owner’s representative, etc., and the methods of installation and performance are satisfactory to all parties.

.6 All exit lights must be installed and operational.

.3 Electronic Safety and Security

.1 Fire alarm system and devices must be operational. Submit fire alarm verification report per CAN/ULC-S537, and submit audibility test. Indicate tap settings of all signalling devices.

.3 If any of the above items have not been completed at the time of Consultant's Inspection, and the letter of "assurance of professional field review and compliance" cannot be issued, any costs for subsequent Inspections will be charged to the Contractor.

1.25 CLOSEOUT SUBMITTALS

.1 Refer to Section 01 78 00.

.2 Project Record Documents

.1 Provide extra sets of white prints on which to make, as the job progresses, all approved changes and deviations from the original drawings. Complete as-built drawings accurately marked up in red ink must be submitted for review by the Consultant before the contract is considered to be completed.

.2 Changes and deviations include those made by addenda, change orders, and supplemental instructions, and changes and deviations to be marked on the white print record drawings indicated on supplemental drawings issued with addenda, change orders, and supplemental instructions. Maintain the "as-built" white prints at the site for periodic inspection by the Consultant throughout the duration of the work.

.3 Upon substantial completion of the work, obtain a set of reproducible white prints of the drawings and neatly amend the print in accordance with the marked-up white prints to produce a true "as-built" set of drawings.

.4 As-built drawings are to indicate all circuiting as installed and all distribution junction box locations as well as conduit routes.

.5 Trace routing of existing panelboard feeders for all panelboards and indicate on as-built drawings.

.6 As-Built AutoCAD [Revit] drawings

.1 Submit completed Document 00 64 01 to the Consultant[, and remit payment as indicated] for release of the Consultant's AutoCAD files.

.2 Transfer the information from the "as-built" white prints to the files, and submit to the Consultant for review.

.3 Employ a competent computer draftsperson to indicate changes on the electronic set of as-built drawings. Provide drawings in PDF and AutoCAD formats.

.4 Submit three (3) USB flash drives including as-built drawings in AutoCAD format, one with each O&M manual.

.5 Provide three (3) sets of full size as-built drawings in hard copy format, one with each O&M manual.

.3 Operations and Maintenance (O&M) Data

.1 Submit two complete sets of Operation and Maintenance instruction manuals in hard copy, and one in electronic format. Include in each copy of the manual:

.1 Verification certificates for installation of life safety systems by the manufacturer's representative.

.2 A copy of "reviewed" shop drawings.

.3 Complete explanation of operating principles and sequences.

.4 Recommended maintenance practices and precautions.

.5 Complete wiring and connection diagrams.

.6 Certificates of guarantees.

.2 Ensure that operating and maintenance instructions are specific and apply to the model and types of equipment provided.

.3 Include attendance records for each training session in the O&M manual.

.4 Warranties

.1 Submit a written guarantee to the Owner for one year from the date of acceptance. This guarantee shall bind the contractor to correct, replace or repair promptly any defective equipment workmanship without cost to the Owner.

.2 All equipment, materials and workmanship shall be unconditionally guaranteed for a minimum period of one year from the date of acceptance.

.3 Provide warranty certificates, wherever given or required, in excess of the normal warranty period showing the name of the firm giving the warranty, dated and acknowledged, on specific equipment and systems.

.4 Warranties for temperature controls and building automation systems will start on the date of verification of acceptance by the Consultant.

.5 Include these certificates with the maintenance and operating manuals in the appropriate sections.

2 Products – Not Used

3 Execution

3.01 DEMOLITION

.1 Refer to Division 02 and Section 26 05 05.

.2 Remove all electrical equipment and devices on redundant structures. Make safe all circuits, and provide continuity of remaining circuits.

.3 To make safe: Withdraw redundant wiring and remove unwanted conduit/wiring and accessories. Position breakers to OFF position and update panel schedules.

.4 Make safe any redundant mechanical devices as shown on mechanical drawings.

.5 Maintain continuity of existing services for other circuits/devices serving areas outside the Work area. Provide additional wiring/conduits/boxes etc. to suit existing services to be maintained and also implement new Work as detailed.

.6 Allow for this work in Tender Price.

.7 Turn over designated equipment to the Owner. Dispose of unwanted materials and equipment.

3.02 CONCRETE WORK

.1 Refer to Division 03 – Concrete.

.2 Provide all concrete work required for the electrical work. Reinstall surfacing as per architectural requirements.

.3 Provide a 100 mm (4 inch) high concrete housekeeping pad for floor mounted electrical distribution equipment, such as the following:

.1 Transformers.

.2 Switchgear and switchboards.

.3 Distribution panelboards.

.4 Engine Generators.

.5 Uninterruptible Power Supplies and batteries.

.6 Transfer Switches.

3.03 LINTELS

.1 Refer to Division 04 – Masonry.

.2 Lintels for openings in masonry shall conform with requirements of by-laws, and as approved by the Structural Engineer.

.3 Pay all costs for lintels over openings, required solely by the electrical trades, not shown on architectural or structural drawings.

3.04 METALS

.1 Refer to Division 05 – Metals.

.2 Steel construction required solely for the work of this trade, and not shown on architectural or structural drawings shall be provided by this Division to the requirements of Division 05.

3.05 FLASHING AND SHEET METAL

.1 Refer to Section 07 60 00.

.2 Flash all conduits and systems passing through roof or built into an outside wall, or a waterproof floor.

.3 Provide copper flashing for sleeves passing through exterior walls or waterproof floors.

3.06 FIRESTOPPING

.1 Provide firestopping in accordance with Section 07 84 00 and Section 26 05 44.13.

.2 Ensure that fire ratings of floors and walls are maintained.

.3 Provide ULC classified firestopping products by 3M, Hilti, STI, or approved equal which have been tested in accordance with CAN/ULC-S115.

.4 Pack clearance spaces, fill all spaces between openings, pipes and ducts passing through fire separations and install firestopping systems in accordance with the appropriate ULC system number for the products and type of penetration.

.5 Install firestopping systems using personnel trained or instructed by the product manufacturer.

3.07 ACCESS DOORS

.1 Provide access doors in accordance with Section 08 31 00.

.2 Before commencing installation of work, coordinate with other trades and prepare on a set of reflected ceiling plans and wall elevations, complete layouts of access doors. Submit these layouts for Consultant's review and show exact sizes and locations of such access doors. Locate and arrange the work to suit.

.3 Group conduit work to ensure the minimum number of access doors is required.

.4 Access doors are to be installed by the trade responsible for the particular type of construction in which the doors are required.

3.08 PAINTING AND FINISHES

.1 Refer to Section 09 91 00.

.2 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.3 Repair and finish factory finished equipment, damaged, or scratched during installation, in an approved manner.

.4 All structural steel including hangers, brackets, supports and other ferrous metals shall be shop or factory prime painted wherever practicable. Wherever structural steel including hangers, brackets, supports, and other ferrous metals cannot be shop or factory prime painted, wire brush to remove all traces of rust, clean of all traces of dirt, oil, and grease, and apply one coat of an approved rust inhibiting primer in accordance with CGSB-GB-40d, and leave ready to receive finish paint.

.5 Primary and final painting for Work, other than items specified as factory primed or finished, will be performed as described in Division 09 – Finishes.

.6 All electrical fittings, supports, hanger rods, pull boxes, channel frames, conduit racks, outlet boxes, brackets, clamps etc., to have galvanized finish or paint finish over corrosion-resistant primer.

.7 All panelboards, motor starters etc., to be factory finished with baked on enamel. All enamel to be baked on gloss over corrosion resistant primer.

.8 Touch up minor damage to finish on factory finished equipment. Items suffering major damage to finish shall be replaced at the direction of the Consultant.

.9 Protect work so that finishes will not be damaged or marred during construction. Maintain the necessary protection until completion of the work.

.10 Provide all exposed ferrous metal work on equipment with at least one factory prime coat, or paint one prime coat on job. Clean up or wire brush all equipment, etc., before painting.

.11 For factory applied finishes, repaint or refinish surfaces damaged during shipment, erection or construction work.

3.09 LOCATION OF OUTLETS

.1 Refer to Architectural drawings for dimensions denoting exact locations.

.2 The Consultant reserves the right to change the location of outlets to within 3 m from the point indicated on the plans without extra charge providing the Contractor is advised before installation is made.

.3 Location of lighting, convenience, telephone, power, and communication outlets shall be subject to change, without extra cost to Owners, provided information is given prior to installation. No extra amount will be paid for extra labour and materials for relocating outlets up to 3000 mm from their original location nor will credits be anticipated where relocation up to 3000 mm reduces materials and labour. Other cases will be considered on their individual merits.

.4 Coordinate location of boxes with latest architectural drawings and instructions to suit door swings, millwork etc. prior to rough-in.

3.10 MOUNTING HEIGHTS AND DEVICE LOCATIONS

.1 Refer to architectural drawings for exact location of electrical equipment and devices.

.2 Architectural elevations take precedence over electrical elevations. If there are conflicts between architectural and electrical, adjust locations of electrical equipment at no additional cost to the owner.

.3 Prior to roughing-in, the contractor is to mark locations of electrical equipment and devices for conflicts with architectural, studs, etc. If conflicts are noted, inform the Consultant for a decision prior to commencing the rough-in.

.4 Mounting heights of equipment and devices listed below is from finished floor to centreline of equipment, unless specified or indicated otherwise.

.5 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.6 Install electrical equipment at following heights above finished floor (AFF). Dimensions are to centre of device unless indicated otherwise.

.1 Power door operator push buttons: 1000 mm.

.2 HVAC thermostats and manual HVAC controls: 1200 mm.

.3 Local switches, and manual lighting control devices:

.1 1100 mm.

.2 Locate on lock side of door.

.4 System furniture service fittings: to suit furniture layout.

.5 Wall receptacles:

.1 General: min. 400 mm AFF.

.2 Above top of counters: 175 mm.

.3 Above top of continuous baseboard heater, or mechanical heating/radiation units: 75 mm to bottom of device.

.4 In fan rooms, mechanical rooms, and electrical rooms: 1100 mm.

.5 For electric ranges: 130 mm.

.6 Outlets in raceways or millwork to be located as per Architectural details.

.7 Door bell pushbuttons: 1100 mm.

.8 Panelboards: as indicated in Section 26 24 16.

.9 Emergency lighting remote heads: 300 mm below finished ceiling, or 2400 mm AFF for exposed areas or areas with ceiling height above 2750 mm (9 feet).

.10 Communications:

.1 Typical communication outlets (voice and data): 400 mm.

.2 Communications outlets for wall mounted telephones, intercom, or similar: 1100 mm.

.3 Television outlets: 200 mm below finished ceiling.

.4 Wall mounted public address speakers: 2100 mm.

.5 Clocks: 2100 mm.

.11 Access control card readers and keypads: 900 mm.

.12 Fire alarm manual pull stations: 1200 mm.

.13 Wall mounted fire alarm audible devices, including bells or horns:

.1 2300 mm to the top of the device in areas of ceiling height 2450 mm or greater.

.2 150 mm below the finished ceiling for ceiling heights less than 2450 mm, measured to the top of the device.

.14 Wall mounted fire alarm visible signal devices, including strobes: 2300 mm.

.15 Fire Alarm emergency telephones: 1400 mm.

3.11 MANUFACTURER'S INSTRUCTIONS

.1 Where the specifications call for an installation to be made in accordance with Manufacturer's recommendations, a copy of such recommendations shall be at all times be kept on the job site and be available to the Owner's Representative.

.2 Follow manufacturer's instructions where they cover points now specifically indicated on the drawings and specifications. If they are in conflict with the drawings and specifications obtain clarification from the Consultant before starting work.

3.12 TESTS AND ACCEPTANCE

.1 The operation of the equipment and electrical system does not constitute an acceptance of the work by the Owner. The final acceptance is to be made after the Contractor has adjusted his equipment and demonstrated that it fulfills the requirements of the drawings and the specifications.

.2 Testing of all systems shall be performed in the presence of the Owner's designated representative. The contractor shall give 72 hours advance notice to the Owner before beginning the tests.

.3 Upon completion of the installation, the Contractor shall furnish certificates of approval from all authorities having jurisdiction, as applicable. Contractor shall demonstrate that work is complete and in perfect operating condition, with raceway and conduit systems properly grounded, wiring free from grounds, shorts, and that the entire installation is free from any physical defects.

3.13 CLOSEOUT ACTIVITIES

.1 Refer to Section 01 79 00.

.2 In the presence of the Owner, demonstrate the proper operation of all systems.

.3 Instruct the Owner's designated representatives in all aspects of the operation and maintenance of systems and equipment listed in the trade sections governed by this Section. Obtain in writing from the Consultant a list of the Owner's representatives qualified to receive instructions.

.4 Arrange for and pay for the services of qualified service technicians and other manufacturer's representatives required for instruction of specialized portions of the installation.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Work in existing facilities.

.2 Electrical demolition.

1.02 RELATED REQUIREMENTS

.1 Section 02 41 19 – Selective Demolition.

1.03 SCHEDULING

.1 Refer to Section 01 14 00, and Section 01 73 00.

.2 All work in the existing building, other than minor works required to permit construction of the new Work, is to be performed in such a manner as to not disrupt the building operations.

.3 All systems are to be kept in full operation during normal building hours.

.4 Coordinate any noise generating works that disrupt the building operation to be carried out after/before normal operating hours.

2 Products

2.01 MATERIALS

.1 Materials and equipment for patching and extending work: As specified in individual sections.

3 Execution

3.01 EXAMINATION

.1 Verification of Conditions

.1 Verify field measurements and circuiting arrangements are as shown on Drawings.

.2 Verify that abandoned wiring and equipment serve only abandoned facilities.

.3 Demolition drawings are based on visual field observations and conditions derived from existing drawings, and do not assess the interiors of electrical equipment. Report discrepancies to the Consultant before disturbing existing installation.

.4 Beginning of demolition means installer accepts existing conditions.

.2 Tracing Existing Electrical Circuits

.1 Trace all circuits in the area of work listed as existing, and verify existing conditions prior to any modifications as indicated.

.2 Where drawings indicate “connect to existing circuit”, use a spare breaker, where available. Otherwise, verify existing load with a meter and advise the Consultant if the additional load will cause a circuit to trip.

.3 Where provided panelboard schedules indicate "Existing Circuit" or similar, provide the correct description for the circuit. Existing Circuit will not be acceptable in the final panelboard schedules submitted as part of closeout submittals.

.3 Existing Cabling in Return Air Plenums

.1 In ceilings being used as a return air-plenum, Contractor to review existing low-voltage cabling uncovered as part of the work.

.2 Immediately notify the Consultant if any cables identified are not plenum rated (i.e. CMP, or FT6 rated).

3.02 PREPARATION

.1 Coordinate utility service outages with utility company.

.2 Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

.3 Existing electrical service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switch overs and connections. Obtain permission from Owner at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

.4 Existing Telephone System: Maintain existing system in service. Notify Owner at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

.5 Existing Fire Alarm System: Maintain existing system in service. Minimize outage duration. Provide fire watch as required. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION

.1 Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

.2 Demolish and extend existing electrical work to Section 02 41 19, and this Section.

.3 Remove, relocate, and extend existing installations to accommodate new construction.

.4 Remove abandoned wiring to source of supply.

.5 When relocating or removing equipment, should any circuits be abandoned, the conductors to these circuits must be removed or properly terminated as detailed in Ontario Electrical Safety Code (OESC) bulletin 12-25-5, or latest revision.

.6 Provide knockout fillers when removing circuits from any panelboard or splitter.

.7 Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

.8 Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

.9 Disconnect and remove abandoned panelboards and distribution equipment.

.10 Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

.11 Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

.12 Repair adjacent construction and finishes damaged during demolition and extension work.

.13 Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

.14 Maintain continuity of existing services for other circuits/devices serving areas outside the Work area. Provide additional wiring/conduits/boxes etc. to suit existing services to be maintained, and also implement new Work as detailed.

3.04 RESTORATION

.1 Install relocated materials and equipment under the provisions of Division 01.

3.05 CLEANING

.1 Clean and repair existing materials and equipment which remain or are to be reused.

.2 Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts, and broken electrical parts.

.3 Waste Management

.1 Turn over designated equipment to the Owner.

.2 Dispose of unwanted materials and equipment.

3.06 PROTECTION

.1 Maintain access to existing electrical installations which remain active. Modify installation or provide access panels as appropriate.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Building wire and cable.

.1 Armoured cable.

.2 Metal clad cable.

.3 Fire resistive cables.

.4 Wiring connectors and connections.

.2 Permitted voltage drop for feeder and branch circuits.

1.02 REFERENCES

.1 CSA Group:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CSA C22.2 No. 0.3-09 (R2019), Test methods for electrical wires and cables.

.4 CSA C22.2 No. 48-15, Nonmetallic sheathed cable.

.5 CSA C22.2 No. 51-14, Armoured cables.

.6 CSA C22.2 No. 52-15, Underground secondary and service-entrance cables.

.7 CSA C22.2 No. 65-13, Wire connectors.

.8 CSA C22.2 No. 75-17, Thermoplastic insulated wires and cables.

.9 CSA C22.2 No. 123-16, Aluminum sheathed cables.

.10 CSA C22.2 No. 131-14, Type TECK 90 cable.

.2 NECA (National Electrical Contractors Association) - Standard of Installation.

.3 NETA (International Electrical Testing Association) - ATS-2021 - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

.4 CAN/ULC-S139:2017 – Standard Method of Fire Test for Evaluation of Integrity of Electrical Power, Data and Optical Fibre Cables.

1.03 COORDINATION

.1 Where wire and cable destination is indicated, and routing is not shown, determine exact routing and lengths required.

1.04 CLOSEOUT SUBMITTALS

.1 Record Documents: Indicate as-constructed feeder sizes on single line diagram.

.2 Megger test results.

.3 Fire rated cables: manufacturer's certification that the cables have been installed in accordance with the manufacturer's instructions.

1.05 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

2 Products

2.01 MANUFACTURERS

.1 American Wire Group.

.2 BICC Phillips.

.3 General Cable.

.4 Nexans.

.5 Prysmian.

.6 Southwire.

2.02 REGULATORY REQUIREMENTS

.1 Provide products listed and classified by CSA Group as suitable for the purpose specified and indicated.

2.03 CONDUCTOR MATERIAL

.1 Submit bid based on copper conductors only.

.2 Aluminum: Not permitted.

2.04 BUILDING WIRE

.1 RW90:

.1 Single copper conductor.

.2 Minimum #12 AWG for branch circuit wiring.

.3 Minimum #14 AWG for 120 V control wiring.

.4 Chemically cross-linked polyethylene insulation.

.5 Rated for 90 degrees C, 600 V.

.6 Suitable for handling to minus 40 degrees C.

.7 For interior installations in conduit.

.2 RWU90:

.1 Single copper conductor.

.2 Minimum 12 AWG for branch circuit wiring.

.3 Minimum 14 AWG for 120 V control wiring.

.4 Chemically cross-linked polyethylene insulation.

.5 Rated for 90 degrees C, 600 V.

.6 Suitable for handling to minus 40 degrees C.

.7 For exterior installations in conduit.

.3 T90 Nylon:

.1 Single copper conductor.

.2 Thin wall PVC insulation with nylon covering.

.3 Rated for 90 degrees C, 600 V.

.4 May be used up to size 10 AWG for interior installations.

.5 Base conduit fill on RW90 cable diameters.

2.05 ARMOURED CABLE

.1 General

.1 Connectors: standard as required, complete with anti-short rings.

.2 Runs to be limited to fixture drops, and runs to devices in walls and partitions, maximum horizontal runs in exposed areas and ceiling spaces to be 1.8 m (6 feet).

.3 Do not daisy chain (leap frog) luminaires with armoured cable.

.2 Type AC:

.1 Two, three or four copper conductors rated RW90, 1000 V.

.2 Bare copper ground wire.

.3 Insulation Voltage Rating: 600 volts.

.4 Insulation Temperature Rating: 90 degrees C (194 degrees F).

.5 Insulation Material: Thermoplastic.

.6 Overall interlocked aluminum tape armour.

.3 Type SPC90:

.1 Use for LED lighting, fluorescent dimming controls, and other SMART building applications.

.2 Colour coded cable with power, control, and signal under one cable.

.3 12-2C Power with a 16-2C Control.

.4 Bare copper ground wire.

.5 Insulation Voltage Rating: 600 volts.

.6 Insulation Temperature Rating: 90 degrees C (194 degrees F).

.7 Insulation Material: Thermoplastic.

2.06 TECK90 CABLE

.1 Single, three, or four conductors as indicated on drawings.

.2 Cable to CSA C22.2 No. 131.

.3 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper, size as indicated.

.4 Insulation: Cross-linked polyethylene (XLPE), type RW90, rating: 600 V.

.5 Inner jacket: polyvinyl chloride.

.6 Armour: interlocking aluminum.

.7 Overall covering: thermoplastic.

.8 Fastenings:

.1 One-hole steel straps to secure surface cables 50 mm diameter and smaller. Two-hole steel straps for cables larger than 50 mm diameter.

.2 Channel type supports for two or more cables at 1500 mm centres.

.3 Threaded rods: 6 mm diameter to support suspended channels.

.9 Connectors: Watertight, approved for TECK cable.

2.07 CONDUCTOR PULLING LUBRICANT

.1 Where pulling lubricant is required, use non-wax based cable lubricants compatible with cable manufacturer recommendations, such as American Polywater.

2.08 CONNECTORS

.1 Armoured cable connectors must be proper squeeze type connectors and plastic anti-short bushings at terminations.

.2 Connectors for conductors connecting to devices as per local governing electrical requirements to be equal to IDI Electric (Canada) Ltd., "Ideal" No. 451, No. 452, and No. 453, "Wing-Nut", CSA certified, 600 volts, rated pressure type connectors.

.3 For conductors sized #3/0 and greater, provide long barrel double crimp, two (2) hole compression type lug connectors, unless otherwise noted.

2.09 WIRING TERMINATION

.1 Lugs, terminals, or screws used for termination of wiring to be suitable for copper conductors. 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. Maintain phase sequence and colour coding throughout.

.2 Splice wire, up to and including No. 6 gauge, with nylon insulated expandable spring type connectors.

.1 Thomas & Betts – Marr Max series.

.3 Splice large conductors using compression type connections insulated with heat shrink sleeves.

.1 Thomas & Betts – 5400 Series lugs & heat shrink type #s series.

3 Execution

3.01 EXAMINATION

.1 Verify that field measurements are as indicated.

.2 Wire and cable routing indicated is approximate unless dimensioned.

.3 Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

.4 Voltage Drop

.1 Ensure voltage drop in power and control conductors is in accordance with the requirements of the OESC.

.2 Size conductors accordingly when sizes are not identified.

.1 Feeder conductors: maximum voltage drop of 2 per cent.

.2 Branch circuit conductors: maximum voltage drop of 3 per cent.

.5 Verify that mechanical work likely to damage wire and cable has been completed.

.6 Verify that raceway installation is complete and supported.

3.02 PREPARATION

.1 Completely and thoroughly swab raceway before installing wire.

3.03 INSTALLATION

.1 Route wire and cable as required to meet project conditions.

.2 Install cable to CSA C22.1 and per manufacturer’s installation guidelines.

.3 Conduit and cable supports:

.1 All wiring to be installed in EMT at all exposed areas unless otherwise specified.

.2 All mechanical equipment to be connected with liquid tight flexible conduit.

.3 Support cables above accessible ceiling, using spring metal clips to support cables from structure. Do not rest cable on ceiling panels.

.4 Conductors

.1 Provide separate neutral for each circuit. Common neutrals not permitted.

.2 Use solid conductor for feeders and branch circuits 10 AWG and smaller.

.3 Use stranded conductors for control circuits.

.4 Use conductor not smaller than 12 AWG for power and lighting circuits.

.5 Use conductor not smaller than 16 AWG for control circuits.

.6 Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 25 m.

.5 Pulling conductors

.1 Pull all conductors into raceway at same time.

.2 Use suitable wire pulling lubricant for building wire 4 AWG and larger.

.3 Neatly train and lace wiring inside boxes, equipment, and panelboards.

.4 Protect exposed cable from damage.

.6 Connectors

.1 Use suitable cable fittings and connectors.

.2 Clean conductor surfaces before installing lugs and connectors.

.3 Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

.4 Use split bolt connectors for copper conductor splices and taps 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 per cent of insulation rating of conductor.

.5 Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

.6 Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

.7 Identification

.1 Identify and colour code wire and cable to Section 26 05 53. Identify each conductor with its circuit number or other designation indicated.

.2 Where colour-coded tape is utilized, apply a minimum of 50 mm (2 inches) at terminations, junction and pull boxes and conduit fittings. Do not paint conductors under any condition.

.3 Utilize colour coding on bussing in panels and, switchgear, disconnects, and metering cabinets to match conductor colour coding.

3.04 CONDUCTORS, WIRES, AND CABLES

.1 Provide fire rated conductors or provide a fire rated assembly around conductors used for life safety applications as described in 2012 OBC 3.2.7.10.

.2 Indoor wiring installed in conduit, unless otherwise noted: 600 volt "RW90 XLPE".

.3 Wiring in channel back of fluorescent and LED lighting fixtures: 600 volt type GTF or TEW.

.4 Lighting and power branch circuit wiring:

.1 Copper, minimum No. 12 gauge.

.2 Home runs to lighting and receptacle panels, which exceed 22 m (75 feet) in length: minimum No. 10 gauge.

.5 Size wires for 2 per cent maximum voltage drop to farthest outlet on a maximum 80 per cent loaded circuit.

.6 Outdoor wiring: “RWU90 XLPE”.

.7 Conductors shall be colour coded. Conductors No. 10 gauge and smaller shall have colour impregnated into insulation at time of manufacture. Conductors size No. 8 gauge and larger may be colour coded with adhesive colour coding tape but only black insulated conductors shall be employed in this case, except for neutrals which shall be white wherever possible.

.8 Colour coding as follows:

.1 Phase "A" - Red

.2 Phase "B" - Black

.3 Phase "C" - Blue

.4 Control - Orange

.5 Ground - Green

.6 Neutral - White

.9 Neatly train circuit wiring in cabinets, panels, pull boxes and junction boxes and hold with nylon cable ties.

3.05 SITE TESTS AND INSPECTIONS

.1 Perform continuity tests of all feeders, motor circuits, and branch circuits.

.2 Perform insulation-resistance test (megger test) on each feeder. Submit report to the Consultant.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Low-voltage control cabling.

.2 Control-circuit conductors.

1.02 REFERENCES

.1 CSA Group:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CSA C22.2 No. 0.3-09 (R2019), Test methods for electrical wires and cables.

.4 CSA C22.2 No. 48-15, Nonmetallic sheathed cable.

.5 CSA C22.2 No. 51-14, Armoured cables.

.6 CSA C22.2 No. 65-13, Wire connectors.

.7 CSA C22.2 No. 75-17, Thermoplastic insulated wires and cables.

.8 CSA C22.2 No. 208-14, Fire alarm and signal cable.

.2 NECA (National Electrical Contractors Association) - Standard of Installation.

1.03 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

1.04 COORDINATION

.1 Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

2 Products

2.01 REGULATORY REQUIREMENTS

.1 Conform to CSA C22.1.

.2 Provide products listed and classified by CSA Group as suitable for the purpose specified and indicated.

2.02 LOW VOLTAGE WIRING

.1 LVT:

.1 Multi conductor PVC insulated.

.2 Bare copper ground conductor.

.3 Overall PVC jacket.

.4 Rated 30 V.

.5 CMP (FT6) rated if cable is exposed.

.6 CMR (FT4) rated if cable is installed in conduit.

.2 Category 5e Network Cabling.

.1 CMP (FT6) rated if cable is exposed.

.2 CMR (FT4) rated if cable is installed in conduit.

2.03 TERMINATIONS AND SPLICES

.1 All terminations and splices shall be of an approved type for the conductors being used.

.2 Where conductors are terminated or spliced, it shall be done in the following manner:

.1 Where a single solid conductor is terminated in a device under one screw or clamping mechanism, no additional terminating hardware is required.

.2 Where multiple or stranded conductors are terminated in a device under one screw or clamping mechanism, self insulated crimp-on cable ends or approved equal shall be used up to and including No. 10 sized conductors. Approved compression lugs shall be used for larger conductor sizes.

.3 Where multiple conductors are spliced, properly sized Wing Nut connectors, or approved equal, shall be used for up to two No. 8 or three No. 10 AWG conductors. Pressure type sleeve cable connectors, splices, tee's, etc., shall be used for all larger size connections and terminations.

.4 Insulate all bare surfaces of splices with heat shrink sleeving or equivalent.

.5 Conductors connected to ground rods for service or equipment grounding or to building structural or architectural elements shall be terminated, connected, and spliced using a thermoweld process or approved non-mechanical compression type connectors.

.3 Install all service and feeder conductors as continuous lengths without breaks, measured and cut based on site dimensions.

3 Execution

3.01 EXAMINATION

.1 Verify that mechanical work likely to damage wire and cable has been completed.

.2 Verify that raceway installation is complete and supported.

.3 Verify that field measurements are as indicated.

.4 Wire and cable routing indicated is approximate unless dimensioned.

3.02 PREPARATION

.1 Completely and thoroughly swab raceway before installing wire.

3.03 INSTALLATION

.1 Route control cabling as required to meet project conditions.

.2 Install cable to the CSA C22.1.

.3 Conduit and supports

.1 All wiring to be installed in EMT at all exposed areas and in partitions unless otherwise specified.

.2 All mechanical equipment to be connected with liquid tight flexible conduit.

.3 Support cables above accessible ceiling, using spring metal clips to support cables from structure. Do not rest cable on ceiling panels.

.4 Conductors

.1 Use stranded conductors for control circuits.

.2 Use conductor not smaller than 16 AWG for control circuits.

.5 Pulling conductors

.1 Pull all conductors into raceway at same time.

.2 Neatly train and lace wiring inside boxes, equipment, and panelboards.

.3 Neatly train circuit wiring in cabinets, panels, pull boxes and junction boxes and hold with nylon cable ties.

.4 Protect exposed cable from damage.

.6 Connectors

.1 Use suitable cable fittings and connectors.

.2 Clean conductor surfaces before installing lugs and connectors.

.3 Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

.4 Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

.7 Identification

.1 Identify and colour code wire and cable to Section 26 05 53. Identify each conductor with its circuit number or other designation indicated.

.2 Where colour coded tape is utilized, apply a minimum of 50 mm (2 inches) at terminations, junction and pull boxes and conduit fittings. Do not paint conductors under any condition.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Grounding electrodes and conductors.

.2 Equipment grounding conductors.

.3 Bonding.

.4 The terms “connect” and “bond” are used interchangeably in this Specification and have the same meaning.

1.02 RELATED REQUIREMENTS

.1 Section 27 05 26 – Grounding and Bonding for Communications Systems.

1.03 REFERENCES

.1 CSA Group:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CSA C22.2 No. 0.4-17, Bonding of electrical equipment.

.4 CSA C22.2 No. 41-13, Grounding and bonding equipment.

.5 CSA C22.2 No. 75-17, Thermoplastic insulated wires and cables.

.2 ANSI/TIA/EIA J-STD-607-A - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

.3 Institute of Electrical and Electronics Engineers, Inc.

.1 IEEE 81-1983 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

1.04 ACTION SUBMITTALS

.1 Product Data: Provide for grounding electrodes and connections.

1.05 INFORMATIONAL SUBMITTALS

.1 Test Reports: Indicate overall resistance to ground and resistance of each electrode.

.2 Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 CLOSEOUT SUBMITTALS

.1 Project Record Documents: Record actual locations of components and grounding electrodes.

.2 Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

1.07 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years' experience.

1.08 REGULATORY REQUIREMENTS

.1 Products: Listed and classified testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

2 Products

2.01 MANUFACTURERS

.1 B-Line by Eaton.

.2 Hubbell (Burndy).

.3 Panduit.

.4 Thomas & Betts.

2.02 PERFORMANCE CRITERIA

.1 Grounding System Resistance: 5 ohms.

.2 Provide all equipment grounding as required regardless of whether it has been shown on drawings or called for in this specification. Arrange grounds so that under normal operating conditions no injurious amount of current will flow in any grounding conductor.

2.03 GROUNDING AND BONDING CONDUCTORS

.1 Electrical grounding conductors shall be CSA C22.2 No. 75 insulated stranded copper, except that sizes #10 AWG and smaller shall be solid copper. Insulation colour shall be continuous green for all equipment grounding conductors.

.2 Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes #10 AWG and smaller shall be ASTM B1 solid bare copper wire.

2.04 SPLICES AND TERMINATION COMPONENTS

.1 Components shall meet or exceed CSA C22.2 No. 41, and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).

2.05 GROUND CONNECTIONS

.1 Below Grade: Exothermic-welded type connectors.

.2 Above Grade:

.1 Bonding Jumpers: compression type connectors, using zinc-plated fasteners and external tooth lockwashers.

.2 Ground Busbars: Two-hole compression type lugs using tin-plated copper or copper alloy bolts and nuts.

2.06 GROUND TERMINAL BLOCKS

.1 At any equipment mounting location (e.g. backboards and hinged cover enclosures) where rack-type ground bars cannot be mounted, provide screw lug-type terminal blocks.

2.07 SPLICE CASE GROUND ACCESSORIES

.1 Splice case grounding and bonding accessories shall be supplied by the splice case manufacturer when available. Otherwise, use 6 AWG insulated ground wire with shield bonding connectors.

2.08 MECHANICAL CONNECTORS

.1 Material: Bronze.

2.09 WIRE

.1 Material: Stranded copper.

.2 Foundation Electrodes: 2/0 AWG.

.3 Grounding Electrode Conductor: Size to meet Ontario Electrical Safety Code requirements.

3 Execution

3.01 EXAMINATION

.1 Verify that final backfill and compaction has been completed before driving rod electrodes.

3.02 INSTALLATION

.1 General

.1 Ground in accordance with the Ontario Electrical Safety Code, as shown on drawings, and as hereinafter specified.

.2 System Grounding:

.1 Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformers.

.2 Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.

.3 Equipment Grounding: Metallic structures (including ductwork and building steel), enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be bonded and grounded.

.4 Ground electrical equipment and wiring in accordance with Ontario Electrical Safety Code and Local Inspection Authority's Rules and Regulations.

.5 Install grounding conductors, outside Electric Rooms and Electrical Closets in conduit and conceal where possible. Make connections to water mains, all metallic piping systems, neutral and equipment with brass, copper or bronze bolts and connectors or weld using Cadweld or Thermoweld processes.

.6 Provide grounding conductors, sized as per Code, and connect to grounding bus or water main wherever non-raceways are installed.

.2 Provide grounding electrode conductor and connect to reinforcing steel in foundation footing. Bond steel together.

.3 Provide bonding to meet Regulatory Requirements.

.4 Bond together metal siding not attached to grounded structure; bond to ground.

.5 Install ground grid under access floors indicated.

.6 Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid. Use #6 AWG bare copper conductor.

.7 Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

.8 Inaccessible Grounding Connections

.1 Make grounding connections, which are buried or otherwise normally inaccessible (except connections for which periodic testing access is required) by exothermic weld.

.9 Secondary Equipment and Circuits

.1 Main Bonding Jumper: Bond the secondary service neutral to the ground bus in the service equipment.

.2 Metallic Piping, Building Steel, and Supplemental Electrode(s):

.1 Provide a grounding electrode conductor sized per code between the service equipment ground bus and all metallic water and gas pipe systems, building steel, and supplemental or made electrodes. Jumper insulating joints in the metallic piping. All connections to electrodes shall be made with fittings that conform to CSA C22.2 No 41.

.2 Provide a supplemental ground electrode and bond to the grounding electrode system.

.3 Conduit Systems:

.1 Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor.

.2 Non-metallic conduit systems shall contain an equipment grounding conductor, except that non-metallic feeder conduits which carry a grounded conductor from exterior transformers to interior or building-mounted service entrance equipment need not contain an equipment grounding conductor.

.3 Conduit containing only a grounding conductor, and which is provided for mechanical protection of the conductor, shall be bonded to that conductor at the entrance and exit from the conduit.

.4 Feeders and Branch Circuits: Install equipment grounding conductors with all feeders and power and lighting branch circuits.

.5 Boxes, Cabinets, Enclosures, and Panelboards:

.1 Bond the equipment grounding conductor to each pull box, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes (except for special grounding systems for intensive care units and other critical units shown).

.2 Provide lugs in each box and enclosure for equipment grounding conductor termination.

.3 Provide ground bars in panelboards, bolted to the housing, with sufficient lugs to terminate the equipment grounding conductors.

.6 Receptacles shall not be grounded through their mounting screws. Ground with a jumper from the receptacle green ground terminal to the device box ground screw and the branch circuit equipment grounding conductor.

.7 Raised Floors: Provide bonding of all raised floor components.

.10 Corrosion Inhibitors

.1 When making ground and ground bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.

.11 Conductive Piping

.1 Bond all conductive piping systems, interior and exterior, to the building to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.

3.03 FIELD QUALITY CONTROL

.1 Perform inspections and tests listed in NETA ATS, Section 7.13.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Conduit and equipment supports.

.2 Anchors and fasteners.

1.02 REFERENCES

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CECA - Canadian Electrical Contractors Association.

1.03 CLOSEOUT SUBMITTALS

.1 Submit the following in the Operation and Maintenance Manual for products used over the course of the project:

.1 Product Data: Provide manufacturer's catalogue data for fastening systems.

.2 Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.04 REGULATORY REQUIREMENTS

.1 Provide products listed and classified by Canadian Standards as suitable for purpose specified and shown.

2 Products

2.01 MANUFACTURERS

.1 B-line by Eaton.

.2 Burndy Canada Ltd. (Hubbell).

.3 Erico Caddy.

.4 E. Myatt & Co. Inc.

.5 Hilti Canada.

.6 Thomas & Betts.

.7 Unistrut.

2.02 GENERAL

.1 All supporting devices, strut channel, threaded rod, anchors, etc. to be used shall be of the “hot dipped” galvanized type. Electrogalvanized components will not be accepted.

