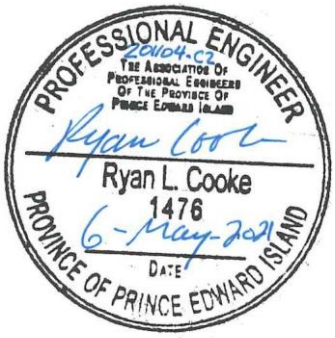
COLES ARCHITECTURE
ENGINEERING
PROJECT MANAGEMENT

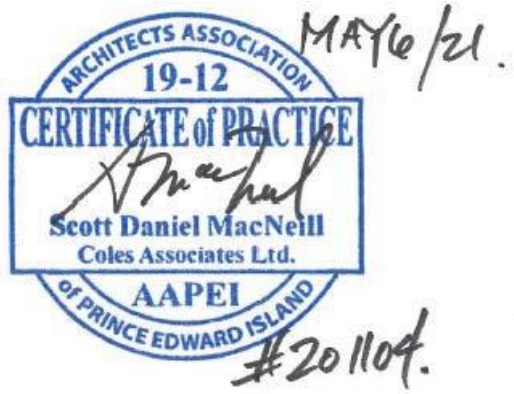
201-85 Fitzroy Street
Charlottetown, PE C1A 1R6
(902) 368-2300
www.colesassociates.com

SPECIFICATIONS

MONTAGUE CONSOLIDATED SCHOOL
MONTAGUE, PEI

CONTRACT #2 – INTERIOR FITUP





Coles Associates Ltd.
Project #: 201104

Issued for Tender: May 06, 2021

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1 General

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END OF SECTION

1 General

1.1 TENDER CALL

.1

The Government of Prince Edward Island, as represented by the Minister of Transportation & Infrastructure will receive sealed tenders at the Security Desk at the main entrance of the Jones Building, 11 Kent Street, Charlottetown, PEI, CIA 7N8. Tenders must be submitted on the forms provided and be in a sealed envelope clearly marked to indicate the project being tendered on.

MONTAGUE CONSOLIDATED SCHOOL
CONTRACT #2 - INTERIOR FIT-UP
MONTAGUE, PE

Tenders for the General Contract will be accepted until 2:00 PM (local time) on Thursday, 27 MAY 2021.

Project comprises the renovation / fit-up to a portion of both floors at the existing Montague Consolidated School, located in Montague, PEI

All enquiries are to be directed to the Consultant, Coles Associates Ltd a minimum of three (3) days prior to tender closing as follows:

Attention:	Nick White, GSC, C. Tech., RSE.
Email:	nwhite@colesassociates.com
Phone:	902-368-2300

Tender documentation will only be available electronically. Electronic documents will be posted electronically to the Government tender page:
https://www.princeedwardisland.ca/en/tenders

Electronic documents will be issued to Construction Association of PEI (CAPEI) as well as to NB and NS Construction Associations. Addenda will only be posted to the Government tender site and issued to the Construction Associations. It is the Contractor's responsibility to ensure that they have incorporated all addenda into their bid submission.

- Tender envelopes must be clearly marked with the Project Name.
- Tender documents will need to be received prior to 2:00 PM (local time) on the date specified in the tender.
- No submissions will be accepted after the 2:00 PM closing time.
- The tender opening will not be opened to the public.
- Tender envelops will be opened immediately after the tender closing and there will be a representative of CAPEI present to witness the opening.

The lowest or any tender will not necessarily be accepted.

END OF SECTION

1 General

1.1 SUMMARY OF WORK

.1 This project involves the renovation / fit-up to a portion of both floors at the existing Montague Consolidated School, located in Montague, PEI

.2 All in accordance with the requirements of the specifications and drawings listed on their respective Index of Specifications and Drawings.

1.2 ENQUIRIES

.1 Direct all inquiries during the tender period to:

Coles Associates Ltd.
P.O. Box 695
85 Fitzroy Street, Suite 201
Charlottetown, PEI
C1A 1R6

Phone: (902) 368-2300
Email: nwhite@colesassociates.com
CC: tellsworth@colesassociates.com

Attention: Nick White, GSC, C. Tech., RSE

.2 All enquiries are to be directed to the Consultant a minimum of three (3) days prior to tender closing in order to allow the Consultant to issue an addendum a minimum of two (2) days prior to tender close.

1.3 TENDERING PROCEDURE

.1 General Contractors:

.1 Submit their tender for the entire work of this Contract, INCLUDING the work of the Civil, Mechanical, Sprinkler and Electrical subcontracts, directly to the Owner in accordance with the requirements of the Invitation to Tender and this specification.

.2 Civil, Mechanical, Sprinkler and Electrical Subcontractors:

.1 Bidders for the work of the Civil, Mechanical, Sprinkler and Electrical subcontracts will submit their tenders directly to the General Contract bidders, for incorporation by the General Contractors into their General Contract tenders.

.3 General Contract bidders shall take particular care to ensure that their tender is submitted on the proper tender form.

.1 Civil, Mechanical, Sprinkler and Electrical subcontract bidders will submit their tenders to the General Contract bidder, on, or in a form acceptable to the individual General Contract bidders, to whom bids are submitted.

1.4 SPECIFICATION EXPLANATION

.1 Whenever the words "as shown," "as noted," "as called for," "indicated," or similar phrases are used, they shall be understood to refer to this specification and/or the accompanying drawings and addenda.

.2 The words "provided", "install" or similar words shall mean the work described shall be completely supplied, and erected or installed by the Contractor, unless otherwise noted.

.3 All materials are to be new unless noted otherwise.

1.5 EXAMINATION OF SITE

.1 All bidders submitting tenders for this work shall first examine the site and all conditions

thereon and/or therein, including:

.1 Existing conditions visually evident at the time of tender upon which the Work of this Contract will be installed.

.2 Conditions attached to, abut against or in any other way affected by existing conditions.

.2 All tenders shall take into consideration all such conditions as may affect the work under this Contract.

.3 No extra payment will be made to the Contractor, above the Contract Price, for costs resultant from failure to determine the conditions that affect the Work.

.4 There will be a schedule Bidder's tour, date as stated in the timing requirements.

1.6 EXISTING CONDITIONS

.1 If in the performance of the contract, subsurface or latent conditions at the site are found to be materially different from those indicated by the drawings and specifications, or unknown conditions not usually inherent in work of the character shown and specified, the attention of the Consultant shall be called immediately in writing to such conditions before they are disturbed. Upon such notice or resulting from his own observation of such conditions the Consultant shall promptly make such changes in the drawings and specifications as he finds necessary to conform to the different conditions and any increase or decrease in the cost shall be adjusted as provided under Changes in the Work.

1.7 DOCUMENT INTERPRETATION

.1 The Consultant's interpretation of Contract Documents shall be final.

.2 Should the Bidder find discrepancies in, or omissions from the drawings, specifications or other tender documents, or be in doubt as to their meaning or interpretation, the Bidder should at once notify the Consultant in writing for clarification.

.3 Any instructions or clarifications to Bidders issued during the period of bidding will be in the form of Addenda and are to be included in the tender. Addenda will form part of the Contract Documents.

.4 The Owner, User Groups or Consultant will not be responsible for verbal instructions.

.5 Addenda will be posted online via https://www.princeedwardisland.ca/en/tenders.

.6 Every effort will be made to issue addenda not less than two (2) days prior to the time for the closing of tenders, at the Consultant's discretion.

1.8 PREPARATION AND SUBMISSION OF BIDS

.1 Contractors shall submit their bids on the Tender Form provided, which will be received at the time and place indicated on the Invitation to Tender. Late tenders will not be accepted and will be returned unopened to the bidder.

.2 Bidders shall fill in all information requested on the Tender Form.

.1 This form must be completely filled out in ink, or be typewritten with the signature in longhand. The completed forms shall be without interlineation, alteration or erasure.

.2 Failure to fill in the Tender Form, as provided, in its entirety may result in the rejection of the bid; however, bidders are not obligated to provide alternative prices to products listed on the Appendix provided for that specific purpose, as part of the tender form.

.3 Tender amount shall be stated both in writing and in figures.

.4 Signatures shall be without alteration or erasure.

.5 Receipt of addenda for the project shall be acknowledged by filling in the addendum number and date of issue for each addendum on the appropriate line on the Tender Form. These lines shall be initialed by the person signing the tender after they have been filled in.

.3 Each tender submitted will be accepted on the understanding that it covers all the Work called for in the specifications and on the drawings, regardless of any notations by Bidder that certain parts of the required Work are omitted from their proposal.

.4 Each bid must:

.1 Give the full business address of the Bidder and be signed by him with his usual signature.

.2 Bids by partnerships must furnish the full name of all partners and must be signed in the partnership name of one of the members of the partnership or by some authorized representative, followed by the signature and designation of the person signing.

.3 Bids by corporations must be signed with the legal name of the corporation, followed by the name of the Province of incorporation, and by the signature designation of the president, secretary, or other person authorized to bind it in the matter. The name of each person signed shall also be typed or printed below the signature.

.4 A bid by a person who affixes to his signature the word "president," "secretary," or "agent," or other designation, without disclosing his principal, may be held to be the bid of the individual signing on behalf of the corporation.

.5 A bid of any individual or any group of individuals operating as co-partners or the bid of any corporation which may be submitted shall be executed and authorized so that it shall be and it will constitute a legal binding act of the persons, co-partners, or corporate entity making the bid.

.5 Bidders shall include with their tender, in the space designated in Section 00 41 13, Appendix A, the name of each Subcontractor and/or Supplier, as designated, whose price has been included in their tender and who will perform the trade work. Substitution for another Subcontractor in the event that the listed Subcontractor is unable to do the work shall be subject to the approval of the Owner and contingent on evidence satisfactory to the Owner that the original Subcontractor's price was legitimately carried in the Tender, and that the original Subcontractor is now incapable of carrying out the work required under the subcontract, or that he refuses to carry out the work and provides documented reasons for such incapacity or refusal.

.6 The term "Own Forces," as a subcontractor, may be used by a Bidder where the Bidder is equipped to and in fact normally carries out the trade work using employees in the direct employment of the Contractor or a wholly owned subsidiary company. Other designations such as "Own Estimate" are unacceptable and may be cause for rejection of the tender by the Owner.

.7 When a Bidder indicates "Own Forces" as a subcontractor, the Bidder may be required to demonstrate to the Owner that he has the resources, experience and employees necessary, available and qualified to perform the trade work in a manner and quality satisfactory to fulfill the obligations of the Contract Documents and that the trade work is a normal and continual part of his business operation.

.8 A Bidder, whose tender is accepted, that included "Own Forces" for a subcontract will if requested, provide the Owner with payroll records verifying that the employees carrying out the "Own Forces" subcontract work are direct employees of the Contractor or of a wholly owned subsidiary company of the Contractor.

.9 Each bidder shall be prepared, if so requested by the Owner, prior to the award of the Contract to present evidence of his experience, qualifications and financial ability to carry out the terms of the Contract.

.10 The Owner will evaluate Tenders submitted for this project. The criteria to be considered by the Owner in awarding the Contract will include a combination of:

.1 Bid price;

.2 Scheduling;

.3 Compliance;

.4 Expertise;

.5 Qualifications of the Contractor and named Subcontractors / Suppliers and

.6 Any other such conditions as may be determined by the Owner to be in the best interests of the Owner. A decision on the acceptance of a Tender will be made by the Owner based on the results of the Owner's evaluation.

.11 Bidders may, at their own discretion, submit Alternatives to items identified as "Acceptable Material".

.1 All proposed Alternatives shall be listed in Appendix "B", ALTERNATIVE PRICES and be identified by name and model number where applicable and each Alternative shall have an associated tender price change "INCREASED BY" $_____ or "DECREASED BY" $_____ or "N/A," as compared with the "Acceptable Material" item carried in the tender amount.

.2 Alternate prices will include ALL related costs associated with charges from Accepted Material. No additional costs will be accepted for failure of the Contractor to identify the full impact of using alternate systems.

.3 Alternate prices will NOT be used in determining the tender price or as the basis for awarding the tender.

.12 Bidders are to complete any other appendices forming part of the Tender Form as directed under Section 00 41 13 - Bid Form.

.13 Tender Forms and accompanying documents shall be enclosed in a sealed envelope marked "TENDER" and bearing the following identification.

.1 Name of project.

.2 Name of Contractor submitting tender.

.14 Envelope to be addressed to the recipient of tenders indicated in the Invitation to Tender and delivered by hand, registered mail or courier.

.15 Submit one (1) only signed copy of Tender Form.

.16 Accompanying the Tender Form shall be:

.1 One (1) copy of Bid Guarantee, together with Surety's Letter of Consent, as specified.

.2 One (1) copy of a preliminary schedule demonstrating the full scope of work to be completed within the identified time for the completion of the contract work.

.3 One (1) copy of a letter from Bidder's insurance provider identifying a list of any claims made against the Bidder within the last five (5) years.

.17 Tender forms and securities must bear original signatures.

.18 Where the bid amount is shown in both written words and number and the two are in conflict, written words will take precedence.

1.9 BID GUARANTEE

.1 Each tender submitted shall be accompanied by the following Security:

.1 For a General Contract Tender less than Three Million Dollars ($3,000,000.00), including Mechanical and Electrical Subcontract values:

.1 A Bid Bond equal to at least ten percent (10%) of the tender amount and a Letter of Surety from a bonding company guaranteeing to supply a Performance Bond in the amount of fifty percent (50%) of the total contract amount.
OR

.2 A security Deposit equal to at least ten percent (10%) of the tender amount.

.2 General Contract Tender more than Three Million Dollars ($3,000,000.00), including Mechanical and Electrical Subcontract values:

.1 A Bid Bond equal to at least ten percent (10%) of the tender amount and a Letter of Surety from a bonding company guaranteeing to supply a Performance Bond

in the amount of fifty percent (50%) of the total contract amount and a Labour and Materials Payment Bond in the amount of fifty percent (50%) of the total contract amount.

.3 All Bonds and Letters of Surety supplied by General Contractors, made payable to the Government of Prince Edward Island as represented by the Minister of Transportation & Infrastructure.

.1 Bonds and Letters of Surety supplied by the General Contractor to the Owner shall be from a recognized surety company, satisfactory to, and approved by the Owner.

.2 If a performance bond is utilized, it shall be maintained in force for a period of not less than twelve (12) months after the issuance of the total performance criteria.

.3 Security Deposits, provided by General Contractors, must be in the form of a Certified Cheque or Bank Draft drawn on a Bank to which the Bank Act applies or a credit Union, payable to the Government of Prince Edward Island as represented by the Minister of Transportation & Infrastructure.
OR

.4 Bonds of the Government of Canada, unconditionally guaranteed, as to the principal and interest by the Government of Canada if such Bonds are:

.1 Payable to the bearer, or

.2 Accompanied by a duly executed instrument of transfer to the Government of Prince Edward Island as represented by the Minister of Transportation & Infrastructure, in the form prescribed by the Domestic Bonds of Canada Regulations, or

.3 Negotiated as to principal or as to principal and interest in the name of the Government of Prince Edward Island as represented by the Minister of Transportation & Infrastructure, pursuant to the Domestic Bonds of Canada Regulations.

.5 Security deposits submitted by subcontractors, to General Contractors, shall be in a form satisfactory to the General Contractor.

1.10 CONTRACT SECURITY

.1 Upon award of a contract the General Contractor is to provide the following contract security:

.1 General Contract Tender less than Three Million Dollars ($3,000,000.00), including Mechanical and Electrical Subcontract values:

.1 A Performance Bond in the amount of fifty percent (50%) of the total contract amount.
OR

.2 A Security Deposit in an amount equal to at least ten percent (10%) of the contract amount.

.2 General Contract Tender more than Three Million Dollars ($3,000,000.00), including Mechanical, Sprinkler and Electrical Subcontract values:

.1 A Performance Bond and a Labour and Materials Payment Bond, each in the amount of fifty percent (50%) of the total contract amount.

.3 All Bonds provided by General Contractors, made payable to the Government of Prince Edward Island as represented by the Minister of Transportation & Infrastructure.

.1 Bonds shall be from a recognized surety company, and approved by the Owner.

.2 If a performance bond is utilized, it shall be maintained in force for a period of not less than twelve (12) months after the issuance of the total performance criteria.

.4 Security Deposits, provided by General Contractors, must be in the form of a Certified Cheque or Bank Draft drawn on a Bank to which the Bank Act applies or a Credit Union,

payable to Minister of Finance, Province of Prince Edward Island.
OR

.5 Bonds of the Government of Canada, unconditionally guaranteed, as to the principal and interest by the Government of Canada if such Bonds are:

.1 Payable to the bearer, OR

.2 Accompanied by a duly executed instrument of transfer to the Government of Prince Edward Island as represented by the Minister of Transportation & Infrastructure, in the form prescribed by the Domestic Bonds of Canada Regulations, or

.3 Negotiated as to principle or as to principle and interest in the name of the Owner, pursuant to the Domestic Bonds of Canada Regulations, or

.4 Contract security shall be provided at the expense of the Contractor, bonds shall be provided by an established surety company satisfactory to, and approved by the Owner. Certified Cheques or Bank Drafts shall be drawn on an account with a recognized financial institution.

.6 If in accordance with the Bid Guarantee requirements the successful Contractor has used a Certified Cheque or Bank Draft as a bid guarantee, the Certified Cheque or Bank Draft will be securely retained and, subject to the progress of the work being acceptable to the Owner and Consultant, will be held without interest until the date of Substantial Performance for the Contract, as defined under Definition 19 of CCDC2-2008, at which time it will be returned to the Contractor.

1.11 RECEIPT AND OPENING OF BIDS - UPDATED FOR COVID 19

.1 We have developed modifications to the tender process to minimize everyone's potential exposure to COVID-19.

.1 Sealed tenders will be received at the Security Desk located at the main entrance to the Jones Building, 11 Kent Street, Charlottetown, PE, C1A 7N8 until 2:00 PM, local time, on date of Tender closing .

.2 Sealed tenders are to be clearly marked with the Bidder's Name and the Project Name.

.3 Tender documents will need to be received prior to 2:00 PM local time on the date specified in the Tender. No submission will be accepted after that time.

.4 Amendments to submitted offer will be permitted if received in writing prior to bid closing and if endorsed by same party or parties who signed and sealed offer. Amendments may be submitted by fax to Department of Transportation & Infrastructure, fax number (902) 569-0590.

1.12 ADJUSTMENT AND WITHDRAWAL OF BIDS

.1 Bids may be withdrawn or adjusted in writing by mail, delivered in person or facsimile transmission delivered to the party to whom the bids were submitted, provided such withdrawal or adjustment is prior to the time fixed for the opening of the bids. Negligence on the part of the bidder in preparing the bid confers no right for the withdrawal or adjustment of the bid after the expiration of the time within which bids may be submitted.

.1 All withdrawals or adjustments to previously submitted tenders must be faxed to Department of Transportation & Infrastructure, fax number (902) 569-0590, prior to the time fixed for the opening of bids.

.2 Neither the Owner nor Coles Associates Ltd. accepts responsibility for the Contractors inability to submit faxed modifications within the allotted time for such circumstances, including but not limited to power and equipment failures, transmission failures, paper outages, busy fax line, etc.

.3 Adjustments must be signed by the same person who signed the original bid.

1.13 AWARD OF CONTRACT

.1 The Contract, if awarded, will be awarded as promptly after the opening of bids as is

possible, and at the discretion of the Owner. The award date will not extend beyond the period indicated on the Tender Form following the scheduled time of tender closing, without first obtaining permission of the three (3) low bidders, or low bidder only, at the discretion of the Owner.

.2 The Form of Agreement, (Contract) which the successful Bidder will be required to enter into with the Owner, may be seen on application to the Consultant. The drawings, specifications and any addenda issued during the tender period, will be suitably marked for identification at the time the Form of Agreement is signed by both parties, shall be considered as being included in the Contract, together with the completed Tender form and are hereinafter referred to as the "Contract Documents." All of these documents shall be read together and construed as one document. Following execution of the Contract, the Contractor shall receive from the Owner one (1) complete signed set of Contract Documents.

.3 Final award of Contract shall be subject to approval of all agencies having direct interest in the project.

.4 Where identical bids are received, the low bidder will be selected on the basis of a coin toss by the Owner in the presence of the identical bidders.

1.14 ACCEPTANCE / REJECTION OF TENDERS

.1 Bids shall remain open to acceptance and irrevocable for a period of thirty (30) days after the bid closing date.

.2 The Owner reserves the right to reject any and all tenders.

.3 In making the decision to award the Contract pursuant to this invitation to tender, the Owner may take into account:

.1 The history of work performance of each Bidder on similar or different types of work in prior Contracts with the Owner.

.2 The Bidder's qualifications to perform the work, the quality of the Bidder's past work, the Bidder's financial capability to do the work, the past history of the Contractor's construction scheduling ability to meet the Owner's specified substantial completion targets and the competence of the Bidder.

.4 If the tender is accepted the Contract will be awarded as promptly after the opening of bids as is possible. The selection of the tender that is accepted shall be at the sole discretion of the Owner.

.5 Each Bidder shall be prepared, if so requested by the Owner, prior to the award of the Contract to present evidence of their experience, qualifications and financial ability to carry out the terms of the Contract.

1.15 REJECTION OF BIDS

.1 The Owner reserves the right to reject any and all bids.

.2 The lowest or any bid will not necessarily be accepted.

.3 Bids submitted which indicate "own forces" for subcontract work, that in the opinion of the Owner cannot be successfully completed by the Contractor's employees will not be accepted.

.4 Bids not submitted on the required form will be rejected.

.5 Bids which are incomplete or qualified will be rejected.

.6 All Bidders acknowledge that they shall have no claim against, or entitlement to damages from the Owner or Consultant by reason of the Owner's rejection of their individual bids or all bids.

1.16 SUBCONTRACT WORK

.1 Contractor is to ensure that all Subcontractors understand the full extent of their responsibilities in order to complete the entire work of the project. Subcontract work may appear in various Sections of Specifications and on various Drawings.

.2 Contractors and their Subcontractors are advised to become familiar with all specifications and drawings.

1.17 CONDITIONS OF WORK AND EMPLOYMENT IN PEI

.1 All Construction Companies and Contractors and subcontractors submitting tenders for this work, or a portion thereof, are advised, in their own interest, to contact the Construction Association of Prince Edward Island, the accredited association for commercial and industrial sectors of the construction industry, to inquire and determine the terms and conditions of work and employment in the Province of Prince Edward Island.

1.18 COVID-19

.1 The parties acknowledge that the obligations of each party from time to time to meet certain terms and conditions of this Contract, may be impeded by the COVID-19 pandemic and related issues. The parties agree to act in good faith by making all reasonable accommodations as the circumstances of the pandemic may require and each party will exercise reasonable efforts to comply with this Contract notwithstanding the effect of the pandemic. No party will require or encourage any person acting on its behalf to violate the terms of any public health directive or to perform any act which would place such person at a material risk of contracting the COVID-19 virus.

.2 This contractor acknowledges that any costs associated with COVID-19 construction protocol related to all required Health and Safety measures during the duration of this construction contract, as referenced in the Tender Documents, shall be included in the base bid for this Contract.

.3 COVID-19 Implications:

.1 Until further notice, and as directed by the Provincial Chief Public Health Office (CPHO), all works shall be conducted with the intent and spirit of the health directives given. As such, bidders shall include provisions within their bids to achieve social and physical distancing between all workers during travel times to and from the site, working, rest breaks, lunch breaks, etc. For more information related to CPHO and COVID-19 refer to the following links provided by the Government of PEI:

.1 Government of PEI:
www.princeedwardisland.ca/covid19

.2 Government of Canada:
www.canada.ca/coronavirus

.3 CAPEI:
www.capei.ca/

.4 In response to the current COVID-19 pandemic we will require all Contractors to:

.1 Develop a written work site specific Pandemic Preparedness plan based on the criteria in the CAPEI industry guide "PANDEMIC PLANNING FOR THE CONSTRUCTION INDUSTRY - A GUIDE" found at the following link:
https://capei.ca/member_access/LiveEditor/images/pdf/INDUSTRY_GUIDE_COVID_19.pdf

.5 The successful Contractor shall have designated an on-site staff person with the authority to enforce the requirements of the 'Pandemic Preparedness Plan' throughout the project(s) or until such directive is deferred by the Chief Provincial Health Office (CPHO). The Owner will require that the Contractor develop a written site specific Pandemic Preparedness Plan and have it available upon award of this tender.

1.19 LABOUR

.1 No prospective employee in the Province of Prince Edward Island shall, with relation to his employment or eligibility for employment, be discriminated against or favored by reason of sex, racial origin, religious views, or political affiliations.

.2 Contractors, to the extent possible, are encouraged to maximize the employment of the local labour force for the Work of this Contract.

1.20 COMPLIANCE WITH STATUTES

.1 It shall be the sole responsibility of the Contractor to prepare and submit any required applications, reports, payments or contributions with respect to Sales Taxes, Income Taxes, Canada Pension Plan contributions, Employment Insurance Premiums, Harmonized Sales Taxes or any other similar matter which may be required by law to be made by the Contractor in connection with the services to be performed under this Agreement.

.2 The Agreement shall be interpreted and applied in accordance with the laws, and in the courts, of the Province of Prince Edward Island.

.3 The Contractor agrees to accept sole responsibility to comply with all federal, provincial and municipal legislation which may have application to the Work and agrees to comply with all provincial and federal legislation affecting conditions of work and wage rates including the Employment Standards Act R.S.P.E.I. 1988, Cap. E-6.2, the Workers Compensation Act R.S.P.E.I. 1988, Cap. W-7.1, or any other laws that impose obligations in the nature of employers' obligations. The Consultant agrees to follow the Public Service Commission Human Resource Policies listed below while working on Government sites, in Government vehicles or alongside Government staff.