.2 Materials and Finishes: Provide adequate corrosion resistance.

.3 Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

.4 Anchors and Fasteners:

.1 Concrete Structural Elements: Use expansion anchor sand preset inserts.

.2 Steel Structural Elements: Use beam clamps and welded fasteners.

.3 Concrete Surfaces: Use self-drilling anchors and expansion anchors.

.4 Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.

.5 Solid Masonry Walls: Use expansion anchors and preset inserts.

.6 Sheet Metal: Use sheet metal screws.

.7 Wood Elements: Use wood screws.

2.03 ANCHORS AND HANGERS

.1 Hangers for electrical conduit shall be galvanized after fabrication.

.2 Perforated strapping: not permitted.

2.04 INSERTS

.1 Use only factory-made threaded or toggle type.

.2 Where inserts cannot be placed, use factory-made expansion shields for light weights, where approved by the Consultant.

.3 Do not use powder-activated tools except with the written permission of the Consultant.

2.05 SLEEVES

.1 Through interior walls, use standard weight steel pipes, conduit, or 18 gauge galvanized steel. Cut flush with finished surfaces. Check room finish schedules.

.2 Through exterior walls above grade, floors, and roof use standard weight steel pipes, machine cut, flush with finished surface inside and to suit flashing outside.

.3 Through exterior walls below grade, water-proofed floors, and other water-proof walls, use heavy weight cast iron pipes, machine cut. Extend sleeves 100 mm (4 inch) above finished floors, and cut flush with underside of floor.

2.06 STEEL CHANNEL

.1 Description: Painted steel.

2.07 SUPPORTS

.1 Steel supports in wet or dry locations to be galvanized after fabrication.

.2 Where galvanized members are bolted together use cadmium plated bolts.

.3 For hanger rods use minimum 10 mm (3/8 inch) diameter steel threaded rod. Use clevis type attachment.

.4 Provide minimum 100 mm (4 inch) high concrete bases for all floor mounted equipment.

2.08 SUPPORTS AND BASES

.1 Submit proposed method of attachment of hangers and beam clamps, to cellular steel deck for approval before proceeding with Work.

.2 Supply and erect special structural Work required for the installation of electrical equipment. Provide anchor bolts and other fastenings unless noted otherwise. Mount equipment required to be suspended above floor level, where details are not shown, on a frame or platform bracketed from the wall or suspended from the ceiling. Carry supports to either the ceiling or the floor, or both as required, at locations where, because wall thickness is inadequate, it is not permitted to use such brackets.

.3 Electrical panels, switches or other electrical equipment shall be complete with suitable bases or mounting brackets.

.4 Provide channel or other metal supports where necessary, to adequately support lighting fixtures. Do not use wood unless wood forms part of the building structure.

.5 Support hangers, in general, from inserts in concrete construction or from building structural steel beams, using beam clamps. Provide additional angle or channel steel members, required between beams for supporting conduits and cables.

.6 Provide any additional supports required from existing concrete construction for any piping or equipment, by drilling same and installing expansion bolt cinch anchors.

.7 Do not use explosive drive pins in any section of Work without obtaining prior approval.

2.09 CONCRETE ANCHORS

.1 Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

.2 Drilled expansion anchors for anchors set in concrete block or poured concrete after the concrete has set. Size the insert and number of anchors so that the maximum load per anchor does not exceed the manufacturer's recommendation.

.3 U-channel concrete inserts shall be 12 gauge steel 1-5/8 in square with insert anchors 1 3/8 in long and 100 mm (4 in) on centre.

.4 Install anchor bolts to elevations required for proper attachment to supported equipment.

2.10 PLYWOOD EQUIPMENT BOARDS

.1 Plywood Equipment Boards: preservative treated, and kiln dried; thickness as indicated, or if not indicated, not less than 19 mm (3/4 inches) deep. Provide marine grade plywood where subject to moisture conditions.

.2 Paint plywood board white, or to match adjacent finishes. Leave the fire-retardant label unpainted for verification by the Consultant and by Authority Having Jurisdiction (AHJ).

.3 Unless otherwise noted, boards shall be painted with two coats of good grade weatherproof flat gray non-conductive fire-retardant paint on all sides and edges (prior to mounting) and plumbed in a true vertical position. Provide nominal 13 mm (1/2 in) rustproof spacers between back of plywood and wall. Cut, fit, and place plywood equipment boards accurately in location, alignment, and elevation to support and anchor electrical materials and equipment. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members. Attach to substrates as required to support applied loads. Maintain at least 100 mm (4 inches) from bottom of plywood equipment boards and the finished floor surface.

.4 Unless directed otherwise in field, plywood equipment boards shall be 2440 mm (8 feet) high by 19 mm (3/4 inches) deep by length shown on drawings (as dimensioned or as scaled) or length as required to accommodate equipment if not indicated on drawings. Unless directed otherwise in field, provide plywood equipment boards for all indoor surface mounted panelboards and systems "head-end" equipment for all applications where located in mechanical or electrical rooms/areas and only where specifically shown on drawings for all other applications.

2.11 ROOF SUPPORTS

.1 High-density polyethylene platform and base, height adjustable with rounded corners and edges to reduce likelihood of roof penetration.

.2 Large surface area to spread the weight of supported objects including conduits, and cable trays over a large surface footprint.

.3 No penetration of the waterproof membrane.

.4 Self drains water, rot proof, and sunlight resistant.

.5 Manufacturers:

.1 Thomas & Betts Superstrut Adjustable Universal Support.

.2 Eaton Dura-Blok series.

3 Execution

3.01 INSTALLATION

.1 Obtain permission from the Consultant before drilling or cutting structural members.

.2 Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

.3 Install surface-mounted cabinets and panelboards with minimum of four anchors.

.4 In wet and damp locations use steel channel supports to stand cabinets and panelboards 25 mm (1 inch) off wall.

.5 Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

.6 Provide inserts, sleeves, equipment supports and hangers, sealing of sleeves and openings, as required for all electrical work. Ensure that the load onto structures does not exceed the maximum loading per square metre as shown on Structural Drawings or as directed by the Consultant.

.7 Provide insets, holes, anchor bolts and sleeves in time when walls, floors, and roof are erected.

.8 Place insets only in structural members and not in the finishing material.

.9 Secure all supports and hangers to the structure unless noted otherwise.

.10 Suspend hanger rods from approved concrete inserts and from beam clamps. Obtain Consultant's approval before welding to steel structural members.

.11 Secure supports to precast concrete members to inserts originally cast into the members or by rods passing between the members and connected to a steel plate bearing.

.12 Sealing of Sleeves and Openings to Maintain Fire Rating

.1 Use Dow-Corning #3-6548 'Silicone RTV' foam, Thomas & Betts "Flamesafe' firestopsystem, Electrovert 'Flameseal" firestop putty, or approved equal materials installed in accordance with the manufacturer's specifications and recommendations.

.2 Submit data sheets for review prior to installation.

.13 Supports

.1 All conduits, panels, etc. to be securely and adequately supported.

.2 Where more than three conduits run together, conduit racks to be used.

.3 Single runs of conduit to be supported by galvanized conduit straps or ring bolt type hangers. Tie wire or perforated metal strap hangers will NOT be accepted.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Rigid steel conduit.

.2 Flexible metal conduit.

.3 Electrical metallic tubing (EMT).

.4 Rigid PVC conduit.

.5 Fittings and conduit bodies.

1.02 REFERENCES

.1 CSA Group:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CSA C22.2 No. 45.1:22 – Electrical rigid metal conduit – steel.

.4 CSA C22.2 No. 56-17 (R2022), Flexible metal conduit and liquid-tight flexible metal conduit.

.5 CSA C22.2 No. 83.1:07 (R2022), Electrical Metallic Tubing – Steel.

.6 CSA C22.2 No. 211.1-06 (R2021), Rigid types EB1 and DB2/ES2 PVC conduit.

.7 CSA C22.2 No. 211.2-06 (R2021), Rigid PVC (unplasticized) conduit.

.8 CSA C22.2 No. 227.1:19 (R2023), Electrical nonmetallic tubing.

.9 CSA C22.2 No. 227.2.1 is a Trinational standard with NMX-J-764-ANCE and UL 1660.

.10 CSA C22.2 No. 227.2.1:19 (R2023), Liquid-tight flexible nonmetallic conduit.

.11 CSA C22.2 No. 2420-09 (R2019), Belowground reinforced thermosetting resin conduit (RTRC) and fittings.

1.03 RECORD DOCUMENTATION

.1 Accurately record actual routing of conduits larger than 51 mm (2 in).

.2 Accurately record actual routing of all conduits installed below grade, regardless of size, including whether direct buried or installed in concrete duct bank.

1.04 REGULATORY REQUIREMENTS

.1 Provide products listed and classified by CSA (Canadian Standards Association) as suitable for purpose specified and shown.

1.05 DELIVERY, STORAGE, AND HANDLING

.1 Accept conduit on site. Inspect for damage.

.2 Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

1.06 PROJECT CONDITIONS

.1 Verify that field measurements are as shown on drawings.

.2 Verify routing and termination locations of conduit prior to rough-in.

.3 Conduit routing, if shown on drawings, is approximate unless dimensioned. Route as required to provide a complete wiring system.

2 Products

2.01 MANUFACTURERS

.1 Where products are listed in this section based on a single manufacturer, the equivalent product from the following manufacturers is acceptable:

.1 Appleton.

.2 Columbia-MBF.

.3 Crouse-Hinds by Eaton.

.4 Hubbell.

.5 Thomas & Betts Ltd.

2.02 RIGID METAL CONDUIT

.1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel, threaded.

.2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.

.3 Fittings and conduit bodies: Material to match conduit.

2.03 FLEXIBLE METAL CONDUIT

.1 Flexible metal conduit: to CSA C22.2 No. 56, interlocked steel construction.

.2 Fittings: CSA C22.2 No. 56.

2.04 LIQUID TIGHT FLEXIBLE METAL CONDUIT

.1 Description: Interlocked steel construction with PVC jacket.

.2 Fittings: CSA C22.2 No. 56.

2.05 ELECTRICAL METALLIC TUBING (EMT)

.1 Description: CSA C22.2 No. 83.1; galvanized tubing.

.2 Fittings and Conduit Bodies: CSA C22.2 No. 83.1; steel type.

2.06 ELECTRICAL NON-METALLIC TUBING (ENT)

.1 To CSA C22.2 No. 227.1.

2.07 NON-METALLIC CONDUIT

.1 Rigid Type EB1 PVC Conduit: to CSA C22.2 No. 211.1.

.2 Rigid Type DB2/ES2 PVC Conduit: to CSA C22.2 No. 211.1.

2.08 CONDUIT, FITTINGS, AND ACCESSORIES

.1 Conduit accessories, conduits and fittings conforming to CSA Standard C22.2 No. 18-1972.

.2 Provide rain tight connectors, couplings, fittings, junction boxes, pull boxes and surface outlet boxes shall be used for surface conduit installations exposed to moisture or in sprinklered buildings.

.3 Rigid conduit bushings:

.1 Thomas & Betts Ltd. - Series 5031.

.4 EMT Connectors:

.1 Thomas & Betts Ltd. - Steel City TC121A series.

.5 Ground Bushings:

.1 Thomas & Betts – Blackjack or 1220 series.

.6 Flexible conduit connectors:

.1 Thomas & Betts Ltd. - Series 3110.

.2 EMT couplings: steel concrete tight to match connectors.

.7 Terminate rigid conduit entering boxes or enclosures with nylon insulated steel threaded bushings.

.1 Thomas & Betts – 8125 series.

.8 Terminate EMT entering boxes or enclosures with nylon insulated steel concrete tight connectors.

.9 Terminate flexible conduit entering boxes or enclosures with nylon insulated steel connectors.

.1 Thomas & Betts – 5332 series.

3 Execution

3.01 PREPARATION

.1 Produce layout sketches of conduit runs through mechanical and electrical service areas, through corridors, and other congested areas in order to resolve any interferences with other work, and to determine the most efficient route to run the conduit.

3.02 INSTALLATION

.1 Minimum size: 21 mm (3/4 inch) unless otherwise specified.

.2 Conceal all conduit except in mechanical rooms and electrical rooms, or unless otherwise indicated in this specification, or noted on the drawings. Surface conduit work is not permitted unless specifically noted.

.3 Install wiring in conduit unless otherwise specified. Where conduit sizes are not shown on drawings, provide conduits sized in accordance with Ontario Electrical Safety Code, CSA C22.1. When conduits are indicated, they are the minimum size required, and must be increased to suit the length of run or voltage drop requirements.

.4 Conduit use:

.1 Unless otherwise specified below or shown on the drawings, all systems shall be installed in electrical metallic tubing (EMT).

.2 Equipment subject to vibration:

.1 Use liquid tight flexible metal conduit for connections to transformers, motors, and equipment, subject to vibration and movement.

.3 Outdoor locations, above grade: use rigid steel.

.4 Underground: Use rigid PVC conduit for wiring in slabs on grade, and wiring below grade.

.5 Wet and damp locations:

.1 Use rigid steel.

.2 Use liquid tight flexible metal conduit for connections to transformers, motors, and equipment, subject to vibration and movement.

.6 Dry locations:

.1 Concealed in metal stud partitions:

.1 Use electrical metallic tubing.

.2 Use of AC90 (Bx) as described in Section 26 05 19.

.2 Concealed in concrete: Use electrical non-metallic tubing or rigid PVC.

.3 Exposed areas: Use electrical metallic tubing.

.4 Use liquid tight flexible metal conduit below raised floors for connections to all devices.

.5 Aluminium conduit may be used, in lieu of steel conduit, in clean and dry locations, but shall not be used in poured concrete, or for signal and intercommunication systems wiring.

.6 Raceways installed less than 2 m above grade in an area where they are subject to mechanical damage, shall be of the rigid steel type or protected by a steel guard of not less than no. 10 MSG, adequately secured in place.

.7 Use epoxy coated conduit in corrosive areas.

.7 Equipment in sprinklered spaces:

.1 Provide CSA certified sealing rings for rigid steel galvanized conduit and CSA certified raintight connectors for steel galvanized electrical metallic tubing (EMT) where conduits enter the top or the sides of enclosures.

.5 Arrangement and supports:

.1 Arrange supports to prevent misalignment during wiring installation.

.2 Arrange conduit to maintain headroom and present neat appearance.

.3 Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

.4 Group related conduits; support using conduit rack.

.5 Construct rack using steel channel; provide space on each for 25 per cent additional conduits.

.6 Fasten conduit supports to building structure and surfaces to Section 26 05 29.

.7 Do not support conduit with wire or perforated pipe straps.

.8 Remove wire used for temporary supports.

.9 Do not attach conduit to ceiling support wires.

.10 Route exposed conduit parallel and perpendicular to walls.

.11 Route conduit installed above accessible ceilings parallel and perpendicular to walls.

.12 Route conduit in and under slab from point-to-point.

.13 In damp and unheated areas, avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

.14 Provide suitable fittings to accommodate expansion and deflection where conduit crosses expansion joints.

.6 Clearances:

.1 Maintain adequate clearance between conduit and piping.

.2 Maintain 300 mm (12 inch) clearance between conduit and surfaces with temperatures exceeding 40 degrees C.

.7 Conduit bends:

.1 Install no more than equivalent of three 90 degree bends between boxes.

.1 Use conduit bodies to make sharp changes in direction, as around beams.

.2 Use hydraulic one-shot bender to fabricate bends in metal conduit larger than 50 mm size or provide prefabricated conduit bends.

.8 Install wall entrance seals where conduits pass through exterior walls below grade.

.9 Provide expansion coupling in conduit runs at building expansion joints and in long runs subject to thermal expansion, all in accordance with manufacturer recommendations.

.10 Cut conduit square using saw or pipe cutter; de-burr cut ends.

.11 Bring conduit to shoulder of fittings; fasten securely.

.12 Use suitable caps to protect installed conduit against entrance of dirt and moisture.

.13 Use conduit hubs or sealing locknuts to fasten conduit and to cast boxes.

.14 Provide suitable pull string in each empty conduit except sleeves and nipples.

.15 Ground and bond conduit to Section 26 05 26.

.16 Identify conduit to Section 26 05 53.

.17 Flexible conduit and armoured cable will be accepted for a maximum length of 1500 mm for final connection to lighting fixtures. Do not connect from fixture to fixture.

3.03 CLEANING

.1 Conduit manufacturer's touch-up enamel shall be used to repair all scratches and gouges on epoxy-coated conduit.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Wall and ceiling outlet boxes.

.2 Pull and junction boxes.

1.02 RELATED REQUIREMENTS

.1 Section 26 09 23 – Lighting Control Devices.

.2 Section 26 27 16 – Electrical Cabinets and Enclosures.

.3 Section 26 27 26 – Wiring Devices: Wall plates in finished areas, floor box service fittings, fire-rated poke-through fittings, and access floor boxes.

.4 Section 26 27 26.13 – Floor Box Assemblies.

1.03 REFERENCES

.1 CSA Group:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CSA C22.2 No. 18.1:13 (R2022), Metallic outlet boxes.

.4 CSA C22.2 No. 18.1-13 (R2022) – Metallic Outlet Boxes (Tri-national standard, with UL 514A and ANCE NMX-J-023/1).

.5 CSA C22.2 No. 40-17 - Junction and Pull Boxes.

.6 CSA C22.2 No. 85-14 (R2018) – Rigid PVC Boxes and Fittings.

1.04 CLOSEOUT SUBMITTALS

.1 Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.05 REGULATORY REQUIREMENTS

.1 Provide products listed and classified by CSA (Canadian Standards Association) as suitable for the purpose specified and indicated.

2 Products

2.01 OUTLET BOXES

.1 Sheet Metal Outlet Boxes: CSA C22.2 No. 18.1, galvanized steel.

.1 Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 13 mm male fixture studs where required.

.2 Concrete Ceiling Boxes: Concrete type.

.2 Non-metallic Outlet Boxes: CSA C22.2 No. 18.1.

.3 Cast Boxes: CSA C22.2 No. 18.1, Type FD, aluminum. Provide gasketed cover by box manufacturer. Provide threaded hubs.

.4 Wall Plates for Finished Areas: As specified in Section 26 27 26.

2.02 PULL BOXES AND JUNCTION BOXES

.1 Sheet Metal Boxes: CSA C22.2 No. 18.1, galvanized steel.

.2 Hinged Enclosures: As specified in Section 26 27 16.

.3 Surface Mounted Cast Metal Box: CSA C22.2 No. 18.1, Type 4; flat-flanged, surface mounted junction box:

.1 Material: Cast aluminum.

.2 Cover: Provide with ground flange, neoprene gasket, and stainless steel cover screws.

2.03 OUTLET BOXES

.1 Conform to CSA C22.2 No. 18.1.

.2 Where 103 mm (4 inch) square outlet boxes are installed in exposed concrete or cinder block finished areas, blocks will be cut as described in Division 04 as instructed under this Section. Cut openings to provide a close fit to boxes and covers so that edges of openings are not visible after installation of plates. Use of mortar to patch up openings that are cut too large or to patch ragged edges is not permitted.

.3 Ceiling boxes: 103 mm (4 inch) octagon or square, complete with fittings, where required to support fixtures.

.4 Switch and receptacle boxes:

.1 103 mm (4 inch) square with plaster ring, where flush mounted in plaster walls.

.2 Iberville 1104 series box, or equal, where flush mounted in wood or drywall, with stud fasteners as required.

.3 Masonry boxes in masonry walls.

.5 Where boxes are surface mounted in unfinished areas they shall be FS conduits.

.6 Standard outlet boxes manufactured from code gauge galvanized steel.

.7 Provide a suitable outlet box for each light, switch, receptacle, or other outlet, approved for the area it is to be installed.

.8 Support outlet boxes independently of conduit and cable.

.9 Locate outlet boxes, mounted in hung ceiling space, so they do not obstruct or interfere with the removal of lay-in ceiling tiles.

.10 Offset outlet boxes, shown back to back in partitions, horizontally a minimum 150 mm (6 inch) to minimize noise transmission between adjacent rooms.

.11 Use gang boxes at locations where more than one device, of the same system only, is to be mounted. Utilize separate boxes for each system.

.12 Use tile wall covers where 103 mm (4 inch) square outlet boxes are installed in exposed concrete or cinder block in finished areas.

.13 Provide flush mount boxes, panels, cabinets, and electrical devices, which are installed in finished areas, with suitable flush trims and doors or covers, unless specifically noted otherwise.

.14 Provide pre-formed polyethylene vapour barriers for all boxes located in walls with internal vapour barriers.

3 Execution

3.01 EXAMINATION

.1 Verify locations of floor boxes prior to rough-in.

3.02 INSTALLATION

.1 Install boxes to CSA C22.1.

.2 Install in locations as shown on drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

.3 Set wall mounted boxes at elevations to accommodate mounting heights indicated.

.4 Electrical boxes are shown on drawings in approximate locations unless dimensioned. Adjust box location up to 3 m (10 feet) if required to accommodate intended purpose.

.5 Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.

.6 Maintain headroom and present neat mechanical appearance.

.7 Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

.8 Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 150 mm (6 inch) from ceiling access panel or from removable recessed luminaire.

.9 Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods.

.10 Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

.11 Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.

.12 Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

.13 Use flush mounting outlet box in finished areas.

.14 Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

.15 Do not install flush mounting box back-to-back in walls; provide minimum 150 mm (6”) separation. Provide minimum 600 mm (24”) separation in acoustic rated walls.

.16 Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

.17 Use stamped steel bridges to fasten flush mounting outlet box between studs.

.18 Install flush mounting box without damaging wall insulation or reducing its effectiveness.

.19 Use adjustable steel channel fasteners for hung ceiling outlet box.

.20 Do not fasten boxes to ceiling support wires.

.21 Support boxes independently of conduit.

.22 Use gang box where more than one device is mounted together. Do not use sectional box.

.23 Use gang box with plaster ring for single device outlets.

.24 Use cast outlet box in exterior locations exposed to the weather.

.25 Use cast outlet box in wet locations.

.26 Set floor boxes level.

.27 Large pull boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

3.03 ADJUSTING

.1 Adjust floor box flush with finish flooring material.

.2 Adjust flush-mounting outlets to make front flush with finished wall material.

.3 Install knockout closures in unused box openings.

3.04 CLEANING

.1 Clean interior of boxes to remove dust, debris, and other material.

.2 Clean exposed surfaces and restore finish.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Metal Raceway is an enclosed pathway used for surface distribution of branch circuit electrical wiring, and cabling for voice, data, multi-media, low voltage, and optical fiber. Raceway is typically installed in existing building structures, or after construction is complete. A complete raceway system includes raceway, covers, mounting hardware, various fittings, and outlet boxes installed at specific locations. Specific codes and standards apply to electrical wires and telecommunications cables that are deployed within metal raceway. Compliance to codes and standards is required for installation, grounding and bonding, and cable deployment.

1.02 RELATED REQUIREMENTS

.1 Section 26 05 33.13 – Conduit for Electrical Systems.

.2 Section 26 05 33.16 – Boxes for Electrical Systems.

1.03 QUALITY ASSURANCE

.1 Product free from defects in material or workmanship.

.2 Materials and work specified in this document shall comply with, and are not limited to the codes, standards, and regulations listed below.

.1 CSA C22.1 - Canadian Electrical Code, Part I, Safety Standard for Electrical Installations.

.2 National Electrical Manufacturer's Association (NEMA)

.1 ANSI/NEMA WD-6-2002: Wiring Devices – Dimensional Requirements

.2 NEMA 250-2003: Enclosures for Electrical Equipment.

.3 Performance Requirements:

.1 Metal raceway and fittings UL Listed and CSA certified.

1.04 SUBMITTALS

.1 Product Data Sheet.

.2 Manufacturer's Instructions.

.3 Product Catalog Literature.

.4 Product Drawings.

1.05 WARRANTY

.1 Product is warranted free of defects in material or workmanship.

.2 Product is warranted to perform the intended function within design limits.

2 Products

2.01 MANUFACTURERS

.1 Wiremold Legrand.

.2 Hubbell.

.3 Thomas & Betts Canada.

2.02 SURFACE MOUNTED RACEWAY, GENERAL

.1 The raceway and all system components must be UL Listed and exhibit non-flammable self-extinguishing characteristics tested to comparable specifications of UL94V-0. The raceway base and cover shall be manufactured by rigid compound, available in ivory or white colours, and allow for field painting.

2.03 SINGLE CHANNEL METAL RACEWAY

.1 Raceway:

.1 Metal raceway shall be a one-piece design with base and cover, factory assembled, with mounting hardware and instructions included.

.2 Metal raceway, cover, surface boxes, shall be a formed steel construction with a thickness of 0.040”, and zinc plated. Related fittings shall be galvanized on all surfaces.

.3 Metal raceway, cover, and related fittings shall have an Ivory colour powder coat paint finish on all external surfaces.

.4 Have tools available for field cutting and bending.

.5 Assembly and disassembly of raceway base, cover, and fittings requiring no special tools.

.6 Available fittings including couplings, internal and external elbows, tees, entrance fittings, conduit adapters and bushings.

.7 Available fittings including internal, external and flat elbows, and tee fitting, with a 1-½” radius to accommodate communications UTP and fiber cabling minimum bend radius requirements.

.8 Installed fittings designed to overlap the raceway to cover exposed or uneven edges from field cutting.

.2 Device Boxes

.1 Compatible device boxes shall have a removable knockout portion to permit metal raceway entry and exit.

.2 Device boxes available in standard NEMA single- and double-gang, and multiple gang up to six-gang. Device box depth shall range from 1.125” to 2.75”.

.3 Device boxes shall have a single seam construction with rounded corners to eliminate sharp edges.

.4 Assembled device box front face design to permit flush mounting of standard wall plates to minimize perimeter profile exposure.

.5 Device boxes shall have threaded standoff posts attached to the base, to facilitate mounting of covers with short screws for ease of alignment during installation.

.3 Basis of Design: Wiremold 500 and 700 series.

3 Execution

3.01 PREPARATION

.1 Submit layout drawings of the raceway system for reviewed prior to installation.

.2 Installation of metal raceway in wet areas is not permitted.

.3 Manufacturer's instructions for installing raceway and fittings shall be followed by the installer.

.4 All wall surfaces, or other permanent structures to which raceway is mounted shall be finished complete.

3.02 INSTALLATION

.1 Mount base and cover together to wall or structure using the appropriate fasteners and clips, per manufacturer's instructions.

.2 Securely support raceway in intervals not exceeding 3 m (10 feet) or per manufacturer's instructions.

.3 Install fittings and device boxes in the specified locations, per manufacturer's instructions and per contract drawing specifications.

.4 Completed raceway installation shall be mechanically continuous and connected to all electrical outlets, device boxes, and enclosures with no gaps or exposed cuts.

.5 Provide insulated ground wire for power raceways per OESC requirements. Raceway shall not be used as the primary ground path.

.6 Prior to wire and cable installation, the raceway system shall be installed complete, including insulating bushings, adapters, fittings, outlets, boxes, and enclosures. Unused raceway openings shall be closed.

.7 Make wiring connections with the proper approved insulated wire connectors or lugs. Exposed conductors at harness wiring junctions are not permitted regardless of connection method.

.8 Provide a physical barrier in raceway and boxes to separate power and communication wiring.

.9 Install covers on raceway, boxes and fittings after wiring is complete, or if wire and cable installation is to be done at a later date.

3.03 FIELD QUALITY CONTROL

.1 Verify layout of system to contract drawings.

.2 Raceway system shall be free of dents, scratches, bare metal edges, and exposed uneven cuts.

.3 Securely fasten all outlets, boxes, and enclosures walls or permanent structures.

.4 Verify that all wiring junctions or connections have no exposed conductors prior to energizing the circuits.

.5 Verify that all bonding locations are code and standards compliant.

.6 Verify that power and communications wiring are separated by a physical barrier in raceway and boxes.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Sleeves, sealing of sleeves and openings, as required for all electrical work.

1.02 SUBMITTALS

.1 Submit data sheets for firestopping in accordance with Section 01 33 00.

.2 Submit copies of firestopping drawings with ULC certificate and system number for each specific installation.

.3 Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance ratings.

.4 Submit dimensioned location drawings indicating required sleeves and formed openings in structural poured concrete or precast concrete construction or in roofing, and locations of cutting or drilling required for Electrical work.

2 Products

2.01 SLEEVES

.1 Galvanized steel sleeves:

.1 No. 24 gauge with an integral flange at one (1) end to secure sleeve to formwork construction.

.2 Schedule 40 pipe.

.2 Schedule 40 PVC sleeves.

2.02 SLEEVE SEALS

.1 Manufacturers

.1 Hilti Canada.

.2 Specified Technologies Inc.

.3 3M Canada Inc.

.4 Tremco.

.5 A/D Fire Protection Systems.

.6 Nelson.

.2 Asbestos-free, elastomeric materials and intumescent materials, tested, listed, and labelled by ULC in accordance with CAN/ULC-S115, and CAN/ULC-S101 for installation in ULC designated firestopping, and smoke seal systems to provide a positive fire, water and smoke seal and a fire resistance rating (flame, hose stream and temperature) no less than fire rating for surrounding construction.

.3 Materials are to be compatible with abutting dissimilar materials and finishes and complete with primers, damming and back-up materials, supports, and anchoring devices in accordance with firestopping manufacturer's recommendations and ULC tested assembly. Coordinate material requirements with trades supplying abutting areas of materials.

.4 Maintain fire rating of separation in accordance with architectural drawings.

3 Execution

3.01 INSTALLATION

.1 Where conduits and conductors pass through structural poured concrete, provide sleeves of type suitable for application, and approved by local governing codes.

.2 Sleeves in concrete slabs, except as noted below, are to be No. 24 gauge or equivalent, with an integral flange to secure sleeves for formwork construction.

.3 Sleeves in waterproof concrete slabs and in other slabs where waterproof sleeves are required are to be lengths of Schedule 40 pipe sized to extend 100 mm (4") above floor.

.4 Sleeves in poured concrete walls and foundation are to be Schedule 40 pipe.

.5 Through interior walls, use standard weight steel pipes, conduit, or galvanized steel. Cut flush with finished surfaces. Check room finish schedules.

.6 Through exterior walls above grade, floors, and roof use standard weight steel pipes, machine cut, flush with finished surface inside and to suit flashing outside.

.7 Through exterior walls below grade, water-proofed floors, and other water-proof walls, use heavy weight cast iron pipes, machine cut. Extend sleeves 100 mm (4") above finished floors, and cut flush with underside of floor.

.8 Size sleeves, unless otherwise noted, to leave 13 mm (1/2") clearance around conduit, duct, conductor, etc. Void between sleeves and conduit, duct, conductors, etc., to be packed and sealed for length of sleeves as in accordance with article entitled “Sleeve Seals” specified in this Section. Pack and seal sleeves set in exterior walls with governing authority approved materials suitable for application and pack both ends of sleeves watertight with approved permanently flexible and water tight materials. Coordinate exact responsibility of work with General Trades Contractor.

.9 Submit to concrete reinforcement detailer at proper time, drawings indicating required sleeves, recesses and formed openings in poured concrete work. Completely and accurately dimension such drawings and relate sleeves, recesses and formed openings to suitable grid lines and elevation datum.

.10 Supply sleeves of a water protecting type in accordance with detail found on drawings for installation in following locations:

.1 in Mechanical and Fan Room floor slabs, except where on grade;

.2 in slabs over Mechanical, Fan, Electrical and Telephone Equipment Rooms or closets;

.3 in floors equipped with waterproof membranes.

.11 "Gang" type sleeving to be permitted only with approval of Owner and reviewed with the Consultant.

.12 Terminate sleeves for work which is exposed, so that sleeve is flush at both ends with wall, partition, or slab surface such that sleeve may be covered completely by escutcheon plates.

.13 Sleeves are not required in interior walls and dry area floors where conduit is installed ahead of floor construction.

.14 Seal all openings and sleeves after installation of equipment:

.1 With an approved material to maintain fire rating where sleeves and openings pass through fire separations and floors.

.2 With an approved material to maintain fire rating for sleeves and openings provided for future equipment.

.3 Flash all conduits and systems passing through roof or built into an outside wall, or a waterproof floor.

.4 Provide copper flashing for sleeves passing through exterior walls or waterproof floors.

.15 Provide all flashing and waterproofing for sleeves through roof and exterior walls to the requirements of Division 07.

.16 Firestop sleeves in accordance with the manufacturer's specifications and recommendations.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Tested firestop systems used in penetrations for the passage of cables, conduit, and other electrical equipment through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

1.02 RELATED REQUIREMENTS

.1 Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:

.1 Section 07 84 00 – Firestopping.

.2 Section 27 05 44 – Sleeves and Sleeve Seals for Communications Pathways and Cabling.

1.03 REFERENCES

.1 Underwriter's Laboratories (UL) and Underwriters Laboratories of Canada (ULC):

.1 Test Requirements: CAN/ULC-S115:2018, Standard Method of Fire Tests of Firestop Systems.

.2 Underwriters Laboratories of Canada (ULC) runs CAN/ULC-S115:2018 under their designation of ULC-S115:2018 and publishes the results in their "FIRE RESISTANCE RATINGS DIRECTORY" that is updated annually.

.3 Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually. UL tests that meet the requirements of ULC-S115-M are given a cUL listing and are published by UL in their "Products Certified for Canada (cUL) Directory.

.4 CAN/ULC-S102:2018, Standard Test Method for Surface Burning Characteristics of Building Materials and CAN/ULC-S101 Fire Endurance Tests of Building Construction and Materials.

.2 ASTM:

.1 Omega Point Laboratories runs ASTM E-814 and publishes the results annually in their "Omega Point Laboratories Directory".

.2 Inspection Requirements: ASTM E 2174, "Standard Practice for On-site Inspection of Installed Fire Stops.", and ASTM E2393 Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.

.3 Test Requirements: ASTM E 2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus".

.4 ASTM D6904, "Standard Practice for Resistance to Wind Driven Rain for Exterior Coatings Applied on Masonry".

.5 ASTM C 679, "Standard Test Method for Tack-Free Time of Elastomeric Sealants".

.3 International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments.

.4 Ontario Building Code.

.5 Ontario Electrical Safety Code.

1.04 DEFINITIONS

.1 Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.05 SUBMITTALS

.1 Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of ULC or cUL firestop systems to be used and manufacturer's installation instructions to comply with Section 01 33 00.

.2 Manufacturer's engineering judgment identification number and drawing details when no ULC or cUL system is available for an application. Engineered judgment must include both project name and contractor’s name who will install firestop system as described in drawing.

.3 Submit material safety data sheets provided with product delivered to project site.

.4 Submit shop drawings in accordance with Section 01 33 00:

.1 Submit complete cUL, ULC, or equivalent approved systems for all applications. Ensure the listing is clearly noted on the submittal.

1.06 CLOSEOUT SUBMITTALS

.1 On completion of firestopping and smoke sealing installation, submit a Letter of Assurance to the Consultant certifying the firestopping and smoke sealing installation has been carried out throughout the building to electrical service penetrations and that installation has been done in strict accordance with requirements of the Ontario Building Code, any applicable municipal bylaws, ULC requirements, and manufacturer’s instructions.

1.07 QUALITY ASSURANCE

.1 Fire-Test-Response Characteristics: Provide through-penetration fire stop systems and fire-resistive joint systems that comply with specified requirements of tested systems.

.2 Firestop System installation must meet requirements of CAN/ULC-S115 tested assemblies that provide a fire rating as shown in Section 2.1 Clauses 4, 5, 6, and 7 below.

.3 Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

.4 Firestop Systems do not re-establish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

.5 For those firestop applications that exist for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Firestop Council.

1.08 INSTALLER QUALIFICATIONS

.1 Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary training to install manufacture’s products per specified requirements. A supplier’s willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

.2 Installation Responsibility: assign installation of through-penetration fire stop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor.

.3 The work is to be installed by a contractor with at least one of the following qualifications:

.1 FM 4991 approved contractor.

.2 UL approved contractor.

.3 Manufacturer’s accredited fire stop specialty contractor.

.4 Installer: Minimum 3 years experience with fire stop installation.

1.09 DELIVERY, STORAGE, AND HANDLING

.1 Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and ULC or cUL label where applicable.

.2 Coordinate delivery of materials with scheduled installation date to allow minimum storage time at project site.

.3 Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

.4 Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

.5 Do not use damaged or expired materials.

1.10 PROJECT CONDITIONS

.1 Do not use materials that contain flammable solvents.

.2 Scheduling

.1 Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.

.2 Schedule installation of Drop-In firestop devices after placement of concrete but before installation of the pipe penetration. Diameter of sleeved or cored hole to match the listed system for the device.

.3 Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

.3 Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

.4 Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

.5 During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

2 Products

2.01 PERFORMANCE REQUIREMENTS

.1 Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

.2 Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

.3 Provide a round fire-rated cable management device whenever cables penetrate fire rated walls, where frequent cable changes and additions may occur. The fire-rated cable management device shall consist of a corrugated steel tube with zinc coating, contain an inner plastic housing, intumescent material rings, and inner fabric smoke seal membrane. The length of the sleeve shall be 315 mm (12.4 inches). The fire-rated cable management device shall contain integrated intumescent firestop wrap strip materials sufficient to maintain the hourly rating of the barrier being penetrated. The fire-rated cable management device shall contain a smoke seal fabric membrane or intumescent firestop plugs sufficient to achieve the L-Rating requirements of the barrier type. Install device per the manufacturer's published installation instructions.

.4 Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with CAN/ULC-S115. For penetrations through a Fire Wall or horizontal Fire Separation provide a firestop system with a "FT" Rating as determined by ULC or cUL which is equal to the fire resistance rating of the construction being penetrated.

.5 W-ratings: in accordance with Section 07 84 00.

.6 Provide a firestop system with an Assembly Rating as determined by CAN/ULC-S115 which is equal to the time rating of construction joint assembly.

.7 Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with CAN/ULC-S115.