.1 Prince Edward Island Public Service Commission, Human Resource Policies

.1 9.05 Violence in the Workplace Policy
https://psc.gpei.ca/sites/psc.gpei.ca/files/HRPolicy/HRManual_9.05.pdf

.2 9.08 Drug, Alcohol and Medication Policy
https://psc.gpei.ca/sites/psc.gpei.ca/files/9.08%20AlcoholDrugandMedicationPolicy.pdf

.3 11.01 Policy for the Prevention and Resolution of Harassment in the Workplace
https://psc.gpei.ca/files/PDF%20Files/hrp-manual/hrppm_11.01.pdf

.4 The Contractor, before undertaking any Work shall provide to Government either a certificate of good standing by the Workers Compensation Board or written confirmation from the Workers Compensation Board that such certificate is not required.

.5 The Contractor agrees to accept the full cost of doing those things required under this paragraph and will not charge or seek reimbursement from Government in any way, such costs having been taken into consideration and included in the rates of payment stipulated in the Payments, Records and Accounts section of this Agreement.

1.21 TAXES

.1 The Harmonized Sales Tax (HST) shall be EXCLUDED from the tender amount. The Contractor, as per current Provincial Regulations, shall include on all invoices the Harmonized Sales Tax (HST) as an additional line item. This would be in addition to the tender amount which does not include HST.

.2 Vendors are required to charge HST on invoices to Province of PEI Departments, Agencies, Crown Corporations, and Regional Health Authorities.

1.22 ACCEPTABLE PRODUCTS

.1 The Bidder shall carry in his tender the base bid product(s) identified in the specifications as "Acceptable Material", or Approved Equals as they are identified throughout the tender period.

.2 The Bidder is also encouraged to carry the products of other manufacturers, that are not considered equals, as "Alternatives Prices," listing them by name on the Appendix provided for that specific purpose, as part of the Tender Form, together with the price difference compared to the specified products, when such Appendix is identified under Section 00 41 13 - Bid Form.

1.23 APPROVED EQUALS

.1 Submission for an Approved Equal is to contain literature and descriptive information with full specification data. Where the requested item is contained on a printed document with other items, it is to be clearly identified.

.2 The Consultant will not search catalogs, e-mails or websites or contact suppliers to obtain the necessary information for proper evaluation.

.3 Submission by Bidders for evaluation of products requested to be considered as equal must be submitted to Consultant no less than 5 working days prior to closing of tenders. No consideration will be given to approving equals after the close of tenders, except when the specified product is found to have been discontinued by the manufacturer.

.4 The consideration of a product(s) for Approved Equal status and the acceptance of individual products as approved equals is entirely at the discretion of the Consultant.

.5 When products are given Approved Equal status these products may, at the discretion of bidders, be carried in their tender price, provided that ALL costs related to changes to the contract work required to incorporate the Approved Equal product are included in the tender price.

.6 The acceptance of a product by the Consultant as an "Approved Equal," even where not specifically indicated on the Approved Equals listing in the Addendum, is to be understood as being contingent upon the provision of the particular series, model and/or type, complete with all options to meet the specified requirements of the Acceptable Material product.

.7 Products given approved status that are found, during construction period, to not have all specified options available, or to have discontinued production of same, or to have made other design changes since the time of approval, will not be accepted for use on this project, except when financial compensation has been mutually agreed upon between the Contractor and the Owner and deemed acceptable by the Consultant. Compensation will not be paid to the Contractor for products acknowledged by the Consultant to be superior to the specified products.

1.24 ALTERNATIVES

.1 Alternative products, when requested under Section 00 41 13 - Bid Form, must be listed in Appendix "B" provided as part of the Tender Form, and are to be understood as being offered only for the Owner's consideration as substitutes for the specified Acceptable Material products, at the amount of increase or decrease in the tender amount indicated in the Appendix. These products and related prices are not to be included in the tender amount.

.2 Alternative products and their related increase or decrease in the base bid amount are not used as the basis for awarding tenders.

.3 When alternative products are listed in Appendix "B", ALL costs related to changes to the contract work required to incorporate the alternative product into the work are to be included in the amount stated in Appendix "B".

.4 Alternative products may or may not be accepted at the discretion of the Owner at the price difference quoted, without any other monetary consideration. If requested, bidders shall promptly supply full details of any or all Alternatives listed. Specific written direction from the Consultant must be given to the Contractor to substitute an alternative product.

.5 Alternative prices shall include all fees, taxes and markups.

1.25 UNIT PRICES

.1 Unit Prices, when requested under Section 00 41 13 - Bid Form, must be listed in Appendix "C", as part of the Tender Form and are to be understood as being offered only for the Owner's consideration; to be accepted or not accepted, at the Owner's discretion in a timely manner during the Work of the Contract, ONLY as a method of adjustment to the Contract Work for changes in the Work, should the Owner opt for the Unit Price

Method.

.2 Unit prices shall include all fees, taxes and markups.

1.26 SEPARATE PRICES

.1 Separate Prices, when requested under Section 00 41 13 - Bid Form, must be listed in Appendix "D", as part of the Tender Form and are to be understood as being offered only for the Owner's consideration; to be accepted or, not accepted, in whole or in part, at the Owner's discretion. If used the Separate Prices may be incorporated into the Contract Work either at the time of Award of Contract or in a timely manner during the Work of the Contract, at the Owner's discretion.

.2 Separate Prices shall include all fees, taxes (excluding HST) and markups.

1.27 GUARANTEES

.1 The Contractor will be required to guarantee the work of this Contract in accordance with the requirements of GC12.3 of the Agreement.

.2 Not withstanding the above, the bidder's attention is directed to the fact that certain individual items on this project may be required to be guaranteed by the manufacturer for periods in excess of twelve months. These specific requirements are to be found in various Sections of the specifications for this project.

1.28 PAYMENT OF WORKERS

.1 The Contractor shall, in addition to any fringe benefits, pay the workers employed by the Contractor on the work at wage rates, not less than those established by the Minimum Wage Order, issued under authority of the Labour Act, which is in effect. The Contractor shall pay workers employed on the work at intervals of not less than twice per month.

.2 The Contractor shall require each Subcontractor, or person doing any part of the work, to covenant with the Owner that workers are employed at the wage rates and in the manner required by this provision.

.3 Where any person employed by the Contractor or any Subcontractor, or other person engaged on the Work of this Contract, is paid less than the amount required to be paid under the provisions of this Contract, the Owner may deduct from any monies payable to the Contractor, under this or any other Contract, and pay to such person, a sum sufficient to bring the person's wages up to the amount required to be paid under this Contract.

.4 No claim for extra payment from the Contractor will be considered by the Owner concerning any change in the Minimum Wage Order which may occur during prosecution of the Contract.

1.29 CONFIDENTIALITY AND FREEDOM OF INFORMATION

.1 By submitting your bid, you agree to disclosure of the information supplied, subject to the provisions of the Freedom of Information and Protection of Privacy (FOIPP) Act.

.2 Anything submitted in your bid that you consider to be "confidential information" because of its proprietary nature should be marked as "Confidential", and will be subjected to appropriate consideration under the Freedom of Information and Protection of Privacy Act.

.3 During the delivery and installation of goods and/or services, you may have access to confidential or personal information. Should this occur, you must ensure that such information is not released to any third party or unauthorized individual.

.4 Any information provided on this contract may be subjected to release under the Freedom of Information and Protection of Privacy Act. You will be consulted prior to the release of any information.

1.30 TIMING REQUIREMENTS

.1 This project will require the achievement of the following project milestones.

- .1 Tender Call 06 MAY 2021
- .2 Pre-tender Site Meeting 18 MAY 2021 @ 3:30 PM
  - .1 Contractors are asked to meet at main entrance of Montague Consolidated School, located at 622 Princess Drive, Montague, PE.
- .3 Tender Close 27 MAY 2021 @ 2:00 PM
  - .1 Location of Closing: Jones Building, 11 Kent Street.
- .4 Tender Award 04 JUN 2021
- .5 Construction Start Immediately following award.
- .6 Substantial Completion: 01 SEP 2021
- .7 Owner Occupancy 01 SEP 2021

END OF SECTION

1 General

1.1 TENDER

.1 SUBMITTED BY:

_____(Name)

_____(Address)

_____(Contact)

DATE: _____

FOR: PROJECT NAME: MONTAGUE CONSOLIDATED SCHOOL
CONTRACT #2 - INTERIOR FIT-UP
LOCATION: 622 PRINCESS DRIVE, MONTAGUE, PE

TO: PROJECT OWNER: GOVERNMENT OF PRINCE EDWARD ISLAND, AS REPRESENTED BY THE MINISTER OF TRANSPORTATION & INFRASTRUCTURE
LOCATION: 11 KENT STREET, CHARLOTTETOWN

Having examined ALL the drawings and specifications for this project, as well as any addenda issued, as prepared by Coles Associates Ltd. and/or their consultants; WE HEREBY OFFER to furnish all materials, plant and labour necessary for the full and proper completion of the Contract work for:

PROJECT NAME: MONTAGUE CONSOLIDATED SCHOOL
CONTRACT #2 - INTERIOR FIT-UP
LOCATION: 622 PRINCESS DRIVE, MONTAGUE, PE

INCLUDING all prime cost allowances and Government sales or other taxes in force at this date, EXCLUDING Harmonized Sales Tax (HST) but not any other additional or deductible allowances or taxes which may be applicable subsequent to this date, and which shall be payable by or to the Owner, in accordance with the above mentioned Documents, for the bid amount of:

_____(Dollars)
($)

in lawful money of Canada.

In submitting this Tender we recognize the necessity to complete the information requested by any appendices, as well as, the right of the Owner to reject all Tenders or to accept any Tender at the price submitted, on the condition that revised Tenders will not be called for if minor changes are made.

In the event of this Tender being accepted within thirty (30) days of the time stated for the closing of Tenders, and our failing or declining to enter into a Contract, then our Bid Guarantee, submitted with our Tender shall be forfeited to the Owner in lieu of any damages which the Owner may suffer by reason of our failure or refusal to enter into such Contract.

In the event of our Tender not being accepted with thirty (30) days of the time stated for the closing of Tenders, our Bid Guarantee, submitted with our Tender will be returned to us forthwith, unless a satisfactory arrangement is made with us covering its retention for a further stated period.

If we are notified of the acceptance of this Tender within the above specified time, we will:

.1 Enter into a formal Contract Agreement with the Owner.

.2 Furnish the Performance Bond and Labour and Materials Payment Bonds, or other form of Contract Security, when specifically permitted, as Contract Security in accordance with the requirements of the specifications.

.3 Furnish a cost breakdown of the Contract sum, the total aggregating the amount of our Tender, in accordance with the requirements of the specifications.

.4 Furnish a certified copy of all insurance policies.

.5 Furnish a certified copy of all insurance policies carried by the named subtrades.

.6 Complete the entire work on or before the dates stated.

.7 Provide and update as required a Construction Schedule which clearly shows the state of progress required to complete the work on the date specified.

.8 Enter into subcontract agreements where applicable.

1.2 ACKNOWLEDGEMENT OF RECEIPT OF ADDENDA

.1 Addendum No. _____ Issued: _____ _____ initial

Addendum No. _____ Issued: _____ _____ initial

Addendum No. _____ Issued: _____ _____ initial

Addendum No. _____ Issued: _____ _____ initial

Addendum No. _____ Issued: _____ _____ initial

1.3 FORM OF TENDER APPENDICES

.1 Appendix 'A' must be completed by bidders.

.2 Appendix 'B' (only the items indicated) may be completed by bidders, any other items are at the bidder's discretion.

.3 Appendix 'C' must be completed by bidders.

.4 Appendix 'D' must be completed by bidders.

.5 Appendix 'E' must be completed by bidders.

1.4 DOCUMENTS ACCOMPANYING BID FORM

.1 As per Section 00 21 13, Par 1.8.16

.1 One (1) copy of Bid Guarantee, together with Surety's letter of consent. _____ initial

.2 One (1) copy of preliminary schedule. _____ initial

.3 One (1) copy of letter from Bidders Insurance Provider identifying list of claims made against Bidder within last five (5) years. _____ initial

1.5 SUPERINTENDENT

.1 Name of Superintendent _____.

.2 Years of Experience with Contractor _____.

1.6 CONFLICT OF INTEREST

.1 The Contractor warrants that as at the date of this Agreement, no conflict of interest, or any circumstance that might interfere with independent and objective exercise of judgment, exists or is likely to arise in relation to execution of this Agreement or its subject matter. The Contractor shall immediately notify Government, in writing, if any such actual or potential conflict of interest should arise at any time during the Term. In the event Government discovers or is notified by the Contractor of an actual or potential conflict of interest, Government, in its sole discretion, may either:

.1 Allow the Contractor to resolve the actual or potential conflict to the satisfaction of Government;
OR

.2 Terminate the Agreement in accordance with the Termination section of this Agreement.

1.7 CONTRACTOR'S SIGNATURE

.1 Signed sealed and submitted for and on behalf of:

_____
(Company Name)

_____

_____
(Address)

_____ _____
(Authorized Signature) (Witness)

_____ _____
(Name and Title) (Name and Title)

_____
(Date)

1.8 APPENDIX 'A'

.1 Herewith are identified the Subcontractors we propose to use on this project. Carrying Sub-Contractor options next to identified work, is not acceptable and may be cause for rejection of the Tender by the Owner.

Building Demolition: _____

Steel Stud: _____

Gypsum Wall Board: _____

Millwork / Cabinetwork: _____

HM Doors and Frames: _____

Wood Doors: _____

Glazing: _____

Flooring: _____

Painting: _____

Mechanical: _____

Electrical: _____

COMPANY: _____

AUTHORIZED SIGNATURE: _____

1.9 APPENDIX 'B'

.1 ALTERNATIVE PRICES

We herewith submit for consideration by the Owner the following systems or products as Alternatives to the Base Bid items indicated below and identify the increase or decrease, as applicable, in our tender price, for each item should it be selected by the Owner for installation in lieu of the Base Bid item. The change in tender price includes for all necessary modifications to the base bid systems.

Alternative prices shall include all fees, taxes and markups.

SECTION ITEM BASE BID ALTERNATIVE:	TENDER PRICE INCREASED BY:	TENDER PRICE DECREASED BY:
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____

COMPANY: _____

AUTHORIZED SIGNATURE: _____

1.10 APPENDIX 'C'

.1 UNIT PRICE COMPONENT

We submit herewith our Unit Prices for the additions or deletions to the work listed below. The Unit Prices listed apply to performing the Units of Work, in accordance with the requirements of the appropriate specifications herein, only during the time scheduled for such work in the project work schedule.

Unit prices shall include all fees, taxes and markups.

	UNIT OF WORK	ONE (1) UNIT PRICE ONLY FOR EITHER ADDITION OR DELETION
.1	_____	$ _____
.2	_____	$ _____
.3	_____	$ _____
.4	_____	$ _____

COMPANY: _____

AUTHORIZED SIGNATURE: _____

1.11 APPENDIX 'D'

.1 SEPARATE PRICES

We submit herewith our Separate Price for the addition of the work listed below and amounts are NOT included in our Stipulated Price. In accordance with the requirements of the appropriate specifications herein, only during the time scheduled for such work in the project work schedule.

Separate prices shall include all fees, taxes and markups.

	UNIT OF WORK	ONE (1) UNIT PRICE ONLY FOR EITHER ADDITION OR DELETION
.1	_____	$ _____
.2	_____	$ _____
.3	_____	$ _____
.4	_____	$ _____

COMPANY: _____

AUTHORIZED SIGNATURE: _____

1.12 APPENDIX 'E'

.1 CASH ALLOWANCES

The undersigned hereby acknowledges that the sum of:

FIFTY-THREE THOUSAND, FIVE HUNDRED DOLLARS
$53,500.00 (EXCLUDING HST)

is included in the total tender amount as Cash Allowances, to perform the following work: This money to be expended in accordance with the requirements of CCDC2 2008 General Condition GC4.1 - Cash Allowances, only on consultant's written instructions.

WORK:

.1 $27,500.00 - Removal & disposal of asbestos containing elbows and fittings (2 floors). Air monitoring to be included in the work.

.2 $26,000.00 - Removal of the asbestos containing material in the Boiler Room. Air monitoring to be included in the work.

Contractors are advised to carry sufficient overhead and administration cost to administer and coordinate this work.

In the event that the Owner decides not to proceed with any or all of this work, we agree to credit the Contract with the unused portion of the full amount of these Cash Allowances, as applicable, and the related HST.

COMPANY: _____

AUTHORIZED SIGNATURE: _____

END OF SECTION

1 General

1.1 FORM OF AGREEMENT

.1 The Form of Agreement between Contractor and Owner shall be Canadian Construction Documents Committee CCDC2-2008, "Stipulated Price Contract", including the Definitions and General Conditions therein dated 2008 including items GC1.1 inclusive to GC12.3, and the modifications to items GC1.1 to GC12.3 incorporated into Section 00 73 00 - Supplementary Conditions of this Specification.

.2 Document CCDC2-2008 may be examined at the Construction Association office in Charlottetown, PEI.

END OF SECTION

1 General

1.1 GENERAL

.1 The Definitions and General Conditions governing the Work shall be those specified in the following amendments and supplements to those provisions, and shall apply to all Sections of this Specification.

.2 Where any Article or portion of Article conflicts with the Laws of the Province concerned, such Article or portion of the Article is hereby stricken.

.3 The following amendments shall apply to the Definitions of CCDC2 Stipulated Price Contract 2008.

1.2 DEFINITIONS

.1 Paragraph 4 Consultant, add the following:

.1 The Consultant shall be the Owner's Prime Consultant, Coles Associates Ltd., 85 Fitzroy Street, Charlottetown, PEI.

.2 Paragraph 12 Owner, add the following:

.1 The Owner shall be Government of Prince Edward Island as represented by the Minister of Transportation & Infrastructure.

.3 Paragraph 19 Subcontractor, add the following:

.1 All dealings with the Subcontractor shall be through the medium of the Contractor, who will be responsible for the proper coordination and execution of the Sub-contractor's work.

.4 New Paragraph 27 Engineer:

.1 This shall mean the designated engineering representative(s) of the Consultant.

1.3 ARTICLE GC1.1 CONTRACT DOCUMENTS

.1 Paragraph 1.1.8 - Delete as written and substitute:
1.1.8 The Contractor shall receive up to fifteen (15) sets of drawings and specifications at no cost from the Owner. Additional sets of drawings will be supplied at cost of reproduction. The above covers the requirements for all trades.

.2 Paragraph 1.1.11 - Add new Paragraph as follows:
1.1.11 The Contract Documents are prepared solely for use by the party with whom the Consultant has entered into a Contract and there are no representations of any kind made by the Consultant to any party with whom the Consultant has not entered into a Contract.

.3 Paragraph 1.1.12 - Add new Paragraph as follows:
1.1.12 Electronic documents are and shall remain the Consultant's property. Copies of electronic documents may be made available for the preparations of shop drawings at the Consultant's sole discretion and for a fee.

1.4 ARTICLE GC3.1 CONTROL OF THE WORK

.1 Paragraph 3.1.1 - add new Sub-Clause 3.1.1.1 as follows:

.1 The Contractor shall co-ordinate his own work and the work of all Subcontractors so as to facilitate and expedite the progress of the work.

.2 Paragraph 3.1.1 Add new Sub-Clause 3.1.1.2 as follows:

.1 It is the responsibility of the Contractor to immediately notify the Consultant of any signs of distress or any other indications of actual or potential damage to the contract work, without regard to his awareness of any errors, inconsistencies or omissions in the Contract Documents.

.3 Add new Paragraph 3.1.3 as follows:

.1 Before ordering any materials or doing any Work, Contractor shall verify all compensation has been allowed on account of differences between actual site

dimensions and the measurements indicated on the drawings. Any difference, which may be found, shall be submitted to the Consultant for consideration before proceeding with the work.

.4 Add new Paragraph 3.1.4 as follows:

.1 The Contractor will be responsible for effecting the removal from the site of any trade, firm, group or person who is delaying the Work, or whose Work is unsatisfactory. The Contractor will arrange for other competent trades people to complete the Work at no expense to the Owner.

1.5 ARTICLE GC3.6 SUPERVISOR

.1 Add new Paragraph 3.6.3 as follows:

.1 The Consultant may require the Contractor to inform him, in writing, of the name and experience of the supervisory personnel he intends to use on the project.

1.6 ARTICLE GC3.8 LABOUR AND PRODUCTS

.1 Add new Paragraph 3.8.4 as follows:

.1 All manufactured articles, materials and equipment shall be installed, applied, connected, erected, used, cleaned, conditioned and commissioned as directed by the manufacturer unless specified to the contrary.

1.7 ARTICLE GC3.9 DOCUMENTS AT THE SITE

.1 Add new Paragraph 3.9.2 as follows:

.1 Maintain at job site, one copy each document as follows:

.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Reviewed Shop Drawings.
.5 List of Outstanding Shop Drawings.
.6 Notice of Change.
.7 Change Orders.
.8 Other Modifications to Contract.
.9 Field Test Reports.
.10 Approved Work Schedule.
.11 Health and Safety Plan and Other Safety Related Documents.
.12 CSA Z317.13-07 - Infection Control Guidelines.
.13 Other documents as specified.

1.8 ARTICLE GC4.1 CASH ALLOWANCES

.1 Article GC4.1 - Delete this article.

1.9 ARTICLE GC4.2 CONTINGENCY ALLOWANCE

.1 Article GC4.2 - Delete this article.

1.10 ARTICLE GC5.2 APPLICATIONS FOR PROGRESS PAYMENT

.1 Paragraph 5.2.2 - add two new Sentences as follows:

.1 Payment shall be less any holdback release, which may have been made in accordance with the specific terms of this Agreement as dictated by GC 5.6. Any such holdback release by the Owner to the Contractor shall be a payment to the Contractor in trust for the specific Subcontractor in respect of whose work the release is made.

.2 Payments shall be less 15% Mechanics' Lien Holdback amount claimed against each progress claim.

.2 Add new paragraph 5.2.6 as follows:

.1 Authorized Change Orders shall be listed on the application for payment indicating the amount claimed against each to date of claim.

.3 Paragraph 5.2.7 - Add new sentences as follows:

.1 Payment for materials will be considered only if such materials are properly stored on site in a secure enclosure acceptable to the Consultant. Security of materials so stored is the responsibility of the Contractor.

.4 Add new Paragraph 5.2.8 as follows:

.1 With the second and all subsequent applications for payment the Contractor shall include a statutory declaration form CCDC 9B, or other similar form acceptable to the Consultant, declaring that all labour and materials entering into the work, including Subcontractors, covered by the previous application, have been paid. With application for release of lien holdback, the Contractor shall include a statutory declaration form CCDC 9A, or other similar form acceptable to the Consultant.

.2 With the second and all subsequent applications for payment the Contractor shall include a Letter of Clearance from the PEI Workers Compensation Board.

1.11 ARTICLE GC5.3 PROGRESS PAYMENT

.1 Paragraph 5.3.1 - Add new Sentence as follows:

.1 When any claim for payment during the course of construction includes for completed or partially completed Work, which in the opinion of the Consultant is defective or otherwise unacceptable, a sum of monies determined by the Consultant to be two (2) times the value of the defective or unacceptable Work, or two (2) times the value of the Work required to correct the defect or an amount solely at the Consultants discretion, will be withheld from the claim.

.2 Paragraph 5.3.1 - Add 3 new Sentences as follows:

.1 Deficiency monies may be held back at any time during the course of the project for Work deemed incomplete or unacceptable.

.2 It remains the Contractor's responsibility to undertake his own deficiency reviews and ensure the entire Work conforms to the Contract including quality, completeness and commissioning.

.3 Two final deficiency reviews will be conducted by the Consultant. The first review with the Owner and Contractor will identify any minor items which may remain outstanding, and the second review will confirm that these items have been completed. All other deficiency reviews where deficiencies are incomplete or not ready for requested inspections, will be charged at cost to the Contractor. The invoice for the additional reviews will be submitted to the Owner with a corresponding amount deducted from the Contractor's progress payment.

1.12 ARTICLE GC5.5 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF THE WORK

.1 Paragraph 5.5.1, Add new Sub-Clause .3 as follows:

.1 5.5.1.3 Submit with application for payment letter of clearance from The Workers Compensation Board to the Owner stating that the Contractor is in good standing with the Board.

1.13 ARTICLE GC5.7 FINAL PAYMENT

.1 Paragraph 5.7.2 - Add new Sentence as follows:

.1 Any delay in delivering the required Project Record Drawings (As-Builts) as described in Section 01 78 00 - Closeout Submittals will have the effect of delaying the final payment to the Contractor until the Consultant has received them complete and in good condition.

1.14 ARTICLE GC6.2 CHANGE ORDER

.1 Delete Paragraph 6.2.1 and replace with a new paragraph as follows:

.1 6.2.1 When a change in Work is proposed or required, the Consultant will provide the Contractor with a written description of the proposed change in the Work. The Contractor shall promptly present, in forms acceptable to the Consultant, a detailed breakdown of the costs associated with the change, if any; and the adjustment in the Contract Time, if any. The breakdown shall include:

.1 Actual (not list) costs of material, as well as Subtrade and Supplier costs.

.2 Labour costs, including fringe benefits and wage levies.

.3 Equipment rental (excluding hand and small power tool).

.2 Change Orders calling for normal changes or additions to the Work will be priced in detail giving actual material trade prices (not list prices) and actual labour costs and wage levies (including Employment Insurance, Worker's Compensation, Holiday Pay) and actual equipment rental.

.3 Each Change Order will be considered as a whole to complete the work, inclusive of all Sub-Contract and/or General Contract work.

.4 To these prices, the Contractor will add:

.1 For Work less than $2,500, involving the General Contractor only, the General Contractor adds 20% to his costs.

.2 For Work over $2,500, involving the General Contractor only, the General Contractor adds 15% to his costs.

.3 For Work less than $2,500, involving a Subcontractor only, the Subcontractor adds 20% to his costs, submits this price to the General Contractor who adds 10%.

.4 For Work over $2,500, involving a Subcontractor only, the Subcontractor adds 15% to his costs, submits this price to the General Contractor who adds 5%.

.5 For Work less than $2,500, involving the General Contractor and a Subcontractor, the Subcontractor adds 20% to his costs, submits his price to the General Contractor who adds 10%; to this amount the General Contractor adds the cost of his own Work plus 20% of the cost of his own Work only. The General Contractor does NOT add a further 10% to the cost of his own Work.

.6 For Work over $2,500, involving the General Contractor and a Subcontractor, the Subcontractor adds 15% to his cost, submits this price to the General Contractor who adds 5%; to this amount the General Contractor adds the cost of his own Work plus 15% of the cost of his own Work only. The General Contractor does NOT add a further 5% to the cost of his own Work.

.7 Deletions to Contract: A mark-up by either Sub-Contractor or General Contractor shall not be charged or credited on credit Change Orders.

.8 Supervision related to Change Orders shall be considered as included in the allowable mark-up, and shall not be added as additional charges for a Change order.

.5 Note: Costs related to management, supervision, estimating, scheduling, bonding, insurance, as built drawings, copying, courier, safety, cleaning, site overhead, site vehicle, hand and small power tools etc. are covered by the mark up indicated in Paragraph 6.2.1.4 and shall not be included on Change Orders.

1.15 ARTICLE GC6.3 CHANGE DIRECTIVE

.1 Delete Paragraphs 6.3.6.1, 6.3.6.2 and 6.3.6.3 and replace with the following.

.2 The Owner or the Consultant, without invalidating the contract, may make changes by altering, adding to, or deducting from the work, the contract sum being adjusted accordingly. All such work shall be executed under the conditions of the Contract.

.3 Where work is required to proceed immediately, work may proceed under a Change

Directive. The Contractor will be instructed to proceed on a time and materials basis and maintain accurate accounting records for the cost of the change.

.4 Change Directives calling for changes to the Work will be priced in detail giving actual material trade prices (not list prices) and actual labour costs and wage levies (including Employment Insurance, Worker's Compensation, Holiday Pay) and actual equipment rental.

.5 Each Change Directive will be considered as a whole to complete the work, inclusive of all Sub-Contract and/or General Contract work.

.6 To these prices, the Contractor will add:

.1 For Work less than $2,500, involving the General Contractor only, the General Contractor adds 20% to his costs.

.2 For Work over $2,500, involving the General Contractor only, the General Contractor adds 15% to his costs.

.3 For Work less than $2,500, involving a Subcontractor only, the Subcontractor adds 20% to his costs, submits this price to the General Contractor who adds 10%.

.4 For Work over $2,500, involving a Subcontractor only, the Subcontractor adds 15% to his costs, submits this price to the General Contractor who adds 5%.

.5 For Work less than $2,500, involving the General Contractor and a Subcontractor, the Subcontractor adds 20% to his costs, submits his price to the General Contractor who adds 10%; to this amount the General Contractor adds the cost of his own Work plus 20% of the cost of his own Work only. The General Contractor does NOT add a further 10% to the cost of his own Work.

.6 For Work over $2,500, involving the General Contractor and a Subcontractor, the Subcontractor adds 15% to his cost, submits this price to the General Contractor who adds 5%; to this amount the General Contractor adds the cost of his own Work plus 15% of the cost of his own Work only. The General Contractor does NOT add a further 5% to the cost of his own Work.

.7 Deletions to Contract: A mark-up by either Sub-Contractor or General Contractor shall not be charged or credited on credit Change Orders

.8 Supervision related to Change Orders shall be considered as included in the allowable mark-up, and shall not be included in the labour changes for a Change order.

1.16 ARTICLE GC9.1 PROTECTION OF WORK AND PROPERTY

.1 Add new Paragraph 9.1.5 as follows:

.1 The Contractor shall be responsible for implementing all necessary security measures required to protect the areas of Work under his control and shall be responsible for damage which may arise from the failure of, or the failure to implement such security measures.

1.17 ARTICLE GC10.1 TAXES AND DUTIES

.1 Paragraph G.C. 10.1.1 - Revise as follows:

.1 Delete the words ..."at the time of closing except for Value Added Taxes"...and replace with the words ..."at the time of closing including Value Added Taxes"...

1.18 ARTICLE GC10.2 LAWS, NOTICES, PERMITS, AND FEES

.1 Paragraph G.C. 10.2.2 - Delete "the building permit" and add the new sub-clause 10.2.2.1 as follows:

.1 The Owner shall apply for, obtain and pay for the building permit.

1.19 INSURANCE

.1 Without restricting the generality of GC 12.1 - INDEMNIFICATION, the Contractor shall provide, maintain and pay for the following insurance coverages:

.1 General liability insurance with limits of at least FIVE Million Dollars ($5,000,000.00) in the name of the Contractor and include, or in the case of a single, blanket policy, be endorsed to name, the Owner and the Consultant as insureds but only with respect to liability, other than legal liability arising out of their sole negligence, arising out of the operations of the Contractor with regard to the Work. General liability insurance shall be maintained from the date of commencement of the Work until one year from the date of Substantial Performance of the 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 the Work, on an ongoing basis for a period of 6 years following Substantial Performance of the Work.

.2 Automobile Liability Insurance with limits of at least TWO Million Dollars ($2,000,000.00) from the date of commencement of the Work until one year after the date of Substantial Performance of the Work.

.3 Aircraft or Watercraft Liability Insurance with limits of at least FIVE Million Dollars ($5,000,000.00) when owned or non-owned aircraft or watercraft are used directly or indirectly in the performance of the Work. The term Aircraft includes drones and other unmanned aircraft.

.4 Broad Form" property insurance (also known as Builders Risk) in the joint names of the Contractor, the Owner and the Consultant. The policy shall include as insureds all Subcontractors. The "Broad Form" property insurance shall be provided from the date of commencement of the Work until the earliest of:

.1 10 calendar days after the date of Substantial Performance of the Work.

.2 On the commencement of use or occupancy of any part or section of the Work unless such use or occupancy is for construction purposes, habitational, office, banking, convenience store under 465 square metres in area, or parking purposes, or for the installation, testing and commissioning of equipment forming part of the Work.

.3 When left unattended for more than 30 consecutive calendar days or when construction activity has ceased for more that 30 consecutive calendar days.

.5 Boiler and machinery insurance in the joint names of the Contractor, the Owner and the Consultant. The policy shall include as insureds all Subcontractors. The coverage shall be maintained continuously from commencement of use or operation of the boiler and machinery objects insured by the policy and until 10 calendar days after the date of Substantial Performance of the Work. The policies shall include any periods of testing prior to full acceptance of the project as required by this Contract, but including coverage for risks arising out of such part of the Work. Coverage to extend to 36 months after the date of Final Completion of the last component of the project.

.6 The "Broad Form" property and boiler and machinery 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. In the event of loss or damage:

.1 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 Contract

Time relative to the extent of the loss or damage as the Consultant may recommend in consultation with the Contractor.

.2 The Contractor shall be entitled to receive from the Owner, in addition to the amount due under the Contract, the amount 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 in accordance with the progress payment provisions. 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; and to

.3 The Work arising from the work of the Owner, the Owner's own forces or another contractor, the Owner shall, in accordance with the Owner's obligations under the provisions relating to construction by Owner or other contractors, pay the Contractor the cost of restoring the Work as the restoration of the Work proceeds and as in accordance with the progress payment provisions.

.7 The insurer shall acknowledge that the policies are primary and any other insurance policies that may be in effect or any other sources of recovery the including Government of Prince Edward Island's Self Insurance and Risk Management Fund shall not contribute in any way to any judgments, awards, payments, or costs or expenses of any kind whatsoever made as a result of actual or alleged claims.

.2 Prior to commencement of the Work and upon placement, renewal, amendment, or extension of all or any part of the insurance, the Contractor shall promptly provide the Owner with confirmation of coverage in the form of certificates of insurance by an authorized representative of the insurer together with copies of any amending endorsements applicable to the Work.

.3 The parties shall pay their share of the deductible amounts in direct proportion to their responsibility in regards to any loss for which the above policies are required to pay, except where such amounts may be excluded by the terms of the Contract.

.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 give evidence to the Contractor and the Consultant. The Contractor shall pay the cost thereof to the Owner on demand or the Owner may deduct the cost from the amount which is due or may become due to the Contractor.

.5 All required insurance policies shall be with insurers licenced to underwrite insurance in the jurisdiction of the Place of Work.

.6 Indemnification:

.1 The Contractor shall indemnify and hold harmless the Government of Prince Edward Island, its agents, representatives and employees from and against all claims, demands, losses, costs, damages, actions, suits or proceedings of every nature and kind whatsoever arising out of or resulting from the performance of work (herein called the "claims"), provided that any such claim is caused in whole or in part of any act, error or omission, including but not limited to those of negligence of the Contractor, or anyone directly or indirectly employed by the Contractor anyone for whom the Contractor may be liable.

1.20 ARTICLE GC12.3 WARRANTY

.1 Add new Paragraph 12.3.7 as follows:

.1 When a part of the work is occupied by the Owner, directly or for the use intended prior to Substantial Performance, the warranty for the Work directly related to the construction and normal operation of that part of the Work, shall start on the date of occupancy.

.2 Add new paragraph 12.3.8 as follows:

.1 The Contractor shall ensure that his subcontractors are bound to the requirements of GC12.3 insofar as their work is concerned.

END OF SECTION

1 General

1.1 SCOPE OF WORK

.1 The Contractor is to provide each item, and properly execute all work as specified herein, indicated by drawings, addenda, or change orders issued with respect to this project.

.2 The Contractor shall coordinate, administer, and supervise all work, material acquisition and labour.

.3 This project involves the renovation / fit-up to a portion of both floors at the existing Montague Consolidated School, located in Montague, PEI

1.2 WORK BY OTHERS

.1 Co-operate and coordinate with other Contractors in carrying out the respective works and carry out instructions from Consultant.

.2 Schedule the Work of this Contract in consultation and cooperation with the Work of other Contractors and/or Owners own forces to produce a coordinated construction schedule.

1.3 COORDINATION

.1 All Trades on site are responsible to co-operate and co-ordinate with each other.

.2 Coordination prior to installation of all building components is mandatory.

.3 Where work must be modified or reinstalled to be properly coordinated, the cost to do so will be paid by the Trades involved. The Owner will not pay for uncoordinated work nor will the Owner pay to resolve uncoordinated work.

.4 If resolution cannot be achieved among the involved Trades, the Consultant will assess Trade involvement and assign costs accordingly.

1.4 DAMAGE

.1 Where damage is done to work in progress or existing areas of the building and is unclaimed by a Trade, the cost to repair the damage will be assessed by the Construction Manager and Consultant and assigned on a pro-rated tender cost basis to all Trades on site at the time the damage occurred.

.2 The Owner will not participate in paying for such damage.

1.5 DEDUCTIONS FOR UNCORRECTED WORK

.1 If, in the opinion of the Consultant, it is not expedient to correct defective work or work not done in accordance with the Contract documents, the Owner may deduct from the Contract price the difference in value between the work as done and that called for by the Contract, the amount of which shall be determined in the final instance by the Consultant.

1.6 CORRECTION AFTER COMPLETION

.1 Subject to any special provisions in the Contract documents, the Contractor shall remedy any defects due to faulty materials or workmanship appearing within a period of one (1) year from the date of substantial completion of the work and shall pay for any damage to other work resulting there from which appears within such period and neither the final certificate nor payment there under shall relieve the Contractor from responsibility hereunder. The Owner shall give notice of observed defects promptly.

1.7 EMERGENCIES

.1 The Consultant has authority in an emergency to stop the progress of the work whenever in his or her opinion, such stoppage may be necessary to ensure the safety of life, or of the structure, or neighbouring property. This includes authority to make such

changes and to order, access and award the cost of such work extra to the Contract or otherwise as may in his or her opinion be necessary.

1.8 WORK SEQUENCE

.1 Coordinate Progress Schedule referred to in Section 01 32 16 - Construction Progress Schedule and coordinate with Owner Occupancy during construction.

.2 Maintain fire access/control.

1.9 EXECUTION

.1 Execute work with least possible interference or disturbance to building operations, public and normal use of premises.

1.10 DOCUMENTS

.1 The Contract Documents are complementary and what is called for by any one shall be as binding as if called for by all.

.2 Descriptions of materials or work which have well known technical or trade meanings shall be held to refer to such recognized standards.

.3 Should the specifications conflict with the drawings, the specifications shall govern.

.4 In the case of discrepancies between drawings, those of larger scale, or if the scale are the same, those of later date shall govern.

.5 All drawings and specifications shall be interpreted in conformity with the agreement.

1.11 PROTECTION OF WORK AND PROPERTY

.1 The Contractor shall maintain continuously adequate protection of all their work from damage and shall take reasonable precautions to protect the Owner's property from all injury arising in connection with this Contract. The Contractor shall make good any damage or injury to their work and shall make good any damage or injury to the property of the Owner resulting from the lack of reasonable protective precautions. The Contractor shall not be responsible, however, for any damage or injury to their work and to the property of the Owner which may be directly due to errors in the Contract documents or caused by the Owner, their agents, or employees, or from any work or risk which the Owner has agreed to insure, provided the Contractor has taken reasonable protective precautions. The Contractor shall adequately protect adjacent property as required by law and the Contract documents.

1.12 COMMUNICATION

.1 All submissions and inquiries shall be directed to the Consultant for review.

.2 All direction will be transmitted to the Contractor by the Consultant.

1.13 CODES AND REGULATIONS

.1 Perform work in accordance with National Building Code of Canada (NBC) 2015 and any other code of provincial or local application, provided that in any case of conflict or discrepancy the more stringent requirements shall apply.

.2 Meet or exceed requirements of contract documents and specified standards.

.3 References to standards, including manufacturer's direction for installation shall be the latest edition.

.4 All materials, components and equipment as well as construction methods shall comply with the NBC (2015) and all other applicable Provincial codes or regulations.

.5 The latest edition of the Canadian Electrical Code shall govern all electrical work, whether pre-wired and/or assembled remote from the site or not.

.6 All equipment supplied or installed shall be CSA approved for the intended use.

.7 The latest edition of the PEI Occupational Health and Safety Act and Regulations shall govern safe construction practices.

.8 Provide a copy of all certificates of acceptance issued by Provincial or local authorities.

1.14 WORK SCHEDULE AND PROGRESS REPORTS

.1 The Contractor will prepare and maintain a consolidated schedule in weekly increments showing scheduled work versus actual work. The schedule shall indicate the contract commencement and completion date for the total project.

.2 The Contractor is to develop a detailed schedule identifying specific components of the mechanical, sprinkler, refrigeration and electrical trades. A single line items for each is not acceptable.

.3 Provide updated schedule information from time to time as the progress of the work or Consultant may require.

.4 The Contractor shall furnish monthly progress reports from the date of commencement. These reports shall show the percentage of completion of the various divisions of work and contain comments on the general progress of the project.

1.15 CONTRACTOR'S USE OF SITE

.1 Do not unreasonably encumber site with materials or equipment.

.2 Move stored products or equipment, which interfere with operations of Consultant or other Contractors.

.3 Obtain and pay for use of additional off site storage or work areas needed for operations.

.4 The work related to modifying the site roadways must be carried out so that one half of the roadway is open to vehicle traffic at all times.

1.16 PROJECT MEETINGS

.1 Hold bi-weekly project meetings at the site, in the Contractor's site office and at a time approved by Consultant. In addition hold any additional meetings as the need arises or as directed by the Consultant.

.2 Notify all parties concerned of such meetings.

.3 The Contractor will record minutes of meetings and distribute to all parties within three (3) days of meeting.

.4 Failure of the Contractor to accurately record minutes or distribute the minutes in a timely manner will result in the Consultant taking over the duties invoicing the owner and deducting an equal amount from the progress claims as compensation.

1.17 OWNER'S SITE INSPECTOR

.1 There will be an Inspector representing the Department of Transportation & Infrastructure, Province of PEI. No work is to be covered without having received approval from the Inspector. The Inspector will have the authority to cause any part of the work to cease, should, in his or her opinion, there be cause to do so.

.2 This work shall be examined by the Department and approval granted to resume when a satisfactory solution has been found out.

.3 The Inspector does not have authority to authorize changes to work. He or she shall confer with the Consultant who, if necessary will authorize any change.

.4 The fact that the Inspector does not reject any work shall not remove the irresponsibility for completing all work as specified from the Contractor.

1.18 SITE INSPECTOR

.1 No work is to be covered without having received approval from the Consultant. The Consultant will have the authority to cause any part of the work to cease, should, in his or her opinion, there be cause to do so.

.2 This work shall be examined by the Consultant and approval granted to resume when a satisfactory solution has been found out.

.3 The fact that the Construction Manager or Consultant does not reject any work shall not

remove the responsibility for completing all work as specified from the Contractor.

1.19 SETTING OUT OF WORK

.1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations.

.2 Provide all equipment, materials and devices needed to lay out and construct work.

.3 Supply such devices as straight edges and templates required to facilitate Consultant's inspection of work.

1.20 CONCEALMENT

.1 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.21 LOCATION OF EQUIPMENT AND FIXTURES

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.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 his approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Consultant.

1.22 CUTTING, FITTING AND PATCHING

.1 Execute cutting, core drilling, fitting and patching, required to install and make new work under this contract fit properly.

.1 Includes all cutting and patching in building for connection of new mechanical and electrical services to service lines.

.2 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.

1.23 EXISTING SERVICES

.1 Before commencing work, establish the location and extent of service lines and notify Consultant of findings if in conflict with information or intent shown.

.2 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.

.3 Contractor shall pay for any or all repairs to existing services that have been damaged due to the Contractor's negligence in the course of his work.

.4 Notify Consultant and utilities of intended interruption of services and obtain permission.

.5 Where Work involves breaking into or connecting to existing services, give Consultant 24 hours notice for necessary interruption. Minimize duration of interruptions. Carry out Work at times as directed by governing authorities or Owner with minimum disturbance.

.6 Provide temporary services when directed by Consultant to maintain critical building and tenant systems.

.7 Provide alternative routes for personnel and vehicular traffic.

.8 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.

.9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by Authorities Having Jurisdiction.

.10 Record locations of maintained, re-routed and abandoned service lines.

.11 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.24 ADDITIONAL DRAWINGS

.1 The Consultant may furnish as necessary for the execution of the work, additional instructions, by means of drawings or otherwise. All such additional instructions shall be consistent with the contract documents. In giving such additional instructions the Consultant shall have authority to make minor changes in the work, consistent with the Contract.

1.25 RELICS AND ANTIQUITIES

.1 Relics and antiquities and items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tablets, and similar objects found during the work, shall remain property of the Owner. Protect such articles and request directives from Consultant.

.2 Give immediate notice to Consultant if evidence of archaeological finds are encountered during construction, and await Consultant's written instructions before proceeding with work in this area.

END OF SECTION

1 General

1.1 REFERENCES

.1 Owner/Contractor Agreement.

.2 Canadian Construction Documents Committee (CCDC).

.1 CCDC 2-2008, Stipulated Price Contract.

.3 Section 00 73 00 - Supplementary Conditions.

1.2 APPLICATIONS FOR PROGRESS PAYMENT

.1 Make applications for payment on account as provided in Agreement as Work progresses.

.2 Date applications for payment last day of agreed monthly payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and Products delivered to Place of Work at that date.

.3 Submit to Consultant, at least 14 days before first application for payment, Schedule of Values for parts of Work, aggregating total amount of Contract Price, so as to facilitate evaluation of applications for payment.

1.3 SCHEDULE OF VALUES

.1 Make schedule of values out in such form and supported by such evidence as Consultant may reasonably direct and when accepted by Consultant, be used as basis for applications for payment.

.2 Include statement based on schedule of values with each application for payment.

.3 Support claims for products delivered to Place of Work but not yet incorporated into Work by such evidence as Consultant may reasonably require to establish value and delivery of products.

.4 Provide, minimum fourteen (14) days before submitting first application for payment, a Schedule of Values, aggregating the Total Contract Price. After approval by the Consultant the Schedule of Values will be used as a basis for the application for progress payments.

.5 Contractor shall submit with the Schedule of Values, an itemized list of all trades and applicable labour rates for each, which will be used as a basis for labour rates in changes to contract Work.

.6 The schedule of values is to indicate separate line items each for mechanical commissioning, electrical commissioning, mechanical operation & maintenance manuals and electrical operations ' maintenance manuals.

1.4 PREPARING SCHEDULE OF UNIT PRICE TABLE ITEMS

.1 Submit separate Schedule of Unit Price items of Work requested in Bid form.

.2 Make form of submittal parallel to Schedule of Values, with each line item identified same as line item in Schedule of Values. Include in unit prices only:

.1 Cost of material.

.2 Delivery and unloading at site.

.3 Sales taxes.

.4 Installation, overhead and profit.

.3 Ensure unit prices multiplied by quantities given equal material cost of that item in Schedule of Values.

1.5 PROGRESS PAYMENT

.1 Consultant will issue to Owner, no later than 10 days after receipt of an application for payment, certificate for payment in amount applied for or in such other amount as Consultant determines to be properly due. If Consultant amends application, Consultant

will give notification in writing giving reasons for amendment.

1.6 SUBSTANTIAL PERFORMANCE OF WORK

.1 Refer to Section 00 73 00 - Supplementary Conditions.

.2 Prepare and submit to Consultant comprehensive list of items to be completed or corrected and apply for a review by Consultant to establish Substantial Performance of Work or substantial performance of designated portion of Work when Work is substantially performed if permitted by lien legislation applicable to Place of Work designated portion thereof which Owner agrees to accept separately is substantially performed. Failure to include an item on list does not alter responsibility to complete Contract.

.3 No later than 10 days after receipt of list and application, Consultant will review Work to verify validity of application, and no later than 7 days after completing review, will notify Contractor if Work or designated portion of Work is substantially performed.

.4 Consultant shall state date of Substantial Performance of Work or designated portion of Work in certificate.

.5 Immediately following issuance of certificate of Substantial Performance of Work, in consultation with Consultant, establish reasonable date for finishing Work.

1.7 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF WORK

.1 After issuance of certificate of Substantial Performance of Work:

.1 Submit an application for payment of holdback amount.

.2 Submit sworn statement that all accounts for labour, subcontracts, products, construction machinery and equipment, and other indebtedness which may have been incurred in Substantial Performance of Work and for which Owner might in any way be held responsible have been paid in full, except for amounts properly retained as holdback or as identified amount in dispute.

.2 After receipt of application for payment and sworn statement, Consultant will issue certificate for payment of holdback amount.

.3 Where holdback amount has not been placed in a separate holdback account, Owner shall, 10 days prior to expiry of holdback period stipulated in lien legislation applicable to Place of Work, place holdback amount in bank account in joint names of Owner and Contractor.

.4 Amount authorized by certificate for payment of holdback amount is due and payable on day following expiration of holdback period stipulated in lien legislation applicable to Place of Work. Owner may retain out of holdback amount any sums required by law to satisfy any liens against Work or, if permitted by lien legislation applicable to Place of Work, other third party monetary claims against Contractor which are enforceable against Owner.

1.8 PROGRESSIVE RELEASE OF HOLDBACK

.1 Where legislation permits, if Consultant has certified that Work of subcontractor or supplier has been performed prior to Substantial Performance of Work, Owner shall pay holdback amount retained for such subcontract Work, or products supplied by such supplier, on day following expiration of holdback period for such Work stipulated in lien legislation applicable to Place of Work.

.2 Notwithstanding provisions of preceding paragraph, and notwithstanding wording of such certificates, ensure that such subcontract Work or products is protected pending issuance of final certificate for payment and be responsible for correction of defects or Work not performed regardless of whether or not such was apparent when such certificates were issued.

1.9 FINAL PAYMENT

.1 Submit an application for final payment when Work is completed.

.2 Consultant will, no later than 10 days after receipt of an application for final payment, review Work to verify validity of application. Consultant will give notification that application is valid or give reasons why it is not valid, no later than 7 days after reviewing Work.

.3 Consultant will issue final certificate for payment when application for final payment is found valid.

END OF SECTION

1 General

1.1 APPOINTMENT AND PAYMENT

.1 The Contractor will arrange and pay for the services of an independent Consultant to carry out the following tests:

- .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
- .2 Inspection and testing performed exclusively for Contractor's convenience.
- .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
- .4 Mill tests and certificates of compliance.
- .5 Tests specified to be carried out by Contractor under the supervision of Consultant.
- .6 Additional tests specified in Article 1.3.7 below.
- .7 Where tests or inspections reveal work not in accordance with contract requirements, Contractor shall pay costs for additional tests or inspections as Consultant may require to verify acceptability of corrected work.

1.2 CONTRACTOR'S RESPONSIBILITIES - GENERAL

.1 Provide labour, equipment and facilities to:

- .1 Provide access to Work for inspection and testing.
- .2 Facilitate inspections and tests.
- .3 Make good Work disturbed by inspection and test.
- .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.

.2 Notify Consultant sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.

.3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

.4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Consultant.

.5 Provide Consultant with two (2) sets of fully documented test reports, submitted immediately following the testing operations.

1.3 CONTRACTOR'S RESPONSIBILITIES - INSPECTION & TESTING REQUIREMENTS

.1 Testing of all soil material types at source, including collection of sample material by testing firm, to verify compliance with material specifications.

.2 Follow up testing of all soil material types delivered to site.

.3 Monitoring placement and verifying compaction densities which have not passed initial testing.

.4 Monitoring of upgrading work.

.5 Verifying the new compaction densities.

.6 Asphalt Paving:

- .1 Review of asphalt mix design submitted by Contractor.
- .2 Monitoring placement and compaction of seal course.
- .3 Testing of asphalt for compliance with material specifications from asphalt core samples taken by testing firm.

.7 All Flooring

- .1 Moisture vapour transmission levels.
  - .1 Moisture tests.
  - .2 PH levels tests.

.3 Bonding tests.

.8 Testing work may occur under various Sections of the Specification.

1.4 OWNERS RESPONSIBILITIES: TESTING REQUIREMENTS

.1 Testing of the following will be paid for by the Owner but coordinated by the Contractor.

.1 Soil compaction tests.

.2 Concrete compression and slump tests.

1.5 FINAL REPORT

.1 Submit to the Owner at completion of job, two (2) bound hard copies and one (1) electronic copy of inspection report. This report to include:

.1 All copies of test results, indexed to correspond with testing requirements of this Section.

.2 Written report from the testing firm carrying out the work of this Contract stating that the work as itemized under Par. 4 of this Section has been performed in strict accordance with the requirements of the Contract documents.