.1 L-Rating: Not exceeding 5.0 CFM/sqft of penetration opening at both ambient and elevated temperatures.

.8 Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of [0] as determined by ASTM G21.

.9 Rain and water resistance: provide perimeter joint sealant tested in accordance with ASTM D 6904 with less than 1 hour tack free time as tested in accordance with ASTM C 679.

2.02 MANUFACTURERS

.1 Manufacturer List:

.1 AD Fire Protection Systems.

.2 Hilti (Canada) Corporation

.3 3M.

.4 Specified Technologies, Inc. (STI).

.5 Tremco, Inc.

.2 Substitutions: Where a specific manufacturer is noted in this Section, equivalent products from the manufacturers listed above may be used, subject to compliance with through penetration firestop systems and joint systems listed in the ULC Fire Resistance Directory – Volume III, or UL Products Certified for Canada (cUL) Directory.

2.03 MATERIALS

.1 Use only firestop products that have been ULC or cUL tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

.2 Accessories: provide components for each firestopping and smoke seal systems that are needed to install fill materials. Use only components specified by firestopping material manufacturer, and approved by the qualified testing agency. Accessories include, but are not limited to, the following items:

.1 Permanent forming, damming, and backing material.

.2 Temporary forming material.

.3 Pre-formed firestop devices for use with non-combustible and combustible pipes (closed and open systems), conduit and/or cable bundles penetrating concrete floors and/or gypsum walls:

.1 Hilti Tub Box Kit (CP 681) for use with tub installations.

.2 Hilti Cast-In Place Firestop Device (CP 680-PX) for use with XFR pipe.

.3 Hilti Cast-In Place Firestop Device (CP 680-M) for use with non-combustible penetrants.

.4 Hilti Speed Sleeve (CP 653) for use with cable penetrations.

.5 Hilti Firestop Drop-In Device (CFS-DID) for use with non-combustible and combustible penetrants.

.6 Hilti Cast-in Firestop sleeve (CFS-CID MD P) and (CFS-CID MD M) for use with combustible and non-combustible pipes through metal deck.

.7 Hilti Firestop Block (CFS-BL).

.8 STI SpecSeal series SSC Firestop Collars.

.9 STI SpecSeal series LCC Firestop Collars.

.4 Sealants or caulking materials for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT).

.1 Hilti Intumescent Firestop Sealant (FS-ONE MAX).

.2 Hilti Fire Foam (CP 620)/CP 660.

.3 Hilti Flexible Firestop Sealant (CP 606).

.4 Hilti Firestop Silicone Sealant Gun Grade (CFS-S SIL GG).

.5 Hilti Firestop Silicone Sealant Self Leveling (CFS-S SIL SL).

.5 Intumescent sealants or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe.

.1 Hilti Intumescent Firestop Sealant (FS-ONE MAX).

.6 Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles.

.1 Hilti Intumescent Firestop Sealant (FS-ONE MAX).

.2 Hilti Fire Foam (CP 620)/660.

.3 Hilti Flexible Firestop Sealant (CP 606).

.4 Hilti Firestop Silicone Sealant Gun Grade (CFS-S SIL GG).

.5 Hilti Firestop Silicone Sealant Self Leveling (CFS-S SIL SL).

.7 Firestop Putty Pads: Intumescent, non-hardening putty pads to be installed on metallic and non-metallic electrical switch and receptacle boxes to reduce horizontal separation between boxes to less than 610 mm (24 in):

.1 STI SpecSeal Series SSP Firestop Putty Pads.

.2 Hilti Firestop Putty Pad (CP 617).

.8 Materials used for large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways.

.1 Hilti Firestop Block (CFS-BL).

.2 Hilti Composite Sheet (CFS-COS).

.3 Hilti Firestop Mortar (CP 637).

.4 Hilti Fire Foam (CP 620)/660.

.5 Hilti Firestop Board (CP 675T).

.9 Non-curing, re-penetrable materials used for large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways.

.1 Hilti Firestop Block (CFS-BL).

.2 Hilti Firestop Board (CP 675T).

.10 Re-penetrable, round cable management devices for use with new or existing cable bundles penetrating gypsum or masonry walls.

.1 Hilti Speed Sleeve (CP 653) with integrated smoke seal fabric membrane.

.2 Hilti Firestop Cable Collar (CFS-CC).

.3 Hilti Firestop Sleeve (CFS-SL SK).

.4 Hilti Retrofit Sleeve (CFS-SL RK) for use with existing cable bundles.

.5 Hilti Gangplate (CFS-SL GP) for use with multiple cable management devices.

.6 Hilti Gangplate Cap (CFS-SL GP CAP) for use at blank openings in gangplate for future penetrations.

.11 For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected.

.1 Hilti CFS-BL Firestop Block (for walls and floors).

.2 Hilti CFS-PL Firestop Plug (for walls and floors).

.12 Cast-In-Place Firestop Device: Single component molded firestop device installed on forms prior to concrete placement with totally encapsulated, tamper-proof integral firestop system and smoke sealing gasket. Device shall allow for a concrete floor thickness of minimum 63 mm (2-1/2 in) up to 914 mm (36 in) without the use of field applied extension tubing:

.1 STI SpecSeal CID Cast-In Firestop Device.

.2 Hilti CP 680 Cast-In Place Firestop Device (for floors only).

.13 For single or cable bundles up to one inch diameter penetrating gypsum, masonry, concrete walls or wood floor assemblies.

.1 Hilti CFS-D Firestop Cable Disc.

3 Execution

3.01 INSTALLERS

.1 Labour Use to Install Firestop Systems

.1 To ensure complete harmony on the project site, the installation of each scope of work is to be performed jurisdictionally correct per existing trade agreements.

3.02 PREPARATION

.1 Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

.1 Verify penetrations are properly sized and in suitable condition for application of materials.

.2 Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

.3 Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

.4 Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

.5 Do not proceed until unsatisfactory conditions have been corrected.

3.03 COORDINATION

.1 Coordinate construction of openings, penetrations to ensure that the fire stop systems are installed according to specified requirements.

.2 Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems.

.3 Coordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.

.4 Do not cover up through-penetration fire stop and joint system installations that will become concealed behind other construction until each installation has been examined by the building inspector.

3.04 INSTALLATION

.1 Regulatory Requirements: Install firestop materials in accordance with ULC Fire Resistance Directory or UL Products Certified for Canada (cUL) Directory or Omega Point Laboratories Directory.

.2 Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.

.1 Seal all holes or voids made by penetrations to ensure an air and water-resistant seal.

.2 Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of ULC or cUL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

.3 Protect materials from damage on surfaces subjected to traffic.

3.05 FIELD QUALITY CONTROL

.1 Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

.2 Keep areas of work accessible until inspection by applicable code authorities.

.3 Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, “Standard Practice for On-Site Inspection of Installed Fire Stops”, or other recognized standard.

.4 Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

.5 Manufacturer’s Field Services: During Installation, provide periodic destructive testing inspections to assure proper installation/application. After installation is complete, submit findings in writing indicating whether or not the installation of the tested system identified was installed correctly.

3.06 IDENTIFICATION AND DOCUMENTATION

.1 The firestop contractor is to supply documentation for each single application addressed. This documentation is to identify each penetration location on the entire project.

.2 The Documentation Form for through penetrations is to include:

.1 A Sequential Location Number.

.2 The Project Name.

.3 Date of Installation.

.4 Detailed description of the penetration location.

.5 Tested System or Engineered Judgment Number.

.6 Type of assembly penetrated.

.7 A detailed description of the size and type of penetrating item.

.8 Size of opening.

.9 Number of sides of assemblies addressed.

.10 Hourly rating to be achieved.

.11 Installer’s Name.

.3 Copies of these documents are to be provided to the general contractor at the completion of the project.

.4 Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

.1 The words: "Warning-Through Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage."

.2 Contractor's Name, address, and phone number.

.3 Through-Penetration firestop system designation of applicable testing and inspecting agency.

.4 Date of Installation.

.5 Through-Penetration firestop system manufacturer's name.

.6 Installer's Name.

3.07 ADJUSTING AND CLEANING

.1 Remove equipment, materials, and debris, leaving area in undamaged, clean condition.

.2 Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Nameplates and labels.

.2 Wire and cable markers.

.3 Conduit markers.

.4 Receptacle labels.

.5 Signage.

1.02 RELATED REQUIREMENTS

.1 Section 09 91 00 – Painting.

.2 Section 27 05 53 – Identification for Communications Systems.

1.03 SUBMITTALS

.1 Product Data: Provide catalogue data for nameplates, labels, and markers.

.2 Provide shop drawings of nameplates for Consultant’s review prior to fabrication (scale 1:1).

.3 Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.04 REGULATORY REQUIREMENTS

.1 Provide products listed and classified by CSA Group as suitable for the purpose specified and indicated.

2 Products

2.01 NAMEPLATES AND LABELS

.1 Nameplates:

.1 Engraved three-layer laminated plastic, letters on contrasting background.

.2 Colours to match existing building system, where applicable. If no building system exists, use the following:

.1 347/600 Volt system: White text on Blue background.

.2 120/208 Volt system: Black text on White background.

.3 Fire Detection system: White text on Red background.

.4 Emergency Lighting system: Red text on White background.

.5 LV systems: White text on Green background.

.6 120/208 Volt Uninterruptable Power Supply (UPS): White text on Orange background.

.3 Confirm colours with the Consultant prior to ordering nameplates.

.2 Equipment Nameplates to indicate:

.1 Equipment/Panelboard ID

.2 Ampacity.

.3 Voltage

.4 Number of Phases

.5 Number of wires in system

.6 Interrupting Capacity

.7 Size, number of poles, Panelboard ID, and circuit number of upstream overcurrent protection device.

.1 Location of upstream device if not in the same room.

.3 Locations:

.1 Distribution panelboards, and individual distribution panelboard branch breakers.

.2 Receptacle panelboards.

.3 Each electrical distribution and control equipment enclosure.

.4 Uninterruptible Power Supply.

.5 Mechanical Equipment.

.6 UPS receptacles.

.7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.8 Terminal cabinets, junction boxes, and pull boxes: indicate system and voltage.

.9 Transformers: indicate capacity, primary and secondary voltages.

.4 Letter Size:

.1 Use 3 mm letters for identifying individual equipment and loads.

.2 Use 6 mm letters for identifying grouped equipment and loads.

.5 Labels:

.1 Mechanically fastened with sheet metal screws, with 5 mm white letters on black background.

.2 White letters on red background for UPS and equipment, and devices downstream of UPS.

.3 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.4 Wording on nameplates and labels to be reviewed by the Consultant prior to manufacturing.

.5 Allow for minimum of twenty-five (25) letters per nameplate and label.

.6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

2.02 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

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

2.03 WIRE MARKERS

.1 Description: tape, split sleeve, or tubing type wire markers.

.2 Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes and each load connection.

.3 Legend:

.1 Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

.2 Control Circuits: Control wire number indicated on shop drawings.

2.04 CONDUIT AND BOX MARKERS

.1 Colour code conduits, boxes, and metallic sheathed cables.

.2 Location: Provide markers for each conduit longer than 2 m.

.3 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.4 Colours to match equipment nameplate background colour:

.1 347/600 Volt system: Blue.

.2 120/208 Volt system: Black.

.3 Fire Alarm system: Red.

.4 Emergency Lighting system: Red/White.

.5 LV Systems (EPO, Remote Monitoring, Generator Control, Communications): Green.

.6 120/208 Volt Uninterruptable Power Supply (UPS): Orange

.5 Confirm colours with the Consultant prior to commencing rough-in.

2.05 JUNCTION AND PULL BOXES

.1 Clearly identify main pull or junction boxes (excluding obvious outlet boxes) by painting outside of covers.

.2 Spray painting: not permitted.

.3 Paint colours to be in accordance with following schedule:

.1 Lighting: yellow.

.2 Normal power: blue.

.3 Fire alarm: red.

.4 Communications systems including telephone and data: green.

.5 Miscellaneous signals: brown.

.4 In addition to painting miscellaneous signal boxes, clearly identify specific system in which box is installed. Identify source panelboard for power circuits.

2.06 BRANCH BREAKER LABELS

.1 General:

.1 Legibly identify every circuit and circuit modification as to its clear, evident, and specific purpose or use. Include sufficient detail to allow each circuit to be distinguished from all others.

.2 Label spare positions that contain unused overcurrent devices or switches.

.3 Do not describe any circuit in a manner that depends on transient conditions of occupancy.

.2 Switchboards, distribution panelboards, enclosed breakers, and disconnect switches:

.1 Locate identification at each switch.

.2 Branch breaker nameplates on switchboards, distribution panelboards and switchboards, and generator load breakers to indicate:

.1 Locate identification at each switch on a switchboard.

.2 Identification of downstream equipment fed from the breaker.

.1 Location of downstream device if not in the same room.

.3 Breaker size and number of poles.

.4 Interrupting Capacity.

.5 Circuit number (where applicable).

.6 Do not describe any circuit in a manner that depends on transient conditions of occupancy.

.3 Lighting and Receptacle Panelboards:

.1 Provide a circuit directory that is located on the face or inside of the panel door.

.2 Do not describe any circuit in a manner that depends on transient conditions of occupancy.

2.07 RECEPTACLE LABELS

.1 Label all receptacles with the panelboard ID and circuit number.

.2 Use receptacle labels by electronic labeller Brother P-Touch, model PT-20/25, Dymo-Tape or approved equal.

.3 Location: On receptacle wall plate.

3 Execution

3.01 EQUIPMENT NAMEPLATES FROM MANUFACTURERS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

.2 Manufacturers' nameplates and CSA labels are to be visible and legible after equipment is installed. Provide warning signs, as specified, or to meet requirements of Inspection Department, Health and Safety, and the Consultant.

.3 Label power outlets with circuit identification on visible portion of faceplate or surface mounted outlet box.

3.02 CONDUIT AND BOX IDENTIFICATION

.1 Locate labels as follows:

.1 At every end of every conduit, duct, or cable run, adjacent to item of equipment serviced.

.2 On each exposed conduit, duct or cable passing through a wall, partition, or floor (one on each side of such wall partition or floor).

.3 At intervals of 15 m (50'-0") along every exposed conduit, duct or cable run exceeding 15 m (50 feet) in length.

.4 At every access point on concealed conduit duct or cable.

.5 At each junction box.

.2 Place labels so as to be visible from 1500 mm (5'-0") above adjacent floor platform.

3.03 PREPARATION

.1 Degrease and clean surfaces to receive nameplates and labels.

3.04 APPLICATION

.1 Confirm colours prior to start of work.

.2 Install nameplate and label parallel to equipment lines.

.3 Secure nameplate to equipment front using adhesive.

.4 Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

.5 Identify conduit using field painting.

.6 Paint coloured band on each conduit longer than 2 m.

.7 Paint bands 6 m on centre.

3.05 LABELLING

.1 Colour code wiring consistently throughout the installation and generally match colour coding of internal wiring of pre-wired components.

.2 Label wiring with point name using Thomas & Betts 12 character polestar metalized labels with 3 rows of characters per label, or equal by Brady. Label to occur as a minimum at both ends and at pull boxes of the wiring run.

.3 Identify all pull boxes, junction boxes, etc. (installed as part of this project or used by this project) with the exact use of the box. Indelible felt pen marker is acceptable.

.4 Label light control items with point name using Thomas & Betts 12 character label, or equal by Brady. Label to be black lettering on clear backing.

.5 Label relays and controllers inside panels using Thomas & Betts 12 character label, or equal by Brady.

.6 Provide red, 13 mm (1/2 inch) diameter, sticker on emergency light fixture frame. Include circuit number on sticker with thin permanent black mark pen.

3.06 LABELS AND SIGNS

.1 Manufacturers' nameplates and CSA labels are to be visible and legible after equipment is installed. Provide warning signs, as specified, or to meet requirements of Inspection Department, Health and Safety, and the Consultant.

.2 Label power outlets with circuit identification on visible portion of faceplate or surface mounted outlet box.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Electrical connections to equipment specified in other sections.

1.02 RELATED REQUIREMENTS

.1 Division 08 – Openings.

.2 Division 11 – Equipment.

.3 Division 20 – Common Mechanical Requirements.

.4 Division 21 – Fire Suppression.

.5 Division 22 – Plumbing.

.6 Division 23 – Heating, Ventilating, and Air Conditioning.

.7 Division 25 – Integrated Automation.

1.03 REFERENCES

.1 NEMA WD 1 - General Colour Requirements for Wiring Devices.

.2 NEMA WD 6 - Wiring Devices - Dimensional Requirements.

1.04 COORDINATION

.1 Coordinate work to Section 01 31 00.

.2 Obtain and review shop drawings, product data, and manufacturer's instructions for equipment provided under other sections.

.3 Determine connection locations and requirements.

.4 Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.

.5 Sequence electrical connections to coordinate with start-up schedule for equipment.

1.05 SUBMITTALS

.1 Submit to Section 01 33 00.

.2 Product Data: Provide wiring device manufacturer's catalogue information showing dimensions, configurations, and construction.

.3 Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.06 REGULATORY REQUIREMENTS

.1 Provide products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

2 Products

2.01 COMMON MOTOR REQUIREMENTS

.1 Motors up to and including 1/3 HP, shall be 1 phase, 60 Hz, 120 volts.

.2 Motors 1/2 HP and above shall be 3 phase, 60 Hz, 575 volts or 208 volts.

2.02 CORDS AND CAPS

.1 Attachment Plug Construction: Conform to NEMA WD 1.

.2 Configuration: NEMA WD 6; match receptacle configuration at outlet provided for equipment.

.3 Cord Construction: NFPA 70, Type SJO multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.

.4 Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

3 Execution

3.01 WIRING OF EQUIPMENT PROVIDED UNDER OTHER DIVISIONS

.1 Use the following procedure with regards to wiring of motors and equipment provided under other Divisions.

.2 The following equipment shall be responsibility of the trade supplying the equipment unless otherwise noted, in accordance with the requirements laid out in the individual section, or this division:

.1 Motors.

.2 Starters.

.3 Variable Frequency Drives.

.4 Motor Control Centres.

.5 Control wiring.

.3 In every instance, install starter, motor control centre, variable frequency drivers (VFD), etc. and wire to line side of the starter, the Motor Control Centre, or VFD. Extend wiring from starter, motor control centre or VFD to motor as indicated.

.4 Provide all wiring for starters and VFD’s from supply to starter to VFD and to motor. Coordinate requirements with the appropriate trade.

.5 Provide 500 mm of liquid tight flexible metal conduit for final connection to motor. Provide disconnect switches where required by code, and as indicated on the drawings.

.6 Where individual starters and controls are grouped together provide a panel for mounting this equipment. Provide a feeder, main fused disconnect and a splitter of adequate size and capacity and wire to line side of the starters on this panel and from starters to motors.

.7 Equipment, General

.1 Ascertain exact locations of starters, motor control centres, motors, etc. from drawings and coordinate exact locations with the supplying trade.

.2 Control wiring shall be the responsibility of the supplying trade.

.1 Control wiring shall be in accordance with Section 26 05 19, and Section 26 05 23.

.2 Control wiring shall be installed in conduit in accordance with Section 26 05 33.13.

.8 Doors

.1 Ascertain exact locations of door operators, push buttons, automatic sensors, and other door hardware.

.2 Provide branch circuit wiring for door operators.

.3 Provide control and control wiring for all low voltage door interconnections.

.9 Plumbing Equipment

.1 Ascertain exact locations of starters, motor control centres, motors, infra-red plumbing fixture controls from Mechanical Drawings and coordinate exact locations with plumbing trade.

.2 Provide branch circuit wiring and an outlet for each infra-red plumbing fixture control.

.3 Control wiring shall be the responsibility of the plumbing trade, as described above.

.10 HVAC Equipment

.1 Ascertain exact locations of starters, motor control centres, motors, motorized dampers, VAV boxes, and heating control valves from HVAC drawings and coordinate exact locations with HVAC Division.

.2 In the case of unit heaters, reheat coils and cabinet unit heaters, terminate wiring on terminals provided. Control wiring, thermostats, or other control devices shall be the responsibility of the HVAC trade, as described above.

.3 Provide branch circuit wiring and an outlet for each motorized damper, variable air volume (VAV) box, or heating control valve. Control wiring shall be the responsibility of the HVAC trade, as described above.

.11 Integrated Automation (Building Automation System)

.1 Refer to drawing notes for requirements.

.2 From equipment as noted on drawings, extend suitable wiring in conduit from equipment contacts to designated BMS panel serving area, terminating wiring and conduit in a junction box. Leave wiring un-terminated with slack coiled length of minimum 2 m (6’) long. Clearly label junction box and wiring end for termination onto BMS panel by respective Mechanical Trade.

3.02 EXAMINATION

.1 Verify that equipment is ready for electrical connection, wiring, and energization.

3.03 ELECTRICAL CONNECTIONS

.1 Provide a local disconnect switch for all equipment, regardless of if a disconnect switch is shown or not shown on the plans.

.2 Make electrical connections to equipment manufacturer's instructions.

.3 Make conduit connections to equipment using flexible conduit. Use liquid-tight flexible conduit with watertight connectors in damp or wet locations.

.4 Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.

.5 Provide receptacle outlet where connection with attachment plug is indicated. Provide cord and cap where field-supplied attachment plug is indicated.

.6 Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

.7 Install disconnect switches, controllers, control stations, and control devices as indicated.

.8 Modify equipment control wiring with terminal block jumpers as indicated.

.9 Provide interconnecting conduit and wiring between devices and equipment where indicated.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Common requirements for commissioning of all electric lighting, including interior, exterior, and emergency lighting.

.2 The party responsible for the functional testing shall not be directly involved in either the design or construction of the project.

1.02 RELATED REQUIREMENTS

.1 Section 26 09 23 – Lighting Control Devices.

.2 Section 26 51 19 – LED Interior Lighting.

.3 Section 26 52 13.13 – Emergency Lighting.

1.03 REFERENCES

.1 ASHRAE

.1 ASHRAE Guideline 0-2005 – The Commissioning Process.

.2 ANSI/ASHRAE/IES 90.1-2013 – Energy Standard for Building Except Low-Rise Residential Buildings.

.2 Illumination Engineering Society (IES)

.1 IES DG-29-11 – Design Guide for the Commissioning Process Applied to Lighting and Control Systems.

.3 Ontario Building Code

.1 Supplementary Standard SB-10: Energy Efficiency Requirements, December 22, 2016 update.

1.04 ACTION SUBMITTALS

.1 Refer to Section 01 33 00.

.2 Submit sample commissioning forms.

1.05 CLOSEOUT SUBMITTALS

.1 Section 01 78 00: Submittals for project closeout.

.2 Submit commissioning reports.

.1 Submit a floor plan or spreadsheet table checklist that indicates each local lighting control device, occupancy sensors, daylighting controls, system component.

.2 Submit the system sequence of operation fully describing the equipment components and functionality, including set points and alarm functions.

.3 The detailed sequence of operation shall be provided regardless of the completeness and clarity of the sequences in the controls specification and/or drawings.

.3 The functional testing party shall provide documentation certifying that the installed lighting controls meet or exceed all documented performance criteria.

2 Products – Not Used

3 Execution

3.01 SITE TESTS AND INSPECTIONS

.1 Sensor placement and orientation for all sensor types.

.2 Occupancy sensor function, sensitivity, and time delays.

.3 Daylight harvesting sensor calibration.

.4 Automated shade operation.

.5 Manual control placement and operation.

.6 Automated control operation, including scheduled on/off functions and dimming trims and presets.

.7 Override operation, access, and functionality.

.8 Centralized control interfaces and operation.

.9 Client education of operations.

.10 Documentation archived to client.

3.02 FUNCTIONAL TESTING

.1 Lighting control devices and control systems shall be tested to ensure that control hardware and software are calibrated, adjusted, programmed, and in proper working condition in accordance with the construction documents and manufacturer's installation instructions.

.2 When occupant sensors, time switches, programmable schedule controls, or photosensors are installed, at a minimum, the following procedures shall be performed:

.1 Confirm that the placement, sensitivity, and time-out adjustments for occupant sensors yield acceptable performance, lights turn off only after space is vacated and do not turn on unless space is occupied.

.2 Confirm that time switches and programmable schedule controls are programmed to turn the lights off.

.3 Confirm that photosensor controls reduce electric lights levels based on the amount of usable daylight in the space as specified.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Materials and installation for contactors for system voltages up to 600 V.

1.02 REFERENCES

.1 CSA Group:

.1 CSA C22.2 No. 14-18, Industrial Control Equipment.

2 Products

2.01 MANUFACTURERS

.1 Allen Bradley "500L" series

.2 Eaton.

.3 Schneider Electric.

.4 Siemens.

2.02 CONTACTORS

.1 Contactors: to CSA C22.2 No. 14.

.2 Electrically held controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.

.3 Contactors shall be electrically held 60 Hz, 120 V coil; NEMA Type 1 general purpose enclosure.

.4 Fused switch combination contactor as indicated.

.5 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.

.6 Mount in CSA Enclosure 1 unless otherwise indicated.

.7 Include following options in cover:

.1 Red indicating lamp.

.2 Hand-Off-Auto selector switch.

.8 Provided complete with control transformer, in contactor enclosure.

3 Execution

3.01 INSTALLATION

.1 Install contactors and connect auxiliary control devices.

3.02 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 53.

.2 Size 4 nameplate indicating name of load controlled as indicated.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Occupancy and Vacancy sensors.

.2 Power packs, and auxiliary relays, momentary switches.

.3 Manual controls devices, including dimming switches and low voltage momentary switches.

1.02 PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION

.1 Line voltage manual control devices, as described in Section 26 27 26 – Wiring Devices.

.2 Multi-zone scene controllers, as described in Section 26 09 36 – Modular Dimming Controls.

1.03 RELATED REQUIREMENTS

.1 Section 26 08 50 – Commissioning of Lighting.

.2 Section 26 27 26 – Wiring Devices.

.3 Section 26 51 19 – LED Interior Lighting.

.4 Section 26 56 19 – LED Exterior Lighting.

1.04 REFERENCES

.1 CSA Group:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CSA C22.2 No. 14-13 – Industrial Control Equipment.

.4 CSA C22.2 No. 42 - General Use Receptacles.

.5 CSA C22.2 No. 42.1 - Cover Plates for Flush Mounted Wiring Devices.

.6 CSA C22.2 No. 184 - Solid-State Lighting Controls.

.7 CSA C22.2 No. 184.1 - Solid State Dimming Controls.

.8 CSA C22.2 No. 156 - Solid-State Speed Controls.

.2 National Electrical Manufacturers Association (NEMA):

.1 WD1 (R2005) –- General Color Requirements for Wiring Devices.

.2 WD6 – Dimensional Specifications.

.3 Ontario Building Code.

.4 UL 924 - Standard for Safety of Emergency Lighting and Power Equipment.

1.05 SUBMITTALS

.1 In accordance with Section 01 33 00.

.2 Product Data:

.1 Submit manufacturer's descriptive literature and product specifications for each product.

.2 Manufacturer's product drawings.

.3 Manufacturer's installation instructions.

.3 Where the lighting controls include the option for custom engraving, or custom touchscreen user interfaces on control devices, switches, or scene controllers, the Contractor is to submit proposed engraving/labelling/graphics as part of the shop drawing submittal, for review by the Owner.

1.06 CLOSEOUT SUBMITTALS

.1 Documentation of all lighting control system setpoints, sensor sensitivities, occupancy sensor timeouts, and as-programmed sequences of operation to aid in future troubleshooting.

.2 Lighting controls functional test report.

1.07 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Products free of defects in material and workmanship.

1.08 WARRANTY

.1 Product is warranted free of defects in material and workmanship.

.2 Product is warranted to perform the intended function within design limits.

2 Products

2.01 MANUFACTURERS

.1 Wattstopper DLM [(Basis of Design)].

.2 Acuity Brands Lighting (nLight, Sensorswitch).

.3 Cooper Lighting Solutions.

.4 Hubbell.

.5 Leviton.

.6 Lutron Vive.

2.02 GENERAL REQUIREMENTS OF ALL SENSORS AND POWER PACKS

.1 Manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1 per cent.

.2 Five year warranty and CUL listed.

.3 In the event of failure, provide a bypass manual "override on" feature on each sensor.

.4 When bypass utilized, lighting to remain on constantly, or control is to be diverted to a wall switch until sensor is replaced. The override feature is to be designed for use by building maintenance personnel and not be readily achieved by building occupants.

2.03 OCCUPANCY AND VACANCY SENSORS

.1 General:

.1 Sensors using passive infrared, ultrasonic, microphonic, and multi-technology adaptive technology.

.2 Sensor timeouts configurable by system software.

.3 Electrical: Rating: 24 VDC input voltage, up to 40 mA current draw.

.4 Mechanical: Mounting: Sensors for mounting on ceilings and walls, including corners, must be available.

.5 Environmental:

.1 Operating Temperature Range: 0 degrees C to 40 degrees C

.2 Relative Humidity: 0 per cent to 95 per cent non-condensing.

.2 Dual Technology Wall Switch Sensor, 24V

.1 Wattstopper DW-100-24-W series (Basis of Design).

.2 Sensor capable of detecting presence in the control area by detecting Doppler shifts in transmitted ultrasound and passive infrared heat changes.

.3 Utilize a dual sensing verification principle for coordination between ultrasonic and Passive Infrared (PIR) Technologies to reduce likelihood of false triggering.

.4 For best results, sensor shall feature a trigger mode where the end-user can choose which technology will activate the sensor from Off mode (initial), the type of detection that will reset the time delay (maintain), and the type of detection that will cause the sensor to be turned back on immediately after the lights are turned off due to lack of motion (re-trigger). Selection of technologies for initial, maintain, and re-trigger shall be done with DIP switches.

.5 Sensor shall have its trigger mode factory preset to allow for quick installation in most applications. In this default setting, both technologies must occur in order to initially activate lighting systems. Detection by either technology shall maintain the lighting on, and detection by either technology shall turn lights back on after lights were turned off for 5 seconds or less in automatic mode, and 30 seconds or less in manual mode.

.6 Robotic test method, as referred in the NEMA WD 7 Guide, shall be utilized for minor motion coverage verification.

.7 Ultrasonic sensing shall be volumetric in coverage with a frequency of 40 kHz. It shall utilize Advanced Signal Processing which automatically adjusts the detection threshold dynamically to compensate for constantly changing levels of activity and air flow throughout controlled space.

.8 The PIR technology shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. The lens shall filter short wavelength IR, such as those emitted by the sun and other visible light sources. Face lens grooves in to avoid dust and residue build up which affects IR reception.

.9 Utilize zero crossing circuitry to reduce stress on relay, and therefore increase sensor life.

.10 Operate at 24 VDC and halfwave rectified and utilize a power pack or lighting control system input module to supply power.

.11 To blend in aesthetically, sensor protrusion not more than 3/8” from the wall and utilize colour-matched lens.

.12 To assure detection at desktop level uniformly across the space, sensor shall have a 28 segment, 2 level, Fresnel injection molded lens.

.13 Sensor shall feature a walk-through mode, where lights turn off 3 minutes after the area is initially occupied if no motion is detected after the first 30 seconds, set by DIP switch.

.14 To avoid false ON activations and to provide immunity to RFI and EMI, Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of a signal, to respond only to those signals caused by human motion.

.15 Coverage up to 1,000 sq. ft. for walking motion, with a field view of 180 degrees.

.16 Automatic-ON or manual-ON operation, adjustable with a DIP switch.

.17 Sensor shall have an adjustable time delay.

.18 Each sensing technology shall have an LED indicator that remains active at all times, in order to verify detection within the area to be controlled.

.19 Sensor shall have a service switch to allow end-users to operate the sensor in the unlikely event of a failure; set by a trim pot.

.20 Sensor shall have a built-in light level that features simple, one-step daylighting setup that works from 8 fc to 180 fc.

.21 The Dual Technology wall switch sensor shall be a completely self-contained control system that replaces a standard toggle switch

.3 Dual Technology Ceiling Mounted Sensor, 24V

.1 Wattstopper DT-300 series (Basis of Design).

.2 The Dual Technology sensor shall be capable of detecting presence in the control area by detecting doppler shifts in transmitted ultrasound and passive infrared heat changes.

.3 Sensor shall utilize Dual Sensing Verification Principle for coordination between ultrasonic or microphonic and Passive Infrared (PIR) Technologies. Detection verification of both technologies must occur in order to activate lighting systems. Upon verification, detection by either technology shall keep the lighting on.

.4 Sensor shall have a retrigger feature in which detection by either technology shall retrigger the lighting system on within 5 seconds of being switched off.

.5 Sensors shall be ceiling mounted with a flat, unobtrusive appearance, and provide 360 degree coverage.

.6 Ultrasonic sensing shall be volumetric in coverage, with a frequency of 40 kHz. It shall utilize Advanced Signal Processing that automatically adjusts the detection threshold dynamically to compensate for changing levels of activity and airflow throughout a controlled space.

.7 To avoid false ON activations, and to provide immunity to RFI and EMI, Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of a signal, in order to respond only to those signals caused by human motion.

.8 The PIR technology shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. The lens shall be Poly IR4 material to offer superior performance in the

infrared wavelengths and filter short wavelength IR, such as those emitted by the sun and other visible light sources. The lens shall have grooves facing in to avoid dust and residue build up which affects IR reception.

.9 Sensors shall operate at 24 VDC, and halfwave rectified, and utilize a 24 V power pack.

.10 Sensors shall feature a walk-through mode, where lights turn off 3 minutes after the area is initially occupied if no motion is detected after the first 30 seconds.

.11 The sensor shall have a built-in light level sensor that works from 10 fc to 300 fc.

.12 The sensors shall feature terminal style wiring.

.13 Each sensing technology shall have an LED indicator that remains active at all times in order to verify detection within the area to be controlled. The LED can be disabled for applications that require less sensor visibility.

2.04 POWER PACKS

.1 General:

.1 Self-contained transformer and relay module.

.2 Internal relay controlling up to 20A for 120, 230, 277VAC or 347VAC ballast loads and 120VAC incandescent loads.

.3 Provide a 24 VDC, 150 mA output.

.4 Capable of parallel wiring without regard to AC phases on primary.

.5 Power pack can be used as a standalone, low voltage switch, or can be wired to sensor for auto control.

.6 Construction: high impact, UL rated plastic case

.7 Power pack shall be UL/CUL Listed, FCC Certified, UL 2043 plenum rated and meets ASHRAE 90.1 requirements

.8 Shall at minimum meet the following environmental specifications:

.1 Operating Temperature Range: 0 degrees C to 40 degrees C

.2 Relative Humidity: 0 per cent to 95 per cent non-condensing

.2 Power Pack and Auxiliary Relay, 347 V

.1 Power Pack: Wattstopper B347D-P Series (Basis of Design)

.2 Auxiliary Relay: Wattstopper S347-E-P Series (Basis of Design)

.3 Power pack shall be a self-contained transformer and relay module measuring 45 mm by 70 mm by 38 mm (1.75 inch by 2.75 inch by 1.5 inch).

.4 For ease and speed of installation, power pack shall have 12 mm (1/2") snap-in nipple for 12 mm (1/2") knockouts and mounting on outside of enclosure.

.5 Power pack shall have dry contacts capable of switching 15 amp ballast @ 347 VAC, 60Hz.

.6 Power pack shall have primary voltage input of 347 VAC.

.7 Power pack shall provide a 24 VDC, 114 mA output, with the relay connected.

.8 Power pack shall be capable of parallel wiring without regard to AC phases on primary.

.9 Power pack can be used as a standalone, low voltage switch, or can be wired to sensor for auto control.

.10 Power pack shall have hold-ON and hold-OFF inputs for integration with lighting control panels, BMS and other building systems.

.11 Power pack shall have overcurrent protection if the low voltage current drawn exceeds 150 mA. In the event of an overcurrent, the low voltage output current shuts down and the LED will blink to indicate a fault condition.

.12 Power pack shall have an LED to indicate status of relay.

.13 Power pack shall utilize Zero Crossing Circuitry to protect from the effects of inrush current and increase product longevity.

2.05 DECORATOR LOW VOLTAGE MOMENTARY SWITCHES

.1 Wattstopper DCC2 series (Basis of Design).

.2 Switch intended for use with power packs and sensors requiring a momentary contact switch that provides on/off signals.

.3 12 VAC/VDC, 24 V Rectified, 24 VAC/VDC

.4 50 mA Max. Internal Contact rating

.5 500 mΩ resistance when closed

.6 Single pole, double throw with centre position rest.

2.06 DIMMING SWITCHES

.1 Direct control of dimming luminaires up to the luminaire manufacturer’s specified rating.

.2 Coordinate dimming signal configuration (2-wire phase cut, 3-wire, 4-wire 0-10V, or 4-wire DALI) with the fixture ballast or driver per Section 26 51 19, lighting fixture schedule, and related sections.

.3 Compatible with related lighting control devices i.e. occupancy sensors.

.4 Submit luminaire manufacturer’s dimmer compatibility documentation to demonstrate compatibility and limits of dimming level.

.5 Manufacturers:

.1 Lutron NovaT* style dimmers.

.2 Cooper

.3 Leviton.

.4 Approved Equal.

2.07 SEQUENCES OF OPERATION

.1 Vacancy Sensor Operation: Manual On, Manual/Auto Off.

.2 In accordance with ASHRAE 90.1-2013.

3 Execution

3.01 INSTALLATION

.1 In accordance with manufacturer's instructions.

.2 Minimum 14 AWG from the circuit control hardware relays.

.3 It shall be the contractor's responsibility to locate and aim sensors in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have 90 per cent to 100 per cent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). 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 room.

.4 It is the contractor's responsibility to arrange a pre-installation meeting with manufacturer's factory authorized representative, at Owner's facility, to verify placement of sensors and installation criteria.

.5 Proper judgement must be exercised in executing the installation so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components.

.6 Install manual control devices and sensors in accordance with manufacturer's instructions for Vacancy Operation.

3.02 SYSTEM STARTUP

.1 The lighting controls manufacturer's representative shall conduct system startup and submit startup report.