.3 The report will be signed and sealed by a Professional Engineer registered to practice in the Province of Prince Edward Island and practicing in the field of materials testing.

END OF SECTION

1 General

1.1 TIME AND ORDER OF COMPLETION

.1 The Consultant may direct the Contractor in writing as to the time, precedence or order in which any work to be done under the contract shall be performed.

1.2 TIME OF COMMENCEMENT

.1 The Contractor shall commence work within three (3) days after the execution of the Contract, unless specifically indicated or directed otherwise by the Consultant, and shall proceed continuously, diligently and with all reasonable dispatch consistent with the Construction Schedule, and the proper execution of the work, until final completion. The rate of progress made with the work shall be such as to ensure its final completion within the specified time.

1.3 TIME OF COMPLETION

.1 The whole of the work to be done under this contract shall be finally completed in full accordance with all the terms and conditions of this contract on or before the day specified for such completion in the tender which forms part of this contract.

.2 The Contractor will be responsible for all costs incurred for failure to complete the project within the project schedule, plus 20 working days.

.3 Costs for Insurance and bonding extensions, Consultant fees for extended services and Construction Management services and expenses for extended services will all be totaled and charged against the Contractors. Costs will be deducted from Progress Claims.

1.4 EXTENSION OF TIME

.1 An extension of time may be granted in writing by the Consultant in the event of the work being delayed beyond the prescribed time for completion as a result of causes beyond the Contractor's control. Such extensions shall be for such time as the Consultant may prescribe, and the Consultant shall fix the terms on which the said extension may be granted. An application by the Contractor for an extension of time shall be made to the Owner in writing as least fifteen calendar days prior to the date of completion fixed by the contract. Where applicable, all bonds or other surety including Liability Insurance furnished to the Owner by the Contractor shall be amended where necessary at the expense of the Contractor to provide coverage beyond the date of any extension of time granted, and the Contractor shall furnish the Owner with evidence of such amendment of the bonds or other surety and Liability Insurance.

.2 Any extension of time that may be granted to the Contractor shall be so granted and accepted without prejudice to any rights of the Owner whatsoever under the Contract, and all of such rights shall continue in full force and effect after the time limited in the Contract for the completion of the work and whenever in the Contract, power and authority is given to the Consultant or any person to take any action consequent upon the act, default, breach, neglect, delay, non-observance or non-performance by the Contractor in respect of the work or Contract, or any portion thereof, such powers or authorities may be exercised from time to time and not only in the event of the happening of such contingencies before the time limited in the Contract for the completion of the work but also in the event of the same happening after the time so limited in the case of the Contractor being permitted to proceed with the execution of the work under an extension of time granted by the Consultant.

1.5 SUSPENSION OF WORK

.1 The Contractor shall, upon written notice from the Consultant, discontinue or delay any or all of the work when, in the opinion of the Consultant, it is unwise to proceed for any reason whatsoever, and the work shall not be resumed until the Consultant shall in

writing so direct.

1.6 LABOUR DISPUTE

.1 Except to the extent that relief is granted under of the Contract, the Contractor shall bear the risk and responsibility of any loss, damage or expense to the work or to himself or any nature and kind whatsoever arising from strikes or labour disputes other than such loss, damage or expense caused by the failure of the Owner to meet its obligations under the Contract.

1.7 CHARACTER AND EMPLOYMENT OF WORKERS

.1 The Contractor shall employ only orderly, competent and skillful workers to do the work and shall give preference to available residents in the area of the Contract. Whenever the Consultant shall inform the Contractor in writing that any person or persons on the work are, in the opinion of the Consultant, incompetent, unfaithful or disorderly, such person or persons shall be discharged from the work and shall not again be employed on the work without the consent in writing of the Consultant.

1.8 LIMITATIONS OF OPERATIONS

.1 The Consultant may, in writing, require the Contractor to cease or limit operations under the Contract, on any day or days if the operations are of such nature that the Consultant deems it necessary or expedient to do so.

.2 The Contractor shall cooperate with other contractors, utility companies and the Owner and they shall be allowed free access to their work at all times. The Consultant reserves the right to alter the method of operations on this Contract to avoid interference with other work.

.3 The Contractor shall have access to their work to allow the incorporation of a double shift if the Contractor deems it necessary to meet the obligations under the contract.

END OF SECTION

1 General

1.1 DEFINITIONS

.1 Activity: An element of Work performed during course of Project. An activity normally has an expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart). A graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: Original approved plan (for Project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: Number of work periods (not including holidays or other nonworking periods) required to complete an activity or other Project element. Usually expressed as workdays or workweeks.

.6 Master Plan: A summary-level schedule that identifies major activities and key milestones.

.7 Milestone: A significant event in Project, usually completion of major deliverable.

.8 Project Schedule: The planned dates for performing activities and the planned dates for meeting milestones. A dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

.9 Project Planning, Monitoring and Control System: Overall system operated by Consultant to enable monitoring of project work in relation to established milestones.

1.2 REQUIREMENTS

.1 Ensure Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete Work in accordance with prescribed milestones and time frame.

.3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.

.4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 SUBMITTALS

.1 Submit to Consultant within 5 working days of Award of Contract Bar (GANTT) Chart representing the project schedule as Master Plan for planning, monitoring and reporting of project progress.

1.4 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).

.2 Consultant will review and return revised schedules within 5 working days.

.3 Revise impractical schedule and resubmit within 5 working days.

.4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.5 PROJECT SCHEDULE

.1 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:

- .1 Award.
- .2 Shop Drawings, Samples.
- .3 Permits.
- .4 Mobilization.
- .5 Excavation.
- .6 Backfill.
- .7 Slab on grade.
- .8 Roofing.
- .9 Interior Architecture (Walls, Floors and Ceiling).
- .10 Millwork.
- .11 Plumbing.
- .12 Lighting.
- .13 Electrical.
- .14 Piping.
- .15 Controls.
- .16 Heating, Ventilating, and Air Conditioning.
- .17 Fire Systems.
- .18 Testing and Commissioning.
- .19 Supplied equipment long delivery items.
- .20 Owner supplied equipment required dates.
- .21 Substantial Completion.
- .22 Deficiency Completion.
- .23 Submittal.
- .24 Total Completion.

1.6 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.7 PROJECT MEETINGS

.1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

.2 Weather related delays with their remedial measures will be discussed and negotiated.

END OF SECTION

1 General

1.1 GENERAL

.1 All submittals are to be delivered within 30 days of award of Contract.

.2 Make specified submittals to the Consultant at commencement of Contract, before beginning work on site (and no later than 10 days after award). Include:

- .1 Contract Security
- .2 Proof of Insurance
- .3 Workers' Compensation clearance letter
- .4 Cost Breakdown
- .5 Permits as required
- .6 Construction schedule for Trade Package activity
- .7 Corporate Safety Plan
- .8 Site specific safety plan
- .9 Shop drawing schedule

.3 During Construction provide:

- .1 Updated trade construction schedule
- .2 Shop drawings as required
- .3 Inspection and test reports
- .4 Request for Information
- .5 Submission required for payment purposes

.4 At completion of Work provide

- .1 Submission at completion of work as specified in Project Close Out, Commissioning, and Operations and Maintenance Data Sections.

1.2 ADMINISTRATIVE

.1 Refer to GC 3.10 Shop Drawings

.2 Submit to Consultant submittals listed for review. Submit 10 working days after award of contract in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.3 Do not proceed with Work affected by submittal until review is complete.

.4 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.5 Where items or information is not produced in SI Metric units converted values are acceptable.

.6 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 coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

.7 Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.8 Verify field measurements and affected adjacent Work are coordinated.

.9 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.

.10 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.

.11 Keep one reviewed copy of each submission on site.

1.3 SUBMITTAL SCHEDULES:

.1 Within 10 days following award of contract, prepare and submit a summary of all

submittals required by the Trade Package.

.2 Submittal schedule shall be formatted as follows:

SECTION NUMBER	ITEM/ EQUIP	SHOP DWG DEL DATE	ORDER DATE	ITEM DEL DATE

.3 The initial submission shall include completion of the first 3 columns of the above table example. Once approved shop drawings are received by the Contractor, the balance of the summary shall be updated and submitted accordingly.

1.4 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 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.

.3 Allow 10 days for Consultant's review of each submission.

.4 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.

.5 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of revisions other than those requested.

.6 Submissions 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 adjacent work.

.7 After Consultant's review, distribute copies.

.8 Submit digital copy of all shop drawings, product data sheets, reports, MSDS sheets and

other traditional paper submissions.

.9 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.

.10 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Consultant.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been within 3 years of date of contract award for project.

.11 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Consultant.

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of project contract complete with project name.

.12 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by Consultant.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.13 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Consultant.

.1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.14 Submit two (2) hard copies of Operation and Maintenance Data for requirements requested in specification Sections, plus one (1) electronic copy and as requested by Consultant.

.15 Delete information not applicable to project.

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

.17 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, transparency will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.5 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Consultant's business address.

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

.4 Where color, pattern or texture is criterion, submit full range of samples.

.5 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.

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

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

1.6 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

.2 Submit transcription of insurance immediately after award of Contract.

END OF SECTION

1 General

1.1 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.3 Province of Prince Edward Island

.1 Occupational Health and Safety Act, R.S.P.E.I.1988 (including any amendments to and regulations).

.4 CSA C22.1-18 - Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

.5 CSA C22.3 No. 7-94 (R2005) - Underground Systems

.6 COSH, Canada Occupational Health and Safety Regulations (SOR/86-304)

.7 Fire Protection Standards issued by Fire Protection Services of Human Resources Development Canada as follows:

.1 FCC No. 301 - June 1982 Standard for Construction Operations.(or latest edition)

.2 FCC No. 302 - June 1982 Standard for Welding and Cutting. (or latest edition)

1.2 COMPLIANCE REQUIREMENTS

.1 Comply with Occupational Health and Safety Act, Occupational Health and Safety Act Regulations PEI (including any amendments to and regulations).

.2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

.3 Perform lockouts in compliance with:

.1 Canadian Electrical Code

.2 Federal and Provincial Occupational Health and Safety Acts and Regulations.

.3 Regulations and code of practice as applicable to mechanical equipment or other machinery being de-energized.

.4 In event of conflict between any provisions of above Authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Consultant will advise on the course of action to be followed.

1.3 CONSTRUCTION SAFETY MEASURES

.1 Observe and enforce construction safety measures required by latest National Building Code, Part 8, Provincial Government, Worker's Compensation Board and municipal statues and authorities.

.2 Provide and maintain first aid equipment appropriate to the work and its location in accordance with the First Aid Regulations. Implement recommendations from Occupational Health and Safety Division specific to the project work site.

.1 Have minimum 2 years site-related working experience specific to activities associated with Construction.

.2 Having working knowledge of occupational health and safety 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.

1.4 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 minimum 2 years site-related working experience specific to activities associated with Construction.

.2 Having working knowledge of occupational health and safety 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.

1.5 SAFETY ASSESSMENT

.1 Perform site specific hazard assessment related to project.

.2 Perform on-going hazard assessments during the progress of Work identifying new or potential health risks and safety hazards not previously known. As a minimum, hazard assessments shall be carried out when:

.1 New subtrade work, new subcontractor(s) or new workers arrive at the site to commence another portion of work.

.2 The scope of work has been changed by Change Order.

.3 Potential hazard or weakness in current health and safety practices are identified by Consultant or by an authorized safety representative.

.3 Each hazard assessment to be made in writing. Keep copies of all assessments on site for duration of Work. Upon request, make available to Consultant for inspection.

1.6 SUBMITTALS

.1 Upon request, submit within seven (7) days to the Consultant, one copy electronically and one hard copy of the site-specific Health and Safety Plan.

.2 Upon request, submit within seven (7) days to the Consultant, one copy electronically and one hard copy of the Contractor's authorized representative's worksite health and safety inspection reports.

.3 Upon request, submit within seven (7) days to the Consultant, one copy electronically and one hard copy of the construction safety tool box meetings and formal contractor safety meetings.

.4 In the event of an incident/accident, immediately submit to the Consultant one copy electronically and one hard copy of the incident/accident report.

1.7 SITE CONTROL AND ACCESS

.1 Control worksite and entry points. Grant and allow entry to only workers and other persons so authorized. Immediately stop non-authorized persons from circulating within construction areas and remove from site.

.2 Prior to gaining access to the site, all contractors, subcontractors and suppliers shall file with the General Contractor their proof of Workers Compensation coverage, proof of required Insurance and proof of contract. Upon request, proof of these documents will be provided to the Owner and Consultant.

.3 Delineate and isolate construction areas from other areas of site by use of appropriate means. Erect barricades, fences, hoarding and temporary lighting as required.

.4 Erect signage at entry points and at other strategic locations around site, clearly identifying construction areas(s) as being "off limits" to non-authorized persons. Signage must be professionally made.

.5 Ensure persons granted access is fitted and wear appropriate personal protective equipment (PPE).

1.8 PROTECTION

.1 Provide temporary facilities for protection and safe passage of building occupants, public

pedestrian and vehicular traffic around and adjacent to work site.

.2 Provide safety barricades, lights and signage within work site as required to provide a safe working environment for workers.

1.9 MEETINGS

.1 Prior to commencement of work hold a Health and Safety meeting. Have Contractor's Site Superintendent in attendance.

.2 Provide site safety orientation session to all workers and all workers new to the site and other authorized persons prior to granting them access to work site. Brief persons on site conditions and on the site safety rules in force at site.

.3 Conduct site specific occupational health and safety meetings during the entire work as follows and submit minutes as requested.

.1 Formal meetings on a minimum monthly basis.

.2 Informal tool box meetings on a regular basis from a predetermined schedule.

.4 Attend Health and Safety meetings as directed by the Contractor.

1.10 HAZARDOUS MATERIALS

.1 Should material resembling hazardous materials (other than those identified within the Contract Documents) be encountered in the course of work, stop work immediately. Do not proceed until written instructions have been received from the Consultant.

.2 Any material which contains asbestos, lead paint or PCB's that is disturbed or removed during construction work shall be removed in accordance with the regulations set out by the Occupational Health and Safety Act.

1.11 WHIMIS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) Regulations regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and provision of Safety Data Sheets.

.2 Have a copy of WHMIS Safety Data Sheets available at the workplace on delivery of hazardous products.

1.12 SITE CLEANING

.1 Except where special permission is obtained, maintain clean access on public sidewalks and roads.

.2 Maintain walks and roads clear of construction materials and debris, including excavated material. Clean walks and roads as frequently as required to ensure that they are cleared of materials, debris and excavated material.

.3 Remove snow and ice from areas as required to execute the work.

1.13 FIRE SAFETY REQUIREMENTS

.1 Comply with requirements of latest standard for Building Construction Operations issued by the Fire Commissioner of Canada and Fire Safety Regulations of Local Authority. (latest editions)

.2 Implement and follow fire safety measures during Work. Comply with following:

.1 National Fire Code, (latest edition)

.2 Fire Protection Standards FCC 301 and FCC 302, (latest edition).

.3 Federal and Provincial Occupational Health and Safety Acts and Regulations.0

.3 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirements, Consultant will advise on the course of action.

1.14 EMERGENCY MANAGEMENT PLAN

.1 Must include response for medical and fire emergencies.

.2 Know the location of the nearest fire alarm box and telephone (if no cell phone available), including the emergency phone number.

.3 Know where the "Civic Address" of worksite is posted to report to emergency personnel.

.4 Report immediately all fire incidents to the fire department as follows:

.1 Activate nearest fire alarm box.

.2 Telephone 911.

.3 Where fire alarm box is exterior to building, the person activating the fire alarm box shall remain at the box to direct Fire Department to scene of the fire.

.4 When reporting a fire by telephone, give location of fire, name or number of building and be prepared to verify the location.

.5 Notify the Owner of any emergency.

1.15 POSTING OF DOCUMENTS

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

1.16 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by Authority having Jurisdiction or by Consultant.

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

1.17 OPEN EXCAVATIONS

.1 If open foundations or demolition areas are to be left at the end of a work day, a protective barrier must be placed around the entire perimeter of the open excavation or demolition areas to limit access by others. Barrier to be approved by the requirements established in the OH&S Regulations.

END OF SECTION

1 General

1.1 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.3 Province of Prince Edward Island

.1 Occupational Health and Safety Act, R.S.P.E.I. 1988.

.4 CSA C22.1-2002 - Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

.5 CSA C22.3 No. 1-M87 (R2001) - Overhead Systems.

.6 CSA C22.3 No. 7-94 (R2000) - Underground Systems.

.7 CSA - S269.1 - Falsework for Construction Purposes.

.8 CAN/CSA - S269.2 - Access Scaffolding for Construction Purposes.

.9 COSH, Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.

.10 Fire Protection Standards issued by Fire Protection Services of Human Resources Development Canada as follows:

.1 FCC No. 301 - June 1982 Standard for Construction Operations.

.2 FCC No. 302 - June 1982 Standard for Welding and Cutting.

.3 FCC standards, may be viewed at the Regional Fire Protection Services' office (previously known as the Fire Commissioner of Canada) located at 99 Wyse Road, 8th Floor, Dartmouth, NS, Tel: (902) 426-6053.

1.2 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Part 1:
List of individual health risks and safety hazards identified by hazard assessments.

.2 Part 2:
List specific measures to control or mitigate each hazard and risk identified in part one of Plan. State engineering controls, personal protective equipment and safe work practices to be used for work having identified hazard(s) or risk(s).

.3 Part 3:
Emergency and Communications Measures as follows:

.1 Emergency Procedures: standard operating procedures, evacuation measures and emergency response implemented on site during an accident or incident. State step by step procedures, applicable to each identified hazard.

.2 Emergency Communications: list names and telephone numbers of officials, to be contacted if incident, accident or emergency situation occurs, including:

.1 General Contractor and all Subcontractors.

.2 Provincial Departments and resources from local emergency organizations, based on type of hazard, incident or accident which might occur and as stipulated in applicable laws and regulations.

.3 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Consultant.

.4 Submit copies of incident and accident reports.

.5 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures.

.6 Consultant will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Revise plan as appropriate and resubmit plan to Consultant within 2 days after receipt of comments from 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 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

.9 Maintain Worker's Compensation Coverage for duration of contract. Submit Letter of Good Standing to Consultant.

1.3 DEFINITIONS

.1 Electrical Facility: means any system, equipment, device, apparatus, wiring, conductor, assembly or part thereof that is used for the generation, transformation, transmission, distribution, storage, control, measurement or utilization of electrical energy, and that has an amperage and voltage that is dangerous to persons.

.2 Guarantee of Isolation: means a guarantee by a competent person in control or in charge that a particular facility or equipment is isolated.

.3 De-energize: in the electrical sense, that a piece of equipment is isolated and grounded, e.g. if the equipment is not grounded, it cannot be considered de-energized (DEAD).

.4 Guarded: means that an equipment or facility is covered, shielded, fenced, enclosed, inaccessible by location, or otherwise protected in a manner that, to the extent that is reasonably practicable, will prevent or reduce danger to any person who might touch or go near such item.

.5 Isolate: means that an electrical facility, mechanical equipment or machinery is separated or disconnected from every source of electrical, mechanical, hydraulic, pneumatic or other kind of energy that is capable of making it dangerous.

.6 Live/alive: means that an electrical facility produces, contains, stores or is electrically connected to a source of alternating or direct current of an amperage and voltage that is dangerous or contains any hydraulic, pneumatic or other kind of energy that is capable of making the facility dangerous to persons.

1.4 PERMITS

.1 Obtain permits, licenses and compliance certificates, at appropriate times and frequency as stipulated by authorities having jurisdiction.

.2 Post all permits on site. Submit copies to Consultant.

1.5 FILING OF NOTICE

.1 File Notice of Project and other Notices with Provincial authorities prior to commencement of Work.

1.6 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 Province having jurisdiction, and in consultation with Consultant.

1.7 CORRECTION OF NON-COMPLIANCE

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

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

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

1.8 MEETINGS

.1 Preconstruction Conference:

.1 The safety officer shall attend and chair the preconstruction conference and prepare a comprehensive agenda for the conference.

.2 Meeting On Work Procedures:

.1 Meet with Contracting Officer to discuss work procedures and safety precautions. Ensure the participation of the Contractor's superintendent, the quality control, officer and representatives of each subcontractor or trade performing work at the site.

.3 Weekly Safety Meetings:

.1 Hold weekly at the project site. Prepare minutes showing contract title, signatures of attendees, a list of topics discussed and meeting minutes.

.4 Work Phase Meetings:

.1 The appropriate activity hazard analysis shall be reviewed and attendance documented by the Contractor at the preparatory, initial, and follow-up phases of quality control inspection.

.5 Prior to commencement of work hold Health and Safety meeting. Have Contractor's Site Superintendent in attendance.

.6 Provide site safety orientation session to all workers, all workers new to the site and other authorized persons prior to granting them access to work site. Brief persons on site conditions and on the minimum site safety rules in force at site. Maintain records of orientation on site.

.7 Conduct site specific occupational health and safety meetings for the duration of the work as follows:

.1 Formal meetings on a minimum monthly basis.

.2 Informal tool box meetings on a regular basis from a predetermined schedule.

.8 Keep workers informed of anticipated hazards, on safety practices and procedures to be followed and of other pertinent safety information related to:

.1 Progress of Work;

.2 New sub-trades arriving on site and;

.3 Changes in site and project conditions.

.9 Record and post minutes of meetings. Make copies available to Consultant upon request.

1.9 SITE SAFETY OFFICER (SSO)

.1 Employ and assign to Work, competent and authorized representative as Site Safety Officer (SSO). The SSO must:

.1 Have minimum 2 years site-related working experience specific to activities associated with Construction.

.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.

.2 The selection of the SSO will be subject to the approval of the Consultant, and changes shall be made as requested by the Consultant.

.3 The SSO shall be responsible for ensuring that all provisions of the Health and Safety Plan and relevant legislation are implemented.

.4 The SSO shall ensure that all monitoring and testing, as specified and at the direction of the Consultant, are conducted.

.5 The SSO shall maintain records of all readings that are taken by the Contractor report and any abnormal or dangerous situation to the Consultant and the Municipality, after having implemented emergency measures, as required, work shall not continue or proceed until the situation has been rectified.

.6 The Safety Officer shall be at the work site at all times whenever work or testing is being performed, shall conduct daily safety inspections.

.7 The SSO shall be authorized to act on behalf of the Contractor on all matters related to Health and Safety.

.8 Qualifications of Site Safety Officer:

.1 Ability to manage the on-site Contractor safety program through appropriate management controls.

.2 Ability to identify hazards and have the capability to expend resources necessary to abate the hazards.

.3 Must have worked on similar types of projects that are equal to or exceed the scope of the project assigned with the same responsibilities.

.4 Shall, as a minimum, have attended a recognized training qualification program including at least 40 hours of classroom instruction.

.9 Qualifications of Qualified Person, Confined Space Entry:

.1 The qualified person shall be capable (by educations and specialized training) of anticipating, recognizing, and evaluating employee exposure to hazardous substances or other unsafe conditions in a confined space. This person shall be capable of specifying necessary control and protective action to ensure worker safety.

1.10 RECORD KEEPING

.1 ALL activities associated with Health and Safety shall be recorded daily in a bound notebook. Include as a minimum: activity date, time, location of occurrence, mitigation action taken and results. Records shall be assessed by the Consultant.

1.11 SUSPENSION OF ACTIVITIES

.1 Exposure to contaminants shall be controlled so that no worker is exposed to contaminants at a concentration greater than the Time Weighted Average (TWA) concentration for the contaminant, for up to a 10 hour workday, 40 hour work week.

.2 The Contractor will halt activities immediately during unsafe conditions. All costs relating to suspension of work for Contractor's failure to maintain Health and Safety procedures shall be borne by the Contractor.

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

1.12 HEALTH AND SAFETY PLAN

.1 Prior to commencement of the work, submit to the Consultant a detailed Health and Safety Plan for review. The Health and Safety Plan shall comply with the provisions of this section, and shall illustrate the Contractor's knowledge and understanding of health and safety aspects of the work, the Contractor's intention to maintain a high level of safety on-site, and shall include, but not be limited to:

.1 Description of Work.

.2 Description of Site-specific Hazards:

.1 Physical

.2 Chemical

.3 Environmental

.3 Protective Equipment:
.1 Respiratory
.2 Contact

.4 Decontamination Procedures:
.1 Personal protective equipment (PPE)
.2 Equipment
.3 Infection Control personal protective equipment required by CSA Z317.13-03.

.5 Medical - Monitoring:
.1 Workers medical profile and suitability to work at the site.

.6 Air - Monitoring Procedures:
.1 Action levels
.2 Site monitoring
.3 Perimeter monitoring

.7 Emergency Procedures:
.1 Emergency Equipment
.2 Contingency Plans:
.1 Spill control
.2 Fire
.3 Ventilation
.4 Medical Emergency

.8 General Safety:
.1 Designation of site-safety officer
.1 Safety log
.2 Trenching, digging, excavations
.3 Storage of flammables, compressed gases
.4 Safety inspections

.9 Site Training:
.1 Initial hazard
.2 Daily safety

.2 All workers shall be trained and be familiar with the Health and Safety Plan and the use of personal protective equipment.

.3 Safety Document Submission:

.1 Ensure Safety Document Submission applies to Work of this specific project and site.

.2 Submit two (2) copies of Safety Document at the Pre-Construction Meeting. Do not commence Work nor deliver material on-site prior to submission.

.3 Included in Safety Document submission specific information detailing the methods and procedures to be implemented ensuring adherence to the acts, regulations, codes and policies specified in this section and to:

.1 Ensure the health and safety of persons at or near the Work; including, but not limited to, the Public.

.2 Ensure the measures and procedures of the regulatory agencies specified are carried out.

.3 Ensure every employee, self-employed person and employer performing Work under this contract complies with the regulatory agencies specified.

.4 Where changes to the methods and procedures in the execution of work change submitted safety methods and procedures, modify submitted Safety Documentation and submit modifications, in writing to the

Consultant and Minister prior to implementation.

.4 Safety Document Organization:

.1 Organize information in the form of an instructional manual as follows:

.1 Place in binders of commercial quality, 8-1/2" x 11" x 3" maximum ring size.

.2 Cover: Identify binder with typed or printed title "Project Safety Document" and list the title of the project.

.3 Provide tabbed fly leaf for each separate heading, with typed heading on tab.

.4 Where drawings are within the safety document, provide with reinforced punched binder tab. Bind in with text; fold in larger drawings to size text pages.

.5 Arrange content under Safety Document headings specified herein.

.5 Safety Document Headings:

.1 Employee Safety Training:

.1 Place, under this heading, a statement indicating employees working on this specific project have met specified training requirements.

.2 Company Safety Policy

.1 Place, under this heading, information pertaining to the company's policy and commitment to Occupational Health and Safety, including the responsibilities of management, supervisors and works.

1.13 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project.

.2 Perform on-going hazard assessments during the progress of Work identifying new or potential health risks and safety hazards not previously known. As a minimum hazard assessments shall be carried out when:

.1 New subtrade work, new subcontractor(s) or new workers arrive at the site to commence another portion of work.

.2 The scope of work has been changed by Change Order.

.3 Potential hazard or weakness in current health and safety practices are identified by Consultant or by an authorized safety representative.

.3 Each hazard assessment to be made in writing. Keep copies of all assessments on site for duration of Work. Upon request, make available to Consultant for inspection.

.4 Contractor to conduct a hazard assessment in conjunction with the Owner's maintenance staff as part of the planning process including isolating existing equipment where applicable and identification of hidden services where anchoring is required. Hazard Assessments to conform with requirements of Health and Safety Section 01 35 29 - Health, Safety, and Emergency Response Procedures.

1.14 COMPLIANCE REQUIREMENTS

.1 Observe and enforce construction safety measures required by National Building Code, latest edition, National Fire Code, Provincial Building Code Act, Worker's Compensation Act and Municipal Statutes and Authorities.

.2 Comply with Canada Labour Code and Canada Occupational Health and Safety Act.

.3 Latest edition of the Occupational Health & Safety Act Statutes of Prince Edward Island (including any amendments to and regulations).

.4 Fire Prevention Act.

.5 Dangerous Goods Transportation Act.

.6 Industrial Best Practices for Equipment Isolation and Lockout Policy.

.7 In case of conflict or discrepancy the more stringent requirement shall apply.

.8 Maintain clear emergency exit paths.

.9 Ensure that employees working on this specific project have met training requirements as legislated by the Prince Edward Island Occupational Health and Safety Act and its regulations.

.10 Where reference is made to jurisdictional authorities, it shall mean all authorities who have within their constituted powers the right to enforce the laws of the place of the building and workplace.

.11 Provide Consultant with Material Safety Data Sheets (MSDS).

.12 Provide and maintain first aid equipment, supplied and medications appropriate to the work and its location in accordance with the First Aid Regulations. Obtain and implement recommendations from Occupational Health and Safety Division specific to the project work site.

1.15 WHMIS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and provision of material safety data sheets acceptable to Labour Canada and Health and Welfare Canada and Provincial Department of Labour.

.2 Submit WHMIS data sheets to Consultant in accordance with Section 01 33 00 - Submittal Procedures.

.3 Maintain WHMIS information station and ensure designated personnel are trained in its use.

.4 Submit copies of all Tool Box or Safety Meeting notes.

.5 Submit copies of all Worksite Safety Inspections.

1.16 SMOKING, ALCOHOL & RESTRICTED SUBSTANCES

.1 Worksites are inherently dangerous, including travelling to and from the site.

.2 Alcohol, medical and recreational cannabis are restricted substances governed by Federal and Provincial laws as are other forms of illegal drugs.

.3 The smoking of or use of tobacco products, including e-cigarettes, the use of alcohol and restricted substances including cannabis in any form in the building or on the work site is strictly prohibited.

.4 Where workers have a prescription for medical cannabis, or other prescription drugs that may cause drowsiness, they are to advise their supervisor and discuss with their supervisor safe and appropriate task(s) while under the influence of these prescriptions on the worksite.

.5 Workers who violate this requirement will be removed from the worksite.

1.17 SITE CONTROL AND ACCESS

.1 Control work site and entry points. Grant and allow entry to only workers and other persons so authorized. Immediately stop non-authorized persons from circulating within construction areas and remove from site.

.2 Prior to gaining access to the site, all contractors, subcontractors and suppliers shall file with the General Contractor their proof of Workers Compensation coverage, proof of required Insurance and proof of contract. Upon request, proof of these documents will be provided to the Owner and Consultant.

.3 Delineate and isolate construction areas from other areas of site by use of appropriate means. Erect barricades, fences, hoarding and temporary lighting as required. See Section 01 50 00 - Facilities and Controls for minimum type of barriers acceptable.

.4 Erect signage at entry points and at other strategic locations around site, clearly identifying construction area(s) as being "off limits" to non-authorized persons. Signage must be professionally made.

1.18 PROTECTION

.1 Provide temporary facilities for protection and safe passage of building occupants, public pedestrian and vehicular traffic around and adjacent to work site.

.2 Provide safety barricades, lights and signage on work site as required to provide a safe working environment for workers.

.3 Use personal protection equipment as required by Occupational Health and Safety Act and as required by this site.

.4 Training of workers in the proper use, fitting, inspection and storage of personal protective equipment shall be done prior to use of the equipment.

1.19 UNFORESEEN HAZARDS

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Consultant verbally and in writing.

1.20 TESTING AND MONITORING

.1 Test and monitor for hazardous conditions, as required to demonstrate compliance with provincial regulations.

.2 If multiple locations are being worked simultaneously, provide monitoring at all locations where work is being carried out, including providing additional monitoring instruments.

1.21 ISOLATION OF EXISTING SERVICES

.1 Obtain Consultant's written authorization prior to conducting work on an existing active, energized service or facility required as part of the work and before proceeding with lockout of such services or facility.

.2 To obtain authorization, submit to Consultant following documentation:

- .1 Written Request for Isolation of the service or facility and;
- .2 Copy of Contractor's Lockout Procedures.
- .3 Make a Request for Isolation for each event, unless directed otherwise by Consultant, and as follows:
  - .1 Fill-out standard forms in current use at the Facility when so directed by Consultant or;
  - .2 Where no form exist at Facility, make request in writing identifying:
    - .1 Identification of system or equipment to be isolated, including it's location;
    - .2 Time duration, indicating Start time & date and Completion time & date when isolation will be in effect.
    - .3 Voltage of service feed to system or equipment being isolated.
    - .4 Name of person making the request.
  - .3 Document to be in typewritten format.
- .4 Do not proceed until receipt of written notification from Consultant granting the Isolation Request and authorization to proceed with the isolation of designated equipment or facility. Consultant may designate other individual at the Facility as the person authorized to grant the Isolation Request.
- .5 Conduct safe, orderly shut down of equipment or facilities, de-energize and isolate power and other sources of energy and lockout items in accordance with requirement of clause 1.8 below.
- .6 Plan and schedule shut down of existing services in consultation with the Consultant and the Facility Manager. Minimize impact and downtime of facility operations.
- .7 Determine in advance, as much as possible, in cooperation with the Consultant,

the type and frequency of situations which will require a Request for Isolation. Follow Consultant's directives in this regard.

.8 Conduct hazard assessment as part of the planning process of isolating existing equipment and facilities. Hazard Assessments to conform with requirements of Health and Safety Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.22 LOCKOUTS

.1 Perform lockouts in compliance with:

.1 Canadian Electrical Code

.2 Federal and Provincial Occupational Health and Safety Acts and Regulations as specified in Section 01 35 29 - Health, Safety, and Emergency Response Procedures.

.3 Regulations and code of practice as applicable to mechanical equipment or other machinery being de-energized.

.4 Procedures specified herein.

.2 Isolate and lockout electrical facilities, mechanical equipment and machinery from all potential energy sources prior to starting work on such items.

.3 Develop and implement lockout procedures to be followed on site as an integral part of the Work.

.4 Use energy isolation lockout devices specifically designed and appropriate for type of facility or equipment being locked out.

.5 Use industry standard lockout tags.

.6 Provide appropriate safety grounding and guards as required.

.7 Prepare Lockout Procedures in writing. Describe safe work practices, work functions and sequence of activities to be followed on site to safely isolate all potential energy sources and lockout/tagout facilities and equipment.

.8 Include within procedures a system of worker request and issuance of individual lockout permit by a person, employed by Contractor, designated to be "in-charge" and being responsible for:

.1 Controlling issuance of permits or tags to workers.

.2 Determining permit duration.

.3 Maintaining record of permits and tags issued.

.4 Submitting a Request for Isolation to Consultant when required by Contractors and / or Owners safety plan.

.5 Designating a Safety Watcher, when one is required based on type of work.

.6 Ensuring equipment or facility has been properly isolated, providing a Guarantee of Isolation to worker(s) prior to proceeding with work.

.7 Collecting and safekeeping lockout tags, returned by workers, as a record of the event.

.9 Clearly establish, describe and allocate, within procedures, the responsibilities of:

.1 Workers.

.2 Designated person controlling issuance of lockout tags/permits.

.3 Safety Watcher.

.4 Subcontractors and General Contractor.

.10 Procedures shall meet the requirements of Provincial and Federal Codes and Regulations.

.11 Generic procedures, if used, must be edited, supplemented with pertinent information and tailored to reflect specific project conditions. Clearly label as being the procedures applicable to this contract.

.1 Incorporate site specific rules and procedures established by Facility Manager

and in force at site. Obtain such procedures through Consultant.

.12 Procedures to be in typewritten format.

.13 Submit copy of Lockout Procedures to Consultant, in accordance with submittal requirements, prior to commencement of work.

1.23 CONFORMANCE

.1 Ensure that lockout procedures, as established for project on site, are stringently followed. Enforce use and compliance by all workers.

.2 Brief all persons working on electrical facilities, mechanical and other equipment fed by an energy source on requirements of this section.

.3 Failure to perform lockouts in accordance with regulatory requirements or follow procedures specified herein may result in the issuance of a Non-Compliance Notification at Consultant's discretion with possible disciplinary measures imposed as specified in Section 01 35 29 - Health, Safety, and Emergency Response Procedures.

1.24 FIRE SAFETY REQUIREMENTS

.1 Comply with requirements of latest standard for Building Construction Operations issued by the Fire Commissioner of Canada and Fire Safety Regulations of Local Authority.

.2 Enforce fire protection methods, good housekeeping and adherence to local and underwriter's fire regulations including, but not limited to, Fire Protection Act and the Provincial Building Code Act. Provide UL approved fire extinguishers, and other fire fighting services and equipment, except where more explicit requirements are specified as the responsibility of individual Sections.

.3 Implement and follow fire safety measures during Work. Comply with following:

.1 National Fire Code, 2010.

.2 Fire Protection Standards FCC 301 and FCC 302.

.3 Federal and Provincial Occupational Health and Safety Acts and Regulations as specified in Section 01 35 29 - Health, Safety, and Emergency Response Procedures.

.4 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Consultant will advise on the course of action.

.5 Advise the Fire Chief in the area of Work of any work that would impede fire apparatus response, including but not limited to violation of minimum overhead clearance prescribed by the fire chief, erecting of barricades and digging of trenches.

.6 Fire Separations:

.1 Ensure that fire separations are installed to maintain total integrity and that they are not breached by Work following their installation.

.2 Replace fire separations which have suffered a lessening of their required rating during construction.

.7 Ensure nothing subverts the integrity of fire protection provided for the building structure.

.8 Coordinate work of all sections so that they do not encroach on space required for fire protection and its installation. Ensure that fire protection damage during construction is totally replaced.

1.25 FIRE PROTECTION AND ALARM SYSTEMS

.1 Fire protection and alarm systems shall not be:

.1 Obstructed.

.2 Shut-off, unless approved by Consultant.

.3 Left inactive at the end of a working day or shift.

.2 Do not use fire hydrants, standpipes and hose systems for purposes other than fire fighting.

.3 Costs incurred, from the fire department, Facility owner and tenants, resulting from negligently setting off false alarms will be charged to the Contractor in the form of financial progress payment reductions and holdback assessments against the Contract.

1.26 FIRE SAFETY

.1 The Sub-Contractors are to participate on the Fire Safety Committee under the Joint Health and Safety Committee. The Fire Safety Committee under the direction of the Contractor is responsible for implementation and maintenance of the Construction Fire Safety Plan.

.2 Construction Fire Safety Plan:

.1 The Construction Fire Safety Plan will include the following:

.1 Introduction of plan and purpose

.2 Fire Safety Committee

.3 Terms of reference.

.2 Committee composition.

.3 Emergency Procedures.

.4 Fire protection equipment.

.5 Building description.

.6 Provisions for fire fighting.

.7 Portable extinguishers.

.8 Exits.

.9 Emergency Lighting.

.10 Reduced drawings.

.11 Fire safety maintenance schedule:

.1 General.

.2 Maintenance levels.

.3 Skill categories.

.4 Frequency.

.5 Checklists.

.12 Other information:

.1 Instruction on use of fire extinguishers.

.2 Emergency Fire Drill procedures.

.3 Portable Fire Extinguishers:

.1 During construction, Contractor is to provide and maintain on the site at all times, ULC listed 25 lb ABC dry chemical type portable fire extinguishers.

.4 Blockage of Roadways:

.1 The Fire Department shall be advised of any work that would impede fire apparatus response. This includes violation of minimum overhead clearance, as prescribed by the Fire Department, erecting of barricades and the digging of trenches.

.5 Rubbish and Waste Materials:

.1 Rubbish and waste materials are to be kept to a minimum.

.2 The burning of rubbish is prohibited.

.3 Removal:

.1 All rubbish shall be removed from the work site at the end of the workday or shift or as directed by Consultant.

.4 Storage:

.1 Extreme care is required where it is necessary to store oily waste in work areas to ensure maximum possible cleanliness and safety.

.2 Greasy or oily rags or materials subject to spontaneous ignition shall be

deposited and kept in an approved receptacle and removed as required in 1.7.3.1.

.6 Flammable Liquids:

.1 The handling, storage and use 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 45 liters provided they are stored in approved safety cans bearing the Underwriter's Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable liquids exceeding 45 liters for work purposes, requires the permission of the Fire Department.

.3 Transfer of flammable liquids having a flash point below 38ºC is prohibited within buildings.

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

.5 Flammable liquids having a flash point below 38ºC, such as naphtha or gasoline, shall not be used as solvents or cleaning agents.

.6 Flammable waste liquids, for disposal, shall be stored in approved containers located in a safe ventilated area. Quantities are to be kept to minimum and the Fire Department is to be notified when disposal is required.

.7 Fire Inspection:

.1 The Fire Department shall be allowed unrestricted access to the work site.

.2 The Contractor shall cooperate with the Fire Department during routine inspections of the work site.

.3 The Contractor shall immediately remedy all unsafe fire situations observed by the Fire Department.

.8 Reporting Fires:

.1 Know the location of the nearest fire alarm box and telephone, including the emergency phone number.

.2 Report immediately all fire incidents to the fire department as follows:

.1 Activate nearest fire alarm box, or

.2 Telephone 911.

.3 Where fire alarm box is exterior to building, the person activating the fire alarm box shall remain at the box to direct Fire Department to scene of the fire.

.4 When reporting a fire by telephone, give location of fire, name or number of building and be prepared to verify the location.

1.27 WELDING AND CUTTING

.1 Use noncombustible shields for electric and gas welding or cutting executed within two (2) meters of combustible material or in occupied space.

.2 Place tanks supplying gases as close to work as possible. Fix in upright position, free from exposure to sun or high temperatures.

.3 Locate fire extinguishing equipment near all welding and cutting operations.

1.28 OPEN FLAMES, SPARKS, EXPLOSION PROTECTION

.1 Keep open flames and sparks to minimum. When flame or sparks are required, follow proper procedures to prevent fire or explosion.

1.29 HOT WORK AUTHORIZATION

.1 Hot Work will not be permitted on or within the building structure, tanks, or confined spaces, except as outlined herein.

.2 Obtain Consultant's written "Authorization to Proceed" before conducting any form of Hot

work on site.

.3 To obtain authorization submit to Consultant:

.1 Contractor's typewritten Hot Work Procedures to be followed on site as specified below.

.2 Description of the type and frequency of Hot Work required.

.3 Sample Hot Work Permit to be used. Shall be included in the safety documentation submission.

.4 Upon review and confirmation that effective fire safety measures will be implemented during performance of hot work, Consultant will provide authorization to proceed as follows:

.1 Issue one written "Authorization to Proceed" covering the entire project for duration of work or;

.2 Separate work, or segregate certain parts of work, into individual entities. Each entity requiring a separately written "Authorization to Proceed" from Consultant. Follow Consultant's directives in this regard.

.5 Requirement for individual authorization based on:

.1 Nature or phasing of work;

.2 Risk to Facility operations;

.3 Quantity of various trades needing to perform hot work on project or;

.4 Other situation deemed necessary by Consultant to ensure fire safety on premises.

.6 Do not perform any Hot Work until receipt of Consultant's written "Authorization to Proceed" for that portion of work.

.7 In tenant occupied Facility, coordinate performance of Hot Work with Facility Manager through the Consultant. When directed, perform Hot Work only during non-operative hours of Facility. Follow Consultant's directives in this regard.

1.30 HOT WORK PROCEDURES

.1 Develop and implement safety procedures and work practices to be followed during the performance of Hot Work.

.2 Procedures to include:

.1 Requirement to perform hazard assessment of site and immediate hot work area for each hot work event in accordance with Hazard Assessment and Safety Plan requirements of Section 01 35 29 - Health, Safety, and Emergency Response Procedures.

.2 Use of a Hot Work Permit system for each hot work event.

.3 The step by step process of how to prepare and issue permit.

.4 Permit shall be issued by Contractor's site Superintendent, or other authorized person designated by Contractor, granting permission to worker or subcontractor to proceed with hot work.

.5 Maintain a fire extinguisher in the immediate area where hot work is being undertaken.

.6 Provision of a designated person to carryout a Fire Safety Watch for a minimum of 2 hours immediately upon completion of the hot work.

.7 Compliance with fire safety codes and standards specified herein and Occupational Health and Safety regulations specified in Section 01 35 29 - Health, Safety, and Emergency Response Procedures.

.3 Generic procedures, if used, must be edited and supplemented with pertinent information tailored to reflect specific project conditions. Clearly label as being the Hot Work Procedures applicable to this contract.

.4 Hot Work Procedures shall clearly establish worker instructions and allocate responsibilities of:

.1 Worker(s),
.2 Authorized person issuing the Hot Work Permit,
.3 Fire Safety Watcher,
.4 Subcontractors and Contractor.

.5 Brief all workers and Subcontractors on Hot Work Procedures and Permit system established for project. Stringently enforce compliance.
.1 Failure to comply with the established procedures may result in the issuance of a Non-Compliance Notification at Consultant's discretion with possible disciplinary measures imposed as specified in Section 01 35 29 - Health, Safety, and Emergency Response Procedures.

1.31 HOT WORK PERMIT

.1 Hot Work Permit to include, as a minimum, the following data:
.1 Project name and project number;
.2 Building name, address and specific room or area where hot work will be performed;
.3 Date when permit issued
.4 Description of hot work type to be performed;
.5 Special precautions required, including type of fire extinguisher needed;
.6 Name and signature of person authorized to issue the permit.
.7 Name of worker (clearly printed) to which the permit is being issued.
.8 Time Duration that permit is valid (not to exceed 8 hours). Indicate start time & date and completion time & date.
.9 Worker signature with date and time upon hot work termination.
.10 Specified time period requiring safety watch.
.11 Name and signature of designated Fire Safety Watcher, complete with time & date when safety watch terminated, certifying that surrounding area was under his continual surveillance and inspection during the full watch time period specified in Permit and commenced immediately upon completion of Hot Work.

.2 Permit to be typewritten form. Industry Standard forms shall only be used if all data specified above is included on form.

.3 Each Hot Work Permit to be completed in full and signed as follows:
.1 Authorized person issuing Permit before hot work commences;
.2 Worker upon completion of Hot Work;
.3 Fire Safety Watcher upon termination of safety watch;
.4 Returned to Contractor's Site Superintendent for safe keeping.
.5 The permit shall describe compliance with the following procedures. After tank or confined space interiors or building areas have been decontaminated, hot work may be conducted only when the tank or confined space is inverted. Hot work shall not be performed unless monitoring indicates atmospheres within and immediately surrounding are less than eight percent (8%) oxygen inside less than ten percent (10%) of the LFL outside; continuous monitoring shall continue until the hot work is completed. The hot work prohibition includes welding, cutting, grinding, sawing, or other similar operations which could be expected to potentially generate combustion-producing temperatures or sparks, or which could produce potentially hazardous fumes or vapours. An individual at each hot work site shall be designated as a fire watch. This person's sole responsibility shall be to monitor the hot work and have immediate access to at least two (2) twenty (20) pound fire extinguishers located at each hot work site. All extinguishers shall be currently inspection tagged, approved safety pin and tamper resistant seal. A new permit shall be obtained at the start of each work shift during which hot work will be conducted.

1.32 BLASTING

.1 Blasting or other use of explosives is not permitted without prior receipt of written instruction by Consultant.

1.33 POWER ACTUATED DEVICES

.1 Use power actuated devices only after receipt of written permission from Consultant.

1.34 HANDLING AND TRANSPORTATION OF DANGEROUS GOODS

.1 Observe and enforce all measures required by the regulatory agencies including but not limited to Environment Canada, Prince Edward Island Department of Environment, and Transport Canada.

.2 Most current regulatory guidelines and Acts will apply to the work.

.3 In case of any conflict, the more stringent requirements will apply.

1.35 OPEN EXCAVATIONS

.1 If open foundations or demolition areas are to be left at the end of a work day, protective fencing must be placed around the entire perimeter to limit access by others. Fencing to be self-supporting, approved by the Department of Labour and the Construction Safety and Industrial Safety Regulations.

1.36 POTENTIAL HAZARDS

.1 Hazards include, but are not limited to, toxic, flammable and explosion hazards associated with cleaning solvents.

.2 The Contractor shall become familiar with all potential hazards associated with the work, and shall take necessary measures to avoid injury or damage of any kind.

1.37 HAZARDOUS MATERIALS

.1 Should material resembling hazardous materials, other than those identified with the Contract Documents, including but not limited to spray or trowel applied asbestos, be encountered in course of work; stop work immediately. Do not proceed until written instructions have been received from Consultant.

.2 Any material which contains asbestos that is disturbed or removed during construction work, shall be removed in accordance with the regulations set out by the Occupational Health and Safety Act. All costs for proper cutting, removal and disposal of all asbestos indentified in this contract shall be included in Tender.

.3 Where work entails use, storage, or disposal of toxic or hazardous materials, chemicals and/or explosives, or otherwise creates a hazard to life, safety, health, or the environment; work shall be in accordance with the Authority Having Jurisdiction (AHJ).

1.38 ENVIRONMENTAL PROTECTION

.1 Ensure that pollution and environmental control of construction activities are exercised during the Work to requirements of the federal and provincial environmental acts; including, but not limited to, the Prince Edward Island Environmental Protection Act.

1.39 SANITATION / DECONTAMINATION PRACTICES

.1 After each use, all disposable protective equipment shall be collected in a dedicated container for disposal.

.2 All respiratory equipment shall be decontaminated daily after use.

.3 All tools, pumps and equipment used during cleanup should be dedicated to the handling of contaminants and labeled as such and thoroughly decontaminated at the completion of the project.

.4 Contaminated work clothing shall not be worn outside of regulated areas.

.5 Workers shall wash their hands and exposed skin before eating, drinking, smoking or using toilet facilities during work shift, and at the completion of a work shift.

.6 Food, drink and tobacco products shall not be permitted in regulated areas.

1.40 WORK PRACTICES AND ENGINEERING CONTROLS

.1 Access to work areas shall be regulated and limited to authorized persons. A daily roster shall be kept of persons entering such areas.

.2 Handling Contaminants and General Work Practices.

.1 Transportation and handling of contaminants to meet applicable local, provincial and federal regulations.

.2 Emergency respiratory equipment shall be located in readily accessible locations which will remain minimally contaminated with contaminants in an emergency.

.3 Containers and systems shall be handled and opened with care. Approved protective clothing shall be worn by all employees engaged in regulated areas.

.4 All wastes and residues containing contaminants shall be collected in appropriate containers.

.3 Confined or Enclosed Spaces

.1 Entry into confined or enclosed spaces, where there is limited egress, shall be controlled by a permit system. Permits shall be signed by an authorized representative of the employer and shall certify that appropriate measures have been taken to prevent adverse effects on the worker's health as a result of his or her entry into such space.

.2 Confined or enclosed spaces which have contained contaminants shall be thoroughly ventilated to assure an adequate supply of oxygen, tested for contaminants, and inspected for compliance with these requirements prior to each entry. Adequate ventilation shall be maintained while workers are in such spaces. Each individual entering such confined or enclosed space shall be furnished with appropriate personal protective equipment and clothing and be connected by a lifeline harness to standby worker stations outside of the space. The standby worker shall also be equipped for entry with approved personal protective equipment and clothing and have contact with a third person. The standby person shall maintain communication (visual, voice, signal line, telephone, radio, or other suitable means) with the employee inside the confined or enclosed space.

.3 Workers entering confined spaces and standby workers shall be trained at a recognized confined space training program.

1.41 PRE-CONSTRUCTION CONTRACTOR SAFETY CHECKLIST

.1 Use this text as a guideline for completing the following checklist. This checklist is a general, pre-construction review of the Contractor safety program, as well as an information session to identify what the Owner requires of the Contractor. Where the item requires a submission, ensure that it is received. If the item does not apply, enter N/A for not applicable.

.2 The following information will assist in establishing what will be reviewed in each section:

.1 Safety Policy:
Each employer is required by law (in Prince Edward Island) to have a safety policy and program and to implement that policy. The Owner will ask for a copy of that program.

.2 Safety Representative:
Each Contractor is required to advise the Owner who their safety representative is. That representative has duties as described in the Occupational Health and Safety Act.

.3 Emergency Procedure:
Each Contractor must have a site specific layout and emergency plan complete with emergency phone numbers.