3.03 SITE TESTS AND INSPECTIONS

.1 The lighting controls manufacturer's representative and Contractor shall conduct functional testing and provide report as described in ASHRAE 90.1-2013:

.1 Lighting control devices and control systems shall be tested to ensure that control hardware and software are calibrated, adjusted, programmed, and in proper working condition in accordance with the construction documents and manufacturer's installation instructions.

.2 When occupant sensors, time switches, programmable schedule controls, or photosensors are installed, at a minimum, the following procedures shall be performed:

.1 Occupant Sensors

.1 Certify that the sensor has been located and aimed in accordance with manufacturer recommendations.

.2 For projects with up to seven (7) occupancy sensors, all occupancy sensors shall be tested.

.3 For projects with more than seven (7) occupancy sensors, testing shall be done for each unique combination of sensor type and space geometry.

.4 For each sensor to be tested, verify the following:

.1 Status indicator (as applicable) operates correctly.

.2 Controlled lights turn off or dim down to the specified level within the required time (20 minutes, or as noted), as applicable to the space type.

.3 For auto-on occupant sensors (occupancy mode), the lights turn on to the permitted level when someone enters the space.

.4 For manual-on sensors (vacancy mode), the lights turn on only when manually activated.

.5 The lights are not incorrectly turned on by movement in nearby areas or by HVAC operation.

.3 The individual(s) responsible for the functional testing shall not be directly involved in either the design or construction of the project and shall provide documentation certifying that the installed lighting controls meet or exceed all documented performance criteria.

.2 Test lighting controls with fire alarm system in accordance with Section 28 08 46 and Section 28 46 51.

.3 Commissioning:

.1 Upon completion of the installation, the system shall be completely commissioned to verify all adjustments and sensor placement to ensure a trouble-free lighting control system.

.2 Submit commissioning report to the Consultant and the commissioning authority for review.

3.04 TRAINING

.1 Provide training session of minimum 4 hours duration in accordance with Section 01 79 00.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Power distribution panelboards – Circuit breaker type.

.2 Lighting and appliance branch circuit panelboards.

1.02 RELATED REQUIREMENTS

.1 Section 26 28 16.02 – Molded Case Circuit Breakers.

1.03 REFERENCES

.1 CSA Group:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CSA C22.2 No. 5-16 – Molded Case Circuit Breakers, molded-case switches, and circuit-breaker enclosures.

.4 CSA C22.2 No. 29-15 – Panelboards and Enclosed Panelboards.

.5 CSA C22.2 No. 269.2-17 – Surge Protective Devices - Type 2 - Permanently Connected.

.2 NEMA:

.1 NEMA ICS 2-2000 (R2020) – Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts.

.2 NEMA KS 1-2013 – Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum).

.3 NEMA PB 1-2011 – Panelboards.

.4 NEMA PB 1.1-2013 – General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

.3 NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment (published by the International Electrical Testing Association).

1.04 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Work of this Section is to be submitted for review after Consultant's review of Coordination Study per Section 26 05 73.16 is completed.

.3 Shop drawings shall contain overall panelboard dimensions, interior mounting dimensions, and wiring gutter dimensions. The location of the main, branches, and solid neutral shall be clearly shown. In addition, the drawing shall illustrate one line diagrams with applicable voltage systems.

.4 Shop drawings:

.1 Indicate the following:

.1 Outline and support point dimensions.

.2 Voltage.

.3 Main bus ampacity.

.4 Integrated short circuit ampere rating.

.5 Circuit breaker arrangement, types, and sizes.

.2 The following information shall be submitted to the Consultant:

.1 Breaker layout drawing with dimensions indicated and nameplate designation.

.2 Component list.

.3 Conduit entry/exit locations.

.4 Assembly ratings including:

.1 Short-circuit rating.

.2 Voltage.

.3 Continuous current.

.5 Cable terminal sizes.

.6 Product data sheets.

.3 Where applicable, the following additional information shall be submitted to the Consultant:

.1 Key interlock scheme drawing and sequence of operations.

.5 Submittals for Construction

.1 The following information shall be submitted for record purposes:

.1 Installation information.

1.05 CLOSEOUT SUBMITTALS

.1 Refer to Section 01 78 00.

.2 Record actual locations of panelboards and record actual circuiting arrangements in project record documents.

.3 Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

.4 Final as-built drawings and information shall incorporate all changes made during the manufacturing and installation process.

.5 Include a copy of each panelboard schedule in the Operation and Maintenance manual.

1.06 MAINTENANCE MATERIAL SUBMITTALS

.1 Manufacturer shall provide installation instructions and NEMA Standards Publication PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

.2 Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets, instruction bulletins and renewal parts lists where applicable, for the complete assembly and each major component.

.3 Provide two of each panelboard key.

.4 Provide final panelboard schedules indicating panelboard data, phasing, breaker sizes, and loads served.

1.07 QUALITY ASSURANCE

.1 Regulatory Requirements

.1 Products: Listed and classified by CSA (Canadian Standards Association).

.2 Qualifications

.1 Company specializing in manufacturing of panelboard products with a minimum of 20 years' experience.

.2 The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.

.3 For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.

.4 The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Consultant, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

1.08 DELIVERY, STORAGE, AND HANDLING

.1 Inspect and report concealed damage to carrier within their required time period.

.2 Handle carefully to avoid damage to panelboard internal components, enclosure, and finish.

.3 Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

.4 Equipment shall be handled and stored in accordance with manufacturer's instructions. One copy of these instructions shall be included with the equipment at time of shipment.

1.09 WARRANTY

.1 Warrant specified equipment to be free from defects in materials and workmanship for eighteen (18) months from the date of purchase.

2 Products

2.01 GENERAL

.1 Description: CSA C22.2 No. 29, circuit breaker type.

2.02 DISTRIBUTION PANELBOARDS – CIRCUIT BREAKER TYPE

.1 Manufacturers:

.1 Square D by Schneider Electric, I-LINE Series.

.2 Eaton Cutler-Hammer, PRL 3 and PRL4 Series.

.3 Equal by Siemens.

.2 The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Consultant ten days prior to bid date.

.3 Panelboard Bus:

.1 Copper, ratings as indicated.

.2 Provide copper neutral bus for panelboards indicated for 4-wire systems.

.3 Provide copper ground bus in each panelboard.

.4 Short Circuit Ratings:

.1 Panelboards rated 600 V shall have minimum integrated short-circuit ratings as shown on the drawings or as herein scheduled, but not less than 65 000 amperes RMS symmetrical.

.2 Distribution panelboards with bolt-on devices contained therein shall have interrupting ratings as specified herein or indicated on the drawings.

.3 Panelboards shall be fully rated.

.4 Where indicated, provide circuit breakers ULC listed for application at 100 per cent of their continuous ampere rating in their intended enclosure.

.5 Minimum integrated short circuit rating: Panelboards rated 240 V shall have minimum integrated short-circuit ratings as shown on the drawings or as herein scheduled, but not less than 10 000 amperes RMS symmetrical.

.6 Molded Case Circuit Breakers: To Section 26 28 16.02.

.7 Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.

.8 Cabinet Front: Surface type, fastened hinge and latch, metal directory frame, finished in manufacturer's standard gray enamel.

.9 Enclosures: CSA type 2 sprinklerproof complete with drip hood, or as noted.

.10 Trims shall be equipped with a flush lock.

.11 Breaker positions labeled as “Spare” or “Space” shall constitute no less than 20 per cent of available breaker positions, whether indicated or not in panelboard schedules.

.12 Each panel shall be complete with a directory which shall be mounted inside door in a metal frame with clear plastic cover and copy in each Data Book. Use final Room Numbers for directories.

2.03 BRANCH CIRCUIT PANELBOARDS

.1 Manufacturers:

.1 Square D by Schneider Electric, NQ or NQOD Series.

.2 Eaton Cutler-Hammer, POW-R-LINE 1, POW-R-LINE 2, POW-R-LINE 3 Series.

.3 Equal by Siemens.

.2 Description: CSA C22.2 No.29, circuit breaker type, lighting and appliance branch circuit panelboard.

.3 Panelboard Bus:

.1 Copper, ratings as indicated.

.2 Provide copper neutral bus in each panelboard.

.3 Provide copper ground bus in each panelboard.

.4 Provide insulated ground bus where scheduled.

.4 Minimum Integrated Short Circuit Rating: 10 000 amperes RMS symmetrical for 240 volt panelboards, or as indicated.

.5 Molded Case Circuit Breakers: NEMA AB 1, plug-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.

.6 Current Limiting Molded Case Circuit Breakers where indicated: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.

.7 Cabinet Front: Surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

.8 Enclosure shall be CSA type 2 sprinklerproof complete with drip hood, or as noted.

.9 Trims shall be equipped with a flush lock.

.10 Breaker positions labeled as “Spare” or “Space” shall constitute no less than 20 per cent of available breaker positions, whether indicated or not in panelboard schedules.

.11 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.12 Panelboards rated 240 Vac or less shall have short-circuit ratings as shown on the drawings or as herein scheduled, but not less than 10,000 amperes RMS symmetrical.

.13 Bus and breakers rated for symmetrical interrupting capacity, as indicated.

.14 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.15 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.16 Two keys for each panelboard and key panelboards alike.

.17 Copper bus with neutral of same ampere rating as mains.

.18 Mains: suitable for bolt-on breakers.

.19 Trim with concealed front bolts and hinges.

.20 Trim and door finish: baked grey enamel.

.21 The minimum short-circuit rating for branch circuit panelboards shall be as specified herein or as indicated on the drawings. Panelboards shall be fully rated.

.22 Bolt-on type, heavy-duty, quick-make, quick-break, single- and multi-pole circuit breakers of the types specified herein, shall be provided for each circuit with toggle handles that indicate when unit has tripped.

.23 Circuit breakers shall be thermal-magnetic type with common type handle for all multiple pole circuit breakers. Circuit breakers shall be minimum 100-ampere frame and through 100-ampere trip sizes shall take up the same pole spacing. Circuit breakers shall be ULC listed as type SWD for lighting circuits.

.1 Circuit breaker handle locks shall be provided for all circuits that supply exit signs, emergency lights, energy management, and control system (EMCS) panels and fire alarm panels.

.24 Circuit breakers shall have a minimum interrupting rating of 10 000 amperes symmetrical at 240 volts, and 14 000 amperes symmetrical at 480 volts, unless otherwise noted on the drawings.

.25 Each panel shall be complete with a directory which shall be mounted inside door in a metal frame with clear plastic cover and copy in each Data Book. Use final Room Numbers for directories.

.26 Panels shall be dead front type in code gauge steel enclosures. All panels shall be sprinkler proof c/w drip hoods as required.

.27 Panels shall have mains of voltage and capacity, and main and branch breakers, as shown on the drawings. Spaces shall include necessary bus work such that Owners, at a later date, need buy only the breakers.

.28 Where panels exceed 42 circuits, use multi-section panel with main cross-over solid bus bars unless noted otherwise on drawings. Main bus capacity of each section shall be full size to match cross-over bus.

.29 Breakers shall have bolted type connections. Multi-pole breakers shall be common trip type with a single handle, suitable for voltage applied and of same manufacture as single pole breakers.

.30 Panels for 120/208 volt, 3-phase, 4-wire systems shall be complete with full size breakers.

.31 Where shown on drawings or required by code, certain breakers shall include ground fault interrupter.

.32 Provide lighting and receptacle panels suitable for surface, or flush-mounting type, as shown.

.33 Provide locking bars on non-switched circuits where panels are used for switching lighting circuits.

.34 Panels for non-linear loads shall be complete with lugs for double neutrals.

.35 Panels shall be given a rust-resistant treatment to both tub and trim.

.36 Flush panels shall have concealed hinges and flush type combination lock latch. Locks shall be chrome plated. Doors shall open minimum 135 degrees. Trims shall have fasteners concealed and shall be prime coated to receive room finish paint.

.37 Surface mounted panels shall have manufacturer's standard surface door trim complete with lock and latch. Finish shall be grey.

.38 Recessed panels shall have standard flush trims.

.39 Co-ordinate panel finish with Room Finish Schedule.

2.04 MOLDED CASE CIRCUIT BREAKERS

.1 Breakers: to Section 26 28 16.02.

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

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for 10 per cent of 15 A to 30 A breakers installed as indicated. Turn over unused lock-on devices to Owner.

.5 Lock-on devices for fire alarm, security, and sprinkler circuits.

.6 Provide shunt trips, bell alarms, and auxiliary switches as shown on the contract drawings.

2.05 CONSTRUCTION

.1 General:

.1 Interiors shall be completely factory assembled. They shall be designed such that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors.

.2 Surface trims shall be same height and width as box. Flush trims shall overlap the box by 3/4 of an inch on all sides.

.3 A temporary directory card with a clear plastic cover shall be supplied and mounted on the inside of each door.

.4 All locks shall be keyed alike. Key same as existing.

.2 Branch Circuit Panelboards:

.1 Trims for branch circuit panelboards shall be supplied with a hinged door over all circuit breaker handles. Doors in panelboard trims shall not uncover any live parts. Doors shall have a semi flush cylinder lock and catch assembly. Door-in-door trim shall be provided. Both hinged trim and trim door shall utilize three point latching. No tools shall be required to install or remove trim. Trim shall be equipped with a door-actuated trim locking tab. Equip locking tab with provision for a screw such that removal of trim requires a tool, at the owner's option. Installation shall be tamper resistant with no exposed hardware on the panelboard trim.

.3 Distribution Panelboards:

.1 Distribution panelboard trims shall cover all live parts. Switching device handles shall be accessible.

2.06 BUS

.1 Lugs: Copper and listed by CSA, or cUL, for use with copper conductors and sized to accept copper conductors of the ampacity specified.

.2 Main bus bars shall be copper sized in accordance with CSA standards to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum.

.3 A copper system ground bus shall be included in all panelboards.

.4 Full-size (100 per cent rated) insulated copper neutral bars shall be included for panelboards shown with neutral. Bus bar taps for panels with single-pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral busing shall have a suitable lug for each outgoing feeder requiring a

neutral connection. 200 per cent rated neutrals shall be supplied for panels designated on drawings with oversized neutral conductors.

2.07 INTEGRAL MOUNTED SURGE PROTECTIVE DEVICE

.1 Where shown on the drawings, furnish panelboards with integral surge protective devices (SPDs), mounted internal to the panelboard.

.2 Certification:

.1 Listed to most recent edition of CSA C22.2 No. 269.2.

.2 Products certified by a recognized testing agency accredited by the Standards Council of Canada, and bear a certification mark from that agency indicating acceptance to Canadian standards.

.1 Equipment certification by one of the following bodies:

.1 Listed by Underwriters Laboratories, Inc. and exhibit the cUL Listing Mark for the category "Surge Protective Devices" or SPD. Provide UL Listing Card under category VZCA7 (SPDs certified for Canada) to confirm compliance to CSA C22.2 No. 269.2, and assigned Voltage Protection Ratings.

.2 Listed by ETL.

.3 Certified by CSA Group.

.2 SPD to be labeled with no less than a 100 kA Short Circuit Current Rating (SCCR).

.3 SPD shall be factory installed integral to the panelboard by the original equipment manufacturer, and shall be a product of the same manufacturer as the panelboard and breakers.

.4 The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable single-mode modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.

.5 Electrical Requirements:

.1 Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.

.2 Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.

.3 The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards. End of life mode to be open circuit. Unit with end of life short-circuit mode are not acceptable.

.4 Unit shall operate without the need for an external overcurrent protection device (OCPD), and be listed by UL as such. Unit must not require external OCPD or replaceable internal OCPD for the UL Listing.

.5 Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

	Protection Modes			
Configuration	L-N	L-G	L-L	N-G
Wye	X	X	X	X
Delta	N/A	X	X	N/A
Single Split Phase	X	X	X	X
High Leg Delta	X	X	X	X

.6 Nominal Discharge Current (In) – All SPDs applied to the distribution system shall have a 20 kA In rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an In less than 20kA shall be rejected.

.7 ANSI/UL 1449 4th Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 4th Edition VPR for the device shall not exceed the following:

Voltage	L-N	L-G	N-G
208Y/120	800 V	800 V	800 V
480Y/277	1200 V	1200 V	1200 V
600Y/347	1500 V	1500 V	1500 V
Voltage	L-L	L-G	
480 Delta	1800 V	1800 V	
600 Delta	2500 V	2500 V	

2.08 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 53.

.2 Nameplate for each panelboard size 4 engraved.

.3 Nameplate for each branch circuit in distribution panelboards size 2 engraved.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit.

.5 Provide an engraved nameplate for each panelboard section.

.6 Provide copies of all circuit directories in manuals.

2.09 SOURCE QUALITY CONTROL

.1 The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of NEMA and CSA standards.

3 Execution

3.01 INSTALLATION

.1 Install panelboards to CSA C22.1.

.2 Install panelboards plumb.

.3 Height: 1800 mm to top of panelboard; install panelboards taller than 1800 mm with bottom no more than 100 mm above floor.

.4 Provide filler plates for unused spaces in panelboards.

.5 Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

.6 Provide engraved plastic nameplates under the provisions of Section 26 05 53.

.7 Ground and bond panelboard enclosure according to Section 26 05 26.

.8 Locate panelboards as indicated and mount securely, plumb, true, and square, to adjoining surfaces.

.9 Install surface mounted panelboards on fire rated plywood backboards in accordance with Section 26 05 29. Where practical, group panelboards on common backboard.

.10 Connect loads to circuits.

.11 Connect neutral conductors to common neutral bus with respective neutral identified.

.12 Deliver five (5) duplicate keys for each panel lock to the Owner.

.13 Mount electrical panels, where possible, with top of trim at uniform height of 2000 mm.

.14 Cap ends of conduits in accessible locations in ceiling spaces above panels, to allow for future wiring.

.15 The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.

.16 Install panelboards in accordance with manufacturer's written instructions, NEMA PB 1.1 and Electrical Code requirements.

.17 After completion of wiring, type directory showing a clear description of each circuit being controlled from panel and place in metal frame inside door.

.18 Provide revised directories for existing panels if revised.

.19 Provide circuit breaker handle locks for all circuits that supply exit signs, emergency lights, energy management, and control system (EMCS) panels and fire alarm panels.

3.02 FIELD QUALITY CONTROL

.1 Perform inspections and tests listed in NETA ATS, Section 7.4 for switches, Section 7.5 for circuit breakers.

.2 Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.

.3 Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads within 20 per cent of each other. Maintain proper phasing for multi-wire branch circuits.

.4 Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

3.03 ADJUSTING

.1 Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other.

.2 Maintain proper phasing for multi-wire branch circuits.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Switches, receptacles, wiring devices, cover plates, and their installation.

1.02 RELATED REQUIREMENTS

.1 Section 26 09 23 – Lighting Control Devices.

.2 Section 26 27 26.13 – Floor Box Assemblies.

1.03 REFERENCES

.1 CSA Group:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CSA C22.2 No. 14-13, Industrial control equipment.

.4 CSA C22.2 No. 42-10 (R2015), General use receptacles, attachment plugs, and similar devices.

.5 CSA C22.2 No. 42.1-13, Cover plates for flush-mounted wiring devices.

.6 CSA C22.2 No. 55-15 (R2020), Special use switches.

.7 CSA C22.2 No.111-10 (R2015), General-use snap switches.

.8 CSA C22.2 No. 182.1-17, Plugs, receptacles, and cable connectors of the pin and sleeve type.

1.04 INFORMATIONAL SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 01 33 00.

.2 Product Data: Provide manufacturer's catalogue information showing dimensions, colours, and configurations.

.3 Submit manufacturer's installation instructions.

2 Products

2.01 MANUFACTURERS

.1 Eaton.

.2 Hubbell Bryant.

.3 Leviton.

.4 Molex.

.5 Pass & Seymour (Legrand).

2.02 WALL SWITCHES

.1 Single pole, double pole, three-way, four-way switches to: CSA C22.2 No. 55 and CSA C22.2 No.111.

.2 Description: CSA 22.2 No. 111, Commercial Spec Grade, AC only general-use snap switch.

.3 Local switches shall be 20 ampere, silent, brown coloured, AC type and CSA certified, specification grade. Provide switches rated to suit system voltage 120 V or 347 V.

.4 Manually-operated general purpose AC switches with following features:

.1 Terminal holes approved for 10 AWG wire.

.2 Silver alloy contacts.

.3 Urea or melamine moulding for parts subject to carbon tracking.

.4 Suitable for back and side wiring.

.5 Voltage: 120 volt or 347 volt, AC as indicated.

.6 Current: 20 amperes.

.7 Body and Handle: white plastic with toggle handle. Confirm finish colour prior to ordering.

.8 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.

.9 Example Products (Toggle style):

.1 120 volt:

.1 Hubbell HBL1221 (single pole).

.2 Hubbell HBL1222 (double pole).

.3 Hubbell HBL1223 (three-way).

.4 Hubbell HBL1224 (four-way).

.2 347 volt:

.1 Hubbell HBL18221 (single pole).

.2 Hubbell HBL18223 (three-way).

.3 Pass & Seymour PS372030I.

.10 Local switches and receptacles shall be of the same manufacturer throughout except where a specified item is not made by that manufacturer.

2.03 RECEPTACLES

.1 General

.1 Description: CSA C22.2 No. 42, Commercial Spec Grade general use receptacles.

.2 Device Body: white plastic.

.3 Configuration: Type as specified and indicated.

.4 Convenience Receptacle: Type 5-15, 5-20 where indicated.

.5 GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

.6 Data Room Receptacle Types: As indicated on drawings.

.7 Receptacles of one manufacturer throughout project.

.2 Receptacles shall be white coloured, specification grade, unless noted otherwise.

.3 Receptacles shall be as listed below:

.1 15 ampere, 120 volt, single phase grounded duplex receptacle shall be NEMA-U- ground type CSA Configuration 5-15R.

.2 20 ampere, 120 volt, single phase grounded duplex receptacle shall be NEMA-U-ground type CSA Configuration 5-20RA

.3 15 ampere, 120 volt, weatherproof receptacles shall be equal to those above but complete with gasketed cast plate and hinged covers.

.4 Other types of receptacles shall be provided as shown on Drawings.

.5 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA-C22.2 No. 42 with following features:

.1 White urea moulded housing.

.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 riveted grounding contacts.

.6 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:

.1 White urea moulded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Four back wired entrances, 2 side wiring screws.

.7 Other receptacles with ampacity and voltage as indicated.

.8 Example Products (Decorator style duplex 5-15R):

.1 Pass & Seymour 26252 Series.

.2 Hubbell HBL2152 Series.

.9 Ground Fault Circuit Interrupter (GFCI or GFI) Receptacles

.1 Protected by a ground fault circuit interrupter of the Class A type.

.2 Any receptacle within 1.5 m of a sink must be GFCI protected.

.3 Any receptacle located outdoor must be GFCI protected.

.10 Isolated Ground (IG) Receptacles:

.1 Marked as such (green triangle).

.2 Example Products:

.1 Hubbell IG2152 (15A duplex decorator style, orange faceplate).

.11 Tamper-resistant receptacles.

.1 Marked as such (for example “TR”).

.2 To be used in the following spaces:

.1 Child care facilities and kindergarten classrooms.

.2 Guest rooms and suites of hotels and motels.

.3 Preschools and elementary education facilities, including kindergarten facilities.

.4 Dwelling units.

.3 Example Products:

.1 Hubbell BR15WHITR (15A duplex decorator style).

.2 Hubbell BR20WHITR (20A duplex decorator style).

.12 USB Charger receptacles: duplex tamper resistant device.

.1 USB ports: one type A and one type C USB charging port, 5 amp, 5 volt.

.2 Example: Hubbell USB15AC5WWR.

2.04 COVER PLATES

.1 Cover plates for wiring devices to: CSA C22.2 No. 42.1.

.2 Cover plates from one manufacturer throughout project.

.3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.4 Stainless steel, vertically brushed, cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.

.5 Cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.6 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

.7 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

.8 Switch, receptacle, telephone, and other plates shall be stainless steel 18-8 chrome metal alloy, Type 302, non-metallic in finished areas and pressed steel in unfinished areas. Finish brush marks shall be run in a vertical direction.

2.05 REGULATORY REQUIREMENTS

.1 Provide products listed and classified by CSA (Canadian Standards Association).

3 Execution

3.01 EXAMINATION

.1 Verify that outlet boxes are installed at proper height.

.2 Verify that wall openings are neatly cut and will be completely covered by wall plates.

.3 Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.02 PREPARATION

.1 Provide extension rings to bring outlet boxes flush with finished surface.

.2 Clean debris from outlet boxes.

3.03 INSTALLATION

.1 Install to CSA C22.1.

.2 Mounting heights in accordance with Section 26 05 00.

.3 Install devices plumb and level.

.4 Install switches with OFF position down.

.5 Install wall dimmers to achieve full rating specified and indicated after de-rating for ganging as instructed by manufacturer.

.6 Do not share neutral conductor on load side of dimmers.

.7 Install receptacles with grounding pole on bottom.

.8 Connect wiring device grounding terminal to outlet box with bonding jumper.

.9 Install decorative plates on switch, receptacle, and blank outlets in finished areas.

.10 Connect wiring devices by wrapping conductor around screw terminal.

.11 Use jumbo size plates for outlets installed in masonry walls.

.12 Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

.13 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.

.14 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.3 Connect receptacle grounding terminal to the outlet box with an insulated green ground strap.

.4 Receptacles to be white for devices connected to normal power circuits, red for devices connected to essential power circuits including isolated power centres. Isolated ground receptacles connected to circuits fed from uninterruptible power supply units to be orange colour.

.5 Receptacles for maintenance of HVAC and similar equipment located on rooftops.

.1 Provide weatherproof GFI 5-20R receptacles on roof, installed at 750 mm (30 inches) above finished roof level, complete with wet location “while in use” “extra duty” cover plate.

.2 Locate within 7500 mm (25 feet) of new HVAC equipment, and at least 2000 mm (6.5 feet) away from roof line.

.3 Refer to 2021 OESC rules 2-316, 26-708, and 26-710, and OESC bulletin 26-27-0, or latest edition.

.15 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.

.4 Do not install plates until final painting of room or area is completed. Remove protective covering.

.16 Circuit identification: in accordance with Section 26 05 53.

3.04 FIELD QUALITY CONTROL

.1 Inspect each wiring device for defects.

.2 Operate each wall switch with circuit energized and verify proper operation.

.3 Verify that each receptacle device is energized.

.4 Test each receptacle device for proper polarity.

.5 Test each GFCI receptacle device for proper operation.

3.05 ADJUSTING

.1 Adjust devices and wall plates to be flush and level.

3.06 CLEANING

.1 Clean exposed surfaces to remove splatters and restore finish.

End of Section

1 General

1.01 REFERENCES

.1 CSA C22.2 No. 248 series.

1.02 SUBMITTALS

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

.2 Product Data:

.1 Provide fuse performance data characteristics for each fuse type and size above 200 amps. Performance data to include: average melting time-current characteristics.

.3 Shop Drawings:

.1 Provide shop drawings in accordance with Section 01 33 00.

1.03 DELIVERY, STORAGE, AND HANDLING

.1 Ship fuses in original containers.

.2 Do not ship fuses installed in switchboard.

.3 Store fuses in original containers in storage cabinet.

.4 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 00.

1.04 MAINTENANCE MATERIAL SUBMITTALS

.1 Provide maintenance materials in accordance with Section 01 78 00.

.2 3 spare fuses of each type and size installed above 600 A.

.3 6 spare fuses of each type and size installed up to and including 600 A.

2 Products

2.01 MANUFACTURERS

.1 Bussman by Eaton.

.2 GEC.

.3 Littelfuse.

.4 Mersen.

.5 Substitutions: not permitted.

2.02 FUSES - GENERAL

.1 Fuse type references L1, L2, J1, R1, etc. have been adopted for use in this specification.

.2 Fuses: product of one manufacturer.

.3 Fuses shall be sized as shown, time delay type, and of the same type throughout.

.4 Fuses shall be CSA certified Class-J for 1-600A or Class-L for 650 Amps and above.

.5 Provide the following accessories where indicated or where required to complete installation:

.1 Fuseholders: Compatible with indicated fuses.

2.03 FUSE TYPES

.1 Class J fuses.

.1 Type J1, time delay, capable of carrying 500 per cent of its rated current for 10 seconds minimum.

.2 Type J2, fast acting.

.2 Class L fuses.

.1 Type L1, time delay, capable of carrying 500 per cent of its rated current for 10 seconds minimum.

.2 Type L2, fast acting.

.3 Class R fuses.

.1 Type R1, (UL Class RK1), time delay, capable of carrying 500 per cent of its rated current for 10 seconds minimum, to meet UL Class RK1 maximum let-through limits.

.2 Type R2, time delay, capable of carrying 500 per cent of its rated current for 10 seconds minimum.

.3 Type R3, (UL Class RK1), fast acting Class R, to meet UL Class RK1 maximum let-through limits.

2.04 FUSE REQUIREMENTS

.1 Dimensions and Performance: CSA C22.2 No. 248 Series, Class as specified or indicated.

.2 Voltage: Provide fuses with voltage rating suitable for circuit phase-to-phase voltage.

.3 Power Load Feeder Switches: HRC-1 Class J time delay type.

.4 Other Feeder Switches: HRC-1 Class J time delay type.

2.05 SPARE FUSE CABINET

.1 Description: Wall-mounted sheet metal cabinet, suitably sized to store spare fuses and fuse pullers specified.

.2 Doors: Hinged, with hasp for Owner's padlock.

.3 Finish: Prime finish for field painting.

.4 Dimensions: Minimum 914 mm by 914 mm by 305 mm (3 foot by 3 foot by 1 foot).

3 Execution

3.01 INSTALLATION

.1 Install fuses to manufacturer's instructions.

.2 Install fuse with label oriented such that manufacturer, type, and size are easily read.

.3 Install spare fuse cabinet in electrical room.

.4 Provide a complete set of fuses in each fusible device supplied under this Division and provide 3 spare fuses for each size used in spare fuse cabinet.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Molded-case circuit breakers.

.2 Molded-case switches.

.3 Accessories.

1.02 RELATED REQUIREMENTS

.1 Section 26 24 13 – Switchboards.

.2 Section 26 24 16 – Panelboards.

1.03 REFERENCES

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CSA C22.2 No. 5-16, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures.

.4 NEMA AB1 - Molded Case Circuit Breakers, Molded Case Switches, and Circuit - Breaker Enclosures.

.5 NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment (published by the International Electrical Testing Association).

1.04 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00.

.2 Include time-current characteristic curves for breakers with ampacity of 400 A and above, or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

.3 Include termination temperature rating in degrees C.

.4 Certificate of Origin

.1 Prior to any installation of circuit breakers in either a new or existing installation, Contractor must submit three (3) copies of a certificate of origin from the manufacturer, duly signed by the factory and the local manufacturer’s representative, certifying that all circuit breakers come from this manufacturer, they are new and they meet standards and regulations. These certificates must be submitted to the Consultant for review.

.2 A delay in the production of the certificate of origin won’t justify any extension of the contract and additional compensation.

.3 Any work of manufacturing, assembly or installation should begin only after acceptance of the certificate of origin by the Consultant. Unless complying with this requirement, Consultant reserves the right to mandate the manufacturer listed on circuit breakers to authenticate all new circuit breakers under the contract, and that, to Contractor’s expense.

.4 In general, the certificate of origin must contain:

.1 The name and address of the manufacturer, and the person responsible for authentication. The responsible person must sign and date the certificate;

.2 The name and address of the licensed dealer, and the person of the distributor responsible for the Contractor's account.

.3 The name and address of the Contractor, and the person responsible for the project.

.4 The name and address of the local manufacturer's representative. The local representative must sign and date the certificate.

.5 The name and address of the building where circuit breakers will be installed:

.1 Project title.

.2 End user's reference number.

.3 The list of circuit breakers.

2 Products

2.01 GENERAL

.1 Molded-case circuit breakers, Circuit breakers, and Ground-fault circuit-interrupters, Fused circuit breakers, and Accessory high-fault protectors: to CSA C22.2 No. 5.

.2 Bolt-on Molded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Plug-in Molded case circuit breakers: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.4 Common-trip breakers: with single handle for multi-pole applications.

.5 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.6 Circuit breakers with interchangeable trips.

2.02 INTERRUPTING CAPACITY

.1 Protective devices shall be fully rated, for required available fault current. Series rated shall not be used on this installation.

.2 Refer to Section 26 24 13, and Section 26 24 16.

2.03 MOLDED CASE CIRCUIT BREAKERS – GENERAL

.1 Molded 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.

.2 NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole.

.3 Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

.4 1-, 2-, or 3-pole bold on, single-handle common trip voltage as indicated on drawings.

.5 Overcentre toggle-type mechanism, quick-make, quick-break action. Trip indication is by handle position.

.6 Calibrate for operation in 40 degree C ambient temperature.

2.04 MOLDED CASE CIRCUIT BREAKERS – UP TO 150 AMPERE

.1 Permanent trip unit containing individual thermal and magnetic trip elements in each pole, unless noted otherwise on drawings.

2.05 MOLDED CASE CIRCUIT BREAKERS – 151 TO 399 AMPERE

.1 Variable magnetic trip elements. Provide push-to-trip button on cover of breaker for mechanical tripping.

2.06 MOLDED CASE CIRCUIT BREAKERS – 400 AMPERE AND ABOVE

.1 Electronic trip type with adjustments for long-time, instantaneous, and short-time functions.

.2 1000 Amp and Above:

.1 Modbus Communications

.1 Breaker status.

.1 Open.

.2 Closed.

.3 Tripped.

.2 Cause of trip.

.3 Time of trip.

.4 Current at time of trip.

.5 RMS currents per phase and ground.

.6 Peak demand.

.7 Present demand.

.8 Energy consumption.

.3 1200 Amp and Above:

.1 Provide handle mechanisms that are lockable in the open (off) position.

2.07 ADDITIONAL FEATURES

.1 Provide as indicated on drawings:

.1 Shunt trip.

.2 Auxiliary switch.

.3 Motor-operated mechanism.

.4 Under-voltage release.

.5 On-off locking device.

.6 Handle mechanism.

2.08 ENCLOSED BREAKERS AND ENCLOSED MOLDED-CASE SWITCHES

.1 Molded case, front operated, automatic circuit breakers sized as specified on drawings each secured in a NEMA 1, flush wall mounting enclosure with steel front panel.

.2 Voltage rating suitable for circuit phase to phase voltage as indicated on drawings.

.3 Units to include solid state adjustable trip units and contactors. Contactors to be of rating and type to suit application.

2.09 CIRCUIT BREAKERS FOR EXISTING DISTRIBUTION EQUIPMENT

.1 Products to be of types from existing equipment manufacturers.

.2 Additional breakers for existing panelboards are to match existing device standards and be completely compatible to equipment in which they are installed.

.3 During Bidding period, check and verify exact requirements of existing equipment to ensure that additional devices are accommodated.

.4 Make necessary modifications to equipment to accommodate device and feeder installation.

.5 Provide suitable engraved lamacoid identification nameplate on additional components.

.6 Revise typed circuit directory cards on branch circuit panelboards.

.7 Mount additional devices to standards of existing equipment manufacturer.

.8 Refer to notes on drawings.

.9 Provide additional retrofit work to existing equipment as noted on drawings.

3 Execution

3.01 INSTALLATION

.1 Install circuit breakers as per related sections.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Fusible and non-fusible enclosed low-voltage disconnect switches from 30 amps to 800 amps.

1.02 RELATED REQUIREMENTS

.1 Section 26 28 13 – Fuses.

1.03 REFERENCES

.1 CSA Group:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CSA C22.2 No. 4-16, Enclosed and Dead-Front Switches.

.4 CSA C22.2 No. 248 series, Low-voltage fuses.

.2 NETA (International Electrical Testing Association) ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.04 SUBMITTALS

.1 Product Data: Provide switch ratings, and enclosure dimensions.

1.05 CLOSEOUT SUBMITTALS

.1 Record actual locations of enclosed switches in project record documents.

2 Products

2.01 MANUFACTURERS

.1 Eaton Cutler-Hammer.

.2 Siemens.

.3 Square D by Schneider Electric.

2.02 REGULATORY REQUIREMENTS

.1 Products: Listed and classified by CSA or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

2.03 DISCONNECT SWITCHES

.1 Provide dedicated disconnect switches at electrical equipment.

.2 Fused or un-fused disconnect or safety switches: Type "A", quick-make, quick-break construction with provision for padlocking switches in either "ON" or "OFF" position.

.1 Quick-make, quick-break.

.2 Heavy duty industrial type.

.3 Lockable with up to 3 padlocks.

.4 Cover interlocked with switch mechanism.

.5 Viewing window for viewing blades.

.3 Fused switches equipped with fuse clips designed for Class "J" fuses and designed to reject standard NEC fuses.

.4 Enclosure: CSA Type 1 sprinkler-proof, or as noted.

.5 Switches throughout project of same manufacturer.

3 Execution

3.01 INSTALLATION

.1 Provide fused or un-fused safety or disconnect switches as shown and as required by Code.

.2 Install disconnect switches complete with fuses, if applicable, to CSA C22.1.

.3 Apply neatly typed adhesive tag on inside door of each fusible switch indicating NEMA fuse class and size installed.

.4 Coordinate fuse ampere rating with installed equipment. Fuse ampere rating variance between original design information and installed equipment, size in accordance with Bussmann Fusetron 40 degree C recommendations. Do not provide fuses of lower ampere rating than motor starter thermal units.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Solid state, light emitting diode (LED) source interior luminaires.

.2 New, fully integrated luminaires for indoor applications.

1.02 RELATED REQUIREMENTS

.1 Section 26 09 23 – Lighting Control Devices.

.2 Section 26 52 13.13 – Emergency Lighting.

1.03 REFERENCES

.1 CSA Group:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CSA C22.2 No. 250.0 - Luminaires (Bi-National Standard, with UL 1598).

.2 DesignLights Consortium (DLC):

.1 Solid-State Lighting Technical Requirements v5.1, or latest edition.

.2 Where the specifications do not explicitly call for DLC qualified LED luminaires, the technical criteria provided in the DLC Technical Requirements provide the basis of the requirements for this section of the Specification.

.3 Energy Star:

.1 Program Requirements for Luminaires - Eligibility Criteria, Version 1.2, or latest edition.

.4 Illuminating Engineering Society (IES):

.1 IES HB-10-11 – The Lighting Handbook, 10th Edition.

.2 IES LM-79-08 – Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products.

.3 IES LM-80-08 – IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.

.4 IES TM-21-11 – IES Technical Memorandum on Projecting Long Term Lumen Maintenance of LED Light Sources.

.5 IES TM-30-15 – IES Method for Evaluating Light Source Color Rendition.

.5 IEEE 1789-2015 – IEEE Recommended Practices for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers.

.6 National Electrical Manufacturer's Association (NEMA):

.1 SSL-1-10 – Electronic Drivers for LED Devices, Arrays, or Systems.

.2 WD 6 - Wiring Devices - Dimensional Requirements.

1.04 DEFINITIONS

.1 CCT: Correlated colour temperature.

.2 CRI: Colour-rendering index.

.3 LED: Light Emitting Diode.

.4 Lumen: Measured output of lamp and luminaire, or both.

.5 Luminaire: Complete lighting fixture, including ballast housing if provided.

1.05 ACTION SUBMITTALS

.1 Refer to Section 01 33 00.

.2 Product submittals shall be accompanied by product specification sheets or other documentation that includes the designed parameters as detailed in this specification. These parameters include (but not limited to):

.1 Maximum power in Watts.

.1 If a transformer is used in conjunction with a driver (for example on some 347 volt lighting circuits), the maximum power shall include the transformer losses.

.2 L70 in hours, when extrapolated for the worse case operating temperature. TM-21 report shall be submitted to demonstrate this.

.3 Product submittals shall be accompanied by performance data that is derived in accordance with appropriate IESNA testing standards and tested in a laboratory that is NVLAP accredited for Energy Efficient Lighting Products.

1.06 INFORMATIONAL SUBMITTALS

.1 Installation instructions.

1.07 CLOSEOUT SUBMITTALS

.1 Section 01 78 00: Submittals for project closeout.

.2 Submit manufacturer's operation and maintenance instructions for each product.

.3 Warranty information.

1.08 QUALIFICATIONS

.1 Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.09 REGULATORY REQUIREMENTS

.1 Products shall be listed and classified by CSA (Canadian Standards Association), ULC (Underwriter’s Laboratories of Canada), or certified by recognized independent testing organizations that test to CSA standards.

.2 Products shall be certified by a recognized testing agency accredited by the Standards Council of Canada and bear a certification mark from that agency.

.3 All luminaires shall be listed and labeled for installation in fireproof or non-fireproof construction, dry, damp, or wet locations as required.

.4 Recessed fixtures mounted in an insulated ceiling shall be listed for use in insulated ceilings.

1.10 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

1.11 WARRANTY

.1 Refer to Section 01 78 00 and Section 26 05 00.

.2 The manufacturer shall provide a warranty against loss of performance and defects in materials and workmanship for the luminaires for a period of 5 years after acceptance of the luminaires. Warranty shall cover all components comprising the luminaire.

.3 All warranty documentation shall be provided to customer prior to the first shipment.

.4 LED Luminaires shall have a manufacturer’s warranty for a period of not less than five years.

.5 LED boards, drivers and associated components shall have a warranty of 5 years on the LEDs, 5 years on the driver, 10 years on the paint finish.

2 Products

2.01 MANUFACTURERS

.1 As noted on Lighting Fixture Schedule.

2.02 INDOOR LED LUMINAIRES, GENERAL

.1 Initial delivered lumens – thermal losses should be less than 10 per cent when operated at a steady state at an average ambient operating temperature of 25 degrees C, and optical losses should be less than 15 per cent.

.2 Average Delivered Lumens – Average delivered lumens over 50 000 hours should be minimum of 85 per cent of initial delivered lumens.

.3 All luminaires shall be tested per LM79/80 and published L70 data.

.4 Colour rendition:

.1 Interior luminaires with a CRI greater than or equal to 80, or as indicated on the lighting fixture schedule.

.2 Where minimum 90 CRI is indicated, the following may be considered acceptable in lieu, subject to confirmation with the Consultant by means of a Request for Interpretation during the bid period:

.1 CRI (Ra) ≥ 90.

.2 CRI (Ra) ≥ 80 and R9 (R9) ≥ 50.

.3 IES Rf ≥ 78, IES Rg ≥ 100, -1% ≤ IES Rcs,h1 ≤ 15%.

.5 Accessibility and Maintenance:

.1 All LED luminaires shall be field serviceable, with LED arrays, LED modules, drivers, etc. fully serviceable and easily accessible. In the case of recessed ceiling mounted, and in the case of

surface mounted ceiling fixtures, these components must be accessible from below. Luminaires in which any of these components are accessible only from above are not acceptable.

.2 Ballasts, drivers, LED arrays, LED modules, and lamps shall be serviceable while the fixture is in its normally installed position. Ballasts or drivers shall not be mounted to removable reflectors or wireway covers unless so specified. In the case of ceiling mounted luminaires, the serviceable components must be accessible from below.

.6 Housings:

.1 Formed to prevent warping and sagging. Housing, trim, and lens frame shall be true, straight (unless intentionally curved), and parallel to each other as designed.

.2 Sheet steel housings to be minimum 20 gauge.

.3 Wireways and fittings: free of burrs and sharp edges, and shall accommodate internal and branch circuit wiring without damage to the wiring.

.4 When installed, any exposed fixture housing surface, trim frame, door frame, and lens frame shall be free of light leaks.

.5 Hinged door frames shall operate smoothly without binding. Latches shall function easily by finger action without the use of tools.

.6 Drivers shall not be mounted to removable reflectors or wireway covers unless so specified.

.7 Mechanical Safety: Lighting fixture closures (lens doors, trim frame, hinged housings, etc.) shall be retained in a secure manner by captive screws, chains, aircraft cable, captive hinges, or fasteners such that they cannot be accidentally dislodged during normal operation or routine maintenance.

.8 Metal Finishes:

.1 Fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

.2 All metal components of fixtures shall be painted after fabrication to mitigate raw metal edges, and thus prevent premature corrosion.

.3 The manufacturer shall apply standard finish (unless otherwise specified) over a corrosion-resistant primer, after cleaning to free the metal surfaces of rust, grease, dirt and other deposits. Edges of pre-finished sheet metal exposed during forming, stamping or shearing processes shall be finished in a similar corrosion resistant manner to match the adjacent surface(s). Fixture finish shall be free of stains or evidence of rusting, blistering, or flaking, and shall be applied after fabrication.

.4 Interior light reflecting finishes shall be white with not less than 85 per cent reflectance, except where otherwise shown on the drawing.

.9 Wiring:

.1 Lighting fixtures shall have a specific means for grounding metallic wireways and housings to an equipment grounding conductor.

.2 Supplied complete with a luminaire disconnect plug.

.10 Control of Visual Perceptions of Temporal Light Modulation (flicker):

.1 All electric lights (except decorative lights, emergency lights and other special-purpose lighting) used in regularly occupied spaces meet at least one of the following requirements for flicker:

.1 A minimum frequency of 90 Hz at all 10% intervals from 10% to 100% light output.

.2 LED products with a “low risk” level of flicker (light modulation) of less than 5%, especially below 90 Hz operation as defined by IEEE standard 1789-2015 LED.

2.03 DRIVERS, GENERAL

.1 Electronic LED drivers shall be integral to the luminaire, and be designed to be accessible in the field for replacement and servicing.

.2 Input Voltage:

.1 Driver with a voltage range of (120-277) +/- 10% or (347-480) +/- 10%.

.2 Refer to lighting fixture schedule.

.3 For luminaires connected to a 347 volt circuit and utilizing a natively 120-277 volt driver, provide an appropriately sized step down transformer.

.3 Input frequency 60 Hz.

.4 Load regulation: +/- 1 per cent from no load to full load.

.5 Output ripple less than 10 per cent.

.6 Output should be isolated.

.7 Case temperature: rated for -40 degrees C through +80 degrees C.

.8 Overheat protection, self-limited short circuit protection and overload protected.

.9 Primary fused.

.10 Driver life rating not less than 50 000 hours

.11 Power Factor and Total Harmonic Distortion

.1 Power factor of greater than or equal to 0.9 at full load.

.2 THD of less than or equal to 20 per cent at full load.

.12 Dimming Control:

.1 Coordinate with Section 26 09 23.

.2 0-10 V dimming control typical for all fixtures unless otherwise noted.

.3 Control range: 10 per cent to 100 per cent typical, unless noted otherwise.

.4 Provide a mock-up to demonstrate the luminaire is free of flicker throughout the dimming range when used with the dimming controllers described in related sections.

2.04 DOWNLIGHT LUMINAIRES

.1 Minimum Light Output: 500 lm.

.2 Zonal lumen density: Minimum 75 per cent between 0 degrees and 60 degrees from nadir.

.3 Minimum luminaire efficacy: 45 lumens per watt.

.4 Correlated Colour Temperature (CCT): 3500 K

.5 Colour Rendition Index (CRI): 80 CRI minimum.

.6 Minimum L70 lumen maintenance to occur at 50 000 hours in accordance with LM-80 testing data and TM-21 extrapolation.

2.05 NOMINAL 305 MM BY 1220 MM (1 FOOT BY 4 FOOT) LUMINAIRES FOR AMBIENT LIGHTING OF INTERIOR SPACES

.1 Minimum Light Output: 1 500 lm.

.2 Zonal lumen density:

.1 Minimum 75 per cent between 0 degrees and 60 degrees from nadir.

.3 Spacing Criteria:

.1 0 degrees to 180 degrees: 1.0 – 2.0

.2 90 degrees to 270 degrees: 1.0 – 2.0

.4 Minimum luminaire efficacy: 85 lumens per watt.

.5 Correlated Colour Temperature (CCT): 4000 K

.6 Colour Rendition Index (CRI): 80 CRI minimum.

.7 Minimum L70 lumen maintenance to occur at 50 000 hours in accordance with LM-80 testing data and TM-21 extrapolation.

2.06 NOMINAL 610 MM BY 1220 MM (2 FOOT BY 4 FOOT) LUMINAIRES FOR AMBIENT LIGHTING OF INTERIOR SPACES

.1 Minimum Light Output: 3 000 lm.

.2 Zonal lumen density:

.1 Minimum 75 per cent between 0 degrees and 60 degrees from nadir.

.3 Spacing Criteria:

.1 0 degrees to 180 degrees: 1.0 – 2.0

.2 90 degrees to 270 degrees: 1.0 – 2.0

.4 Minimum luminaire efficacy: 85 lumens per watt.

.5 Correlated Colour Temperature (CCT): 4000 K

.6 Colour Rendition Index (CRI): 80 CRI minimum.

.7 Minimum L70 lumen maintenance to occur at 50 000 hours in accordance with LM-80 testing data and TM-21 extrapolation.

3 Execution

3.01 VERIFICATION OF CONDITIONS

.1 Coordinate the lighting system installation with the relevant trades so as to eliminate interferences with hangers, mechanical ducts, sprinklers, piping, steel, etc.

3.02 INSTALLATION

.1 Install lighting equipment, including but not limited to luminaires, controls, auxiliary devices and the integration of same in strict conformance with all manufacturers' recommendations and instructions the securing of which shall be the responsibility of the Contractor.

.2 Integrate luminaires with controls in accordance with respective luminaire manufacturers' and controls manufacturers' recommendations and instructions and to provide a complete, trouble-free operation without compromising safety, code and CSA requirements.

.3 Seal all luminaires for wet locations (i.e. all knock-outs, all pipe and wire entrances, etc.) as is standard industry practice to prevent water from entering luminaires.

.4 Luminaire Alignment:

.1 Locate recessed ceiling luminaires as indicated on reflected ceiling plan. Install recessed luminaires to permit removal from below. Include accessories and materials to meet applicable codes and regulatory requirements.

.2 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.3 Align luminaires mounted individually parallel or perpendicular to building grid lines.

.4 Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.

.5 Locate and install luminaires as indicated. Mounting heights and configuration of the luminaires shall be as specified in the Luminaire Schedule portion of the Specification or indicated on the drawings, and where conflicts exist, as approved by the Consultant.

.6 Installed all luminaires plumb and true and level as viewed from all directions unless specifically identified otherwise in the Lighting Fixture Schedule. Luminaires shall remain plumb and true without continual adjustment or visibly obvious means beyond what is shown on luminaire submittal drawings.

.7 For installation in suspended ceilings, ensure that the luminaires are supported such that there is no resultant bowing or deflection of the ceiling system greater than 1/360 of the length of the total span of the ceiling member.

.5 Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

.6 Whenever a luminaire or its hanger canopy is installed directly to a surface mounted junction box, use a finishing ring painted to match the ceiling to conceal the junction box.

.7 Suspended Luminaires:

.1 Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

.2 Suspended luminaires shall be installed plumb and true and level unless specifically identified otherwise in the Luminaire Schedule portion of this Specification and at a height from finished floor as specified on the drawings, details and Luminaire Schedule. In cases where this is impractical, refer to the Consultant for a decision. All appurtenances shall be consistently organized for a neat, uniform appearance.

.8 Install wall mounted luminaires at height as indicated.

.9 Accessories:

.1 Reflector cones, louvers, baffles, lenses, trims and other decorative elements shall be installed after completion of ceiling tile installation, plastering, painting and general cleanup.

.2 Install accessories provided with each luminaire.

.3 All accessories shall be properly installed and adjusted by Contractor in accordance with specification and installation instructions. Any spare items shall be clearly labeled (indicate type of accessory and associated luminaire types).

3.03 TESTING AND ADJUSTMENT

.1 As required, all adjustable luminaires shall be aimed, focused, locked, etc., by the Contractor under the observation of the Consultant. As aiming and adjusting is completed, locking setscrews and bolts and nuts shall be tightened securely by the Contractor.

.2 For luminaires with field selectable lumen output and/or CCT, ensure the correct setting matches the intended set points.

.3 All ladders, scaffolds, lifts, etc. required for aiming and adjusting luminaires shall be furnished by the Contractor.

.4 Where possible, units shall be focused during the normal working day. However, where daylight interferes with seeing lighting effects, aiming shall be accomplished at night.

3.04 LUMINAIRE SUPPORTS

.1 Provide adequate support to suit ceiling system.

.2 Support luminaires independently of ceiling framing, unless ceiling is certified by the manufacturer to support weight of installed devices. Confirm if T-bar ceilings are metric or imperial and provide luminaires to suit ceiling dimensions.

.3 Provide chain hangers for new and existing luminaires.

.4 Install clips to secure recessed grid-supported luminaires in place.

.5 Fixtures supported by suspended ceiling systems shall be securely fastened to the ceiling framing member by mechanical means, such as bolts, screws, or rivets. Ceiling framing members must be securely attached to each other and to the building structure as required by all applicable codes and standards. Use of integral clips is not acceptable.

3.05 WIRING

.1 Use SPC90 conductors for final connections to luminaires (including 0-10 V dimming conductors for applicable luminaires).

.2 Install luminaire disconnect plugs on all new luminaires not provided as such from the manufacturer.

.3 Connect luminaires to branch circuit outlets provided under Section 26 05 33.13 using flexible conduit.

.4 Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

.5 Bond products and metal accessories to branch circuit equipment grounding conductor.

3.06 FIELD QUALITY CONTROL

.1 Operate each luminaire after installation and connection. Inspect for proper connection and operation.

.2 Make wiring connections to the branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

.3 Occupancy Sensors.

.1 Locate and aim sensors in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas.

.2 Rooms shall have 90 per cent to 100 per cent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room.

.3 Exercise proper judgment in executing the work to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components.

3.07 CLEANING

.1 Thoroughly clean all luminaires and accessories after installation. All fingerprints, dirt, tar, smudges, drywall mud, dust, etc. shall be removed by the Contractor from the luminaire bodies, reflectors, trims, and lens or louvers prior to final acceptance. All reflectors shall be free of paint other than factory-applied, if any. All reflectors, cones and lenses shall be cleaned only according to manufacturers' instructions.

.2 Clean electrical parts to remove conductive and deleterious materials.

.3 Remove dirt and debris from enclosures.

.4 Clean photometric control surfaces as recommended by manufacturer.

.5 Clean finishes and touch up damage.

.6 Luminaire finishes which are disturbed in any way during construction shall be touched up or refinished in a manner satisfactory to the Consultant.

3.08 COMMISSIONING

.1 In accordance with Section 26 08 50.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Emergency lighting units with battery back-up for emergency illumination of remote emergency fixtures and internally illuminated exit signs.

.2 Remote emergency fixtures.

1.02 RELATED REQUIREMENTS

.1 Section 26 51 19 – LED Interior Lighting.

.2 Section 26 52 13.16 – Exit Signs.

1.03 REFERENCES

.1 CSA Group:

.1 CSA C22.2 No. 141-15 (R2020), Emergency lighting equipment.

.2 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.3 Ontario Electrical Safety Code (28th edition/2021).

.2 Ontario Building Code.

.3 National Building Code of Canada.

.4 Underwriters Laboratories, Inc. (UL):

.1 UL 924 – Standard for Safety of Emergency Lighting and Power Equipment.

1.04 SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for emergency lighting and include product characteristics, performance criteria, physical size, finish, and limitations.

1.05 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data for emergency lighting for incorporation into manual.

1.06 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Products shall be free of defects in material and workmanship.

.2 Furnished products are listed and/or certified by third party agencies as suitable for the intended purpose.

.3 All units will be certified that they have been tested prior to shipping.

1.07 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect emergency lighting from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 00.

1.08 WARRANTY

.1 Product is warranted free of defects in material and workmanship.

.2 Product is warranted to perform the intended function within design limits.

.3 For batteries in this Section, 12 month warranty period is extended to 24 months.

2 Products

2.01 EMERGENCY BATTERY UNITS

.1 Manufacturers:

.1 Lumacell RG12S series.

.2 Aimlite.

.3 BeLuce (formerly Beghelli).

.4 Emergi-Lite.

.5 Lithonia (Acuity Brands Lighting).

.6 Stanpro.

.2 Battery Unit Features:

.1 Self-contained unit equipment for LED emergency lighting shall be manufactured and labeled as certified to meet CSA C22.2 No 141.

.2 Housing: Constructed of formed and welded 18 gauge cold rolled steel with knockouts for conduit, finished in baked white enamel. Cabinet suitable for direct or shelf mounting to wall. Removable or hinged front panel for easy access to batteries.

.3 Charger:

.1 Solid-state micro-controller PCB, Pulse-Guard charger, features include; auto-equalized, temperature compensated, current limited, short circuit and reverse polarity protected.

.2 Recharges battery within 24 hours in accordance with CSA requirements.

.4 Transfer: Upon failure of the power supply, or voltage dip below 75 per cent of nominal, a sealed relay automatically and instantaneously connects the battery to the emergency lighting load and disconnects when battery discharge reaches 87.5 per cent expectancy.

.5 Batteries: seal lead calcium, maintenance free, and 10 year pro-rated service life.

.6 Auto-test: Unit to perform self-test for 1 minute ever 30 days, 10 minutes on the 6th month and 30 minutes ever 12 months.

.3 Battery Electrical Features:

.1 Input Voltage:120-347 VAC universal input:

.1 Provided with plug and receptacle when connected to 120 volt source panelboard.

.2 direct connected to 347 volt source panelboard.

.2 Output Voltage: 12 VDC; balance loads to battery unit terminals.

.1 Normally "Off" output: wattage capacity as indicated for emergency remotes and internally illuminated exit signs.

.2 Battery Run Time at full load: must meet OBC minimum, 30 minutes.

.3 Voltage regulation: ± 5 per cent of nominal maximum.

.3 Signal lights: solid state, for 'AC Power ON' and 'High Charge'.

.4 Lamp heads:

.1 Integral on unit, 345 degrees horizontal and 180 degrees vertical adjustment.

.2 Lamp type:

.1 Two 12 V, 6 W MR16 LED lamps mounted on top of the battery cabinet, shall be injection molded thermoplastic, white finish.

.2 Average lamp lumens: 170 lm.

.3 Centre Beam Candlepower: 440 cd.

.4 Beam angle: 30 degrees.

.5 Lamp efficacy: 42.5 lm/W.

.5 Auxiliary equipment:

.1 Ammeter.

.2 Voltmeter.

.3 Test switch.

.4 Time delay relay.

.5 Battery disconnect device.

.6 AC input and DC output terminal blocks inside cabinet.

.7 Shelf Bracket.

.8 Cord and single twist-lock plug connection for AC.

.9 RFI suppressors.

.10 Voltage Sensing Relay:

.1 Up to six inputs for line voltage detection from different normal lighting zone. The wire connection from each zone circuit shall be made with terminal blocks.

.2 Operation Sequence: In the case of power failure of one or several circuits feeding normal lighting, the output circuit will open and transfer the battery unit(s) in emergency lighting mode.

.3 Provide “push to test” push button and a pilot light for each zone circuit for manual testing and service.

2.02 EMERGENCY LIGHTING EMERGENCY REMOTE HEADS

.1 Refer to drawings and lighting schedule.

.2 One or two lamps, shall be injection molded thermoplastic, white finish, lamps shall be MR16 LED 12 V, 540 lumen, 25 degree beam angle, 6 watt.

.3 Remote heads to be mounted not less than 2100 mm (6’-10") AFF.

.4 LED MR16 lamps:

.1 Lumacell MQM-x-12V4W-LD10 series.

.2 Approved equal by Emergi-Lite.

.3 Approved equal by Stanpro.

.4 Approved equal by Beghelli.

3 Execution

3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections are acceptable for emergency lighting installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Owner.

.2 Inform Owner of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Owner.

3.02 INSTALLATION

.1 Install emergency lighting in compliance with local inspection authorities.

.2 Wiring:

.1 Connect battery input to source panelboard. Balance the emergency lighting loads connected to battery output terminal blocks. Provide and connect remote fixtures and internally illuminated exit signs as specified and as required for system performance in compliance with OBC minimum egress illumination requirements. Install remotes in locations as shown on the drawings. Connect all remotes to normally "Off" output from battery units.

.2 Contractor is responsible for revisions to system, including relocations, aiming and additional remote heads as determined by testing results. All wiring shall be in accordance with manufacturer's recommendations.

.3 Use minimum #10 gauge or heavier if needed to provide a maximum voltage drop of 5 per cent. Consult manufacturer's table for sizing the minimum gage and length of wire runs permitted for connected loads to ensure a maximum voltage drop of 5 per cent from the battery unit to the farthest emergency remote, in accordance with OBC and local inspection authorities.

.3 Mounting: Suitable for wall mounting, complete with bracket from manufacturer lighting heads, test switch and diagnostic LED indicator shall be visible.

.4 Provide Voltage Sensing Relays internal or external to battery units to meet the intent of OESC Rule 46-304 (4). Unit equipment shall be installed in such a manner that it will be automatically actuated upon failure of the power supply to the normal lighting in the area covered by that unit equipment.

3.03 TESTING AND COMMISSIONING

.1 When installation of emergency lighting equipment is complete, contractor shall commission and test the entire system and adjust if necessary.

.2 Contractor is responsible for arranging and cost of a verification test of emergency illumination levels by the manufacturer’s representative.

.1 Verification test shall be performed with a lux/footcandle meter at 1 m intervals along all paths of egress throughout the space, and record light level readings on floor plans provided by the consultant.

.2 The contractor shall also provide consultant with a letter stating the recorded emergency lighting levels meet the OBC requirements of 10 lx (1 fc) average with minimum readings not less than 1 lx (0.1 fc) on the path of egress.

.3 The manufacturer is to provide a letter of verification confirming testing and operation of all emergency lighting as well as installation to all applicable codes.

.3 Contractor is to indicate in the letter the duration of emergency lighting run time that was observed.

.4 Testing shall be performed during non-daylight hours. Contractor shall aim all remotes to optimise illumination on the floor and stair.

.5 Contractor shall certify in writing to the consultant that the system is complete, installed per CSA C22.2 No. 141, has been tested, and operates for the specified battery run time.

.6 Contractor shall notify Owner and consultant at least ten days prior to proposed testing date and schedule testing at time and date acceptable to the Owner.

.7 Installation shall be in accordance to the electrical code and manufacturer’s instructions.

.8 The Contractor is to submit a letter on Contractor’s letterhead confirming the criteria specified above is met, including light levels, and run time, and include a copy of the plans with light levels recorded.

.9 Provide breaker lock on emergency lighting circuit at source panelboard.

3.04 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by emergency lighting installation.

3.05 TESTING, MAINTENANCE, AND WARRANTY SERVICE

.1 Provide complete instructions for the operation and care of the emergency power supply or unit equipment that shall specify testing at least once every month to ensure security of operation. Instructions to be framed under glass.

.2 OBC testing obligations: Owner's facility maintenance personnel are required to document one manual test of the battery units each month, and conduct one full discharge test once a year per OBC and CSA C22.2 No.141 requirements.

.3 Annual Maintenance: The manufacturer recommends maintenance to be performed by a qualified service provider. Contact the manufacturer for any warranty service.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Internally illuminated “Running Man” exit sign units for ordinary location use.

1.02 RELATED REQUIREMENTS

.1 Section 26 52 13.13 – Emergency Lighting: Emergency Battery Units.

1.03 REFERENCES

.1 CSA Group:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CSA C22.2 No. 141-15 (R2020), Emergency lighting equipment.

.4 CAN/CSA-C860-11 (R2020), Performance of Internally Lighted Exit Signs.

.2 International Organization for Standardization (ISO)

.1 ISO 7010:2011 – Graphical symbols – Safety colours and safety signs.

.2 ISO 3864-1:2011 – Graphical symbols -- Safety colours and safety signs -- Part 1: Design principles for safety signs and safety markings

.3 Ontario Building Code.

.4 Underwriters Laboratories of Canada (ULC)

.1 ULC/ORD-924-02, Standard for Emergency Lighting and Power Equipment.

.2 CAN/ULC-S572-10, First Edition Standard for Photoluminescent and Self-Luminous Exit Signs and Path Marking Systems.

1.04 SUBMITTALS

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

.2 Product Data: Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and maintenance.

1.05 QUALITY ASSURANCE

.1 Exit signs units shall be ULC Listed and/or CSA Certified to CSA C22.2 No. 141 and CSA C860.

.2 Furnished products are listed and/or certified by third party agencies as suitable for the intended purpose.

.3 Manufacturer Qualifications: Products shall be free of defects in material and workmanship.

.4 All units will be certified that they have been tested prior to shipping.

1.06 DELIVERY, STORAGE, AND HANDLING

.1 In accordance with Section 01 61 00.

1.07 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 00.

1.08 WARRANTY

.1 Product is warranted free of defects in material and workmanship for a minimum of one year from substantial completion.

2 Products

2.01 EXIT SIGNS, GENERAL

.1 Manufacturers

.1 Aimlite.

.2 BeLuce (formerly Beghelli).

.3 Emergi-Lite.

.4 Lithonia (Acuity Brands Lighting).

.5 Lumacell.

.6 Stanpro.

.7 Other manufacturers as indicated in Section 26 52 13.13.

.2 Substitution Limitations:

.1 Manufacturer of exit signs to be the same as manufacturer of emergency lighting battery units and remote heads specified in Section 26 52 13.13.

.2 No manufacturer substitutions.

.3 Description

.1 Green and White LED Pictogram “Running Man” exit sign.

.2 The pictogram sign shall be certified as CSA 22.2 No. 141, and meet ISO 3864-1 and ISO 7010.

.3 The pictogram legend shall have a minimum illuminated dimension of 5.9" high and 11.13" with ISO 3864-1 and ISO 7010 pictogram printed on a pure-acrylic panel.

.4 The sign shall include a standard single face with optional double-faceplate included.

.5 Not acceptable:

.1 Red LED EXIT signs.

.2 Externally illuminated photoluminescent, or non-electrical radioluminescent type of pictogram signs are unacceptable.

.4 Mounting

.1 The canopy shall universal to allow for wall, end, or ceiling mount.

.5 Electrical

.1 The LED light source shall be long-life white Light-Emitting Diodes and shall provide uniform illumination of the pictogram in normal and emergency operation.

.2 The sign shall operate with universal 2-wire AC input voltage of 120 to 347 Vac at less than 3 Watts, and universal 2-wire DC input voltage from 6 to 24 Vdc at less than 2.5 Watts for single and double face legends with a single arrow either left or right.

.3 If arrow left and arrow right is required for T intersection, the contractor shall supply and install two separate pictogram signs.

.4 The pictogram edge-lit exit sign where indicated on the plans in a self-powered configuration shall use a sealed Nickel-Cadmium battery of 2.4 V nominal voltage and shall stay illuminated during emergency operation for at least two hours upon AC failure.

2.02 EXTRUDED ALUMINUM PICTOGRAM EXIT SIGNS

.1 Manufacturers

.1 Lumacell LA series.

.2 Beghelli QR-RM series.

.3 Equivalent products from manufacturers as described in Article 2.01 of this specification.

.2 Materials

.1 The housing assembly shall be constructed of extruded aluminum in [factory white] [black] [grey] [brushed aluminum] colour.

.2 The housing shall be constructed of rugged extruded aluminum and have a maximum depth of 2-1/2”.

.3 The faceplate(s) shall be constructed of extruded aluminum and shall incorporate a protective clear poly-carbonate panel.

.4 Each face plate shall come standard with two legend films for pictogram and directional indicators.

3 Execution

3.01 INSTALLATION

.1 Install exit lights to manufacturer's recommendations, listing requirements, CSA standard and local regulatory requirements.

.2 Ensure exit signs are not obscured. Where an exit sign is to be installed in an area with no ceiling, provide a suitable pendant mount.

.3 Connect fixtures to exit light circuits normal power supply and emergency battery units specified in Section 26 52 13.13.

.4 Ensure that emergency lighting circuit breaker is locked in ON position.

.5 If arrow left and arrow right is required for T intersection, the contractor shall supply and install two separate pictogram signs.

3.02 FIELD QUALITY CONTROL

.1 Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.03 CLEANING

.1 Proceed in accordance with Section 01 74 00.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

3.04 TESTING AND COMMISSIONING

.1 When installation of emergency lighting equipment is complete, contractor shall commission and test the entire system and adjust if necessary.

.2 Contractor shall certify in writing to the consultant that the system is complete, installed per CSA C22.2 No. 141, has been tested, and operates for the specified battery run time.

.3 Contractor shall notify owner and consultant at least ten days prior to proposed testing date and schedule testing at time and date acceptable to the owner.

.4 Installation shall be in accordance to the electrical code and manufacturer’s instructions.

.5 Provide breaker lock on emergency lighting circuit at source panelboard.

3.05 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by exit sign installation.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Provide a complete system of conduits, pull boxes, outlets, sleeves, and all components for a complete working system.

.2 Existing PA System is InterM.

1.02 RELATED REQUIREMENTS

.1 Section 26 05 33.13 – Conduit for Electrical Systems.

.2 Section 26 05 33.16 – Boxes for Electrical Systems.

.3 Section 10 25 19 – Classroom Control Panels.

1.03 REFERENCES

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CAN/CSA-C22 No. 214 M90 Communications Cables.

.4 CAN/CSA-T530 Commercial Building Standards for Telecommunications Pathways and Spaces.

.5 CAN/CSA-T529-95 Commercial Buildings Telecommunications Standards.

.6 CAN/CSA-T527 Grounding and Bonding Requirements for Telecommunications in Commercial Buildings.

.7 CAN/CSA-T528 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

.8 Ontario Building Code.

1.04 SUBMITTALS

.1 Product Data.

2 Products

2.01 OUTLET BOXES

.1 Wall outlets shall be 115 mm square boxes with plaster rings to suit single gang devices unless otherwise noted.

2.02 CONDUIT

.1 Conduit size shall be in accordance with recommended standard for conduits in Building as published by BICSI.

.2 Minimum conduit size shall be 21 mm (3/4”) diameter.

.3 Plywood backboards shall be minimum 1200 x 2400 mm, 19 mm thick, painted with 2 coats of fire retardant light grey enamel.

2.03 CABLING

.1 Provide twisted pair shielded cabling by Belden to building standard for each device.

.2 Plenum cables are permitted in accessible ceilings. Provide 'J' hooks in these locations for cable installation.

2.04 EQUIPMENT

.1 Handset: Dukane model PCS821, black cycolac, dynamic transmitter, standard magnetic receiver, 6'(1.8m) coiled cord, c/w two-gang stainless steel face plate, chromed steel two-pole hookswitch/cradle, rocker (PVCY and CALL) switch, and standard two-gang electrical back box.

.2 Speakers: McBride series 8224 (recess mounted in ceiling), pre-assembled "call-in" speaker complete with 8'' dual cone speaker with magnet, 12.5'' square steel baffle (MC25A), 24 or 70 Volt to match existing, 4 watt transformer and suitable back box.

3 Execution

3.01 INSTALLATION

.1 Vertically mount outlet boxes, unless noted otherwise, 300 mm to centre above floor, or 150 mm above counter top where shown at counters or benches.

.2 Fish conduit, clear blockages and outlet and clean out pull boxes at completion of installation. Leave conduit free of water or excess moisture. Install No. 12 gauge galvanized soft iron pull wire, or 1/8" nylon pull cord continuously from outlet to outlet, through conduit and fasten at each box.

.3 Conduit bonds shall have a bending radius of not less than nine times conduit diameter. Ream out conduit and identify ends with green paint.

.4 Install additional steel pull boxes in such a manner that, throughout entire system, there shall be not more than two 90 degree or equivalent bends or more than 30 000 mm in each run, so that wire or cables may be pulled in or withdrawn with reasonable ease. Minimum space requirements in pull boxes having one conduit each in opposite ends of the box, shall be as follows:

Maximum conduit size	Size of pull boxes in millimetres			For each additional conduit size increase width by:
	Width	Length	Depth	
21 mm	150 mm	300 mm	100 mm	50 mm
27 mm	200 mm	400 mm	150 mm	75 mm
35 mm	250 mm	450 mm	200 mm	75 mm
41 mm	300 mm	600 mm	250 mm	100 mm
53 mm	350 mm	750 mm	300 mm	125 mm

.5 Include above noted information on final record drawings at project completion.

.6 Install new devices in locations noted on the drawings.

3.02 TERMINATIONS

.1 Connections at main PA rack shall be provided by the installing Contractor.

End of Section

1 General

1.01 CONDITIONS AND REQUIREMENTS

.1 Refer to the General Conditions, Supplementary General Conditions, and General Requirements.

.2 Provisions of this Section shall apply to all Sections of Division 27.

.3 Refer to Consultant's drawings for exact location of electrical equipment and devices. Refer to Designer drawings for additional notes which complement these specifications.

.4 The Division 26 specification documents shall be followed in conjunction with the specification in this section.

1.02 RELATED REQUIREMENTS

.1 Division 25 – Integrated Automation.

.2 Division 26 – Electrical.

.3 Division 28 – Electronic Safety and Security.

1.03 INTENT

.1 Include all material, labour, equipment, and plant construction as necessary to make a complete installation as shown and specified hereinafter. Sections of this specification are not intended to delegate functions nor to delegate work and supply to any specific trade. Ensure that the systems specified hereafter are complete and operative.

1.04 REFERENCE STANDARDS

.1 The equipment, material and installation shall conform to the latest version of the applicable codes, standards (including technical service bulletins and addenda), and regulations of authorities having jurisdiction.

.2 BICSI

.1 Telecommunications Distribution Methods Manual.

.2 BISCI G1-17 – Outside Plant Manual.

.3 CSA Group:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CSA T529 – Commercial Building Telecommunications Cabling Standard (ANSI/EIA/TIA-568-B).

.4 CSA T530 – Commercial Building Standard For Telecommunications Pathways And Spaces (TIA/EIA 569-A).

.5 CSA T528 – Administration Standard For The Telecommunications Infrastructure Of Commercial Buildings (ANSI/EIA/TIA-606).

.6 CSA T527 – Commercial Building Grounding And Bonding Requirements For Telecommunications (ANSI/EIA/TIA-607).

.7 CSA C22.2 No. 214 – Communications Cables.

.8 CSA C22.2 No. 232-M – Fibre Optic Cables.

.9 CSA C22.2 No. 182.4-M90 – Plugs, Receptacles, and Connectors for Communication Systems.

.4 TIA

.1 TIA/EIA-568-B.1 – Commercial Building Telecommunications Cabling Standard

.2 TIA/EIA-568-B.2 – Balanced Twisted Pair Cabling Components

.3 TIA/EIA-568-B.3 – Optical Fibre Cabling Components Standard

.5 ISO

.1 ISO/IEC IS 11801A – Generic Cabling for Customer Premises.

.6 CENELEC EN 50173 – Performance Requirements for Generic Cabling Schemes.

.7 IEC

.1 IEC 603-7, PART 7 – Detailed Specification For Connectors, 8-Way, Including Fixed And Free Connectors With Common Mating Features.

.2 IEC 807-8 – Rectangular Connectors For Frequencies Below 3 MHz, Part 8: Detailed Specification For Connectors, Four-Signal Contacts And Earthing Contacts For Cable Screens, First Edition.

.8 FIPS PUB 174 – Commercial Building Telecommunications Wiring Standard. Federal Information Standard Publication.

.9 UL 444 and 13 – Adopted Test and Follow-Up Service Requirements For the Optional Qualification of 100Ω Twisted-Pair (Cables).

.10 NEMA WC 63 – Performance Standard For Field Testing Of Unshielded Twisted-Pair Cabling System.

.11 ANSI/EIA/TIA

.1 ANSI/EIA/TIA-492AAAA – Detailed Specification For 62.5µm Core Diameter / 125µm Cladding Diameter Class 1a Multimode, Graded-Index Optical Waveguide fibres.

.2 ANSI/EIA/TIA-492BAAA – Detailed Specifications For Class Iva Dispersion-Unshifted Singlemode Optical Waveguide Fibres Used In Communication Systems.