.4 Employee Orientation:
Each and every person working for a Contractor, including Sub-Contractors, will be given an orientation to familiarize them with the site safety program. Unless otherwise specified, each Sub-Contractor is responsible for the orientation of their workers.

.5 Safe Work Plan:
Most Contractors are involved in tasks that subject workers to hazards. In order to ensure that these workers are secured from hazard, the Contractor will supply the Owner with a written safe work plan which affords protection against the hazards. This plan must be signed by a company representative and communicated to the workers involved in the task.

.6 Personal Protective Equipment Review:
Advise that all workers require CSA Class "B" hard-hat, CSA "Green Patch" (eight inch) footwear, eye, ear and respiratory protection as required (boots and hats at all times).

.7 Fall Protection:
Fall restraint or fall arrest protection required where a fall of 2.4 meters or more is possible. NO EXCEPTIONS.

.8 Housekeeping:
Advise of daily, or as needed, clean-up requirements.

.9 Tool Box Talks:
Each Contractor is required to conduct weekly safety meetings with their forces and advise the Owner they have been done.

.10 Material Handling / Storage:
Advise Contractor about storage areas and handling of material so as not to endanger their worker or another worker. Stacked material to be banded, chained, blocked or otherwise secured.

.11 Landing Platform:
Advise Contractor about movement of material on or off platforms. All material to be secured. Platform gates or chains to be kept closed at all times workers are on platform. If not possible, worker to be tied off with fall restraint system independent of platform.

.12 WHMIS Training:
Receive verification that all workers are trained and that the Contractor submits their MSDS.

.13 GFCI:
Advise Contractor that all tools are required to have ground fault circuit interrupters (where electricity is supplied by Contractor).

.14 Accident Investigations:
Any injury to any of their workers must be investigated and reported to the Owner.

.15 Verbal, Written, Gone:
Explain Zero Tolerance Program.

.16 Joint / Worker Safety Committee:
Sites of over 20 workers must establish a safety committee; over 50 workers, an additional worker committee. Workers required to attend committee meetings will do so and not be prevented by employers.

.17 Fire Protection:
All trades involved in performing hot work of any kind are required to provide fire protection at the work location.

.18 Guardrails:
Advise Contractor that where temporary removal guardrails required, guardrails must be replaced as soon as possible.

.19 First Aider:
Each Contractor is required to have a first aid kit and trained first aider. Employer must name their first aider.

.20 Visitors:
Advise Contractor that any visitors to site must be suitably protected from hazard. They must wear hard hat, safety vest, and proper safety footwear while on site.

.21 Task Lighting:
Review responsibilities of task specific lighting (who provides it).

.22 Swamper / Rigger Competency:
Where cranes are used, the Contractor must use a swamper / rigger. They shall provide the Owner with a written statement identifying, by name(s) their rigger and that the named person is a competent work as described in the Construction regulation.

.23 Scaffolds:
Review scaffold building requirement:
- Use all braces required by design.
- Access ladder for platform over 1.5 meters.
- Full width platform if height over 3 meters.
  PEI Regulations require double planks.
- Tied in three time base dimension or use of outriggers.
- Engineered over 16 meters in height (standard frame type).

.24 Elevating Work Platforms:
- All boom and scissors lifts required to be CSA approved and have approval on machine.
- Operators manual required on machine at all times.
- Maintenance record on machine at all times.
- Operator must receive training in operation of equipment.
- Fall protection must be used at all times on a boom lift.
- Fall protection required to be used on scissors lift when unit is being moved.

.25 Protruding Rebar:Installers of reinforcing steel must protect the protruding hazard or make arrangements to have it protected. Removal of protective coverings for task purposes only is allowed, however, protective covering must be replaced as soon as possible.

.26 WCB Clearance Certificates:Advise Contractor that the Owner will not release any funds for payment until Workers Compensation Board Clearance Certificate has been received by the Owner.

.3 The following checklist is a general pre-construction review of the Contractor's safety program as required by the Owner.

PROJECT: _____ DATE: _____

CONTRACTOR: _____

WORK BEING PERFORMED: _____

Checkmark means YES / X means NO

.1 ____ Safety Policy Submitted
.2 ____ Safety Representative
.3 ____ Emergency Procedure Review
.4 ____ Employee Orientation
.5 ____ Written Safe Work Plan
.6 ____ Personal Protective Equipment Review
  .1 ____ Hard Hat & Footwear
  .2 ____ Safety Glasses & Hearing
  .3 ____ Dust & Fumes
.7 ____ Fall Protection
.8 ____ Housekeeping
.9 ____ Tool Box Safety Talks (Weekly)
.10 ____ Material Handling / Storage
.11 ____ Landing Platforms
.12 ____ WHMIS Training Verification
.13 ____ GFCI Requirements
.14 ____ Accident / Incident Investigations Notification
.15 ____ Verbal, Written, Gone
.16 ____ Joint / Worker Safety Committee
.17 ____ Fire Protection
.18 ____ Guardrails
.19 ____ First Aider on Staff - Name Supplied
.20 ____ Visitors & Safety Equipment
.21 ____ Task Lighting
.22 ____ Swampers / Riggers Competency (in writing)
.23 ____ Scaffolds
.24 ____ Elevating Work Platforms
.25 ____ Protruding Rebar Protection - MSDS Received
.26 ____ WCB Clearance Certificate.

_____	_____
(Print name and title)	(Print name and title)
_____	_____
Owner Representatives (Signature)	Contractor Representatives (Signature)
_____(Date)	_____(Date)

END OF SECTION

1 General

1.1 FIRES / DISPOSAL OF WASTES

.1 Fires and burning of rubbish on site not permitted.

.2 Do not bury rubbish and waste materials on site.

.3 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

1.2 DRAINAGE

.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.3 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties.

.2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.

.3 Protect roots of designated trees to drip line during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal to areas indicated or designated by Consultant.

1.4 WORK ADJACENT TO WATERWAYS

.1 Do not operate construction equipment in waterways.

.2 Do not use waterway beds for borrow material.

.3 Do not dump excavated fill, waste material or debris in waterways.

.4 Design and construct temporary crossings to minimize erosion to waterways.

1.5 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this contract.

.2 Control emissions from equipment and plant to local authorities emission requirements.

.3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.6 SMOKING RESTRICTIONS

.1 Smoking is not permitted inside the building or on the property at any time or at any stage of construction.

1.7 ENVIRONMENTAL PERMIT APPROVAL

.1 Comply with requirements contained in the Transportation and Infrastructure Environmental Management Division environmental approval permit for the project.

.2 Contractor is to remove all protections upon project completion.

END OF SECTION

1 General

1.1 REFERENCES AND CODES

.1 Perform Work in accordance with National Building Code of Canada (NBC) 2015 including all amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.2 Meet or exceed requirements of:

.1 Contract documents.

.2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

.1 Asbestos: Demolition of spray or trowel-applied asbestos is hazardous to health. Should material resembling spray or trowel-applied asbestos be encountered in course of demolition work, immediately stop work and notify Consultant.

.2 Should material suspected of containing PCB's be encountered in the course of demolition work, immediately stop work and notify Consultant.

END OF SECTION

1 General

1.1 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-2008, Stipulated Price Contract.

1.2 INSPECTION

.1 Allow Consultant 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 if Work is designated for special tests, inspections or approvals by Consultant instructions, or law of Place of 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.

.4 Consultant may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Owner shall pay cost of examination and replacement.

1.3 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies are to be engaged by Contractor for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Contractor.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of Inspection/Testing Agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency may request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Consultant at no cost to Owner. Pay costs for retesting and re inspection.

1.4 PROCEDURES

.1 Notify appropriate agency and Consultant in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or 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.

1.5 REJECTED WORK

.1 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 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 in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Consultant.

1.6 REPORTS

.1 Submit 3 copies of inspection and test reports to Consultant.

.2 Provide copies to Subcontractor of work being inspected or tested.

1.7 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.

1.8 MOCK-UPS

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

.2 Construct in all locations acceptable to Consultant.

.3 Prepare mock-ups for Consultant's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.

.4 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.

.5 If requested, Consultant will assist in preparing a schedule fixing dates for preparation.

.6 Remove mock-up at conclusion of Work or when acceptable to Consultant.

.7 Mock-ups may remain as part of Work as directed by Consultant.

1.9 MILL TESTS

.1 Submit mill test certificates as requested.

1.10 EQUIPMENT AND SYSTEMS

.1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

END OF SECTION

1 General

1.1 SITE ACCESS AND PARKING

.1 The Owner will designate Contractor's access to project site as well as parking facilities for equipment.

.2 A location for parking will be designated for Contractors, Sub-Contractor & workers.

.3 The Contractor will maintain all roads and sidewalks free from mud and debris tracked from construction site, on a daily basis, at no cost to Owner.

.4 The Contractor will provide snow removal within the site fence during period of work as required to maintain access to building, at no cost to the Owner.

.5 The Contractor will provide and maintain signs, barricades and other devices required to indicate construction activities or other temporary and unusual conditions resulting from project work, at no cost.

1.2 SITE SAFETY FENCING

.1 Contractor to provide site safety fencing around entire construction site to separate construction zone from public.

.2 Size of compound to be determined by Contractor, but must contain all construction and construction related activities within the compound, except parking for workers.

.3 Contractor to provide 1800mm high page wire fence supported by steel "T" bars driven into the ground. Space at 2400mm maximum.

.4 Contractor to provide double gates at entrance complete with lock.

.5 Contractor to lock gate after every days activities are completed.

.6 Contractor to post notices for both construction zone and personal protective equipment requirements.

1.3 PARKING

.1 Parking space for workers' vehicles will be restricted to within the limit of contract and security fencing.

.2 Parking for delivery and service vehicles for the supply and removal of construction materials and debris will be restricted to within the limit of contract and security fencing.

1.4 SNOW REMOVAL

.1 General snow removal to the building site inside Limit of Contract by the Contractor.

.2 All snow removal to access Contractor's construction trailers and storage, and to perform own work by the Contractor.

1.5 STORAGE SHEDS

.1 Provide adequate weather tight sheds with raised floors, for storage of materials, tools and equipment which are subject to damage by weather.

.2 Provide heat when materials being stored are subject to frost damage.

.3 Under no circumstances will Consultant accept materials damaged due to exposure to weather elements, for incorporation into construction. Consultant will determine what constitutes damaged material.

.4 All storage sheds or trailers must be located within the limits of the contract and/or temporary construction fence.

1.6 LAYOUT

.1 The Contractor will provide a bench mark and control grid.

.2 Contractor shall be responsible for detailed setting out of his work.

1.7 MATERIAL STORAGE

.1 Locate site storage trailers where directed by Consultant. Place in location of least interference with existing facility operations.

.2 Material storage space on site is limited. Coordinate delivery to minimize storage period on site before being needed for incorporation into work.

.3 Make arrangements elsewhere in the City as deemed required and pay all costs for storage of materials not ready for incorporation into work.

1.8 REMOVAL OF TEMPORARY FACILITIES

.1 Remove temporary facilities from site when directed by Consultant.

1.9 WASTE REMOVAL

.1 The Contractor will provide bins as required. Contractor responsible for placement and sorting of waste in the collection bins and removal of waste from site.

END OF SECTION

1 General

1.1 INSTALLATION AND REMOVAL

.1 Contractor to provide temporary utilities identified in this Section, in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.2 DEWATERING

.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

.2 Filter water containing silt through geofabric prior to discharge into municipal storm water system or water course.

1.3 WATER SUPPLY

.1 Water supply is available on site and will be provided for construction usage at no cost. Make arrangements for the use and transportation of such services to work area through the Consultant.

1.4 SANITARY FACILITIES

.1 The Contractor will provide, at no cost to the Owner, sanitary facilities for work force in accordance with governing regulations and ordinances for entire duration of project. Facilities within the existing building are not available to the Contractor's work force.

.2 The Contractor will post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.

.3 Sanitary facilities must be located within the limits of the temporary construction fence, provided under the work of this Contract.

1.5 POWER

.1 Power supply is available and will be provided for construction usage at no cost.

- .1 Make arrangements for the use of such services through the Consultant.
- .2 Consultant will designate and approve each location of existing power source to which connections can be made to obtain temporary power service.
- .3 Connect to existing power supply in accordance with Canadian Electrical Code.

.2 Electrical power and lighting systems installed under this Contract can be used for construction requirements provided that guarantees are not affected thereby. Make good damage.

1.6 TEMPORARY HEATING AND VENTILATING

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.

.2 Construction heaters used inside building/hoarding must be vented to outside or be flameless (vent free) type. Solid fuel salamanders are not permitted.

.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 safe working environment.

.4 Maintain temperatures of minimum 10 degrees Celsius in areas where construction is in progress.

.5 Ventilating:
  .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
  .2 Ventilate storage spaces containing hazardous or volatile materials.
  .3 Ventilate temporary sanitary facilities.
.6 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.
.7 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.7 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies, authorities having jurisdiction, governing codes, regulations and bylaws.

END OF SECTION

1 General

1.1 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)
  .1 CCDC 2-2008, Stipulated Price Contract.
.2 Canadian General Standards Board (CGSB)
  .1 CGSB 1-GP-189M-84, Primer, Alkyd, Wood, Exterior.
  .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
.3 Canadian Standards Association (CSA International)
  .1 CAN3-A23.1-/A23.2-94, Concrete Materials and Methods for Concrete Construction/Method of Test for Concrete.
  .2 CSA-0121-M1978, Douglas Fir Plywood.
  .3 CAN/CSA-Z321-96, Signs and Symbols for the Occupational Environment.
  .4 CSA 5269.1-16, Falsework and Formwork.
.4 Fall Protection and Scaffolding Regulations, Province of Prince Edward Island.

1.2 INSTALLATION AND REMOVAL

.1 Provide construction facilities in order to execute work expeditiously.
.2 Remove from site all such work after use.

1.3 OVERLOADING

.1 Ensure no part of work is subjected to a load that will endanger its safety or cause permanent deformation.

1.4 FALSEWORK

.1 Design and construct falsework in accordance with CSA s269.2.

1.5 SCAFFOLDING AND FALL ARREST

.1 Provide and maintain scaffolding.
.2 Design, construct and maintain scaffolding in rigid, secure and safe manner in accordance with CAN/CSA-S269.2.
.3 Erect scaffolding independent of walls. Remove when no longer required.
.4 Comply with the requirements of the Fall Protection and Scaffolding Regulations, Province of Prince Edward Island.
.5 Each user of scaffolding shall examine scaffolding for sufficiency before using it. Make scaffolding secure or notify Consultant.

1.6 HOISTING

.1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.
.2 Hoists and cranes shall be operated by qualified operator.
.3 Maintain current inspection certificate.
.4 Qualifications of crane operator must be submitted to Consultant for approval and must be authorized to operate the crane.

1.7 SITE STORAGE/LOADING

.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.

1.8 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

.3 Provide adequate weather tight, heat and ventilation appropriate for the use and storage of equipment, tools and materials.

.4 Each user of equipment or tools shall be appropriately trained and be responsible to examine for sufficiency before use. Make equipment and tools safe if necessary, or notify the Contractor in writing that user will not commence work with such tools until it is made safe.

1.9 CONSTRUCTION SIGNAGE

.1 Signs and notices for safety and instruction shall be in English; Graphic symbols shall conform to CAN3-Z321.

.2 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Consultant.

END OF SECTION

1 General

1.1 REFERENCES

.1 Canadian General Standards Board (CGSB)
  .1 CGSB 1.189M-84, Primer, Alkyd, Wood, Exterior.
  .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
.2 Canadian Standards Association (CSA International)
  .1 CSA-O121-M1978, Douglas Fir Plywood.

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.
.2 Remove from site all such work after use.
.3 Temp barrier for 01 50 00.

1.3 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs, and other areas where a change in elevation of greater than 900mm exists.
.2 Provide as required by governing authorities.

1.4 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 and snow loading.

1.5 FIRE ROUTES

.1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.6 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.

1.7 PROTECTION OF BUILDING FINISHES

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
.2 Provide necessary screens, covers, and hoardings.
.3 Confirm with Consultant locations and installation schedule 3 days prior to installation.
.4 Be responsible for damage incurred due to lack of or improper protection.

1.8 PROTECTION OF LANDSCAPE ELEMENT

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
.2 Be responsible for damage incurred due to lack of or improper protection.

END OF SECTION

1 General

1.1 GENERAL

.1 Use new material and equipment unless otherwise specified.

.2 Within 7 days of written request by Consultant, submit following information for materials and products proposed for supply:

- .1 Name and address of manufacturer.
- .2 Trade name, model and catalog number.
- .3 Performance, descriptive and test data.
- .4 Manufacturer's installation or application instructions.
- .5 Evidence of arrangements to procure.

.3 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.

1.2 REFERENCE STANDARDS

.1 Conform to reference standards, in whole or in part as specifically requested in specifications.

.2 If there is question as to whether any product or system is in conformance with applicable standards, Consultant reserves right to have such products or systems tested to prove or disprove conformance.

.3 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.

1.3 CONFORMANCE

.1 When material or equipment is specified by standard or performance specifications, upon request of Consultant, obtain from manufacturer an independent testing laboratory report, stating that material or equipment meets or exceeds specified requirements.

1.4 SUBSTITUTION OF MATERIAL

.1 Proposals for substitution may be submitted only after award of Contract. Such requests must include statements of respective costs of items originally specified and proposed substitutions.

.2 Proposals will be considered by Consultant if:

- .1 Products selected by tenderer from those specified, are not available, or
- .2 Delivery date of products selected from those specified would unduly delay completion of Contract.
- .3 Alternative products to those specified, which are brought to attention of, and considered by Consultant as equivalent to those specified and will result in credit to Contract amount.
- .4 Should proposed substitution be accepted either in part or in whole, assume full responsibility and costs when substitution affects other work on project. Pay for design or drawing changes required as a result of substitution.
- .5 Amounts of all credits arising from approval of substitutions will be determined by Consultant and Contract price will be reduced accordingly. No substitutions will be permitted without prior written approval of Consultant.

1.5 QUALITY OF PRODUCTS

.1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 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.

.3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Consultant based upon requirements of Contract Documents.

.4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.6 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 reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard of Quality of Work in cases of dispute rest solely with Consultant, whose decision is final.

1.7 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. 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.

.2 In 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 right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.8 TRANSPORTATION

.1 Pay costs of transportation and handling of products required in performance of Work.

.2 Transportation cost of products supplied by Owner will be paid for by Owner. Contractor to unload, handle and store such products.

1.9 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Consultant.

.9 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use touch-up

materials to match original. Do not paint over name plates.

1.10 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install 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.

.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 re-installation at no increase in Contract Price or Contract Time.

1.11 CO-ORDINATION

.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.

1.12 FASTENINGS - GENERAL

.1 Provide metal fastenings and accessories in same texture, color and finish as base metal in which they occur.

.2 Prevent electrolytic action between dissimilar metals.

.3 Use non-corrosive fasteners, anchors and spacers for securing exterior work.

.4 Space anchors within limits of load bearing or shear capacity and ensure that they provide positive permanent anchorage. Wood plugs not acceptable.

.5 Keep exposed fastenings to minimum, space evenly and lay out neatly.

.6 Fastenings which cause spalling or cracking are not acceptable.

.7 Obtain Consultant's approval before using explosive actuated fastening devices. If approval is obtained comply with CSA Z166-1975, and observe restrictions in Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.13 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 No. 304 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 and resilient washers with stainless steel.

1.14 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Consultant of conflicting installation. Install as directed.

1.15 CONCEALMENT

.1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation, inform Consultant if there is interference. Install as directed by Consultant.

1.16 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.

1.17 CONSTRUCTION EQUIPMENT AND PLANT

.1 On request, prove to the satisfaction of Consultant that the construction equipment and plant are adequate to manufacture, transport, place and finish work to quality and production rates specified. If inadequate, replace or provide additional equipment or plant as directed.

.2 Maintain construction equipment and plant in good operating order.

END OF SECTION

1 General

1.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.

.2 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.3 Provide on-site containers for collection of waste materials and debris.

.4 Provide and use clearly marked separate bins.

.5 Remove waste and debris from site and deposit in waste container at end of each working day.

.6 Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.

.7 Store volatile waste in covered metal containers, and remove from premises at end of each day.

.8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 CLEANING DURING CONSTRUCTION

.1 Maintain work site in a tidy condition, free from accumulations of waste material and debris. Clean areas on a daily basis.

.2 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

.3 Immediately clean all dust, dirt, smears, scuffs and soiled surfaces in lobbies, corridors, stairwells and within tenant occupied areas resulting from use by workers.

.1 Perform cleaning, dusting and washing operations, carpet vacuuming (including shampooing if deemed required by Consultant) and floor washing as necessary to thoroughly clean all soiled surfaces.

1.3 FINAL CLEANING

.1 Prior to final review, remove surplus products, tools, construction machinery and equipment.

.2 Remove waste products and debris.

.3 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.4 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls and floors.

.5 Clean lighting reflectors, lenses, and other lighting surfaces.

.6 Vacuum clean and dust building interiors, behind grilles, louvers and screens.

.7 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.

.8 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.9 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.10 Remove dirt and other disfiguration from exterior surfaces.

.11 Clean and sweep roofs, gutters, area ways, and sunken wells.

.12 Sweep and wash clean paved areas.

.13 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.

.14 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

.15 Remove snow and ice from access to construction.

END OF SECTION

1 General

1.1 INSPECTION AND DECLARATION

.1 Contractor's Inspection:

.1 Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify Consultant in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.

.2 Request Consultant's Inspection.

.2 Consultant's Inspection:

.1 Consultant, Owner and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.

.3 Completion: submit written certificate that following have been performed:

.1 Work has been completed and inspected for compliance with Contract Documents.

.2 Defects have been corrected and deficiencies have been completed.

.3 Equipment and systems have been tested, adjusted and are fully operational.

.4 Certificates required by Boiler Inspection Branch have been submitted.

.5 Systems have been commissioned.

.6 Operation of systems have been demonstrated to Owner's personnel.

.7 Work is complete and ready for Final Inspection.

.4 Final Inspection:

.1 When items noted above are completed, request final inspection of Work by Owner and Consultant. If Work is deemed incomplete by Consultant complete outstanding items and request re inspection.

.5 Declaration of Substantial Performance:

.1 When Consultant consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for Certificate of Substantial Performance. Refer to CCDC 2, General Conditions Article for specifics to application.

.6 Commencement of Lien and Warranty Periods:

.1 Date of Owner's acceptance of submitted declaration of Substantial Performance shall be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.

.7 Final Payment:

.1 When Consultant consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. Refer to CCDC 2. If Work is deemed incomplete by Owner, complete outstanding items and request re inspection. Cost of re inspection will be deducted from final payment.

.8 Payment of Holdback:

.1 After issuance of Certificate of Substantial Performance of Work, submit an application of payment of holdback amount in accordance with CCDC2.

1.2 CERTIFICATE OF SUBSTANTIAL PERFORMANCE

.1 Upon approval, a Certificate of Substantial Performance will be issued to the Owner by the Consultant with a copy delivered to the Contractor. This Certificate will take the form shown in Section 01 77 00 - Closeout Procedures.

.2 The Certificate of Substantial Performance will establish the date of the Consultant's inspection as the date of Substantial Performance of the Contract, and will commence

the required 60-day period before release of the lien holdback amount.

.3 During the 60-day period, Contractor shall continue to complete the work.

.4 The Contractor shall immediately deliver to the Consultant specified submissions upon receipt of the Certificate of Substantial Performance.

1.3 ESTABLISHMENT OF WARRANTIES

.1 Warranties shall commence at date of Substantial Performance of the Work.

1.4 CERTIFICATE FOR PAYMENT OF LIEN HOLDBACK AMOUNT

.1 The Contractor shall submit statement and supporting documents for application of Release of Lien Holdback amount. These documents include those listed in Paragraph 2.2.2 and 2.2.3 and the Statutory Declaration Form CCDC 9A.

.2 Within five working days of receipt of application for Release of Lien Holdback amount and if approved, the Consultant will prepare a Certificate for Payment of the Lien Holdback amount. This Certificate dated on the day following termination of the 60 day period will be issued to the Owner with a copy delivered to the Contractor.

.3 The Owner will before the date of this Certificate ensure that no liens related to the Contract are registered and that no notice of liens has been received at the end of the 60-day period.

.4 Should no liens exist, the Lien Holdback will be due and payable one day after termination of the 60-day period in the amount indicated on the approved application for Certificate of Substantial Performance.

.5 The Owner will review jointly with the Contractor's Insurance related to the Contract before the 60-day period is terminated to ensure that all parties are adequately covered.

1.5 TOTAL PERFORMANCE

.1 The Contractor shall inspect the work to establish its completion in accordance with the Contract Documents and when satisfied of this completion request of the Consultant a final inspection.

.2 The Consultant will compile a final deficiency list at this inspection and issue it to the Contractor and Owner.

.3 The Contractor shall correct final deficiencies before a date agreed upon by the Contractor and Consultant.

.4 When the Contractor has satisfied himself that these corrections have been completed in a satisfactory manner by his inspection, he shall schedule a re-inspection by the Consultant, and the Owner's representatives if required, within five working days of the Contractor's request.

.5 When the Consultant is satisfied that all deficiencies have been rectified and the work is complete, the Contractor shall submit an application for the final progress payment.

.6 When "seasonal deficiencies", as determined by the Owner and/or Consultant exist, a sum of money will be withheld in accordance with the requirements of CCDC2-GC5.8.

1.6 WARRANTY PERIOD

.1 The Owner will advise the Consultant of defects observed during Warranty periods.

.2 The Consultant will notify the Contractor of these defects and request him to remedy the defects in accordance with the Contract Documents.

.3 Thirty days before expiration of Warranties the Owner's representatives, the Consultant and the Contractor will review the work as arranged by the Contractor noting defects of products and workmanship.

.4 The Contractor shall immediately remedy such noted defects.

1.7 CERTIFICATE

.1 CONTRACTOR: _____

PROJECT: _____

DATE OF SUBSTANTIAL PERFORMANCE: _____

.1 Substantial Performance Inspection for above described work was carried out _____ (date) by:

.1 For Owner _____
.2 For Consultant _____
.3 For Contractor _____

.2 The items which are not in accordance with the Plans and Specifications and require correction under the Conditions of the Contract Agreement are listed as an attachment to this Document.