.3 ANSI/EIA/TIA-472CAAA – Detailed Specifications For All Dielectric (Construction 1) Fibre optic Communications Cable For Indoor Plenum Use, Containing Class 1a, 62.5µm Core Diameter / 125µm Cladding Diameter Fibre optic(s).

.4 ANSI/EIA/TIA-472DAAA – Detailed Specifications For All Dielectric Fibre optic Communications Cable For Outdoor Plant Use, Containing Class 1, 62.5µm Core Diameter / 250µm Cladding Diameter Fibre optic(s).

.5 ANSI/EIA/TIA-455 – Test Procedures For Fibre optics, Cables And Transistors.

.6 ANSI/EIA/TIA-598 – Colour Coding of Fibre Optic Cables.

.7 ANSI/EIA/TIA-604-3 – FOCIS 3 Fibre Optic Connector Intermateability Standard.

.8 ANSI/EIA/TIA-606 – Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

.9 ANSI/EIA/TIA-607 – Commercial Building Grounding and Bonding Requirements for Telecommunications.

.12 ANSI Z136.2 – American Standards For The Safe Operation of Fibre optic Communication Systems Utilizing Laser Diode And LED Sources.

.13 ANSI/CEA

.1 ANSI/ICEA S-83-640 – Fibre Optic Outside Plant Communications Cable.

.2 ANSI/ICEA S-83-596 – Fibre Optic Premises Distribution Cable.

1.05 SUBMITTALS

.1 Before delivery to site of any item of equipment, submit shop drawings c/w all data, pre-checked and stamped accordingly, for review to the Consultant. Indicate project name on each brochure or sheet. Submit shop drawings within 1 week after award of contract.

1.06 RECORD DOCUMENTATION

.1 To Section 01 78 00.

.2 Red lines, mark-ups by this contractor.

1.07 OPERATION AND MAINTENANCE MANUALS

.1 Refer to Division 01.

1.08 INSPECTIONS

.1 The Consultant will carry out inspections and prepare deficiency list for action by the Contractor, during and on completion of project.

1.09 DRAWINGS AND SPECIFICATIONS

.1 The drawings and specifications are complementary each to the other and what is called for by one to be binding as if called for by both. Should any discrepancy appear between the drawings and specifications which leaves the Contractor in doubt as to the true intent and meaning of plans and specifications, a ruling is to be obtained from the Engineer in writing before submitting Tender. If this is not done, the maximum, the most expensive alternate or option will be provided in base tender bid.

.2 All drawings and all Divisions of these specifications shall be considered as a whole and work of this Division shown anywhere therein shall be furnished under this Division.

.3 Drawings are diagrammatic and indicate the general arrangement of equipment and pathways. Most direct routing of cabling is not assured. Exact requirements shall be governed by architectural, structural, and mechanical conditions of the job. Consult all other drawings in preparation of the bid. Extra lengths of wiring or addition of pull and junction boxes, etc. necessitated by such conditions shall be included in the bid. Check all information and report and apparent discrepancies before submitting the bid.

.4 Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of pathways so as to best fit the layout of the job.

.5 Scaling off the drawings will not be sufficient or accurate for determining these locations. Where job conditions require reasonable changes in indicated arrangement and locations, such changes shall be made by the Contractor at no additional cost to the Owner.

.6 Before ordering any conduit, cable tray, cables, fittings, etc., this Contractor shall verify all pertinent dimensions at the job site and be responsible for their accuracy.

1.10 MATERIAL

.1 This contractor is responsible to ensure that all items submitted meet all requirements of the drawings and specification, and fits in the allocated space. The final determination of a product being acceptable shall be determined by the Engineer.

1.11 TESTING DATA

.1 The contractor shall provide a complete testing report utilizing a testing device as specified in the applicable TIA/EIA standard with the correct adapter and test. All copper tests shall be compliant to the current TIA/EIA standards: Perm Link or Channel.

.2 The Summary report shall provide be provided to the end user in a universal format so that there is no need to purchase any software to read and print the report.

.1 Utilizing Adobe Acrobat is an acceptable manner.

1.12 PAINTING AND FINISHES

.1 Minor damages to finish on factory finished equipment shall be touched up to the Engineer's satisfaction. Items suffering major damage to finish shall be replaced at the direction of the Engineer. Protect work so that finishes will not be damaged or marred during construction. Maintain the necessary protection until completion of the work.

1.13 SAFETY

.1 The Contractor shall be responsible for the safety of his workmen and the equipment on the project in accordance with all applicable safety legislation passed by Federal, Provincial, and local authorities governing construction safety. The more stringent regulations shall prevail.

1.14 WARRANTY

.1 Submit a written performance warranty to the Owner for one year for the complete installation for a period of no less than five years from the date of testing and acceptance. The system warranty shall be based on industry standards.

.2 The contractor shall also provide a one year labour warranty on the installation.

2 Products

2.01 MATERIAL APPROVAL

.1 The design, manufacture and testing of electrical equipment and materials shall conform to or exceed the latest applicable CSA, IEEE, and ANSI standards.

.2 All materials must be new and be ULC or CSA listed. Any materials not covered by the aforementioned listing standards shall be tested and approved by an independent testing laboratory, Technical inspection Services, or other government agency.

3 Execution

3.01 WORKMANSHIP AND CONTRACTOR’S QUALIFICATIONS

.1 Only first class workmanship will be accepted, not only in regards to durability, efficiency and safety, but also in regards to neatness of detail. Present a neat and clean appearance on completion to the satisfaction of the Engineer. Any unsatisfactory workmanship will be replaced at no extra cost.

.2 Conform to the best practices applicable to this type of work. Install all equipment and systems in accordance with the manufacturer's recommendations, but consistent with the General Requirements of this Specification. This Contractor will be held responsible for all damage to the work of his own or any other trade, resulting from the execution of his work. Store all equipment and materials in dry locations.

.3 Provide foreman in charge of this work at all times.

.4 The contractor shall be fully liable to provide and maintain in force during the life of this Contract, such insurance, including Public Liability Insurance, Product Liability Insurance, Auto Liability Insurance, Worker's Compensation, and Employer's Liability Insurance.

3.02 WORK SEQUENCE

.1 Prior to start of each work period in occupied area, temporary protection shall be installed to prevent damage to any personal property or furnishing. Coordinate with Owner's representative if any furniture must be relocated to facilitate work.

.2 Owner's representative shall approve temporary protection plan prior to use.

.3 Necessary steps shall be taken by contractor to ensure that required fire fighting apparatus is accessible at all times. Flammable materials shall be kept in suitable places outside the building.

3.03 COORDINATION

.1 Coordinate work with other trades.

.2 Verify equipment dimensions and requirements with provision specified under this Section. Check actual job conditions before fabricating work. Report all necessary changes in time to prevent needless work. Changes or additions subject to additional compensation, which are made without written authorization and an agreed price, shall be at Contractor's risk and expense.

.3 Read specifications and drawings of other trades and conform with their requirements before proceeding with any work specified in this Division related to other trades. Cooperate with all other trades on the job, so that all equipment can be satisfactorily installed, and so that no delay is caused to any other Trades.

3.04 MANUFACTURERS' INSTRUCTIONS

.1 Where the specifications call for an installation to be made in accordance with Manufacturer's recommendations, a copy of such recommendations shall be at all times be kept on the job site and be available to the Owner's Representative.

.2 Follow manufacturer's instructions where they cover points now specifically indicated on the drawings and specifications. If they are in conflict with the drawings and specifications obtain clarification from the Consultant before starting work.

3.05 QUALITY ASSURANCE

.1 See General Provisions of the Contract.

.2 The specifications contained herein are set forth as the minimum acceptable requirements. This does not relieve the Contractor from executing other quality assurance measures to obtain a complete operating system within the scope of this project.

.3 The Contractor shall ensure that all workmanship, all materials employed, all required equipment and the manner and method of installation conforms to accepted construction and engineering practices, and that each piece of equipment is in satisfactory working condition to satisfactorily perform its functional operation.

.4 Provide quality assurance tests and operational check on all components of the electrical distribution system, all lighting fixtures, and communication systems.

3.06 LABELS AND SIGNS

.1 Labelling shall be as per TIA/EIA-606.

3.07 ADJUST AND CLEAN-UP

.1 The Contractor and associated sub trades, at all times during construction, to keep the site free of all debris, boxes, packing, etc., resulting from work of this Trade. At the completion of this work, the installation is to be left in a clean and finished condition to the satisfaction of the Engineer.

3.08 TESTS AND ACCEPTANCE

.1 The operation of the equipment does not constitute an acceptance of the work by the Owner. The final acceptance is to be made after the Contractor has adjusted his equipment and demonstrated that it fulfils the requirements of the drawings and the specifications.

.2 Testing of all systems shall be performed in the presence of the Owner's designated representative. The contractor shall give 72 hours advance notice to the Owner before beginning the tests.

.3 Upon completion of the installation, the Contractor shall furnish certificates of approval from all authorities having jurisdiction, as applicable. Contractor shall demonstrate that work is complete and in perfect operating condition. In the presence of the Owner, the Contractor shall demonstration the proper operation of all miscellaneous systems.

End of Section

1 General

1.01 SUMMARY

.1 Section Includes:

.1 Demolition and removal of selected portions of building or structure.

.2 Demolition and removal of selected site elements and/or Information Technology (IT), Security or other special systems or infrastructure.

.3 Salvage of existing items to be reused or recycled.

.2 Contractor shall include in the Bid all labour, materials, tools, plant, transportation, storage costs, equipment, insurance, temporary protection, permits, inspections, taxes, and all necessary and related items required to provide complete demolition and cutover of existing telecommunication systems shown and described in the Specifications.

.3 The Contractor is responsible for providing and coordinating phased activities and construction methods that minimize disruption to Terminal operations and provide complete and operational systems.

.4 The Contractor shall coordinate interfaces to existing systems that are being demolished in order to minimize disruption to the existing systems operations. Any systems outages shall be approved in advance and scheduled with Owner.

.5 The Contractor shall coordinate specialty electronic, IT data networks, common use, CCTV, public address, and any other IT infrastructure systems.

1.02 RELATED REQUIREMENTS

.1 Section 02 41 19 – Selective Demolition.

1.03 DEFINITIONS

.1 Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

.2 Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.

.3 Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

.4 Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.04 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Demolition Meeting

.1 Conduct a pre-demolition meeting at Project Site with Owner and all affected stakeholders.

.1 Inspect and discuss condition of construction to be selectively demolished.

.2 Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

.3 Existing telecommunications rooms that have demolition work may involve electrical, mechanical, and architectural demolition. Review and coordinate requirements of work performed by other trades.

.4 Review areas where existing construction is to remain and requires protection.

.5 Review procedures to be followed when critical systems are inadvertently interrupted.

1.05 SUBMITTALS

.1 Action Submittals

.1 Comply with all submittal procedures given in other Sections.

.2 Submit a Schedule of selective demolition and cutover activities which indicates the following as a minimum:

.1 Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's and tenants' on-site operations are uninterrupted.

.2 Duration of how long IT and security services will be interrupted and when systems cannot be disabled and temporary parallel service is required submit how this is proposed to be accomplished.

.3 The contractor’s plan for coordination of shutoff, capping, and continuation of IT and all other utility services.

.4 Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

.3 Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

.4 Pre-demolition Photographs or Video: Submit before Work begins.

.5 Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

.2 Closeout Submittals

.1 Submit a list of items that have been removed and salvaged.

.2 Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

.3 Submit as-built documentation of all remaining IT and security systems conduit and cabling that remains.

1.06 MATERIAL OWNERSHIP

.1 Unless otherwise indicated, demolition waste becomes property of Contractor.

1.07 FIELD/SITE CONDITIONS

.1 Owner will occupy portions of building immediately adjacent to selective demolition area.

.1 Conduct selective demolition so Owner's operations will not be disrupted.

.2 Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

.1 Before selective demolition, Owner will remove their equipment from the space.

.3 Notify Consultant of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

.4 Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

.1 Hazardous materials will be removed by Owner before start of the Work.

.2 If suspected hazardous materials are encountered, do not disturb; immediately notify Engineer. Hazardous materials will be removed by Owner under a separate contract.

.5 Storage or sale of removed items or materials on-site is not permitted.

.6 Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1.08 WARRANTY

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

2 Products – Not Used

3 Execution

3.01 EXAMINATION

.1 Verify that utilities have been disconnected and capped per Owner approved procedures before starting selective demolition operations.

.2 Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

.3 Survey existing condition of all IT related conduits and cables from origin to destination and correlate with requirements indicated to determine extent of selective demolition required.

.4 Label all conduits and cables with origin, destination and what system they serve.

.5 Consult with Owner to determine whether systems can be disabled or whether a new parallel system needs to be installed.

3.02 REMOVAL OF COMMUNICATIONS CABLING AND EQUIPMENT

.1 Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

.1 Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level. Remove all abandoned cables from origin to destination.

.2 Dispose of demolished items and materials promptly.

.2 Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Engineer, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

.3 For existing equipment cabinets with active components in them, provide an airtight dust seal around the cabinet and circulate cooling air with a portable air conditioning unit or other means to ensure equipment does not overheat.

.4 If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

.5 When removing communications outlets, remove all conductors back to patch panel in communications closet or IT rack. Provide blank faceplates where outlets are removed from walls or partitions to remain.

.6 Where communications cabling is to be re-used, coil the communications outlet cabling in the ceiling space for re-use.

.7 [Turn over wireless access points to Owner.\

3.03 DISPOSAL OF DEMOLISHED MATERIALS

.1 General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in accordance with the requirements of the Authority Having Jurisdiction.

.1 Do not allow demolished materials to accumulate on-site.

.2 Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

.3 Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

.2 Burning: Do not burn demolished materials.

.3 Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.04 CLEANING

.1 Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

End of Section

1 General

1.01 SUMMARY

.1 This Section covers the Specification and requirements for the grounding and bonding of communications systems and structured cabling infrastructures.

.2 Contractor shall provide all services, labor, materials, tools, and equipment required for the implementation of a complete and effective grounding and bonding System, as specified this Section.

.3 Contractor shall comply with all the requirements of Specification, Design Drawings, and all applicable Telecommunications Standards and Electrical Codes.

.4 Grounding and bonding System shall be designed, engineered, and installed to suit the Client's premises, communications systems and cabling infrastructure.

.5 Grounding electrode system refers to all electrodes required by Electrical Code, including, telecommunications system grounding electrodes.

.6 The terms "connect" and "bond" are used interchangeably in this Specification and have the same meaning.

1.02 DEFINITIONS

.1 AWG – American Wire Gauge – The standardized system for gauging the diameter of round, solid, non–ferrous, electrically–conducting wire.

.2 BBC – Bonding Backbone Conductor – A telecommunications bonding connection which interconnects telecommunications bonding backbones. Formerly known as the grounding equalizer.

.3 BN – Bonding Network – A set of interconnected conductive structures that provides a low impedance path for the associated telecommunications infrastructure.

.4 EF – Entrance Facility – An entrance to a building for both public and private network service cables, including wireless, that includes the entrance point of the building and continues to the entrance room or space.

.5 ESD – Electrostatic Discharge – The sudden flow of electricity between two electrically–charged objects caused by contact, an electrical short, or dielectric breakdown.

.6 Mesh–BN – Mesh Bonding Network – A bonding network to which all associated equipment, such as cabinets, frames, racks, trays, and pathways, are connected using a bonding grid that is connected to multiple points on the common bonding network.

.7 PBB – Primary Bonding Busbar – A busbar placed in a convenient and accessible location and bonded, by means of the Telecommunications Bonding Conductor (TBC), to the building's service equipment (power) ground. Formerly known as the Telecommunications Main Grounding Busbar (TMGB).

.8 RBB – Rack Bonding Busbar – A busbar within a cabinet, frame, or rack.

.9 RBC – Rack Bonding Conductor – A bonding conductor from the rack or Rack Bonding Busbar (RBB) to the Telecommunications Equipment Bonding Conductor (TEBC).

.10 SBB – Secondary Bonding Busbar – A common point of connection for telecommunications system and equipment bonding to ground, located in the distributor room. Formerly known as the Telecommunications Grounding Busbar (TGB).

.11 TBB – Telecommunications Bonding Backbone – The conductor that interconnects the Primary Bonding Busbar (PBB) to the Secondary Bonding Busbar (SBB).

.12 TBC – Telecommunications Bonding Conductor – A conductor that interconnects the telecommunications bonding infrastructure to the building's service equipment (power) ground. Formerly known as the bonding conductor for telecommunications.

.13 TEBC – Telecommunications Equipment Bonding Conductor – A conductor that connects the Primary Bonding Busbar (PBB) or Secondary Bonding Busbar (SBB) to equipment racks or cabinets.

.14 TR – Telecommunications Room – An enclosed space for housing telecommunications equipment, cable terminations, and cross–connect cabling. It is the recognized location of the cross–connect between the backbone and horizontal facilities.

.15 UBC – Unit Bonding Conductor – A bonding conductor from equipment or a patch panel to a Rack Bonding Conductor (RBB) or a Rack Bonding Busbar (RBB).

1.03 REFERENCES

.1 Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this Specification to the extent referenced. Publications are referenced in the text by the basic designation only.

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

.1 ASTM-B1-13(2018) – Standard Specification for Hard-Drawn Copper Wire.

.2 ASTM B8-11(2017) – Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

.3 Institute of Electrical and Electronics Engineers, Inc. (IEEE):

.1 IEEE 81-2012 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.

.4 Canadian Standards Association (CSA):

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.5 Telecommunications Industry Association (TIA): Latest Revision of Standards

.1 TIA-606 – Administration Standard for Telecommunications Infrastructure

.2 TIA-607 – Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.

.6 BICSI:

.1 Information Technology Systems Installation Methods Manual (ITSIMM), Recommended Testing Procedures and Criteria – Latest Revision

.2 Telecommunications Distribution Methods Manual (TDMM) – Latest Revision

.7 Underwriters Laboratories, Inc. (UL):

.1 UL 44 (19th Edition, 2018) – UL Standard for Safety Thermoset-Insulated Wires and Cables.

.2 UL 83 (16th Edition, 2017) – UL Standard for Safety Thermoplastic-Insulated Wires and Cables.

.3 UL 467 (11th Edition, 2022) – UL Standard for Safety Grounding and Bonding Equipment.

.4 UL 486A-486B (3rd Edition, 2018) – UL Standard for Safety for Wire Connectors.

.8 International Annealed Copper Standard (IACS)

1.04 SUBMITTALS

.1 Submit in accordance with Sections 01 33 00 and 27 05 00.

.2 Action Submittals: Product Data for each type of product (PBB, SBB, RBB, 2–Hole Lugs, etc.)

.3 Shop Drawings:

.1 Sufficient information, clearly presented, shall be included to determine compliance with latest TIA-607 Standard and this Specification.

.2 Include the location of system grounding electrode connections and the routing of aboveground and underground grounding electrode conductors.

1.05 CLOSEOUT SUBMITTALS

.1 Submit closeout documents in accordance with Section 27 05 00.

.2 As–Built Data: Submit plans showing as–built locations of grounding and bonding infrastructure, including the following: PBB, SBB, RBB and routing of their bonding conductors.

.3 Test Reports: Provide test reports of ground resistance to each primary or secondary bonding busbar (PBB/SBB) located in each telecommunications space impacted by the work.

2 Products

2.01 MANUFACTURERS

.1 Hubbell.

.2 nVent Erico.

.3 Panduit.

.4 Thomas & Betts.

2.02 GENERAL REQUIREMENTS

.1 Contractor shall provide a comprehensive and effective telecommunications grounding and bonding infrastructure for the protection of personnel and equipment, in compliance with the current Canadian Electrical Code, the latest TIA-607 Standard, and all applicable codes of Authority Having Jurisdiction (AHJ).

.2 Grounding and bonding infrastructure shall follow the latest TIA-607 design methodology, whereby within a building the generic telecommunications bonding infrastructure originates at the facility's electrical entrance ground and extends throughout the building. The infrastructure shall comprise the following major components:

.1 Primary bonding busbar (PBB).

.2 Telecommunications bonding conductor (TBC).

.3 Telecommunications bonding backbone (TBB).

.4 Secondary bonding busbar (SBB).

.5 Backbone bonding conductor (BBC).

.3 All cables shall be plenum rated FT6.

.4 External Grounding Electrodes:

.1 The grounding electrode system shall be designed to have a resistance to earth of 25 ohms or less for a single grounding electrode.

.2 For sites that are critical in nature (e.g., public safety facilities, military installations, data centers, web hosting facilities, central offices) the grounding electrode system shall be designed to have a resistance of less than 10 ohms – ideally less than 5 ohms.

2.03 BONDING CONDUCTORS

.1 The following common requirements apply to all types of bonding conductors specified in this Section:

.1 All bonding conductors shall be made of stranded copper wire with a green jacket (or per CE Code depending on size), run as a continuous conductor.

.2 Bonding conductors may be insulated. If insulated they shall be cUL Listed for the application.

.3 Bonding conductors shall be protected from physical and mechanical damage.

.4 Bonding conductors shall be sized to meet the ANSI/TIA-607-D requirements.

.2 Telecommunications Bonding Backbone (TBB)

.1 The TBB is a conductor that bonds the Secondary Bonding Busbars (SBB) to the Facility's Primary Bonding Busbar (PBB).

.2 The TBB shall meet the following requirements:

.1 The TBB shall be sized to meet the requirements of ANSI/TIA-607-D and shall be as straight as practicable avoiding bends. The TBB minimum conductor size shall be AWG 6.

.2 Bonding and grounding conductors may be insulated or un–insulated and shall not decrease in size as the grounding path moves closer to earth.

.3 Connections (bonds) between the telecommunications grounding network and associated electrical panels shall be done by a qualified electrician in accordance with guidelines in the latest TIA-607 and applicable electrical codes.

.4 Bonding Conductors should be continuous (splices not allowed) and routed in the shortest possible straight-line path, avoiding changes in elevation and sharp bends.

.5 TBB grounding conductors routing through ferrous metal conduit should be avoided, but if it is necessary due to building constraints, any grounding conductor running through ferrous conduit longer than 3 feet shall be bonded at the end using appropriately sized conduit grounding clamps as described TIA-607.

.6 Bonding the TBB to the PBB and each SBB shall be performed with a UL listed irreversible compression (crimp) dual-lug connector.

.7 Metallic cable shield(s) and cabling pathways, including metallic conduits, shall not be used as a TBB.

.8 Whenever two (2) or more TBBs are used within a multistory building, the TBBs shall be bonded together with a BBC at every third floor as a minimum, and at the top floor.

.9 Conductor sizing depends upon the Project specification, and shall be determined based on the TBB length as stipulated in TIA-607. Contractor shall ensure TBB sizing complies with the TIA-607 guidelines outlined in the Table below:

Sizing of the TBB	
TBB Length in Linear Meters (Feet)	TBB Size (AWG)
Less than 4 (13)	6
4-6 (14-20)	4
6-8 (21-26)	3
8-10 (27-33)	2
10-13 (34-41)	1
13-16 (42-52)	1/0
16-20 (53-66)	2/0
20-26 (67-84)	3/0
26-32 (85-105)	4/0
32-38 (106-125)	250 kcmil
38-46 (126-150)	300 kcmil
46-53 (151-175)	350 kcmil
53-76 (176-250)	500 kcmil
76-91 (251-300)	600 kcmil
Greater than 91 (301)	750 kcmil

.3 Telecommunications Bonding Conductor (TBC)

.1 The TBC connects the telecommunications bonding infrastructure to the building's service equipment (power) ground (formerly known as the bonding conductor for telecommunications).

.2 The TBC shall have at a minimum the same size as the largest TBB.

.3 The TBC shall bond the PBB to the service equipment (power) ground.

.4 Backbone Bonding Conductor (BBC)

.1 The BBC (formerly known as the grounding equalizer) is a bonding conductor which interconnects telecommunications bonding backbones.

.2 The BBC shall have at a minimum the same size as the largest TBB to which it is bonded.

.5 Telecommunications Equipment Bonding Conductor (TEBC)

.1 The TEBC is a bonding conductor which connects the cabinets and racks in a telecommunications room/closet to the local primary or secondary bonding busbar (PBB or SBB).

.2 The TEBC shall have a minimum size of AWG 6.

.3 Metallic objects and pathways shall not be used as a replacement for the TEBC.

.4 The TEBC may be routed inside cable trays. It shall be secured at maximum intervals of 0.9 m (3 ft).

.5 The TEBC shall be separated a minimum of 50.8 mm (2 in) from other cable groups, such as power or telecommunications cables.

.6 The TEBC shall be connected to the cabinets/racks, to a Rack Bonding Conductor (RBC) or to a vertical/horizontal Rack Bonding Busbar (RBB).

.7 Connections to the TEBC shall be made with UL Listed irreversible compression connectors, suitable for multiple conductors, and with the rack bonding conductors (RBCs) routed toward the PBB/SBB.

.6 Rack Bonding Conductor (RBC)

.1 The RBC is a bonding conductor from the cabinet or Rack Bonding Busbar (RBB) to the Telecommunications Equipment Bonding Conductor (TEBC).

.1 The RBC shall have a minimum size of AWG 6.

.2 The RBC shall be bonded to the Telecommunications Equipment Bonding Conductor (TEBC) using UL Listed irreversible compression (crimp) connectors.

.1 Where connected to a server cabinet, the RBC extends to the bottom of the server cabinet allowing Equipment Bonding Conductors to be attached at any point in the cabinet.

.2 Where connected to a network rack/cabinet, the Rack Bonding Conductor (RBC) is bonded to the Rack Bonding Busbar (RBB) via a UL Listed two-hole compression lug.

.2 Unit Bonding Conductor (UBC)

.1 The Unit Bonding Conductor (UBC) connects individual equipment in a cabinet or rack to the Rack Bonding Conductor (RBC) or Rack Bonding Busbar (RBB).

.2 The UBC shall also be used for bonding cable tray sections to the Telecommunications Equipment Bonding Conductor (TEBC).

.3 The UBC shall have a minimum size of AWG 6.

.4 Bonding.

.1 Where used in a server cabinet, UBC shall be bonded to the Rack Bonding Connector (RBC) using UL Listed irreversible compression (crimp) connectors and to IT equipment via a UL Listed two-hole compression lug. (Some IT equipment may require one-hole lugs.)

.2 Where used in a network cabinet/rack, UBC shall be bonded to the Rack Bonding Busbar (RBB) via a UL Listed two-hole compression lug and to IT equipment via a UL Listed two-hole compression lug. (Some IT equipment may require one-hole lugs.)

.3 Where used as a cable tray bonding conductor connecting cable tray sections, UBC shall be bonded to each adjoining section of the cable tray using UL Listed two-hole compression lugs.

.4 Where used as a cable tray bonding conductor connecting cable tray sections to the Telecommunications Equipment Bonding Conductor (TEBC), UBC shall be bonded to the TEBC using UL Listed irreversible compression (crimp) connectors and to the cable tray via a UL Listed two-hole compression lug.

3 Execution

3.01 GENERAL

.1 Ground in compliance with the CE Code, the latest TIA-607 Standard, and as specified in this Section and the Drawings.

.2 Components of the telecommunications bonding system shall be installed and connected using materials and techniques as specified in the latest TIA-607 Standard.

.3 Follow equipment manufacturer's grounding instructions.

3.02 EXAMINATION

.1 Contractor shall check the AC grounding electrode system and equipment grounding for compliance with the requirements for maximum ground–resistance level, and other conditions affecting performance of grounding and bonding of the telecommunications system.

.2 Inspect the test results of the AC grounding system.

.3 Prepare written report listing all conditions detrimental to the performance of the Work.

.4 Proceed with Work only after unsatisfactory conditions have been corrected.

3.03 CORROSION INHIBITORS

.1 When making ground and bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.

.2 PBB and SBB shall always have tinned surfaces to restrain oxidation and shall be cleaned and have an antioxidant paste applied to both bonding surfaces prior to fastening conductors.

3.04 TELECOMMUNICATIONS SYSTEM GROUNDING

.1 Bond the telecommunications grounding system to the electrical grounding electrode system.

.2 Provide dedicated telecommunications grounding busbars for the following locations/spaces:

.1 Telecom entrance facility rooms

.2 Server rooms

.3 IT rooms/closets

.3 Provide bonding to all telecom cabinets, racks, metallic cable shields, junction/pull boxes, enclosures, and communications/security equipment, as required by Standards and Code.

.4 Provide bonding to all metallic cable trays and conduits to building ground.

.5 Bond incoming carrier armor sheath to building ground.

.6 Furnish and install all busbars and bonding conductors required to properly ground and bond all communications raceways, cable trays, metallic cable shields, and equipment, in compliance with design, Codes and Standards.

.7 Bonding jumpers/conductors shall be continuous with no splices. Use the shortest possible length of bonding jumper.

.8 Provide ground paths that are permanent and continuous with a resistance of 1 ohm or less from raceway, cable tray, and equipment connections to the building grounding electrode. The resistance across individual bonding connections shall be 10 milliohms or less.

.9 Above-Grade Grounding Connections: When making bolted or screwed connections to attach bonding conductors, remove paint to expose the entire contact surface by grinding where necessary; thoroughly clean all connector, plate and other contact surfaces; and apply an appropriate corrosion inhibitor to all surfaces before joining.

.10 Bonding Conductors:

.1 Use insulated ground wire of the size and type shown on the Drawings or use a minimum of #6 AWG insulated copper wire.

.2 Assemble bonding jumpers using insulated ground wire terminated with compression connectors.

.3 Use compression connectors of proper size for the specified conductors. Use connector manufacturer's compression tool.

.11 Bonding Jumper Fasteners:

.1 Conduit: Fasten bonding jumpers using screw lugs on grounding bushings or conduit strut clamps, or the clamp pads on push-type conduit fasteners. When screw lug connection to a conduit strut clamp is not possible, fasten the plain end of a bonding jumper wire by slipping the plain end under the conduit strut clamp pad; tighten the clamp screw firmly. Where appropriate, use zinc-plated external tooth lockwashers.

.2 Wireway and Cable Tray: Fasten bonding jumpers using zinc-plated bolts, external tooth lockwashers, and nuts. Install protective cover, e.g., zinc-plated acorn nuts on any bolts extending into wireway or cable tray to prevent cable damage.

.3 Ground Plates and Busbars: Fasten bonding jumpers using two-hole compression lugs. Use tin-plated copper or copper alloy bolts, external tooth lockwashers, and nuts.

.4 Strut Channel and Raised Floor Stringers: Fasten bonding jumpers using zinc-plated, self-drill screws and external tooth lockwashers.

3.05 RACEWAY GROUNDING

.1 Conduit: Use insulated #6 AWG bonding jumpers to ground metallic conduit at each end and to bond at all intermediate metallic enclosures.

.2 Cable Tray: Use insulated #6 AWG bonding jumpers to ground metallic cable tray at:

.1 Each end

.2 All intermediate metallic enclosures/boxes

.3 All cable tray section junctions

3.06 IDENTIFICATION AND ADMINISTRATION

.1 Provide complete grounding system labeling in accordance with the requirements of:

.1 ANSI/TIA–606, Latest Revision

.2 Section 27 05 53 – Identification for Communications Systems

.2 Primary Bonding Busbar (PBB): Label with “PBB”.

.3 Secondary Bonding Busbar (SBB): Label with “SBB”.

.4 Telecommunications Bonding Backbone (TBB): Label with “WARNING! TELECOMMUNICATIONS BONDING BACKBONE. DO NOT REMOVE OR DISCONNECT” Labels shall be affixed at both ends and at accessible intermediate points.

3.07 TESTING

.1 Perform tests as specified in BICSI Information Technology Systems Installation Methods Manual (ITSIMM), Recommended Testing Procedures and Criteria.

.2 Perform two-point bond testing to be preformed by qualified technicians.

.3 Conduct continuity tests to verify that all metallic pathways and pathway sections are bonded to PBB or SBB.

.4 Conduct electrical continuity test to verify that PBB is effectively bonded to the facility grounding electrode conductor.

.5 Perform resistance tests to ensure rack and cabinet bonding connection resistance measures less than 4 Ω to PBB or SBB.

.6 Provide a complete test report to Consultant and Owner.

End of Section

1 General

1.01 SUMMARY

.1 Provide a complete system of empty conduit, pull boxes, outlets, and sleeves for enclosure of communications cabling.

1.02 RELATED REQUIREMENTS

.1 Section 26 05 33.13 – Conduit for Electrical Systems.

.2 Section 26 05 33.16 – Boxes for Electrical Systems.

1.03 REFERENCES

.1 BISCI Telecommunications Distribution Methods Manual, 14th Edition.

1.04 CLOSEOUT SUBMITTALS

.1 Record documentation:

.1 Records of underground utility locates.

.2 Record as-constructed location of all underground conduits and telecommunications pathways on as-built drawings regardless of conduit size.

2 Products

2.01 OUTLETS

.1 Wall outlets shall be 115 mm square boxes with plaster rings to suit single gang devices unless otherwise noted.

.2 Provide 53 mm conduit through walls as noted.

2.02 CONDUITS

.1 Conduit size shall be in accordance with recommended standard for conduits in Building as published by BICSI.

.2 Minimum conduit size shall be 21 mm diameter.

.3 Minimum space requirements in pull boxes for 90 degree pulls, shall be as follows:

Maximum conduit size	Size of pull boxes in millimetres			For each additional conduit size increase width by:
	Width	Length	Depth	
21 mm	150 mm	300 mm	100 mm	50 mm
27 mm	200 mm	400 mm	150 mm	75 mm
35 mm	250 mm	450 mm	200 mm	75 mm
41 mm	300 mm	600 mm	250 mm	100 mm
53 mm	350 mm	750 mm	300 mm	125 mm

.4 Plenum cables are permitted in accessible ceilings. Provide ‘J’ hooks in these locations for [later cable installation by others].

.5 Plywood backboards shall be minimum 1200 mm by 2400 mm, 19 mm thick, painted with 2 coats of fire retardant light grey enamel.

.6 Provide a minimum of two 5-15R duplex receptacles on separate circuits at each backboard.

3 Execution

3.01 INSTALLATION

.1 Vertically mount outlet boxes, unless noted otherwise, 300 mm to centre above floor, or 150 mm above counter top where shown at counters or benches.

.2 Fish conduit, clear blockages and outlet and clean out pull boxes at completion of installation. Leave conduit free of water or excess moisture. Install No. 12 gauge galvanized soft iron pull wire, or 3.2 mm (1/8”) nylon pull cord continuously from outlet to outlet, through conduit and fasten at each box.

.3 Conduit shall have a bending radius of not less than nine times conduit diameter. Ream out conduit and identify ends with green paint.

.4 Install additional steel pull boxes in such a manner that, throughout entire system, there shall be not more than two 90 degree or equivalent bends or more than 30 m in each run, so that wire or cables may be pulled in or withdrawn with reasonable ease. Minimum space requirements in pull boxes having one conduit each in opposite ends of the box, shall be as follows:

Maximum conduit size	Size of pull boxes in millimetres			For each additional conduit size increase width by:
	Width	Length	Depth	
21 mm	150 mm	300 mm	100 mm	50 mm
27 mm	200 mm	400 mm	150 mm	75 mm
35 mm	250 mm	450 mm	200 mm	75 mm
41 mm	300 mm	600 mm	250 mm	100 mm
53 mm	350 mm	750 mm	300 mm	125 mm

.5 Include above noted information on final record drawings at project completion.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Provide a complete system of empty conduits, pull boxes, outlets, and sleeves for enclosure of wiring by noted in Section 27 01 51.16 – Revisions and Upgrades of Public Address Systems.

1.02 RELATED REQUIREMENTS

.1 Section 26 05 33.13 – Conduit for Electrical Systems.

.2 Section 26 05 33.16 – Boxes for Electrical Systems.

.3 Section 28 46 13 – Fire-Alarm Systems.

1.03 REFERENCES

.1 BISCI Telecommunications Distribution Methods Manual, 13th Edition (2014).

2 Products

2.01 OUTLETS

.1 Wall outlets shall be 115 mm square boxes with plaster rings to suit single gang devices unless otherwise noted.

2.02 CONDUITS

.1 Conduit size shall be in accordance with recommended standard for conduits in Building as published by BICSI.

.2 Minimum conduit size shall be 21 mm diameter.

.3 Minimum space requirements in pull boxes for 90 degree pulls, shall be as follows:

Maximum conduit size	Size of pull boxes in millimetres			For each additional conduit size increase width by:
	Width	Length	Depth	
21 mm	150 mm	300 mm	100 mm	50 mm
27 mm	200 mm	400 mm	150 mm	75 mm
35 mm	250 mm	450 mm	200 mm	75 mm
41 mm	300 mm	600 mm	250 mm	100 mm
53 mm	350 mm	750 mm	300 mm	125 mm

.4 Plenum cables are permitted in accessible ceilings. Provide ‘J’ hooks in these locations for cable installation.

.5 Plywood backboards shall be minimum 1200 mm by 2400 mm, 19 mm thick, painted with two coats of fire retardant light grey enamel.

.6 Provide a minimum of two duplex receptacles on separate circuits at each backboard.

.7 Provide fire alarm over-ride feature at fire alarm control panel (FACP) to deactivate public address system when Fire Alarm System is in alarm.

3 Execution

3.01 INSTALLATION

.1 Vertically mount outlet boxes, unless noted otherwise, 300 mm to centre above floor, or 150 mm above counter top where shown at counters or benches.

.2 Fish conduit, clear blockages and outlet and clean out pull boxes at completion of installation. Leave conduit free of water or excess moisture. Install No. 12 gauge galvanized soft iron pull wire, or 3.2 mm (1/8”) nylon pull cord continuously from outlet to outlet, through conduit and fasten at each box.

.3 Conduit bonds shall have a bending radius of not less than nine times conduit diameter. Ream out conduit and identify ends with green paint.