CONTRACTOR'S CERTIFICATION
I hereby Certify that the work has been executed in accordance with the Plans and Specifications with the exception of deficiencies listed herewith. The undersigned hereby agrees that notwithstanding the generality of the foregoing, the acceptance of the works shall not prejudice any rights of the Owner or affect any liabilities of the undersigned Contractor pursuant to the provisions of the Contract.

_____
Contractor Date

OWNER'S ACCEPTANCE
I hereby accept the work on behalf of the Owner providing that the deficiencies listed herewith are completed. This acceptance is not to be construed as relieving the Contractor from the responsibility to correct other defects in the work, whether latent or patent, as may become apparent within the guarantee/ warranty period. This acceptance is made without prejudice to the rights of the Owner or to the liabilities of the Contractor which may arise and/or continue after acceptance of the work.

_____
Owner Date

CONSULTANT'S DECLARATION
Based on periodic visits to the job site and general familiarity with the progress of the work, I declare that, to the best of my knowledge, information and belief, construction is proceeding in accordance with the intent of the design and in general compliance with the plans and specifications, with the exception of the deficiencies listed herewith.

_____
Consultant Date

1.8 DEFICIENCIES

.1 The following is a list of deficiencies to be corrected. This acceptance is not to be construed as relieving the Contractor from the responsibility of correcting other defects in the work as may become apparent during the Guarantee/Warranty Period.

.1 _____
.2 _____
.3 _____

END OF SECTION

1 General

1.1 SECTION INCLUDES

.1 Project Record Documents as follows:
- .1 As-Built drawings;
- .2 As-Built specifications;
- .3 Reviewed shop drawings.

.2 Operations and Maintenance data as follows:
- .1 Operations and Maintenance Manual;
- .2 Maintenance Materials;
- .3 Spare Parts;
- .4 Special Tools.

1.2 PROJECT RECORD DOCUMENTS

.1 Consultant will provide two white print sets of contract drawings and two copies of Specifications Manual specifically for "as-built" purposes.

.2 Maintain at site one set of the contract drawings and specifications to record actual as-built site conditions.

.3 Maintain up-to-date, real time as-built drawings and specifications in good condition and make available for inspection by the Consultant at any time during construction.

.4 As-Built Drawings:
- .1 Record changes in red ink on the prints. Mark only on one set of prints and at completion of project and prior to interim inspection, neatly transfer notations to second set (also by use of red ink). Submit both sets to Consultant. All drawings of both sets shall be stamped "As-Built Drawings" and be signed and dated by Contractor.
- .2 Show all modifications, substitutions and deviations from what is shown on the contract drawings or in specifications.
- .3 Record following information:
  - .1 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure;
  - .2 Field changes of dimension and detail;
  - .3 Location of all capped or terminated services and utilities.
  - .4 Chases for mechanical, electrical and other services;
  - .5 Ceiling and floor elevations;
  - .6 Reflected ceiling plan condition showing finished layout of all ceiling-mounted services and devices;
  - .7 Plumbing, heating, air conditioning and ventilation, sprinkler and electrical service installation locations; all to be dimensioned and referenced to building columns or load bearing walls;
  - .8 All design elevations, sections, floor plans and details dimensioned and marked-up to consistently report finished installation conditions;
  - .9 Any details produced in the course of the contract by the Consultant to supplement or to change existing design drawings must also be marked-up and dimensioned to reflect final as-built conditions and appended to the as-built drawing document;
  - .10 All change orders issued over the course of the contract must be documented on the finished as-built documents, accurately and consistently depicting the changed condition as it applies to all affected drawing details.

.5 As-built Specifications: legibly mark in red each item to record actual construction,

including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly items substituted from that specified.

.2 Changes made by Addenda and Change Orders.

.3 Mark up both copies of specifications; stamp "as-built", sign and date similarly to drawings as per above clause.

.6 Maintain As-built documents current as the contract progresses. Consultant will conduct reviews and inspections of the documents on a regular basis. Frequency of reviews will be subject to Consultant's discretion. Failure to maintain as-builts current and complete to satisfaction of the Consultant shall be subject to financial penalties in the form of progress payment reductions and holdback assessments.

1.3 REVIEWED SHOP DRAWINGS

.1 Compile full set of shop drawings and product data reviewed on project and incorporate into Operations and Maintenance Manual. Supply number of shop drawing sets equal to the required number of final Operations and Maintenance manuals.

.2 Submit shop drawing sets at same time and as part of the contents of the Operation and Maintenance manuals specified in this section.

1.4 OPERATIONS AND MAINTENANCE MANUALS

.1 Definition: an organized compilation of operating and maintenance data including detailed technical information, documents and records describing operation and maintenance of individual products or systems as specified in individual sections of the specifications.

.2 Manual Language: final manuals to be in English language.

.3 Number of copies required:

.1 Submit two (2) draft copies of the manual for review and inspection by Consultant. Make revisions and additions as directed and resubmit.

.2 Upon review and acceptance by Consultant, submit two (2) final chard copies, and one (1) electronic copy. Initial copies are not to be considered as part of the final copies unless they have been fully revised and are identical to the final approved version.

.4 Submission Date: submit complete operation and maintenance manual to Consultant 3 weeks prior to application for Interim Certificate of Completion of project.

.5 Manual Binding & Format:

.1 Organize data in the form of an instructional manual.

.2 Assemble, coordinate, bind and index required data into Operation and Maintenance Manual.

.3 Use vinyl, hard covered, 3 "D" ring binders, loose leaf, sized for 215 x 280 mm paper, with spine and face pockets.

.4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Where multiple binders are needed, correlate data into related consistent groupings. Identify contents of each binder on spine.

.6 Organize and divide data into sections the same as the Masterformat Divisions numerical order of contract specifications and thereafter subdivided into various equipment or building systems, under Section numbers and sequence of Table of Contents.

.7 Material: separate each section by use of cardboard dividers and labels. Provide tabbed fly leaf for each separate product or system within each section and with typed description of product and major component parts of equipment.

.8 Text: Manufacturer's printed data, or typewritten data. Do not hand write.

.9 Drawings, diagrams and manufacturers' literature must be legible, determined solely by the Consultant. Provide with reinforced, punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.6 Manual Contents:

.1 Cover sheet containing:

.1 Date submitted.

.2 Project title, location and project number.

.3 Names and addresses of Contractor, and all Sub-contractors.

.2 Table of Contents: provide full table of contents in each binder(s), clearly indicate which contents are in each binder.

.3 List of maintenance materials.

.4 List of spare parts.

.5 List of special tools.

.6 Original or certified copy of Warranties and Guarantees.

.7 Copies of approvals, and certificates issued by Inspection Authorities.

.8 Copies of reports and results from tests designated as Contractor's responsibilities.

.9 Product Information Data on all materials, equipment and systems as specified in individual sections of the specifications to include:

.1 List of equipment including manufacturer's name, supplier, local source of supplies and service depot(s). Provide full addresses and telephone numbers.

.2 Nameplate information including equipment number, make, size, capacity, model number and serial number.

.3 Parts list.

.4 Installation details.

.5 Operating instructions.

.6 Maintenance instructions for equipment.

.7 Maintenance instructions for finishes.

.7 Shop drawings:

.1 Bind one complete set of reviewed shop drawings into each copy of operations and maintenance manual.

.2 Bind the shop drawings in a manner such that they correspond with the specification section they relate to.

.3 Where large quantity of data is supplied due to size of project, fold and bind professionally into separate correctly sized binder.

.8 Equipment and Systems Data: the following list indicates the type of data and extent of information required to be included for each item of equipment and for each system:

.1 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 nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed color 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 seasonal 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 Servicing and lubrication schedule, and list of lubricants required.

.7 Manufacturer's printed operation and maintenance instructions.

.8 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 Contractor's coordination drawings, with installed color 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 list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports.

.15 Additional requirements as specified in individual specification sections.

.9 Materials and Finishes Maintenance Data:

.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and color 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 Additional Requirements: as specified in individual specifications sections.

1.5 SPARE PARTS, TOOLS AND MAINTENANCE MATERIALS

.1 Provide spare parts, special tools and extra materials for maintenance purposes in quantities specified in individual specification sections.

.2 Tag all items with associated function or equipment.

.3 Provide items of same manufacture and quality as items in Work.

.4 Deliver to site in well packaged condition. Store in location as directed by Consultant.

.5 Clearly mark as to contents indicating:

.1 Part number.

.2 Identification of equipment or system for which parts are applicable.

.3 Installation instructions or intended use as applicable.

.4 Name, address and telephone number of nearest supplier.

.6 Prepare and submit complete inventory list of items supplied. Include list within Maintenance Manual.

.7 Turnover to Facility Manager and obtain signature. Include receipt with Maintenance Manual.

1.6 SPECIAL TOOLS

.1 Provide special tools, in quantities specified in individual specification section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to site; place and store.

.4 Receive and catalog all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

.5 Turnover to Facility Manager and obtain signature. Include receipt with Maintenance Manual.

1.7 SUBMISSION

.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.2 Copy will be returned after final inspection, with Consultant's comments.

.3 Revise content of documents as required prior to final submittal.

.4 Two (2) weeks prior to Substantial Performance of the Work, submit to the Consultant, two (2) final hard copies and one (1) electronic final copy of operating and maintenance manuals in English.

.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.

.9 Failure to deliver maintenance materials, spare parts, special tools and as-builts will delay progress payments.

1.8 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;

.1 date of submission; names,

.2 addresses, and telephone numbers of Consultant and Contractor with name of responsible parties;

.3 schedule of products and systems, indexed to content of volume.

.2 For each product or system:

.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control and Section 01 77 00 - Closeout Procedures.

.6 Training: Refer to Section 01 91 13 - General Commissioning Requirements.

1.9 AS-BUILTS - RECORDING ACTUAL SITE CONDITIONS

.1 Record information on 2 sets of white print, opaque drawings, and in copy of Project Manual.

.2 Provide felt tip marking pens, maintaining separate colors for each major system, for recording information.

.3 Record information concurrently with construction progress. Do not conceal Work until required information is 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 catalog number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

.6 Other Documents: maintain manufacturer's certifications, required by individual specifications sections.

1.10 STORAGE, HANDLING AND PROTECTION

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and to satisfaction of Consultant.

1.11 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 Obtain warranties and bonds, executed in duplicate by Subcontractors, suppliers, and manufacturers where specifically requested by individual specification sections, within ten days after completion of the applicable item of work.

.4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.

.5 Verify that documents are in proper form, contain full information, and are notarized.

.6 Co-execute submittals when required.

.7 Retain warranties and bonds until time specified for submittal.

END OF SECTION

1 General

1.1 COMMISSIONING OBJECTIVE

.1 Perform commissioning activities in order to achieve the following objectives:

- .1 Collect data on equipment and systems supplied; and to document their installation;
- .2 Conduct checks and tests on fully installed building component, equipment, systems and integrated systems to:
  - .1 Verify whether they operate in accordance with requirements of Contract Documents;
  - .2 Verify performance against design criteria and user requirements and measure peak capacities;
- .3 Prepare a Building Management Manual (BMM) which contains operations and maintenance data, as-built record documents, commissioning reports, training data and other critical information for future use by Facility operational staff;
- .4 Ensure transfer of knowledge on the operations, maintenance and management of the Facility to Owner and Operational personnel by means of appropriate training.

.2 Commissioning activities conducted by Owner and/or Consultant does not replace checks, tests, adjustments, balancing and other performance verification responsibilities to be performed by General and all Sub-Contractors as part of the work and as specified in other sections of the Specifications.

1.2 DEFINITIONS

.1 For the purpose of this contract, the following terms, used in this section, as they relate directly or indirectly to the commissioning process, shall be deemed to have the meaning as defined hereafter.

.2 Commissioning Process: a planned program of tasks, activities and procedures carried out systematically during the Construction and Occupancy Stages in accordance with the commissioning objectives, specified in clause 1.2 above, to:

- .1 Verify whether the fully installed equipment, systems and integrated systems operate in accordance with Contract Documents, design criteria, manufacturers' recommendations and;
- .2 Ensure that appropriate documentation is compiled to effectively train Operation and Maintenance staff and prepare a comprehensive Building Management Manual (BMM).

.3 Commission (ie: to commission a building component or system): tests and checks conducted on all systems and integrated systems of Facility; carried out only after they are fully installed, functional and Contractor's Performance Verification responsibilities have been completed and approved.

- .1 Contractor provides assistance during this process by operating equipment and systems, by troubleshooting and making adjustments as may be required.
- .2 Systems are run under their full operation and under various modes to determine if they function correctly, consistently, at peak efficiency and interactively with each other as intended in accordance with Contract Documents, design criteria and manufacturers' recommendations.
- .3 During these checks, adjustments may be made enhancing performance to meet environmental or user requirements.

.4 Contractor: means the Contractor, however it also refers to any personnel from Subcontractors, including the controls subcontractors, suppliers and certified manufacturer techncians with whom the Contractor contracts or obtains services for the performance of work and designated commissioning duties.

.5 Consultant: persons from the civil, architectural, mechanical and electrical design disciplines of the consultant firm(s) engaged by Owner to prepare the final design and contract documents.

.6 Design Criteria: All those factors included in the design of a Facility prescribed by the tenant needs or as determined by Consultant as necessary in order to meet all Facility functional and user operational requirements.

.7 Installation/Start-up Checks:(sometimes referred to as pre-functional checks). Checks and inspections to be performed by Contractor during the pre-start-up and start-up of a particular equipment or system component.

.1 Checklist sheets are to be produced, which include but are not limited to the following data:

.1 Product manufacturer's installation instructions and recommended checks and;

.2 Special procedures as specified in relevant sections of Specifications;

.3 Other items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.

.2 Standard Installation/Start-up Checklist sheets prepared by equipment manufacturer are acceptable for use. Supplement with additional data representative of specific project conditions as deemed required by Consultant.

.3 Use Checklist sheets for all equipment installation. Document in writing on checklist the various checks made, deficiencies noted and corrective action taken.

.4 Installing Sub-Contractor and/or certified manufacturers technicians, to sign Checklist sheets upon completion, certifying that stated checks and inspections have been performed.

.8 Performance Verification: (sometimes referred to Functional Testing) checks, running dynamic tests and adjustments carried out by Contractor on equipment and systems, upon their installation, to ensure they operate correctly, efficiently and function independently and interactively with other systems as intended in accordance with contract documents and manufacturer's recommendations.

.1 Performance Verification shall not be considered part of the commissioning process. It is however considered an essential and integral part of Contractor's responsibilities in the equipment installation process which must be stringently conducted, successfully completed and approved by Owner before a piece of equipment or system is considered fully installed and functional.

.2 Facility components and systems will not be commissioned until performance verification has been completed and approved.

.9 Product Information (PI Data): a compilation of data gathered on a particular piece of equipment, typically produced by manufacturer, which includes nameplate information, installation/startup instructions, parts list, operating instructions, maintenance guidelines and other pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of such equipment. This documentation is included in the Building Management Manual (BMM).

1.3 CONTRACTOR'S COMMISSIONING RESPONSIBILITIES

.1 General:

.1 Coordinate the participation of the various subcontractors, their specialists and manufacturer's certified technicians in providing the commissioning activities described below.

.2 Workers and manufacturer's certified technicians are to be knowledgeable and qualified to interpret system functions and intended design criteria.

.3 Develop a commissioning schedule.

.4 Notify Consultant in writing when entire system is ready to be commissioned. Give fourteen (14) calendar day notice.

.5 Commissioning of Facility and designated systems will only commence once that required documentation has been received and all installed equipment and systems have undergone successful performance verification.

.6 Be aware that inspection certificate will only be issued by Consultant when:

.1 All commissioning documentation has been received, reviewed for suitability and approved by Consultant;

.2 Designated facility components and systems have been commissioned and;

.3 Training has been completed and signed off on.

.7 Non-Conformance of Performance Verification Requirements:

.1 Should incorrectly installed or malfunctioning equipment, system components or associated controls be found while Facility is being commissioned, Contractor shall be required to re-verify 100% of all equipment and components within the non-functional system, including other related system as deemed required by Consultant, to correct deficiencies and ensure effective performance of the fully functional system as designed.

.2 Costs to correct work and any additional tests or inspections, as deemed required by Consultant, to determine acceptability and proper performance of such items to be paid for by Contractor.

.1 Above costs held against Contractor will be as financial penalties in the form of progress payment reductions or holdback assessments.

.2 Prior to Facility being Commissioned:

.1 Submit commissioning documentation as specified in Clause 1.8 for use during commissioning.

.2 Carryout pre-start-up and start-up of equipment.

.3 Conduct performance verification on all installed equipment and systems. Ensure they are fully functional.

.4 Address deficiencies in Work identified during performance verification of equipment and systems. Conduct additional performance verification checks and tests to ensure acceptability of Work.

.5 Arrange for special tools, devices and services, identified at commissioning meeting(s), as deemed required to assist with commissioning.

.6 Provide access ladders, two way radios and other equipment required by Commissioning Agents to facilitate commissioning.

.3 When Facility is being Commissioned:

.1 Provide qualified tradespersons to be present at site to assist commissioning activity.

.2 Assist in commissioning architectural and structural building component, and mechanical, electrical and civil systems specified and as follows:

.1 Operate designated building component, mechanical/electrical equipment and system under all modes of operation and conduct checks and tests as directed by Consultant.

.2 Check and verify that building component, equipment, systems and integrated systems, including their controls, are functioning and responding correctly and interactively with each other.

.3 Test systems independently and then in unison with other related systems.

.4 Conduct all Commissioning checks and tests in presence of and

witnessed by Consultant.

.3 Specific procedures used to commission Facility may be provided by Consultant which includes:

.1 Sequential order of building component and system to be tested.

.2 Running systems under various anticipated modes and demands (example: high and low cooling or heating loads, duplicating outside temperature conditions, fire alarm and power failure conditions etc...).

.3 Running building controls through all sequences of operation to verify and confirm that equipment and systems are responding as designed and intended.

.4 Operating designated equipment at peak capacities, recording output data against design criteria.

.4 Run component or systems as long as necessary to effectively commission all items as deemed required by Consultant.

.5 Monitor equipment and system responses.

.6 Record test results, measurements and other data.

.7 Assist in analyzing results. Identify system deficiencies and components not responding as intended.

.8 Correct deficiencies and system non-conformance issues. Adjust, calibrate or fine tune system components as required. Debug system software as may be required.

.9 Retest systems when directed to confirm compliance.

.4 Upon completion of Facility Commissioning:

.1 Provide training to Maintenance & Operational personnel as specified in clause 1.7 below.

.2 Turn over any filled-in checks sheets, reports or signed and dated certificates resulting from commissioning.

.5 During Warranty period at Occupancy Stage:

.1 Fine tune components, systems and integrated systems and continue system debugging to optimize Facility performance.

.2 Rectify warranty issues.

.3 Submit written report to Consultant.

.1 Indicate results noted and corrective action taken.

.2 Note improvements made to operating parameters and control settings.

.3 Recommend modifications deemed advisable to improve performance, environmental conditions, energy consumptions and other issues.

.4 Consultant to be present during such work.

1.4 COMMISSIONING MEETINGS

.1 Convene commissioning meetings following project meetings: as required through the project to coordinate commissioning requirements.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to commissioning .

.3 Continue commissioning meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60% construction completion stage. Contractor to call a separate commissioning scope meeting to review progress including Consultant, discuss schedule of equipment start-up activities and prepare for commissioning . Issues at meeting to include:

.1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.

.2 Determine the degree of involvement of trades and manufacturer's

representatives in the commissioning process.

.5 Thereafter commissioning meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meeting will be chaired by Contractor, who will record and distribute minutes within 3 business days.

.7 Ensure Subcontractors and relevant manufacturer representatives are present at subsequent commissioning meetings and as required.

1.5 COMMISSIONING SCHEDULE

.1 Address commissioning activities within the construction work schedule. Clearly identify allocated time period for commissioning and training activities.

.2 Provide a commissioning schedule at the 60% construction stage in order that specific issues and individual details of commissioning can be reviewed, discussed and dealt with from that period onward to project completion. Submit updates thereafter,

.3 Indicate allocated time period and anticipated dates for:

.1 Submission of commissioning documentation, including O&M Manuals and Verification Reports

.2 Equipment and system start-up and performance verification, making them ready to be commissioned.

.3 Allocated period to commission designated building components and systems.

.4 Training period.

.5 Work during Warranty period.

.4 Submit schedule to Consultant for review.

.5 Day-to-day operations are to be maintained throughout the facility during the work and activities which may be potentially disruptive are to be included in the schedule. After hours and / or overtime work may be required to facilitate day-to-day operations throughout the facility and should be included in the schedule.

1.6 INSTRUCTORS

.1 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:

.1 Start-Up, operation, shut-down of equipment, components and systems.

.2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.

.3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.

.2 Contractor and equipment manufacturer to provide instruction on:

.1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.7 TRAINING OBJECTIVES

.1 Training to be detailed and duration to ensure:

.1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.

.2 Effective on-going inspection, measurements of system performance.

.3 Proper preventive maintenance, diagnosis and trouble-shooting.

.4 Ability to update documentation.

.2 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.8 TRAINING MATERIALS

.1 Contractor to be responsible for content and quality.

.2 Training materials to include:
  .1 "As-Built" Contract Documents.
  .2 Operating Manual.
  .3 Maintenance Manual.
  .4 Management Manual.
  .5 Testing, Adjusting and Balancing, Performance Verification Reports and Certificates.
.3 Training materials to be in a format that permits future training procedures to same degree of detail.
.4 Supplement training materials:
  .1 Multimedia presentations or other supplemental digital information.
  .2 Manufacturer's training videos.
.5 Equipment models.

1.9 RESPONSIBILITIES

.1 Be responsible for:
  .1 Implementation of training activities,
  .2 Coordination among instructors,
  .3 Quality of training, training materials,
.2 Consultant will evaluate training and materials.
.3 Upon completion of training, provide written report, signed by Instructors, witnessed by Consultant.
  .1 Report to include a list of all attendees.

1.10 TRAINING CONTENT

.1 Training to include demonstrations by Instructors using the installed equipment and systems.
.2 Content includes:
  .1 Review of facility and occupancy profile.
  .2 Functional requirements.
  .3 System philosophy, limitations of systems and emergency procedures.
  .4 Review of system layout, equipment, components and controls.
  .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
  .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
  .7 Maintenance and servicing.
  .8 Trouble-shooting diagnosis.
  .9 Inter-Action among systems during integrated operation.
  .10 Review of O&M documentation.
.3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

1.11 VIDEO-BASED TRAINING

.1 Manufacturer's videos to be used as training tool with Consultant's review and written approval 3 months prior to commencement of scheduled training.
.2 On-Site training videos:
  .1 Record training sessions for use during future training.
  .2 To be performed after systems are fully commissioned.
  .3 Organize into several short modules to permit incorporation of changes.

.3 Production methods to be professional grade with good audio and video quality.

.4 Video to be recorded digitally and submitted on CD or EEProm Drive, in accordance with Section 01 33 00 - Submittal Procedures.

1.12 TRAINING

.1 Commence process of familiarizing O&M personnel in the early stages of work on purpose and operation of various equipment and systems. Continue process throughout the entire construction duration.

.1 Provide informal briefings during occasional site visits, at planned commissioning meetings and during the final commissioning site activities.

.2 Conduct formal demonstration and training sessions only after all identified systems have been commissioned and Consultant has given approval to proceed with the training process.

.3 Provide training and demonstration on equipment, sub-systems, systems and integrated systems.

.4 Carryout training in accordance with requirements of Section 01 91 13 - General Commissioning Requirements.

.5 Submit written agenda of training session(s) 4 weeks before hand for review by Consultant.

.6 Submit training manuals for review 2 weeks prior to actual training.

.7 Ensure required tools and O&M Manuals are on site for training and system demonstration.

.8 As a minimum, the training sessions to cover the following information:

.1 Introduction.

.2 Description of the system with factory personnel being involved at appropriate times.

.3 Instructions on start-up procedures including seasonal procedures, system check-lists and emergency procedures.

.4 Operational procedures, including occupancy considerations, seasonal change-over, manual and automatic operations and emergency modes.

.5 Instruction on system shutdowns, including checklists.

.6 Instructions on all aspects of system maintenance, including routine servicing, lubrication, overhaul and factory servicing.

.7 Information concerning the scope of warranties and their use.

.8 A description of spare parts in stock and their service.

.9 A description of normal tools required for servicing the systems/equipment.

.9 Submit typewritten record of training sessions given and list of attendees. Use forms of format approved by Consultant.

1.13 DESCRIPTION

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of final inspection.

.2 Owner will provide list of personnel to receive instructions, and will co-ordinate their attendance at agreed-upon times.

1.14 QUALITY CONTROL

.1 When specified in individual Sections require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

.2 Obtain signature from attendees and provide a copy in the Building Maintenance Manual.

1.15 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Consultant's approval.

.3 Submit reports and certificates within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Record signatures of all attendees.

.5 Give time and date of each demonstration, with list of persons present.

1.16 CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation in accordance with respective applicable Sections.

.2 Testing, adjusting, and balancing has been performed and equipment and systems are fully operational.

.3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.17 PREPARATIONS

.1 Verify that conditions for demonstration and instructions comply with requirements.

.2 Verify that designated personnel are present.

1.18 DEMONSTRATION AND INSTRUCTIONS

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, sequencing, winter/summer operating, servicing, and maintenance of each item of equipment at scheduled times, at the equipment location.

.2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.

.3 Review contents of manual in detail to explain aspects of operation and maintenance.

.4 Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

1.19 COMMISSIONING DOCUMENTATION

.1 Submit the following documentation for use during commissioning and for incorporation thereafter into a Building Management Manual (BMM).

.2 Operations and Maintenance Manuals, Project Record Documents and other data as specified in Section 01 78 00 - Closeout Submittals. Data to include:

.1 Equipment Product Information (PI Data) complete with:

.1 Nameplate info,

.2 Installation instructions,

.3 Operating procedures and

.4 Maintenance guidelines.