.4 Install additional steel pull boxes in such a manner that, throughout entire system, there shall be not more than two 90 degree or equivalent bends or more than 30 000 mm in each run, so that wire or cables may be pulled in or withdrawn with reasonable ease. Minimum space requirements in pull boxes having one conduit each in opposite ends of the box, shall be as follows:

Maximum conduit size	Size of pull boxes in millimetres			For each additional conduit size increase width by:
	Width	Length	Depth	
21 mm	150 mm	300 mm	100 mm	50 mm
27 mm	200 mm	400 mm	150 mm	75 mm
35 mm	250 mm	450 mm	200 mm	75 mm
41 mm	300 mm	600 mm	250 mm	100 mm
53 mm	350 mm	750 mm	300 mm	125 mm

.5 Include above noted information on final record drawings at project completion.

End of Section

1 General

1.01 SUMMARY

.1 The work covered under this section consists of the furnishing of all necessary labour, supervision, materials, equipment, and services to completely execute the system of non-continuous cable supports ("J-Hooks") as described in this specification.

1.02 SCOPE

.1 Non-continuous cable supports.

.2 Adjustable non-continuous cable support sling.

.3 Multi-tiered non-continuous cable support assemblies.

.4 Non-continuous cable support assemblies from tee bar.

.5 Non-continuous cable support assemblies from drop wire/ceiling.

.6 Non-continuous cable support assemblies from beam, flange.

.7 Non-continuous cable support assemblies from C & Z Purlin.

.8 Non-continuous cable support assemblies from wall, concrete, or joist.

.9 Non-continuous cable support assemblies from threaded rod.

.10 Raised floor non-continuous cable support assemblies.

.11 Cantilever-Mounted Option for non-continuous cable supports.

.12 Installation accessories for non-continuous cable supports.

1.03 DEFINITIONS

.1 UTP: Unshielded twisted pair.

.2 ANSI: American National Standards Institute.

.3 ASTM: American Society for Testing and Materials.

.4 EIA: Electronic Industries Alliance.

.5 TIA: Telecommunications Industry Association.

.6 cULus: Listed by Underwriters Laboratories based on both Canadian and US (United States) standards requirements.

1.04 SUBMITTALS

.1 Submit product data on non-continuous cable support devices, including attachment methods. Product data to include, but not limited to materials, finishes, approvals, load ratings, and dimensional information.

1.05 QUALITY ASSURANCE

.1 Non-continuous cable supports and cable support assemblies shall be listed by Underwriters Laboratories for both Canadian and US standards (cULus).

.2 Non-continuous cable supports shall have the manufacturers name and part number stamped on the part for identification.

.3 Manufacturer: Company specializing in manufacturing products specified in this section with a minimum of five years documented experience in the industry, and certified ISO 9000.

2 Products

2.01 MANUFACTURERS

.1 ERICO, Inc.

.2 Approved equal.

2.02 REFERENCES

.1 ASTM B633 Standard Specification for Electro-deposited Coatings of Zinc on Iron and Steel

.2 ASTM B 695-90 Standard Specification for coatings of Zinc Mechanically Deposited on Iron and Steel

.3 ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

.4 ASTM A924/A924M Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

.5 ASTM A109 Standard Specification for Steel, Strip, Carbon, Cold-Rolled

.6 ASTM A167 Standard Specification for Stainless and heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

.7 ASTM A480/A480M Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

.8 ASTM A568 Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy Hot-Rolled and Cold-Rolled

.9 A653 G60-Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip process

.10 ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar

.11 ASTM A682 Standard Specification for Steel, Strip, High-Carbon, Cold-Rolled, Spring Quality

.12 ASTM A879 Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface

.13 ASTM B117 Standard Method of Salt Spray (Fog) Testing

.14 ASTM D610 Standard test Method for Evaluating Degree of Rusting on Painted Steel Surfaces UL 2043 - Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.

.15 ANSI/ TIA/ EIA 568 Commercial Building Telecommunications Cabling Standard, current revision level.

.16 ANSI/ TIA/ EIA 569 Commercial Building Standard for Telecommunications Pathways and Spaces, current revision level.

.17 NFPA 70 National Electrical Code®

2.03 NON-CONTINUOUS CABLE SUPPORT SYSTEMS

.1 Non-continuous cable supports

.1 Non-continuous cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables; cULus Listed.

.2 Non-continuous cable supports shall have flared edges to prevent damage while installing cables.

.3 Non-continuous cable supports sized 1 5/16” and larger shall have a cable retainer strap to provide containment of cables within the hanger. The cable retainer strap shall be removable and reusable and be suitable for use in air handling spaces.

.4 Non-continuous cable supports shall have an electro-galvanized or G60 finish and shall be rated for indoor use in non-corrosive environments.

.5 Stainless Steel non-continuous cable supports are intended for indoor and outdoor use in non-corrosive environments or where only mildly corrosive conditions apply.

.6 Non-continuous cable supports shall be ERICO CableCatTM J-hook series CAT12, CAT21, CAT32, CAT64, CAT21SS, CAT32SS, CAT64SS; CAT-CMTM Double J-Hook CAT100CM; CAT-CMTM U-hook series CAT200CMLN, CAT300CMLN; and CAT-CMTM retainer CATRT200CM, CATRT300CM or approved equal.

.2 Adjustable non-continuous cable support sling

.1 Constructed from steel and woven laminate; sling length can be adjusted to hold up to 425 4-pair UTP; rated for indoor use in non-corrosive environments. Rated to support Category 5 and higher cable, or optical fiber cable; cULus Listed.

.2 Adjustable non-continuous cable support sling shall have a static load limit of 100 lbs.

.3 Adjustable non-continuous cable support sling shall be suitable for use in air handling spaces.

.4 If required, assemble to manufacturer recommended specialty fasteners including beam clips, flange clips, C and Z purlin clips.

.5 Acceptable products: ERICO CADDY CableCatTM CAT425; or approved equal.

.3 Multi-tiered non-continuous cable support assemblies

.1 Multi-tiered non-continuous cable support assemblies shall be used where separate cabling compartments are required. Assemblies may be factory assembled or assembled from pre-packaged kits. Assemblies shall consist of a steel angled hanger bracket holding up to six non-continuous cable supports, rated for indoor use in non-corrosive environments; cULus Listed.

.2 If required, the multi-tier support bracket may be assembled to manufacturer recommended specialty fasteners including beam clamps, flange clips, C and Z purlin clips.

.3 The multi-tiered support bracket shall consist of ERICO CADDY CATHBA and CableCatTM J-Hooks with screws; or approved equal.

.4 Non-continuous cable support assemblies from tee bar

.1 Tee bar support bracket with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments; cULus Listed.

.2 Acceptable products: ERICO CADDY CAT12TS, CAT21528, CAT32528; or approved equal.

.5 Non-continuous cable support assemblies from drop wire/ceiling

.1 Fastener to wire/rod with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments; cULus Listed.

.2 Acceptable products: ERICO CADDY CAT124Z34, CAT126Z34, CAT214Z34, CAT216Z34, CAT324Z34 or CAT326Z34; or approved equal.

.6 Non-continuous cable support assemblies from beam, flange

.1 Fastener to beam or flange with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments; cULus Listed.

.2 Acceptable products: ERICO CableCatTM J-hook series CAT12, CAT21, CAT32, CAT64 with CADDY beam clamps and CADDY flange clips; or approved equal.

.7 Non-continuous cable support assemblies from C & Z Purlin

.1 Fastener to C or Z purlin with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments, cULus Listed.

.2 Acceptable products: ERICO CableCatTM J-hook series CAT12, CAT21, CAT32, CAT64 with CADDY Purlin hangers; or approved equal.

.8 Non-continuous cable support assemblies from wall, concrete, or joist

.1 Fastener to wall, concrete, or joist with one non-continuous cable support, factory or jobsite assembled; rated for indoor use in non-corrosive environments, cULus Listed.

.2 Acceptable products: ERICO CableCatTM J-hook series CAT12, CAT21, CAT32, CAT64, with CADDY angle bracket; or approved equal.

.9 Non-continuous cable support assemblies from threaded rod

.1 Fastener to threaded rod with one non-continuous cable support, factory or jobsite assembled, rated for indoor use in non-corrosive environments, cULus Listed.

.2 The multi-tiered support bracket shall have a static load limit of 300 lbs.

.3 U-hooks and Double J-hook shall attach directly to threaded rod using standard nuts.

.4 Acceptable products: ERICO CableCatTM J-hook, CAT12, CAT21, CAT32, CAT64 with CADDY CATHBA series; CAT-CMTM Double J-hook CAT100CM, CAT-CMTM Direct mount U-hook CAT200CMLN, CAT300CMLN; or AFAB series; or approved equal.

.10 Raised floor non-continuous cable support assemblies

.1 Fastener to raised (access) floor pedestal with one non-continuous cable support, factory or jobsite assembled, rated for indoor use in non-corrosive environments; cULus Listed.

.2 Acceptable products: ERICO CADDY CAT12CD1B, CAT21CD1B or CAT32CD1B; CAT64CD1B; or approved equal.

.11 Cantilever-Mounted cable supports

.1 U-hook shall be able to be assembled to a wide variety of wall mount brackets.

.2 Spacing of individual U-hooks as needed, max of 4’ to 5’ apart.

.3 U-hooks may have the optional attachment of a cable roller for ease in pulling cables.

.4 Acceptable products: ERICO CAT-CMTM U-hooks CAT200CMLN, CAT300CMLN: CAT-CM roller assemblies CATRL200CM, CATRL300CM; CATWMCM bracket; or approved equal.

.12 Installation accessories for non-continuous cable supports

.1 Cable Pulley

.1 Non-continuous cable supports may be used as an installation tool when a removable pulley assembly is included. The pulley shall be made of plastic and be without sharp edges. The pin and bail assembly must be able to be secured to the J-Hook during cable installation. The pulley must remain secured while cables are being pulled.

.2 The pin and roller assembly must be removed after cables are installed.

.3 Acceptable products: ERICO CADDY CAT32PLR, CAT64PLR, or approved equal.

.2 Cable Protector

.1 The protective steel tube shall fit over threaded rod and be at least 4” in length.

.2 The tube shall prevent damage to cables placed in or pulled through CAT-CMTM U-hooks. The tube shall not inhibit the pulling of cables.

.3 Acceptable products: ERICO CAT-CMTM CATTBCM, or approved equal.

2.04 FINISHES

.1 ASTM B633 Standard Specification for Electro-deposited Coatings of Zinc on Iron and Steel

.2 ASTM B 695 Standard Specification for coatings of Zinc Mechanically Deposited on Iron and Steel

.3 ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

.4 ASTM A924/A924M Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

.5 Non-continuous cable supports used where only mildly corrosive conditions apply shall be stainless steel, AISI type 304.

3 Execution

3.01 INSTALLATION

.1 Installation and configuration shall conform to the requirements of the current revision levels of ANSI/ EIA/TIA Standards 568 & 569, NFPA 70 (National Electrical Code), applicable local codes, and to the manufacturer’s installation instructions.

.2 Install cables using techniques, practices, and methods that are consistent with Category 5 or higher requirements and that supports Category 5 or higher performance of completed and linked signal paths, end to end.

.3 Install cables without damaging conductors, shield, or jacket.

.4 Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by manufacturer.

.5 Pull cables without exceeding cable manufacturer’s recommended pulling tensions. Use pulling means that will not damage media.

.6 Do not exceed load ratings specified by manufacturer.

.7 Adjustable non-continuous support sling shall have a static load limit of 100 lbs.

.8 Follow manufacturer's recommendations for allowable fill capacity for each size non-continuous cable support.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Firestopping through penetrations in fire rated assemblies.

1.02 RELATED REQUIREMENTS

.1 Section 07 84 00 – Firestopping.

1.03 REFERENCES

.1 ASTM E 84, “Surface Burning Characteristics of Building Materials”.

.2 ASTM E 119, “Fire Tests of Building Construction and Materials”.

.3 ASTM E 814, “Fire Tests of Penetration Firestop Systems”.

.4 ANSI/UL263, “Fire Tests of Building Construction and Materials”.

.5 ANSI/UL723, “Surface Burning Characteristics of Building Materials”.

.6 ANSI/UL1479, “Fire Tests of Through Penetration Firestops”.

.7 Underwriters Laboratories Inc. (UL) – Fire Resistance Directory

1.04 PERFORMANCE REQUIREMENTS

.1 Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur, such devices shall:

.1 Meet the hourly rating of the floor or wall penetrated.

.2 Permit the allowable cable load to range from 0% to 100% visual fill thereby eliminating the need to calculate allowable fill ratios.

.3 Not require any additional action on the part of the installer to open or close the pathway device or activate the internal smoke and fire seal, such as, but not limited to:

.1 Opening or closing of doors.

.2 Twisting an inner liner.

.3 Removal or replacement of any material such as, but not limited to, sealant, caulk, putty, pillows, bags, foam plugs, foam blocks, or any other material.

.4 Permit multiple devices to be ganged together to increase overall cable capacity.

.5 Allow for retrofit to install around existing cables.

.6 Include an optional means to lengthen the device to facilitate installation in thicker barriers without degrading fire or smoke sealing properties or inhibiting ability of device to permit cable moves, add-ons, or changes.

.2 Where single cables (up to 0.27 in. (7 mm) diameter) penetrate gypsum board/stud wall assemblies, a fire-rated cable grommet may be substituted. Acceptable products shall be molded from plenum-grade polymer and conform to the outer diameter of the cable forming a tight seal for fire and smoke. Additionally, acceptable products shall lock into the barrier to secure cable penetration.

.3 Where non- mechanical products are utilized, provide products that upon curing do no re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.

.4 Where it is not practical to use a mechanical device, openings within floors and walls designed to accommodate telecommunications and data cabling shall be provided with re-enterable products that do not cure or dry.

.5 Cable trays shall terminate at each barrier and resume on the opposite side such that cables pass independently through fire-rated pathway devices. Cable tray shall be rigidly supported independent from fire-rated pathway devices on each side of barrier.

1.05 SUBMITTALS

.1 Submit under provisions of Section 01 33 00.

.2 Product Data: Provide manufacturer's standard catalog data for specified products demonstrating compliance with referenced standards and listing numbers of systems in which each product is to be used.

.3 Shop Drawings: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance ratings.

.4 Certificates: Product certificates signed by firestop system manufacturer certifying material compliance with applicable code and specified performance characteristics.

.5 Installation Instructions: Submit manufacturer's printed installation instructions.

1.06 QUALITY ASSURANCE

.1 Products/Systems: Provide firestopping systems that comply with the following requirements:

.1 Firestopping tests are performed by a qualified, testing and inspection agency. A qualified testing and inspection agency is UL, or another agency performing testing and follow-up inspection services for firestop system acceptable to authorities having jurisdiction.

.2 Firestopping products bear the classification marking of qualified testing and inspection agency.

.2 Installer Qualifications: Experience in performing work of this section who is qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products in accordance with specified requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

.1 Delivery:

.1 Manufacturer's original, unopened, undamaged containers, identification labels intact identifying product and manufacturer, date of manufacture; lot number; shelf life, if applicable; qualified testing and inspection agency's classification marking; and mixing instruction for multicomponent products.

.2 Handle and store products according to manufacturer's recommendations published in technical materials. Leave products wrapped or otherwise protected and under clean and dry storage conditions until required for installation.

.2 Storage and Protection:

.1 Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.08 PROJECT CONDITIONS

.1 Do not install firestopping products when ambient or substrate temperatures are outside limitations recommended by manufacturer.

.2 Do not install firestopping products when substrates are wet due to rain, frost, condensation, or other causes.

.3 Maintain minimum temperature before, during, and for a minimum 3 days after installation of materials.

.4 Do not use materials that contain flammable solvents.

.5 Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

.6 Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

.7 Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

2 Products

2.01 MANUFACTURERS

.1 Specified Technologies Inc.
200 Evans Way, Somerville, NJ 08876. Tel: (800) 992-1180, Fax: (908) 526-9623, Email: specseal@stifirestop.com, Website: www.stifirestop.com.

.2 Substitutions: as approved by the Consultant prior to tender closing.

.3 Single Source: Obtain firestop systems for each type of penetration and construction condition indicated only from a single manufacturer.

2.02 MATERIALS

.1 General: Use only firestopping products that have been tested for specific fire resistance rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire rating involved for each separate instance.

2.03 FIRE RATED CABLE PATHWAYS

.1 Steel raceway with intumescent foam pads allowing 0 to 100 percent cable fill, the following products are acceptable:

.1 Specified Technologies Inc. (STI) EZ-PATH Fire Rated Pathway.

3 Execution

3.01 EXAMINATION

.1 Before beginning installation, verify that substrate conditions previously installed under other sections are acceptable for installation of firestopping in accordance with manufacturer’s installation instructions and technical information.

.2 Surfaces shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellants, and any other substances that may inhibit optimum adhesion.

.3 Provide masking and temporary covering to protect adjacent surfaces.

.4 Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

.1 General: Install through-penetration firestop systems in accordance with Performance Criteria and in accordance with the conditions of testing and classification as specified in the published design.

.2 Manufacturer's Instructions: Comply with manufacturer's instructions for installation of firestopping products.

3.03 FIELD QUALITY CONTROL

.1 Keep areas of work accessible until inspection by authorities having jurisdiction.

.2 Where deficiencies are found, repair firestopping products so they comply with requirements.

3.04 ADJUSTING AND CLEANING

.1 Remove equipment, materials, and debris, leaving area in undamaged, clean condition.

.2 Clean all surfaces adjacent to sealed openings to be free of excess firestopping materials and soiling as work progresses.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Labelling and identification requirements for communications systems.

1.02 REFERENCES

.1 ANSI/TIA/EIA-606-A – Administration Standard for Commercial Telecommunications Infrastructure.

.2 UL 969 – Marking and Labeling Systems.

2 Products

2.01 SUMMARY

.1 Adhesive cable labels to meet the legibility, defacement, and adhesion requirements specified in UL 969 (Ref. D-16). In addition, the labels shall meet the general exposure requirements in UL 969 for indoor use.

.2 Self-laminating vinyl construction cable labels with a white printing area and a clear tail that self laminates the printed area when wrapped around a cable. The clear area should be of sufficient length to wrap around the cable at least one and one-half times.

.3 ANSI/EIA/TIA-606 for colour codes shall be followed. Labels are to be mechanically printed using a laser printer. Hand written labels will not acceptable.

2.02 LABEL PRINTER

.1 Thermal Transfer Printer shall print high quality, industrial labels on a wide variety of materials for electrical and network applications such as wire/cable, components, safety, and facility identification.

.2 Laminated Adhesive Label Cassettes:

.1 For flat label applications.

.2 Polyester material.

.3 Non-Laminated Adhesive Label Cassettes:

.1 For marking wire and cable and flat label applications.

.2 Polyester material

.4 Example Products:

.1 Panduit LS7 series hand-held printer.

.2 Panduit LS8 series hand-held printer.

2.03 NAMEPLATES

.1 Engraved three-layer laminated plastic, letters on contrasting background:

.2 Rack and Cabinet ID labels: 25 mm (1”) high White Text on Black Background

3 Execution

3.01 INSTALLATION

.1 Cable identification labels should appear at the following locations with the numbers indicated on the cable schedule and drawings:

.1 300 mm (12 inches) from each end of the cable – after termination.

.2 Front of patch panels.

.3 Front of IDC termination blocks.

.4 Front of workstation/communications outlet faceplates.

.5 Each end of each Telecommunications Conduit.

.2 Fibre Optic safety labels shall appear at the following locations:

.1 Along the length of the conduit or innerduct at 3 m (10 foot) intervals.

.2 At all junction boxes

.3 At all pull boxes.

.4 On all fibre optic patch panels.

.3 Provide 25 per cent additional labels to be left in each telecommunications room on site for future growth.

.4 Provide two Rack/Cabinet nameplates. Mount one on the front, and one on the rear of the rack.

3.02 IDENTIFICATION CONVENTIONS

.1 All cabling will be labelled with the closet letter, followed by a dash and the wire number (i.e. A-001 would be the first wire in closet A).

.2 Labelling for backbone wiring will be preceded with BB followed by the wire number (i.e. BB-001 would be the first backbone.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Commissioning Requirements.

1.02 REFERENCES

.1 Refer to Section 27 05 00 for references.

1.03 CLOSEOUT SUBMITTALS

.1 The Telecommunications Cabling Contractor is required to submit test results in native tester format or a format which can be read with a text reader (i.e. ".txt" extension). Paper results shall not be submitted for projects with 100 or more horizontal cable drops and/or fibre cables.

.2 The Telecommunications Cabling Contractor is required to provide the software required to view the results.

.3 The report should be divided into sections by Telecommunications Room.

.4 The report should indicate for each cable when it was tested successfully, the result, and the length.

.5 The Telecommunications Cabling Contractor shall sign off on the entire test report prior to submitting to the Consultant.

.6 The test result documentation is to be submitted to the Consultant for review no later than 10 working days following the completion of the installation.

.7 All deficiencies must be corrected before the Consultant will provide a certificate to release the Holdback on the project.

2 Products – Not Used

3 Execution

3.01 INSTALLATION

.1 Testing of all horizontal copper cables are to be completed in accordance with the follow test criteria:

.1 Basic Link

.2 Grounds

.3 NEXT

.4 ELFEXT

.5 Continuity

.6 correct polarity

.7 PSNEXT

.8 PSELFEXT

.9 Shorts

.10 Length

.11 ACR

.12 Return Loss

.13 Opens

.14 Attenuation

.15 PSACR

.16 Resistance

.2 Fibre strands in excess of 122 m (400 ft) shall be tested with an Optical Time Domain Reflectometer for length and attenuation.

.3 Test each stand of fibre, bi-directionally, with a Power Meter / Light Source combination operating at wavelengths of 850 nm and 1300 nm for multimode fibres.

.4 Maximum multi-mode passive link loss (including patch cords) is not to exceed -2.35 dB.

.5 Maximum single-mode passive link loss (including patch cords) is not to exceed -1.0 dB.

3.02 RECORD DRAWINGS

.1 The Telecommunications Cabling Contractor is required to maintain one set of correct and accurate record drawings on-site at all times. These drawings are to be made available to the General Contractor/Construction Manager or the Consultant for review during the project.

.2 The Telecommunications Cabling Contractor is required to provide record drawings of the telecommunication cabling installation in relation to the drawings provided in this specification.

.3 The record drawings shall be updated electronically and include, but are not limited to;

.1 Horizontal cable numbers on the floor plans

.2 Horizontal Cable Routing on the floor plans

.3 Changes on the floor plans

.4 Backbone cable Routing between Telecommunications Rooms

.5 Paging Speaker Locations including daisy chain cable run

.6 Wireless Access Points and Cell coverage

.7 Cabinet/Rack Elevation drawings

.8 Backboard Elevation Drawing

.4 The Telecommunications Cabling Contractor shall provide one soft copy in AutoCAD 2007 and one plotted copy for the Consultant to review prior to complete substantial performance and close-out documentation submission.

.5 After approval, the Telecommunications Cabling Contractor shall submit one plotted copy of the drawings for;

.1 The Main Computer Room

.2 Each Telecommunications Room

.6 All close-out documentation must be submitted to the General Contractor/Construction Manager or The Consultant within 10 working days of the completion of the project before the documentation holdback will be released.

End of Section

1 General

1.01 SUMMARY

.1 Supply, install and test complete data cabling system and accessories, based on physical star wiring topology, and as specified herein and indicated on drawings [for the new addition.

.2 Include data cabling system the following sub-systems:

.1 Backbone Terminal Systems, located in Communications Closets, to serve as connection points between backbone cables and horizontal distribution cables.

.2 Horizontal distribution system links backbone terminal system to telecommunications outlets.

.3 Contractor is to submit details on equipment types and locations for review and approval prior to installation.

1.02 RELATED REQUIREMENTS

.1 Active electronics, including servers, hubs, routers, switchers, and, PCs are by Owner and are not part of this contract.

1.03 ABBREVIATIONS AND ACRONYMS

.1 MTER Main Telecommunication Equipment Room.

.2 TC Telecommunications Closet.

.3 TCs Telecommunications Closets.

.4 RCDD Registered Communications Distribution Designer.

.5 BICSI Building Industry Consulting Service International.

.6 MDTS Main Distribution Terminal System.

.7 IDC Insulation Displacement Connection.

.8 OTDR Optical Time-Domain Reflectometer.

.9 BCS Backbone Cabling System.

.10 IDT Intermediate Distribution Terminal.

.11 BTS Backbone Terminal System.

1.04 REFERENCE STANDARDS

.1 Conform to CAN/CSA-T530 for new buildings and areas of substantial renovations of telecommunications, spaces, and pathways.

.2 Ensure that cabling system shall conform to current issue of industry standard CAN/CSA-T529. This standard is currently being revised and is available as document EIA/TIA SP-2840A (future CAN/CSA-T529). All requirements of this new document must be followed including: Structural Return Loss (section 10.2.4.5), Power Sum Testing (section 10.3.4.7) and End to End Link Performance and continuity, attenuation, cable open and shorts, NEXT; mutual capacitance, pair polarity and cable impedance, S/N ratio, and Pass/Fail status. Tests are to be conducted and recorded using a Penta Scanner. Fibre optic cables shall be tested in conformance to ISO/IEC IS 11801 standards using an EXFO Optical Time Domain Reflectometer. Test results such as; dB loss, cable length and fibre deficiencies (if any) shall be conducted. Verification, documentation, and warranty shall be provided.

.3 Where applicable, have performance of Category 5e cabling components used, verified by nationally recognized testing laboratory. Submit test results upon request.

.4 Conform to applicable Building and Electrical Safety Codes.

1.05 SUBMITTALS

.1 Shop Drawings

.1 Provide submittals in accordance with Section 01 33 00 prior to commencing installation.

.2 Submit complete cabling system layout for Consultant review for data, cable routing summary and cable outlet designation. Have cabling system layout performed by accredited RCDD (Registered Communications Distribution Designer) as defined by BICSI (Building Industry Consulting Service International). The Data Cabling system will not be accepted without this submission.

.3 Documentation proving compliance to End-to-End Link Performance test, as specified in Annex E of EIA/TIA SP-2840A shall be provided prior to structured cabling being installed.

.4 Submit detailed layout drawings, including termination racks prior to commencing this installation.

.5 Manufacturer's product information documents on all components of the cabling system, including horizontal and vertical cable management systems and all auxiliary components/devices and equipment prior to commencing this installation.

.6 The following documentation shall be submitted with a following cover letter listing attachments prior to commencement of work.

.1 A list of personnel for the project that will include the name of the Project Manager, Site Manager(s), Lead Hands, and Installers.

.2 Permits and notifications as may be required for the project.

1.06 CLOSEOUT SUBMITTALS

.1 Provide manufacturer’s certificate at completion of installation certifying the installation.

.2 Prepare and submit "As-built" drawings reviewed by an RCDD.

.3 "As-built" drawings are to detail the exact location of equipment indicating wiring runs and raceways, pull, junction and terminal boxes. Also to include outlet locations, cable numbers and equipment rack profiles.

.4 Upon completion of work and prior to final acceptance, the contractor will submit to the Owner the required copies of Network Certification and Documentation in the form of manuals that will include the following:

.1 Detailed information on types of materials and equipment used and their locations including: distribution frame equipment (rack), equipment types and locations; a detailed listing of cable and outlet types and locations.

.2 Accurately and neatly recorded test results.

.3 Accurately and neatly record locations including room numbers, of all network components in list form for easy reference.

.4 Identify drawings as ‘Project Record Copy’ and maintain in new condition making available for inspection by Owner.

.5 Bind all items listed above in a 3-ring hard covered binder suitably labelled with the names of each site/project.

1.07 QUALITY ASSURANCE

.1 Qualifications of Manufacturer

.1 Supply equipment manufactured by experienced reputable manufacturer, whose installations have rendered satisfactory service for at least 2 years and who would provide factory trained technicians fully experienced in telecommunications wiring. Submit information regarding number of employees, and proof of VAR/CSV certification, including length of time Contractor or employee(s) have been certified to install Cable systems.

.2 Provide certification that cabling solution offered will perform as a system as is defined in standards documents such as EIA-TIA SP-2840A and T568A configuration for Category 5E system standards. Provide certification supported by manufacturer of cabling components used.

.3 In addition to certificate of assurance, evidence of support by manufacturer for above items shall be provided upon request in writing with bidding response.

.4 Use components sourced completely from single manufacturer.

.2 Qualifications of Installer

.1 Provide installation and supervision work supervised by telecommunications technicians qualified to install voice and data cabling system and to perform related tests as required by manufacturer. Installers/company must have valid certification.

.2 Provide fully qualified telecommunications technicians, trained and certified by manufacturer in installation and testing of equipment specified. Provide evidence upon request in writing prior to work commencement of manufacturer's certification of supplier's ability to properly install structured cabling for building.

.3 Submit proven track record in cabling projects of similar size. Include details of minimum 3 projects of similar size involving category 5E cabling, Multimode and Single-mode fibre optic cabling which have been completed in last 2 years. Include names, addresses, and phone numbers of references for 3 projects.

.3 Certifications

.1 UTP network wiring shall conform to T568A configuration, Category 5e system standards. All UTP cables shall provide minimum signal impairment by preserving wire pair twists as closely as possible to the point of mechanical termination at each end. The following tests will be conducted and recorded using a Penta Scanner:

.2 End to end continuity, attenuation, cable open and shorts; NEXT; mutual capacitance; pair polarity and cable impedance; S/N ratio and pass/fail status.

1.08 WARRANTY

.1 The structured cabling systems shall be warranted for 25 years, covering all system products manufactured and provided by the single source supplier. The warrantor shall guarantee the following:

.1 All passive system components, e.g. patch panels, UTP cable and outlet jacks are free from manufacturing defects in material or workmanship

.2 Approved cabling systems exceed the specifications of the T1A-568A standards and ISO/IEC IS 11801, if applicable.

.3 The installation exceeds attenuation and near end cross talk, loss and bandwidth requirements TIA Bulletin TIA TSB-67 and ISO/EIC IS 11801.

.2 General workmanship and apparatus installed under this contract shall be warranted against defects of workmanship and material for a period of one year after final acceptance of work by the Owner, unless otherwise specified. The contractor will make good any defects developed as a result of their work during such time without expense to the Owner.

2 Products

2.01 MANUFACTURERS

.1 Manufacturer List

.1 Belden.

.2 Commscope.

.3 Panduit.

.4 TE.

.5 Wirewerks.

.6 Approved equal.

.2 Substitution Limitations

.1 Copper cabling installation shall be of one manufacturer.

2.02 UTP CABLING

.1 100 ohm 4 pair UTP, compliant with TIA/EIA-568-C.2

.2 Category 3 cabling for telephone communication.

.3 Category 6 for data communication.

.1 Unshielded twisted pair, 4 pair twisted, #24AWG, FT-6/CMP plenum rated, blue outer insulation,

.4 CMP (FT6) Plenum rated.

.5 No splicing of any data network cabling will be permitted.

2.03 DATA OUTLETS

.1 All data jacks must meet specifications.

.2 Computer outlets complete with termination jacks shall be single, duplex or quad flush faceplates complete with Category 6, 8-position jacks.

.3 Supply and install one – 4 pair cable to the single outlet, two – 4 pair cables to the duplex outlet, and three – 4 pair cables to quad outlet.

2.04 PATCH PANELS/EQUIPMENT RACKS

.1 All data UTP, 4 pair, Category 6 horizontal cables are to be terminated on cabinet or rack mounted 24/48 port panels wired.

.1 PS5 HD-BIX Patch panel, 1U, 24 Port (Belden AX100465 or equal)

.2 PS5 HD-BIX Patch panel, 2U, 48 Port (Belden AX100473 or equal)

.2 Network rack must have the following features:

.1 Free standing.

.2 Standard 19” module compatible.

.3 Lockable door.

.4 Maximum dimensions of 22”w x 36”d x 85” h.

.5 Acceptable products:

.1 RF Mote Cat. #RFM-1944-RHD c/w hinged lockable door.

.2 Anixter Cat. #175419 c/w hinged lockable door.

.3 Distribution panels must be category 5E rated BIX punchdown style with capacities as follows;

.1 24 port Belden AX100465

.2 48 port Belden AX100473

.3 96 port Belden AX100485

.4 In addition to the above, provide all necessary ancillary equipment such as cable management, label holders, and patch cords.

2.05 PATCH CORDS

.1 Provide Category 6 patch cords, consisting of 4 pair stranded cable rated FT4 or higher and stamped accordingly. They must conform to EIA/TIA 568A and meet or exceed the EIA/TIA TSB-36 specifications for cordage.

.2 Patch cords at the workstation end shall be 3050 mm in length, one per data cable.

.3 Patch cords at the TC end shall be 2133 mm in length, one per data cable.

3 Execution

3.01 PATHWAYS FOR COMMUNICATIONS

.1 Conduit to Section 26 05 33.13. J-Hooks: as described in Section 27 05 29.

.2 Cabling between cable tray/j-hooks and data outlets to be enclosed in EMT conduit.

.3 Cables/data outlets may be enclosed in pre-finished non-metallic raceways computer labs, classrooms, etc. where indicated.

.4 Data network cables shall be installed in cable tray. Data network cables shall not be tie-wrapped to electrical conduits, mechanical piping, etc. and shall be run as far as possible from fluorescent lighting fixtures, transformers and electrical power service conduits.

3.02 INSTALLATION

.1 Each equipment rack shall be anchored securely to the floor and grounded to the building ground with a #6 AWG Insulated Ground Wire in accordance with applicable code requirements (refer to CAN/CSA T5238).

.2 Ground all data cables shields and associated equipment in Telecommunications rooms to meet applicable code requirements.

.3 Supply vertical cables and backbone cabling using cable clamps or wiring harnesses.

.4 Conform to Telecommunications Industry Standards (refer to EIA/TIA 568A) for all cable termination and pinning assignments.

.5 Utilize cable trays in MTER and TCs to manage cable in orderly fashion.

.6 All sleeves containing cable or unused shall be fire sealed. Coordinate with Section 07 84 00 for provision and installation of fire barriers.

.7 Cabling is to be run at 90 degrees to the building grid except where the distance would exceed 90m in length if installed in this manner.

.8 The maximum horizontal run length is not to exceed 90 metres. If the 90 metre constraint cannot be met, the Cabling Contractor is to notify the Owners Designee of any cables that exceed 90 metres, prior to the installation.

.9 Ensure all grounding conductors are rated FT-6. Tie into bundles and support using j-hooks outside of tray or conduit and fasten to under-slab at intervals not to exceed 1500 mm.

.10 Route all cable in such a way as to ensure minimum separations are maintained from sources of EMI as defined in EIA/TIA SP-2840A.

.11 Place all exposed cabling in TC in neat and professional manner and route as per specifications and drawings. Cables are to be combed, bundled, and routed in a neat and organized manner. Tie-wrap all exposed cable bundles at maximum of every 200 mm using black ‘hook-and-loop- fastening ties.

.12 Securely mount voice outlets at all work area locations and locate so that cable required to reach work area equipment will be no more than 3 m long.

.13 Ensure that optical fibre splices, fusion or mechanical, do not exceed maximum optical attenuation of 0.3 dB when measured in accordance with EIA/TIA 455-34 and CSA Standard C22.2 No. 232.

.14 All cables must be properly handled and installed in accordance with the manufacturer's specification. Undue pulling tension, abrasion or rough handling must be avoided to ensure that the cables will permit transmission of the intended information with no impairment or degradation of signal quality. Cable runs between the wiring closets and wall plates must be performed with no splices or cuts to ensure the elimination of reflections, discontinuities, impedance, mismatches, and egress/ingress of undesired signals. Cables must be installed at a specified distance (shown below) from any electrical equipment such as radios, televisions, fluorescent lights or fixtures, motors, transformers, or other significant sources of RFI/EMI interference

.15 Label all cables in accordance with Industry Standards and CAN/CSA T528 specifications. Number cables as per drawings.

.16 In cases where the routing may bring the cable in close proximity to the above mentioned sources of disruption, the following minimum distances must be maintained:

.1 125 mm (5 inches) from power lines of 2 kVA or less.

.2 305 mm (12 inches) from lighting (including fluorescent).

.3 914 mm (36 inches) from power lines of 5 kVA or greater

.4 40 inches from transformers and motors

.17 As well, cables must be routed to avoid direct contact with steam pipes or other heat sources so as to avoid thermal degradation of the cable insulation or other undesired effects.

.18 Cables shall be located in ceiling spaces neatly, tied in bundles and installed in cable management “trays”, J-hooks, and conduit as indicated on the drawings.

.19 All cables entering the wiring closets must be neatly dressed in bundles and run to the appropriate terminating location.

.20 Each cable sheath must be clearly and permanently identified with a labelling scheme acceptable to the owner. Each patch panel port a must be clearly and indelibly marked with a structured, user friendly numbering scheme. This numbering scheme must be capable of accepting cable additions so as not to disrupt the logical flow of the scheme. All testing documentation is to reference this numbering scheme.

.21 NOTE: The faceplate identification numbers/tags MUST be added to the electronic versions of the floor plans. This will be considered part of the As Built contract closeout submittals. The electronic version of the floor plan will be provided in ACAD 14 format by the consultant.

.22 The wiring closets shall be labelled C1 etc.

.23 Fibre optic cable installation procedures shall be as follows:

.1 All cables must be properly handled and installed in accordance with the manufacturer's specification. Undue pulling tension, abrasion or rough handling must be avoided to ensure that the cables will permit transmission of the intended information with no impairment or degradation of signal quality. Cable runs between the wiring closets and must be performed with no splices or cuts to ensure the elimination of reflections, discontinuities, excess signal loss, or other undesirable problems.

.2 All fibre cables shall be installed in conduits from end-to-end.

.3 If, during the course of cable installation, it is necessary to bore holes through a firewall, the holes must be sealed with an acceptable sealing material of compound once the cables are in place.

.4 All cables entering the computer room must be neatly dressed in bundles and run to the appropriate terminating location.

.5 Cable runs shall be free of tension at both ends as well as over the length of the run.

.6 Each cable sheath must be clearly and permanently identified at each end using an appropriate labelling scheme accepted by the Owner.

3.03 CABLE IDENTIFICATION AND LABELS

.1 To Section 27 05 53.

.2 All adhesive cable labels shall meet the legibility, defacement, and adhesion requirements specified in UL 969 (Ref. D-16). In addition the labels shall meet the general exposure requirements in UL 969 for indoor use.

.3 Cable labels shall be of self-laminating vinyl construction with a white printing area and a clear tail that self laminates the printed area when wrapped around a cable. The clear area should be of sufficient length to wrap around the cable at least one and one-half times.

.4 All labels must be mechanically printed using a laser printer. Hand written labels are not permitted.

.5 Labels are to be attached to:

.1 front of the IDC connector or communication outlet faceplate

.2 each patch panel jack

.3 each end of the horizontal cable at maximum distance of 50mm from the end of the sheath

.6 Affix faceplate label printed with Workstation Identification number to faceplate cover of in-tile service box.

3.04 SITE TESTS AND INSPECTIONS

.1 All UTP distribution cabling must be tested with a specialized UTP cable tester to measure the following characteristics:

.1 DC Resistance

.2 Characteristic Impedance

.3 Cable Length

.4 Pair Sequence Testing

.5 Hardcopy checklists indicating room number and faceplate ID, should be prepared, These results should be documented and form part of the Certification Report, Any documentation supplied in hardcopy form should also be supplied in electronic format (suitable word processing file, spread sheet, graphics file (e.g. AutoCAD, etc.).

.6 In addition to the above UTP testing, each cable and termination must be tested to 100 MBS standards.

.7 The specific tests to be performed, after all jack plates are mounted on boxes and labelled, are as follows,

.1 Mutual Capacitance

.2 Attenuation

.3 Near End Cross Talk

.2 Fibre Optic Cable Testing Procedure

.1 System acceptance tests must be performed to verify that the cable plant can be certified fully operational. All optical fibre strands must be properly measured with approved optical fibre test equipment for the following characteristics:

.1 End to end attenuation loss in dB as measured by a calibrated optical power meter.

.2 Splice loss (if any)

.3 Cable length

.2 The above results are to be obtained by the following test procedures:

.1 Power meter and light source.

.2 OTDR - provide hard copy of signature trace in report.

.3 Detailed results of these tests must be included as part of a Certification Report.

.4 No connector should exceed 0.5 dB loss. Splices shall not exceed 0-3 dB loss. Total attenuation of link including fibre cable, connectors and splices shall not exceed 5 dB.

.3 These test results must be documented and form part of the Certification Report.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Wireless Access Points for Wi-Fi network communications.

2 Products

2.01 OWNER-SUPPLIED PRODUCTS

.1 WAP (Wireless Access Points).

.1 Power Over Ethernet (PoE) powered.

3 Execution

3.01 INSTALLATION

.1 Allow for site wireless survey for the final locations of WAPs.

.2 Allow for 5 m cable slack at WAP outlets end for final location adjustment.

End of Section

1 General

1.01 Section Includes

.1 This section describes the requirements for upgrade and replacement of an existing fire alarm system while retaining existing conventionally wired zones.

.2 Replacement of obsolete Fire Alarm Control Panel (FACP).

.3 Connection of existing fire alarm zones to new panel and addition of new zones for new work as required.

.4 Replacement of field devices to suit requirements of the new system (i.e. smoke detectors).

.5 Connection of all new devices to Fire Alarm Control Panel and annunciator.

.6 System testing and verification.

.7 Work to be done under this Section shall include furnishing of labour, materials, and equipment required for installation, testing, and putting into proper operation complete Fire Alarm System as shown, as specified and as otherwise required. Complete systems shall be left ready for continuous and efficient satisfactory operation.

1.02 Related Requirements

.1 Section 28 46 21.52 – Fire Detection, Suppression, and Pre-action Releasing Panels: new equipment.

.2 Most recent verification report for existing fire alarm system.

1.03 References

.1 The publications listed below form a part of this specification. The publications are referenced in text by the basic designation only. Comply with latest edition/amendment referenced Code/Publication.

.1 Canadian Standards Association:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.2 Ontario Regulations:

.1 Ontario Building Code.

.2 Ontario Fire Code.

.3 Underwriter’s Laboratories of Canada

.1 CAN/ULC-S524-14 – Installation of Fire Alarm Systems.

.2 CAN/ULC-S536 – Inspection and Testing of Fire Alarm Systems.

.3 CAN/ULC-S537 - Verification of Fire Alarm Systems.

.4 All requirements of the Authority Having Jurisdiction (AHJ).

1.04 Submittals

.1 Submit to the Fire Department, drawings showing signal devices, manual pull stations, complete wiring diagrams and annunciator details and obtain their approval.

.2 General:

.1 All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality.

.3 Shop Drawings:

.1 Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

.2 Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, and device arrangement.

.3 Show annunciator layout and main control panel module layout, configurations and terminations.

.4 Show device layout, complete riser diagram, and auxiliary functions.

.5 The supplier of the system shall prepare a complete zoning schedule and artwork layout for active graphic to be included with submittal package.

.4 Manuals:

.1 Submit complete operating and maintenance manuals listing the manufacturer's name(s) including technical data sheets (with model numbers to be used indicated).

.2 Wiring diagrams shall indicate terminals and the interconnections between the items of equipment.

.3 Provide a clear and concise description of operation which gives, in detail, the information required to properly operate the equipment.

1.05 Closeout Submittals

.1 ESA inspection certificate.

.2 Fire Alarm Verification Report.

1.06 Quality Assurance

.1 Fire alarms system components shall have CSA and/or ULC approval.

.2 Fire alarm shall conform to the Building Code, Ontario Regulations 925/75 and as amended subsequently.

.3 Fire alarm system installation shall conform to ULC Standard S524-M, latest edition.

.4 Sprinkler flow valves and supervisory valves are existing to remain. Connect new to existing.

.5 All devices/components shall be suitable for the locations, environment, temperatures in which they are to be installed.

.6 The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

.7 The new FACP and new peripheral devices shall be manufactured 100% by a single manufacturer (or division thereof).

.8 Basic Performance:

.1 Initiation Device Circuits (IDC) shall be wired Class B.

.2 Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style Y).

.3 Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.

.4 The fire alarm system shall be a Zoned Single Stage Non-Coded System as defined in the Ontario Building Code.

.9 Approvals

.1 The system shall have proper listing and/or approval from the following nationally recognized agencies:

.1 FM Factory Mutual.

.2 UL Underwriters Laboratories Inc.

.3 ULC Underwriters Laboratories Canada.

.2 The fire alarm control, panel shall meet the modular listing requirements of ULC. Each subassembly of the FACP, including all printed circuit boards, shall include the appropriate ULC modular label.

1.07 Delivery, Storage, and Handling

.1 In accordance with Division 01 requirements.

1.08 Warranty

.1 All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance.

2 Products

2.01 Existing System

.1 The existing Fire Alarm System is as indicated on drawings, GE Fireshield series single-stage fire alarm system.

.1 The location of the Fire Alarm Control Panel is as indicated on the drawings.

.2 There is one passive graphic annunciator to be updated, location as indicated on the drawings.

2.02 Manufacturers

.1 The new system shall be:

.1 Edwards EST3X series.

.2 Mircom FX-2000 series.

2.03 Equipment and Material, General

.1 All equipment and components shall be new, and the manufacturer's current model.

.2 All equipment and components shall be installed in strict compliance with manufacturers' recommendations.

.3 All Equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place. (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

.4 Re-use existing field devices where compatible with the new system.

.5 Where new devices are required (for example current draw for smoke detectors), provide new field devices as described in this section. Where new devices are required, style shall match existing.

2.04 Conduit and Wire

.1 Existing conventional zone wiring is existing to remain.

.2 New conduit and wire for new zones and new devices to Section 27 15 01.19.

.3 Conduit:

.1 Conduit shall be in accordance with the Electrical Safety Authority (ESA), local and provincial requirements.

.2 All wiring shall be installed in conduit or raceway.

.4 Wire:

.1 All fire alarm system wiring shall be new, with the exception of the existing building, if acceptable.

.2 Wiring shall be in accordance with local, provincial and national codes and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as outlined in the Ontario Electrical Safety Code and as recommended by the fire alarm system manufacturer.

.3 All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signalling system, as outlined in the Ontario Electrical Safety Code.

.5 Terminal Boxes, Junction Boxes and Cabinets:

.1 All boxes and cabinets shall be listed for their purpose and use.

2.05 Components

.1 Programmable Electronic Sounders:

.1 Electronic sounders (bells) shall match existing system.

.2 Shall be flush mounted as required.

.2 Strobe Synchronizing Modules:

.1 Synchronize strobes at 1 Hz and horns at temporal over single wire pan.

.2 Compatibility to match existing system.

.3 Manual Fire Alarm Stations

.1 Manual fire alarm stations shall be non-code, non-breakable glass type.

.2 Stations must be designed such that after an actual activation, they cannot be restored to normal without the use of a special tool.

.3 An operated station shall automatically condition itself so as to be visually detected, as operated, at a minimum distance of 30.5 m (100 feet) front or side.

.4 Manual stations shall be constructed of metal, with operating instructions provided on the cover. The word FIRE shall appear on the manual station in letters 12.7 mm (1/2 inch) in size or larger.

.5 Manual stations shall be complete with lexan vandal covers.

.6 Style of new manual pull stations to match existing system.

.4 Conventional Photoelectric Area Smoke Detectors

.1 Photoelectric smoke detectors shall be two wire, ceiling-mounted, light scattering type using an LED light source.

.2 Each detector shall contain a remote LED output and a built-in test switch.

.3 Detector shall be provided on a twist-lock base.

.4 It shall be possible to perform a calibrated sensitivity and performance test on the detector without the need for the generation of smoke. The test method shall test all detector circuits.

.5 A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs), on the detector, which may be seen from ground level over 360 degrees. These LEDs shall flash every 10 seconds, indicating that power is applied to the detector.

.6 The detector shall not go into alarm when exposed to air velocities of up to 914.4 m (3000 feet) per minute.

.7 The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.

.8 All field wire connections shall be made to the base through the use of a clamping plate and screw.

.9 Style of detectors shall match existing system.

.5 Duct Smoke Detectors

.1 Duct smoke detectors shall be with visual alarm and power indicators, and a reset switch. Each detector shall be installed upon the with properly sized air sampling tubes. To match existing system.

.6 Automatic Conventional Heat Detectors

.1 Automatic heat detectors shall have a combination rate of rise and fixed temperature rated at 57.2 degrees C (135 degrees F) for areas where ambient temperatures do not exceed 37.7 degrees C (100 degrees F), and 93.33 degrees C (200 degrees F) for areas where the temperature does not exceed 65.5 degrees C (150 degrees F).

.2 Low profile, ceiling mount type with positive indication of activation.

.3 The rate of rise element shall consist of an air chamber, a flexible metal diaphragm, and a factory calibrated, moisture-proof, trouble free vent, and shall operate when the rate of temperature rise exceeds 9.4 degrees C (15 degrees F) per minute.

.4 The fixed temperature element shall consist of a fusible alloy retainer and actuator shaft.

.5 Automatic heat detectors shall have a smooth ceiling rating of 762 square metres (2500 square feet).

.6 Style of detectors shall match existing system.

.7 Remote Annunciator and Passive Graphic

.1 This contractor to connect all new zones for the addition to annunciator.

.2 Provide new passive graphic, multicolour, under plexiglass with anodized frame and concealed tamperproof mounting.

2.06 Basic System Functional Operation

.1 An alarm is caused by actuation of any one of the following devices:

.1 Pulling a manual station.

.2 Operation of an automatic fire alarm detector.

.3 Operation of a sprinkler flow switch.

.4 Operation of a smoke detector.

.2 If, in any area of the building, an alarm is caused by actuation of the aforementioned devices, the following shall occur:

.1 Signals in the building shall sound.

.2 Annunciators shall indicate exact zone where alarm originated.

.3 Fans shall be automatically turned off.

.3 Central station shall be automatically alerted via telephone lines connected for fire alarm system.

.4 If, in any area of the building, supervised valves of the sprinkler, systems are operated or exhibit short or open circuits, the following shall occur:

.1 The annunciator shall identify, as a separate zone, the item causing the trouble signal.

.2 The trouble buzzer on the annunciator(s) shall sound.

.3 The signals in the building shall not be sounded.

3 Execution

3.01 Examination

.1 The approximate location of all initiating devices is shown on the drawings. All existing initiating devices shall not be disturbed unless absolutely necessary to facilitate installation of a new device. No existing devices are to be disturbed without specific authorization by the Project Manager.

.2 Conduct an impedance test of initiation and signal circuits, and submit report to the Consultant. Report any discrepancies in circuit loading.

.3 Refer to fire alarm verification report for a summary of existing zones (including zone naming convention), devices, and sequence of operation on the obsolete system to be reconnected to the new.

3.02 Installation

.1 Install fire alarm system in accordance with specification, codes, and manufacturer's recommendations.

.2 Sprinkler/Standpipe System Connections

.1 Connect contact of sprinkler flow, supervisory and standpipe system switches to fire alarm zones indicated.

.3 Wiring

.1 Install wiring in conduit and in accordance with recommendations of manufacturer.

.4 Connect automatic detectors, smoke detectors and manual stations between red and black conductors at each outlet. Cut red and black conductors at each outlet and connect to terminal screws provided, red to red and black to black.

.5 Wire up annunciators to full capacity.

.6 Align alarm devices and signals, where grouped together, one above the other.

.7 Mount devices at the following heights unless replacing existing device at existing rough-in, or otherwise shown:

.1 Signal – minimum 150 mm, maximum 300 mm below finished ceiling as directed on site by the Consultant, or 2300 mm above finished floor in unfinished areas.

.2 Manual Stations – 1200 mm above finished floor.

.8 Entire installation shall be done under supervision of manufacturer. Upon completion of installation, check entire system to approval and correct any malfunction immediately.

.9 Test each automatic detector to ensure correct wiring and zoning by setting off its rate of rise component and sounding the bells or by ringing it out. Test each smoke detector, sprinkler system and standpipe valves to ensure correct wiring.

.10 Manufacturer shall examine Drawings and Specifications prior to award of Contract to ensure that detectors, control panels and miscellaneous devices being supplied will provide a satisfactory working installation.

.11 Update annunciator / passive graphic to include Addition and renovation areas.

.12 New devices for the addition shall be compatible with the new system.

.13 Audibility: Ensure that audible pattern.

3.03 Fire Alarm System Verification

.1 Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

.2 Provide a full system verification in accordance with CAN/ULC-S536.

.3 All initial testing shall be in accordance with CAN/ULC-S537. A representative of the electrical contractor shall be present to participate and assist the manufacturer representative during the course of the verification. The electrical contractor shall make good any deficiencies discovered during the verification. All devices, new and existing, shall be verified. The electrical contractor shall provide one person for assistance with the verification.

.4 Carry out a complete audibility test.

.5 Include associated costs in Tender Price.

.6 On completion of the inspection the manufacturer shall supply a certificate, together with detailed inspection record sheets showing location of each device and certifying the test results per unit,

confirming that the system is installed, supervised and operate in accordance with Article "System Verification".

.7 The manufacturer(s) of the fire alarm shall make a complete inspection of all existing and new components installed for system(s), such as manual stations, horns, and annunciators and sprinkler and standpipe valves and smoke detectors to ensure the following:

.1 That the system is complete in accordance with Specifications.

.2 That the system is connected according to ULC requirements.

.3 That the system is connected in accordance with the Manufacturer's recommendations.

.4 That the regulations concerning the supervision of components have been adhered to (e.g. stations, detectors, supervised valves, bells), and are properly wired and supervised.

.5 That all valves are properly connected and displayed correctly on each annunciator.

.6 That any subsequent changes necessary to conform to the above will be carried out with technical advice supplied by the manufacturer.

.7 That all thermal detectors, smoke detectors and manual pull stations have been operated and are in good working order.

.8 That all sprinkler system and standpipe system valves have been operated and are in good working order.

.9 That all annunciators correctly pin-point the origin of any fire alarm.

.10 That actual smoke concentration of sufficient density, have been applied to each smoke detector to cause the detector to be set off and that the sensitivity of each smoke detector has been set.

.11 That all existing devices are in good working order. Include for replacing any defective/damaged devices at no extra cost to Owner.

.12 That signal audibility is acceptable in all areas. Submit audibility readings for every Room.

.13 If existing audible signal devices have been discontinued by the manufacturer (for example mechanical horns), allow for replacement of all audible devices so that all devices generate similar sounds and sound patterns when activated.

3.04 Manufacturer’s Field Services

.1 At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

3.05 Closeout Activities

.1 Provide instruction as required to the building personnel and fire and safety personnel.

.2 Provide "hands-on" demonstrations of the operation of the system.

End of Section

1 General

1.01 SUMMARY

.1 Provide commissioning of fire alarm and interconnected systems to verify that installations are in accordance with project requirements, and to ensure proper system operation.

1.02 RELATED REQUIREMENTS

.1 Section 01 91 13 – General Commissioning Requirements.

.1 Section 01 91 26.13 – Integrated Systems Testing of Fire Protection and Life Safety Systems.

1.03 REFERENCES

.1 CAN/ULC-S1001-11 – Integrated Systems Testing of Fire Protection and Life Safety Systems.

1.04 SUBMITTALS

.1 Commissioning plan.

1.05 CLOSEOUT SUBMITTALS

.1 Final commissioning and functional test report.

1.06 QUALIFICATIONS

.1 Commissioning Organizations:

.1 Certified member of Electrical Contractors Association of Ontario (ECAO) or Canadian Fire Alarm Association (CFAA).

2 Products – Not Used

3 Execution

3.01 SITE TESTS AND INSPECTIONS

.1 Perform Commissioning of integrated systems in accordance with CAN/ULC-S1001.

.2 Follow manufacturer's recommendations for testing.

.3 Inspect wiring connections to all devices comprising the system.

.4 Verify supervision of wiring at every device connection to a supervised circuit.

.5 Test operation of every device on a system to verify its function.

.6 Examine equipment for any apparent damage or tampering that may interfere with its intended operation.

.7 Test equipment with capabilities for field adjustment to establish that it functions as intended under the conditions prevailing at its point of installation.

.8 Examine devices for evidence of damage or obstructions which may interfere with their operating mechanisms.

.9 Test automatic devices by simulating an operating condition.

.10 Wiring:

.1 Inspect every device and test to demonstrate that disconnection of the device from the circuit or malfunction of the equipment or wiring activates the required supervisory signals. Inspection shall include verification that:

.1 Supervisory signals operate in response to open circuits, short circuits, ground faults and disconnection of plug-in components;

.2 Terminations of conductors entering and leaving equipment have been made;

.3 Circuit polarities are in accordance with the system design, where applicable.

.2 In addition, test to establish that the power supplied to any device is within its recommended operating range and that the required voltage levels are maintained and that the fusing is correct.

.11 Initiating Devices - Manual:

.1 Inspect manual alarm stations in consideration of the following:

.1 The device shall be mounted with sufficient clearance to facilitate ease of access and proper operation;

.2 Operate each manual alarm station, toggle switch and key switch to verify proper functions.

.12 Automatic heat detectors:

.1 Use a heat source reproducible in its intensity, as recommended by the manufacturer of the device, to initiate an alarm.

.2 Test equipment - Heat lamp or Air heater. DO NOT USE AN OPEN FLAME HEAT SOURCE.

.3 Apply heat source as to not damage or operate fusible disc parts.

.13 Automatic heat detectors - non-resettable:

.1 Test by simulating its electrical operation by jumpering the wiring points (creating a short) adjacent to its operating mechanism.

.14 Automatic smoke detectors - area type:

.1 Test by introducing smoke into its detecting chamber. This may consist of actual smoke from burning materials or artificially generated smoke aerosol spray as recommended by the manufacturer. The sensitivity should be noted and adjusted if necessary.

.15 Automatic smoke detectors:

.1 Examine the air sampling arrangements of the detectors under actual conditions of balanced air circulation by conducting a check of the field sensitivity and a check of the air velocity in accordance with the manufacturers' recommendations.

.2 Test gas to be used similar to Automatic Smoke Detector.

.16 Alarm signals - audible:

.1 Test on main power supply and standby power supply with the maximum expected load on the system.

.2 The audible signalling appliances shall function as intended and shall be audible throughout the building over the background noise present.

.3 Decibel recordings in each area covering 100 sq. metres shall be taken.

.4 The level of sound should usually be 15 dB above ambient noise level.

.17 Alarm signals - visual:

.1 The visual signal appliances shall function as intended and shall be clearly visible.

.18 Fire suppression supervision:

.1 Coordinate with the requirements of Section 21 12 00, and Section 21 13 00.

.2 Sprinkler and standpipe trade to active each sprinkler and standpipe supervisory and alarm device by operating valves and producing flows as required in conjunction with fire alarm technician to observe activation of flow switches, pressure switches, supervised valves, etc.

.19 Annunciators, printers, and workstations:

.1 Inspect and operate to establish that their operation in conjunction with the control equipment and other system components, is as intended. The equipment shall be inspected to ensure:

.1 The zone of each alarm initiating device is properly indicated;

.2 The legend is clearly visible;

.3 Adequate voltage under local conditions is present;

.4 Wiring connections have been made in a workmanlike manner.

.5 Proper care must be taken to establish that each item is complete and satisfactory.

.20 Standby power supplies - batteries:

.1 Examine batteries for possible damage and consideration of the following:

.1 The charging system functions as intended;

.2 The installation has not resulted in the bypassing of a fuse or a similar protective device;

.3 The installation protects the batteries from accidental or mechanical damage.

.4 The batteries must be able to operate the fire alarm system with the charger input disconnected for one rated load cycle.

.21 Control equipment and transponders:

.1 Test to establish that they function as intended. The following examinations and tests shall be performed:

.1 A visual and physical inspection of all cables, plug interconnections, plug-in circuit components, lamps, sockets and controls to establish that their mechanical and electrical connections and mounting are as required for intended function and, where applicable, to confirm electrical supervision;

.2 Verification that all field wiring is terminated in a workman-like manner;

.3 All lamps and indicators shall be tested for operation and intended function;

.4 All keypad functions shall be tested for operation and intended function;

.5 All control unit functions shall be operated to verify appropriate response including all software routines and programme functions are simulated;

.6 Simulation of open circuits, short circuits and ground faults on all relevant internal circuits in order to confirm the appropriate supervisory response;

.2 Commissioning Report:

.1 Provide in accordance with requirements of Section 01 91 13, supplemented as specified herein.

.2 Report to include relevant information of the system including:

.3 Each system part described.

.4 How the system is operated.

.5 What functions the system performs.

.6 Requirements for tests and service.

.7 Itemization of all devices connected on the system, their general location.

.8 The date of the performed tests.

.9 All pertinent details of the report sheets requested.

.3 Verification:

.1 The Commissioning Report to be submitted to the Commissioning Manager upon completion of commissioning and will be subject to verification by the Commissioning Manager.

3.02 SIMULATIONS OF INTERCONNECTED SYSTEMS

.1 Provide simulations of all interconnected systems in accordance with CAN/ULC-S1001.

End of Section

1 General

1.01 SECTION INCLUDES

.1 Automatic door controls for restrooms.

.2 Emergency call systems for universal and barrier-free restrooms.

.3 Automatic door relay controls.

.4 Automatic door activation.

.5 Automatic door wireless activation.

1.02 RELATED REQUIREMENTS

.1 Section 08 71 00 – Hardware: requirements for door operators and electric strikes interconnected with this equipment.

.2 Section 26 05 00 – Common Work Results for Electrical.

1.03 REFERENCES

.1 ANSI A117.1 - Accessible and Usable Buildings and Facilities.

.2 ANSI A156.19 - Standard for Power Assist and Low Energy Power Operated Doors.

.3 Ontario Building Code 2012, section 3.8.3.12.(2) – Universal Washrooms.

1.04 SUBMITTALS

.1 Submit under provisions of Section 01 33 00 – Submittal Procedures.

.2 Product Data: Manufacturer's data sheets on each product to be used, including:

.3 Preparation instructions and recommendations.

.4 Storage and handling requirements and recommendations.

.5 Installation methods.

.6 Shop Drawings: Electrical schematic, device mounting requirements and rough-in for recessed devices.

.7 Verification Samples: For each finish product specified, two samples, minimum size 150 mm (6 in) square representing actual product, color, and patterns.

1.05 CLOSEOUT SUBMITTALS

.1 Functional test report.

.2 Training attendance records.

1.06 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.

.2 Installer Qualifications: Minimum 2 year experience installing similar products.

.3 Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

.1 Finish areas designated by Architect.

.2 Do not proceed with remaining work until workmanship is approved by the Consultant.

.3 Rework mock-up area as required to produce acceptable work.

1.07 PRE-INSTALLATION MEETINGS

.1 Convene minimum two weeks prior to starting work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

.1 Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

.2 Handling: Handle materials to avoid damage.

1.09 PROJECT CONDITIONS

.1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by the manufacturer for optimum results. Do not install products under environmental conditions outside the manufacturer's recommended limits.

1.10 SEQUENCING

.1 Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.11 WARRANTY

.1 Manufacturer's Warranty: Provide manufacturer's warranty for defective parts for a three-year period from the date of Substantial Completion.

2 Products

2.01 MANUFACTURERS

.1 Camden Door Controls (basis of design).

.2 Substitutions: Thomas Door & Security Hardware, TA-3230C-KIT.

2.02 EMERGENCY CALL SYSTEMS FOR UNIVERSAL RESTROOMS

.1 Performance:

.1 Emergency Call System shall comply with the latest requirements of the Ontario Building Code (OBC), effective January 1, 2015.

.2 Emergency Call System shall be designed to provide a washroom occupant with the ability to request emergency assistance, to receive visual and audible confirmation that their request has been made, and visual and audible notification to building staff and occupants outside the restroom of an emergency condition.

.2 Product: Emergency Call Systems For Universal and Barrier Free Restrooms – CX-WEC10K2 System as manufactured by Camden Door Controls.

.1 Operation: the 'Press For Emergency Assistance' mushroom push button is activated by the occupant. This energizes the LED annunciator and sounder within the washroom and the dome

light with sounder outside the washroom. Both annunciators will be energized until the latching mushroom push button switch is pulled out.

.2 Components:

.1 The following items are part of the CX-WEC10K2 equipment package:

.1 CM-AF540SO Double gang, push/pull mushroom push button, red, 'Assistance Required', w/ LED annunciator and adjustable sounder, 'Assistance Requested'.

.1 ‘Press for Emergency Assistance’ switch, ‘Push/Pull’ operation 41.27 mm (1-5/8”) vandal resistant red button, N/O and N/C contacts, rated 10 Amp @ 30 VDC and permanently laser etched graphics (black).

.2 Single gang LED annunciator with adjustable sounder rated 85 dB at 102 mm (4 in), weather and vandal-resistant construction, brushed stainless steel faceplate, with 'ASSISTANCE REQUESTED'. ‘White Out’ text shall not be legible unless the annunciator is energized.

.3 Heavy gauge stainless steel double gang faceplate.

.2 CM-AF141SO: Single gang LED dome light with adjustable piezo sounder, rated 93 dB at 1 m (3 feet), weather (indoor/outdoor) and vandal resistant construction, white. 180 degree visibility with ‘ASSISTANCE REQUIRED' text printed on two sides of the lens.

.3 CM-SE21A: sign, to be located above the activation switch, 1.6 mm (1/16 in), 152 mm high by 270 mm wide (6 in by 10-5/8 in), fire-rated expanded PVC white with 25 mm (1 in) red lettering. The text shall be “IN THE EVENT OF AN EMERGENCY PUSH EMERGENCY BUTTON AND AUDIBLE AND VISUAL SIGNAL WILL ACTIVATE”.

.2 The following items are required, but not included in the CX-WC11 equipment package:

.1 CX-PS13 24V linear power supply and CX-TRX-4024 UL listed 40 VA transformer.

.2 Electric Strike: CX-ED2079 ('Universal' Grade 2 Electric Strike).

.3 Contact for Pushbutton (normally closed CM-4000/61N).

.4 Door contact.

2.03 AUTOMATIC DOOR CONTROLS FOR RESTROOMS

.1 Performance:

.1 Automatic door controls shall comply with Americans with Disability Act.

.1 Regulatory compliance with Accessibility Guidelines (ADAAG) and the Uniform Federal Accessibility Standard (UFAS) as required by Authority Having Jurisdiction (AHJ).

.2 Automatic door controls shall comply with National Building Code of Canada.

.3 Automatic door controls shall comply with NFPA National Fire Code or International Fire Code for restroom doors acting as egress doors as required by Authority Having Jurisdiction (AHJ).

.4 Emergency Power: System shall be provided with an emergency power connection.

.2 Product: Push Button and Annunciator Restroom Control System - CX-WC11 as manufactured by Camden Door Controls.

.1 Operation:

.1 The door is normally closed and either locked or unlocked. Pressing the exterior push plate unlocks and opens the door. Once inside and the door is closed, pressing the 'Push to Lock' mushroom pushbutton locks the door, disables the exterior ' Push to Open' push plate switch and illuminates the exterior annunciator to show ' Occupied when Lit'. Pressing the interior push plate switch unlocks the door, deactivates the illuminated annunciator, and resets the system. If the door is opened manually to exit the restroom, the overhead magnetic contact switch resets the system.

.2 Status: Normally locked. Fail secure electric strike.

.3 Status: Normally unlocked. Fail safe electric strike.

.2 Components:

.1 The following items are part of the CX-WC11 equipment package:

.1 CX-33PS includes Advanced Logic Control Relay and 2 Amp Power Supply in pre-wired metal cabinet.

.2 CM-45/4 114 mm (4.5 in) square activation (wall) switch (2 required), stainless steel construction, N/O contacts rated 15 Amps @ 30 VDC and paint filled debossed ‘wheelchair symbol and ‘Push To Open’ graphics (blue). Mounted on in-wall single gang electrical box.

.3 CM 400/8 ‘Push to Lock’ Mushroom Push Button with heavy duty brushed stainless steel faceplate, 40 mm (1-5/8”) vandal resistant red button and N/O contacts rated 10 Amps @ 30 VDC.

.4 CM-AF500 Single Gang LED Annunciator, with heavy duty 18 gauge, vandal resistant stainless steel faceplate, ‘Occupied When Lit’ ‘white out’ text, super-bright LEDs, 10 VDC to 36 VDC voltage, max. 40 mA current draw.

.5 CX-MDA surface mount SPST N/C Magnetic Door Contact.

.6 CX-ED2079 Electric Strike, grade 2 ‘universal’ strike for cylindrical locksets c/w 3 faceplates, 12/24V AC/DC, selectable fail safe/fail secure. The strike shall have horizontal faceplate adjustment.

.2 The following items are required, but not included in the CX-WC11 equipment package:

.1 CX-PS13 12/24V linear power supply and CX-TRX-4024 UL listed 40 VA transformer.

3 Execution

3.01 EXAMINATION

.1 Do not begin installation until substrates have been properly prepared.

.2 If substrate preparation is the responsibility of another installer, notify the Consultant of unsatisfactory preparation before proceeding.

3.02 PREPARATION

.1 Clean surfaces thoroughly prior to installation.

.2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

.1 Install in accordance with manufacturer's instructions.

.1 Install push button and the red “assistance requested’ annunciator ganged together adjacent to the toilet.

.2 Install the emergency push button adjacent to the toilet, and post the sign above the emergency button.

.3 Install the dome light at exterior of the universal washroom, above the door of the washroom.

.4 Install conduit between system components, and install wiring as directed by manufacturer.

.2 Provide all low voltage control wiring between system components.

3.04 FIELD QUALITY CONTROL

.1 Perform test of system in the presence of the Owner. Submit report documenting the test was completed.

3.05 DEMONSTRATION AND TRAINING

.1 Manufacturer's representative shall provide on-site training of staff and maintenance of operation, maintenance and "trouble/error" detection/correction.

3.06 PROTECTION

.1 Protect installed products until completion of project.

.2 Touch-up, repair or replace damaged products before Substantial Completion.

End of Section

24-7540-RFT - Pioneer Park Public School Interior Renovations

Opening Date: March 25, 2024 3:00 PM

Closing Date: April 15, 2024 2:00 PM

Schedule of Prices

* Denotes a "**MANDATORY"** field

Do not enter $0.00 dollars unless you are providing the line item at zero dollars to the Board.

Bid Price Form

The amounts stipulated on the Bid Price Form(s) are intended to cover the cost of the complete Work as described in this Procurement and must remain fixed and firm for the term of the Contract unless otherwise specified in this Procurement.

All prices shall be in Canadian Funds, Free On Board (FOB) Destination, and Freight Prepaid (Board locations). and shall be exclusive of Harmonized Sales Tax (HST) but shall include all materials, labour, equipment, disbursements, expenses, insurance, bonding, customs charges, freight, shipping and handling costs, travel costs and all other charges of every kind attributable to the Work and Services provided.

Bid Price includes Cash Allowance

Line Item	Description	Unit of Measure	Quantity	Bid Price *	Total
1	Pioneer Park Public School Interior Renovation as per scope of work	Lump Sum	1		
				Subtotal:	

Summary Table

Bid Form	Amount
Bid Price Form	
HST (13%)	$ 0.00
Total Contract Amount:	

Bid Questions

Bill S-211 - This enactment enacts the Fighting Against Forced Labour and Child Labour in Supply Chains Act, which imposes an obligation on certain government institutions entities to ensure measures are taken to prevent and reduce the risk that forced labour or child labour is used by suppliers or in their supply chains. The Board principles align with Bill S-211. Please confirm that your organization will comply with this Act. YES or NO. If no, please explain.	
The Board will require General Contractors on the approved Roster List to have their IHSA - Certificate of Recognition (COR®) by January 2026. Although not mandatory for this bid opportunity, the Board requests bidders to respond to the question below YES or NO. By responding NO, you acknowledge the deadline requirement above. Does your company have a current IHSA - Certificate of Recognition (COR®)? - YES or NO	

Specifications

Bidder's Contact Information

A Site Supervisor and Project Manager, assigned to manage and supervise the Work, must be named in this form. Personnel will be subject to approval by the Board and cannot be changed without prior written approval from the Board.

A dedicated Site Supervisor is required full-time for this project. If your company is awarded more than one project/contract, a different Site Supervisor is required for each project. In the event of this situation, you have the option to name and include a resume for an alternative Site Supervisor at this time.

If providing an alternative Site Supervisor with your submission, it is understood, that the alternative Site Supervisor will only be reviewed if the first Site Supervisor has already been accepted and working on another WRDSB project.

Note: resumes are required to be uploaded in the document section. Optional for alternative Site Supervisor

.

Title	Name *	E-mail *	Cell Phone Number *	
Project Manager				*
Site Supervisor				*
Optional - Alternative Site Supervisor in the event the Site Supervisor listed above is assigned to another WRDSB Project.				

Documents

It is your responsibility to ensure the uploaded file(s) is/are not defective or corrupted and are able to be opened and viewed by the Owner. If the attached file(s) cannot be opened or viewed, your Bid Submission may be rejected.

Upload a resume for each person named in the Specification section.

- Project Manager - Resume * (mandatory)
- Site Supervisor - Resume * (mandatory)
- Optional - Alternative Site Supervisor - Resume (only if Site Supervisor #1 is assigned to another project prior to this award) (optional)

BONDING UPLOAD SECTION

Refer to the Bonding Requirements Section of the Terms and Conditions.

Bonding is required if the project is equal to or greater than $200,000.00. Note: The Bidding System has flagged these fields as mandatory. If your bid is less than $200,000.00, please upload a pdf document stating: Not Applicable.

Bidders shall upload their electronically verifiable and enforceable (e-Bond) format for Bid Deposit Bond and Agreement to Bond separately in this section. If both Bonds are in the same pdf file, please upload it in both fields and indicate one is a “duplicate”

The date on the Bonds must be the Closing Date

Tender # and Project Title must be included on the Bonds

- Bid Deposit Bond * (mandatory)
- Agreement to Bond * (mandatory)

Addenda, Terms and Conditions

I/We have read and understand this Bid Solicitation document, and agree to perform the Work required in accordance with this Bid

Solicitation document, including all addenda, at the price(s) detailed in the Bid.

I/We confirm that:

1. The person named in this Bid is authorized to sign and electronically submit this Bid through the Bidding System.

2. I/We meet all mandatory requirements of the Bid Solicitation document.

3. The bid will remain open for a specified acceptance period after the Closing Time. The Board may, at any time within this period, accept the Bid whether or not any other Bid has previously been accepted.

4. All prices provided in the Bid will remain fixed and firm for the duration of the term of the agreement, unless specified otherwise.

5. All prices provided in my/our Bid are in Canadian funds and include all charges of every kind attributable to the Work. Harmonized Sales Tax will be extra and not shown, unless specified otherwise.

6. To the best of my/our knowledge and belief:

a) the information provided in the Bid is correct; and

b) the Bid is made without any comparison of figures or arrangement with any other individual, corporation or person submitting a Bid for the same Work and is in all respects fair and without collusion or fraud.

7. I/We comply with the all applicable Board policies, provincial, and federal laws, and are aware of the Board's "Principles of Business Conduct" and will comply.

8. I/We agree and understand that the recommendation to award the Work may be subject to the approval from the Board as well as availability of funds.

9. I/We agree to be bound by the terms and conditions of the Bid Solicitation document and submit this Bid on behalf of the Bidder.

☐ I have the authority to bind the Bidder.

The Bidder/Proponent is to declare any actual, potential or perceived conflict of interest that could arise from submitting the Bid/Proposal.

Do you have a potential conflict of interest?

○ **Yes** ○ **No**

The Bidder acknowledges and agrees that the addendum/addenda below form part of the Bid Solicitation Document.

Please check the box in the column "**I have reviewed this addendum"** below to acknowledge each of the addenda.

File Name	I have reviewed the below addendum and attachments (if applicable)	Pages
There have not been any addenda issued for this bid.		