.5 Reviewed shop drawings,

.6 As-built record drawings and Specifications.

.2 Completed Installation/Start-up Checklist sheets used.

.3 Copy of any static and dynamic test and reports conducted.

.4 Reports as specified in various trade sections.

.3 Documentation to include detailed information and number of copies as specified for maintenance manuals of Section 01 78 00 - Closeout Submittals.

END OF SECTION

1 General

1.1 DESCRIPTION OF WORK

.1 The work of this Section comprises the furnishing of all labour, materials and equipment necessary for all demolition work required to complete the Work of this Contract in accordance with the requirements of this Section and as shown on the Drawings.

.2 The Contractor are hereby advised that demolition works within the scope of work outlined involves materials which have been identified to contain asbestos, and are to ensure that the abatement has been completed prior to beginning equipment removals. The facility hazardous materials report has been included in the appendices of these Specifications, for reference on the extents of asbestos containing materials (ACM's).

.1 Plumbing Scope (Division 22 Subcontract):

.1 Removal of existing domestic hot water tank(s) within the boiler room, associated recirculation pump, and piping made redundant through the works (note - equipment insulation contains asbestos). Coordinate with the Division 23 and 26 subcontracts for removal of the heating circuit and power respectively.

.2 Removal of plumbing fixtures identified within the associated drawings package (Lower Level Room 111 and washroom fixtures adjacent washroom).

.2 Mechanical Pipe-fitting (Division 23 HVAC scope):

.1 Saw cutting of the floor to access floor drain (sanitary) is required in the boiler room and facility center-core, coordinate with general contractor to remove the flooring, excavate, backfill and remediate.

.2 Demolition and removal of the existing heating boilers, breeching, and associated piping made redundant through the works (Note - equipment insulation contains asbestos).

.3 Demolition of the existing heating circulation pumps, and associated piping, coordinate with Division 26 for removal of electrical infrastructure. (Note - piping insulation around equipment contains asbestos).

.4 Demolition of the noted cabinet unit heaters, baseboard heaters noted within the drawing set, and demolition of piping made redundant (Note - piping insulation contains asbestos).

.5 Remove and dispose of existing control devices made redundant through the execution of the works, trace out and dispose of control wiring, isolate and cap off redundant pneumatic control lines.

.3 Mechanical Ventilation (Division 23 HVAC scope):

.1 Demolition of branch ducting, diffusers, dampers and associated material made redundant through the execution of the works.

1.2 PROTECTION

.1 Size, depth and location of existing utilities and structures as indicated are for guidance only; completeness and accuracy are not guaranteed.

.2 Protect existing items designated to remain. In event of damage, immediately replace such items or make repairs to approval of Consultant and at no additional cost to the Owner.

.3 Protect existing surface features which may be affected by work from damage while work is in progress and repair damage resulting from work.

.4 Prevent movement, settlement or damage of adjacent utilities and structures. Provide bracing, shoring and underpinning required. Make good damage and be liable for injury caused by demolition.

.5 If safety of structure being repaired or adjacent structures appear to be endangered,

cease operations and notify Consultant and Owner. Take precautions to support structures.

.6 Maintain and protect from damage, all structures, utilities encountered during the execution of Work. Obtain direction of Consultant before moving or otherwise disturbing utilities or structures.

.7 Record in accordance with requirements of Section 01 72 00 - Project Record Documents, locations of maintained, re-routed and abandoned underground lines.

.8 Make good and pay for damage to any lines resulting from work.

1.3 SAFETY CODE

.1 Carry out demolition work in accordance with ALL applicable codes and regulations and as outlined in Section 01 54 50 Safety Requirements.

2 Products

2.1 NOT APPLICABLE

.1 Not applicable.

3 Execution

3.1 PREPARATION

.1 Inspect building and site and verify items designated for removal and items to be preserved.

.2 Locate and protect all utility services.

.3 Any damage to existing utilities and services shall be immediately repaired to the satisfaction of the Owner.

3.2 REMOVAL OF SALVAGED ITEMS

.1 Remove items designated for salvage and stockpile on site or inside building as designated by Owner.

.2 Items not designated for salvage and re-use shall be removed and dispose of off-site by the Contractor.

3.3 DISPOSAL OF MATERIAL

.1 Dispose of all removed materials off-site.

.2 Pay all fees that may be charged to dispose of materials at licensed disposal sites.

.3 Remove all material contaminated with oil, gasoline, calcium chloride or other toxic or dangerous materials and dispose of in manner to minimize danger at site and to a location off site approved by Provincial Authority governing such disposal.

3.4 RESTORATION

.1 Upon completion of work, remove debris, trim surfaces and leave work site clean.

.2 Reinstate areas and existing works outside areas of demolition to conditions that existed prior to commencement of work.

END OF SECTION

1 General

1.1 SUMMARY

.1 Comply with requirements of this Section when performing following work:

.1 Installing containing asbestos at locations indicated on drawings.

.2 Cut, shape, grind, drill, scrape or abrade materials mentioned above using hand powered tools, or using power tools equipped with a HEPA filter.

.3 Removing drywall.

.2 Contractor is to fully abate all asbestos containing materials highlighted in the hazardous materials report as outlined in Appendix __ of this specification

1.2 SECTION INCLUDES

.1 Requirements and procedures for asbestos abatement on non-friable asbestos-containing materials.

1.3 REFERENCES

.1 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act, 1999 (CEPA).

.2 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.3 Workers Compensation Act.

1.4 DEFINITIONS

.1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibers greater than 0.3 microns in any direction at 99.97% efficiency.

.2 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow thorough wetting of fibers.

.3 Asbestos-Containing Materials (ACMs): materials identified under Existing Conditions including fallen materials and settled dust.

.4 Asbestos Work Area: area where work takes place which will, or may, disturb ACMs.

.5 Authorized Visitors: Engineers, Consultants or designated representatives, and representatives of regulatory agencies.

.6 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

.7 Occupied Area: any area of the building or work site that is outside Asbestos Work Area.

.8 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.

.9 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for work.

1.5 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit proof satisfactory to Consultant that suitable arrangements have been made to dispose of asbestos-containing waste in accordance with requirements of authority having jurisdiction.

.3 Submit Provincial and/or local authority to proceed.

.4 Submit proof of Contractor's Asbestos Liability Insurance.

.5 Submit to Consultant necessary permits for transportation and disposal of asbestos-containing waste and proof that asbestos-containing waste has been received and properly disposed.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial, and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications, more stringent requirement applies. Comply with regulations in effect at time Work is performed.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

.2 Safety Requirements: worker protection.

.1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:

.2 Non-powered reusable or replaceable filter-type respirator equipped with HEPA filter cartridges, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction.

.3 Disposable-type protective clothing that does not readily retain or permit penetration of asbestos fibers, consisting of full-body covering including head covering with snug-fitting cuffs at wrists, ankles, and neck.

.3 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.

.4 Before leaving Asbestos Work Area, dispose of protective clothing as contaminated waste.

.5 Ensure workers wash hands and face when leaving Asbestos Work Area. Facilities for washing are located as indicated on drawings.

.6 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

1.7 EXISTING CONDITIONS

.1 Reports and information pertaining to ACMs to be handled, removed, or otherwise disturbed and disposed of during this project are bound into the specification following this section.

.2 Notify Consultant of friable material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material pending instructions from Consultant.

1.8 SCHEDULING

.1 Hours of Work: perform work involving removal of ACM's outside of normal working hours. Include in Contract Sum additional costs due to this requirement.

1.9 OWNER'S INSTRUCTIONS

.1 Before beginning Work provide Consultant satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.

.2 Instruction and training related to respirators includes, following minimum requirements:

.1 Fitting of equipment.

.2 Inspection and maintenance of equipment.

.3 Disinfecting of equipment.

.4 Limitations of equipment.

.3 Instruction and training must be provided by a competent, qualified person.

1.10 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Collect and separate for disposal paper packaging material in appropriate on-site bins

for recycling in accordance with Waste Management Plan.

.3 Separate for reuse and place in designated containers steel waste in accordance with Waste Management Plan.

.4 Place materials defined as hazardous or toxic in designated containers.

.5 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA and Municipal regulations.

.6 Fold up metal banding, flatten and place in designated area for recycling.

.7 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 ml bags or leak proof drums. Label containers with appropriate warning labels.

.8 Transport containers by approved means to licensed landfill for burial.

.9 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MATERIALS

.1 Drop Sheets:

- .1 Polyethylene: 0.15 mm thick.
- .2 FR polyethylene: 0.15 mm thick woven fiber reinforced fabric bonded both sides with polyethylene.

.2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in a concentration to provide thorough wetting of asbestos-containing material.

.3 Waste Containers: contain waste in two separate containers.

- .1 Inner container: 0.15 mm thick sealable polyethylene waste bag.
- .2 Outer container: sealable metal or fiber type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fiber type or second 0.15 mm thick sealable polyethylene bag.
- .3 Labeling requirements: affix preprinted cautionary asbestos warning in English language that is visible when ready for removal to disposal site.

3 Execution

3.1 PROCEDURES

.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

.2 Before beginning Work, isolate Asbestos Work Area using, minimum, preprinted cautionary asbestos warning signs in English language that are visible at access routes to Asbestos Work Area.

- .1 Remove visible dust from surfaces in the work area where dust is likely to be disturbed during course of work.
- .2 Use HEPA vacuum, or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate.
- .3 Do not use compressed air to clean up or remove dust from any surface.

.3 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.

- .1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in Asbestos Work Area where dust and contamination cannot otherwise be safely contained.

.4 Wet materials containing asbestos to be cut, ground, abraded, scraped, drilled, or otherwise disturbed unless wetting creates hazard or causes damage.
  .1 Use garden reservoir type low - velocity fine - mist sprayer.
  .2 Perform Work to reduce dust creation to lowest levels practicable.
  .3 Work will be subject to visual inspection and air monitoring.
  .4 Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.

.5 Clean-Up:
  .1 Frequently during Work and immediately after completion of Work, clean up dust and asbestos-containing waste using HEPA vacuum or by damp mopping.
  .2 Place dust and asbestos-containing waste in sealed dust-tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste; wet and fold these items to contain dust, then place in plastic bags.
  .3 Clean exterior of each waste-filled bag using damp cloths or HEPA vacuum and place in second clean waste bag immediately prior to removal from Asbestos Work Area.
  .4 Seal waste bags and remove from site. Dispose of in accordance with requirements of Provincial and Federal Authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.
  .5 Perform final thorough clean-up of Work areas and adjacent areas affected by Work using HEPA vacuum.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 20 00 - Concrete Reinforcing.
.2 Section 03 30 00 - Cast-in-Place Concrete.
.3 Section 03 35 00 - Concrete Finishing.
.4 Section 07 92 00 - Joint Sealants.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)
  .1 CAN/CSA-A23.1-2014, Concrete Materials and Methods of Concrete Construction.
  .2 CAN/CSA-O86-19, Engineering Design in Wood (Limit States Design).
  .3 CSA O121-17, Douglas Fir Plywood.
  .4 CSA O151-17, Canadian Softwood Plywood.
  .5 CSA O153-13 (R2017), Poplar Plywood.
  .6 CAN3-O188.0, Standard Test Methods for Mat-Formed Wood Particleboards and Waferboard.
  .7 CSA O437 Series-93 (R2013), Standards for OSB and Waferboard.
  .8 CSA S269.1-2016, Falsework for Construction Purposes.
  .9 CAN/CSA-S269.3-M92 (R2013), Concrete Formwork.
.2 Council of Forest Industries of British Columbia (COFI)
  .1 COFI Exterior Plywood for Concrete Formwork.

1.3 SHOP DRAWINGS

.1 Submit shop drawings for formwork and falsework in accordance with Section 01 33 00 - Submittal Procedures.
.2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings.
.3 Indicate sequence of erection and removal of formwork/falsework as directed by Consultant.
.4 Each shop drawing submitted shall bear stamp and signature of qualified professional engineer registered or licensed to practice in the Province of Prince Edward Island, Canada.

1.4 QUALITY CONTROL

.1 Pre-Pour Meeting
  .1 Attend a quality control meeting including all relevant sub-trades to review the quality of the formwork, reinforcement installation, exposed concrete finishes, under floor services, pour sequence and related issues.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.
.2 Place in appropriate on-site bins in accordance with Waste Management Plan.
.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.
.4 Place materials defined as hazardous or toxic waste in designated containers.
.5 Ensure emptied containers are sealed and stored safely for disposal.

.6 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOC's.

2 Products

2.1 MATERIALS

.1 Formwork materials:
  .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121.

.2 Tubular column forms: round, spirally wound laminated fiber forms, smooth, non patterned PVC internally treated with release material. Spiral pattern to show in hardened concrete.

.3 Form ties:
  .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.

.4 Form release agent: non-toxic.

.5 Form release agent: chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete from sticking to forms.

.6 Falsework materials: to CSA-S269.1.

.7 Sealant: to Section 07 92 00 - Joint Sealing.

.8 Allow for sleeves through the foundation as follows. Locations to be as directed on site.
  .1 1-150mm diameter sleeve;
  .2 1-250mm diameter sleeves;
  .3 3-300mm diameter sleeves;
  .4 1-400mm diameter sleeves;

3 Execution

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centers before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Obtain Consultant's approval for framing openings not indicated on drawings.

.3 Hand trim sides and bottoms of excavation and remove loose earth from earth forms before placing concrete.

.4 Fabricate and erect falsework in accordance with CSA S269.1.

.5 Refer to architectural drawings for concrete members requiring architectural exposed finishes.

.6 Do not place shores and mud sills on frozen ground.

.7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1.

.8 Align form joints and make watertight. Keep form joints to minimum.

.9 Locate horizontal form joints for exposed columns 2400 mm above finished floor elevation.

.10 Use 25 mm chamfer strips on external corners and square at interior corners, joints, unless specified otherwise.

.11 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.12 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces

designated to receive applied finishes, including painting.

.13 Clean formwork in accordance with CAN/CSA-A23.1, before placing concrete.

3.2 REMOVAL

.1 Leave formwork in place for following minimum periods of time after placing concrete.

.1 72 hours for walls and sides of beams.

.2 72 hours for columns.

.3 28 days for beam soffits, slabs, decks and other structural members, or 7 days when replaced immediately with adequate shoring to standard specified for falsework.

.4 72 hours for footings and abutments.

.2 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 10 00 - Concrete Forming and Accessories.

.2 Section 03 30 00 - Cast-in-Place Concrete.

1.2 REFERENCES

.1 American Concrete Institute (ACI)

.1 ACI 315R-2018, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

.2 American National Standards Institute/American Concrete Institute (ANSI/ACI)

.1 ANSI/ACI 315-99, Details and Detailing of Concrete Reinforcement.

.3 American Society for Testing and Materials (ASTM)

.1 ASTM A775 / A775M-91c, Specification for Epoxy-Coated Reinforcing Steel Bars.

.4 Canadian Standards Association (CSA)

.1 CAN/CSA-A23.1-14, Concrete Materials and Methods of Concrete Construction.

.2 CAN3-A23.3-14, Design of Concrete Structures for Buildings.

.3 CSA G30.3-M1983 (R1998), Cold Drawn Steel Wire for Concrete Reinforcement.

.4 CSA G30.5-M1983 (R1998), Welded Steel Wire Fabric for Concrete Reinforcement.

.5 CSA G30.14-M1983 (R1998), Deformed Steel Wire for Concrete Reinforcement.

.6 CSA G30.15-M1983 (R1998), Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

.7 CAN/CSA-G30.18-09 (R2014), Billet-Steel Bars for Concrete Reinforcement.

.8 CAN/CSA-G40.21-13, Structural Quality Steels.

.9 CAN/CSA-G164-2018, Hot Dip Galvanizing of Irregularly Shaped Articles.

.10 CSA W186-M1990 (R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Consultant with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to commencing reinforcing work.

.2 Upon request inform Consultant of proposed source of material to be supplied.

1.4 SHOP DRAWINGS

.1 Submit shop drawings including placing of reinforcement in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Consultant, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacings and locations of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada, ANSI/ACI 315 and ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

.3 Detail lap lengths and bar development lengths to CAN3-A23.3, unless otherwise

indicated. Provide type A tension lap splices where indicated.

.4 Each shop drawing submitted shall bear stamp and signature of qualified professional engineer registered or licensed to practice in the Province of Prince Edward Island, Canada.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MATERIALS

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

.2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.

.3 Cold-drawn annealed steel wire ties: to CSA G30.3.

.4 Welded steel wire fabric: to CSA G30.5. Provide in flat sheets only.

.1 All 152 x 152 MW x 18.7 x 18.7

.5 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.

.6 Mechanical splices: subject to approval of Consultant.

.7 Steel Fiber: DRAMIX 3D 55 / 60 to Manufacturers recommendations.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, ANSI/ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada. ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures unless indicated otherwise.

.2 Obtain Consultant's approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Consultant, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

3 Execution

3.1 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Consultant.

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 Replace bars which develop cracks or splits.

3.2 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CAN/CSA-A23.1.

.2 Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.

.3 Prior to placing concrete, obtain Consultant's approval of reinforcing material and placement.

.4 Ensure cover to reinforcement is maintained during concrete pour.

.5 Protect epoxy coated portions of bars with covering during transportation and handling.

.6 Provide concrete half-bricks to support welded wire mesh in proper position in floor slabs during placing of concrete.

.7 Provide 20mm dowels into thickened concrete slabs at 1200mm on center or as noted on drawings for all masonry load bearing walls.

3.3 FIELD TOUCH-UP

.1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

END OF SECTION

1 General

1.1 DESCRIPTION OF WORK

.1 The work of this Section comprises the furnishings of all equipment, labor and materials necessary for the provision of all concrete for the work of this project, which includes but is not necessarily limited to, the following:

.1 All concrete work required for the building which includes, but is NOT necessarily limited to:

.1 Floor slabs on grade.

.2 All concrete work including housekeeping pads and reinforcement, both inside and outside of building, required for the work of Mechanical and Electrical Division. This work will be the financial responsibility of, and carried out by the General Contractor under the direction of the Mechanical and Electrical Division Subcontractors, respectively.

1.2 RELATED REQUIREMENTS

.1 Section 03 10 00 - Concrete Forming and Accessories.

.2 Section 03 20 00 - Concrete Reinforcing.

.3 Section 03 35 00 - Concrete Finishing.

.4 Section 04 05 00 - Common Work Results for Masonry.

.5 Section 05 50 00 - Metal Fabrications.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C109/C109M-16, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50-mm Cube Specimens).

.2 ASTM C260-10a (2016), Specification for Air-Entraining Admixtures for Concrete.

.3 ASTM C309-11, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.4 ASTM C332-17, Specification for Lightweight Aggregates for Insulating Concrete.

.5 ASTM C494-17, Specification for Chemical Admixtures for Concrete.

.6 ASTM C827-16, Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.

.7 ASTM C939-16a, Test Method for Flow of Grout for Preplaced-Aggregate Concrete.

.8 ASTM D1751-04 (2013), Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).

.9 ASTM D1752-04a (2013), Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86, Vapor Barrier, Polyethylene Sheet for Use in Building Construction.

.3 Canadian Standards Association (CSA)

.1 CAN/CSA-A3000-18, Cementitious Materials Compendium.

.2 CAN/CSA-A23.1-14, Concrete Materials and Methods of Concrete Construction.

.3 CAN/CSA-A23.2-14, Methods of Test for Concrete.

1.4 CERTIFICATES

.1 Submit certificates in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1.

.3 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1.

1.5 TESTING AND INSPECTION

.1 Testing and inspection of concrete and concrete materials will be carried out by testing laboratory engaged and paid by the Contractor in accordance with Section 01 29 83 - Payment Procedures: Testing Laboratory Services. Frequency of tests will be determined by the testing laboratory.

.2 Remove defective concrete and embedded debris and repair as directed by Consultant.

1.6 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Pre-Pour Meeting

- .1 Convene a pre-pour meeting 2 weeks prior to beginning concrete works.
- .2 Ensure concrete forming, finishing and concrete supplier personnel, attend.
- .3 Verify project requirements.
- .4 Review all aspects of the work including construction sequence, access to work by other Trade Contractors, Quality of falsework for trueness to dimensions, quality of finish expected at exposed concrete and all other aspects of the work.

.3 Submit to Consultant, minimum 4 weeks prior to starting concrete work, valid and recognized certificate from plant delivering concrete.

.4 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures for review by Consultant on following items:

- .1 Falsework erection.
- .2 Hot weather concrete.
- .3 Cold weather concrete.
- .4 Curing.
- .5 Finishes.
- .6 Formwork removal.
- .7 Joints.

1.7 ENVIRONMENTAL CONDITIONS

.1 Provide all protection during concrete placing and curing in hot and in cold weather, and to CAN/CSA-A23.1, Clause 21.

.2 Prior to placing, ensure that all needed material and equipment is on hand, and obtain the Consultant's approval for particular methods to be used.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

.4 Use excess concrete for: additional paving, post footing anchorage, swale rip-rap reinforcing, mud slab, flowable fill, retaining wall footing ballast, storm structure covers, underground utility pipe kickers, storm pipe flared end section, toe wash protection, shoulder and toe outfall restraints for temporary erosion pipes.

.5 Use trigger operated spray nozzles for water hoses.

.6 Designate a cleaning area for tools to limit water use and runoff.

.7 Carefully coordinate the specified concrete work with weather conditions.

.8 Ensure emptied containers are sealed and stored safely for disposal.

.9 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, noncombustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.

.10 Choose least harmful, appropriate cleaning method which will perform adequately.

2 Products

2.1 MATERIALS

.1 Portland cement: to CAN/CSA-A5.

.2 Blended hydraulic cement: to CSA A362-98.

.3 Supplementary cementing materials: to CAN/CSA-A23.5.

.4 Cementitious hydraulic slag: to CAN/CSA-A363.

.5 Water: to CAN/CSA-A23.1.

.6 Aggregates: to CAN/CSA-A23.1. Coarse aggregates to be normal density.

.7 Air entraining admixture: to CSA CAN3 - A 266.1

.8 Chemical admixtures: to CSA CAN3 - A 266.2 Consultant to approve accelerating or set retarding admixtures during cold and hot weather placing.

.9 Shrinkage compensating grout: premixed compound consisting of metallic aggregate, Portland cement, water reducing and plasticizing agents.

.1 Compressive strength: 50 MPa at 28 days.

.2 Consistency:

.1 Fluid: to ASTM C827. Time of efflux through flow cone (ASTM C939), under 30s.

.2 Flowable: to ASTM C827. Flow table, 5 drops in 3s, (ASTM C109, applicable portion) 125 to 145%.

.3 Plastic: to ASTM C827. Flow table, 5 drops in 3s, (ASTM C109, applicable portions) 100 to 125 %.

.4 Dry pack to manufacturer's requirements.

.3 Net shrinkage at 28 days: maximum nil %.

.10 Curing compound: to CAN/CSA-A23.1 white and to ASTM C309, Type 1-chlorinated rubber. Coordinate with finish floor materials for compatibility.

.11 Premoulded waterstops: bentonite and polyethylene sandwich, minimum 19mm thickness x 25mm wide, water-activated, expanding type forming compression seal.

.1 Acceptable Material:

.1 Parastop.

.2 Volclay Waterstop-RX.

.3 Hydrotite.

.12 Ribbed waterstops: extruded PVC, 150mm long, flanges tapered 6.3mm to 9.5mm at center bulb with pre-welded corners and intersecting pieces to following properties:

.1 Tensile strength: to ASTM D412, Die C method, minimum 11.4MPa.

.2 Elongation: to ASTM D412, Die C method, minimum 275%.

.3 Tear resistance: to ASTM D624, Die B method minimum 48 kN/m.

.4 Acceptable Material:

.1 W.R. Meadows Sealtight No. 6380.

.2 CPD No. 5.

.13 Labyrinth waterstops: extruded PVC Arctic Grade of sizes indicated with prewelded corner and intersecting pieces.

.1 Tensile strength: to ASTM D412, method A, Die "C".
.2 Elongation: to ASTM D412, method A, Die "C", minimum 250%.
.3 Tear resistance: to ASTM D624, method A, Die "B", minimum 30 kN/m.

.14 Premoulded joint fillers:
.1 Bituminous impregnated fiber board: to ASTM D1751.

.15 Weep hole tubes: galvanized steel or plastic.

.16 Dampproofing:
.1 Refer to Section 07 11 13 - Bituminous Dampproofing.

.17 Polyethylene film: 10 mil thickness to CAN/CGSB-51.34.

.18 Joint Sealer: chemical curing, multi-component, Class B, Type I for horizontal joints, Type II for vertical joints to CAN/CGSB 19.24.

.19 The use of super plastizer for the structural slab and retaining wall is acceptable provided it meets the requirements of CAN/CSA-A23.1.

2.2 MIXES

.1 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative 1 to give following properties:

.1 Concrete foundation walls and footings, except where specified otherwise:
.1 Cement: use Type 10 Portland cement.
.2 Minimum compressive strength at 28 days: 25 MPa.
.3 Class of exposure: F-2.
.4 Nominal size of coarse aggregate: 20mm.
.5 Slump at point and time of discharge: 80mm +/- 20.
.6 Air content: 4 to 7%

.2 Concrete floor slabs generally:
.1 Cement: use Type 10 Portland cement.
.2 Minimum compressive strength at 28 days: 25 MPa.
.3 Class of exposure: N.
.4 Nominal size of coarse aggregate: 20mm.
.5 Slump at point and time of discharge: 80mm +/- 20

.3 Concrete floor slabs - Suspended Floor and Columns:
.1 Cement: use Type 10 Portland cement.
.2 Minimum compressive strength at 28 days: 30 MPa.
.3 Class of exposure: N.
.4 Nominal size of coarse aggregate: 20mm.
.5 Slump at point and time of discharge: Mass Concrete 40mm ±20 & Structural Concrete 80mm +/- 20.
.6 Air content: 0%.

.4 Concrete exterior retaining walls & ramps - structurally reinforced:
.1 Cement: use Type 10 Portland cement.
.2 Minimum compressive strength at 28 days: 35 MPa.
.3 Class of exposure: C-1.
.4 Nominal size of coarse aggregate: 20mm.
.5 Slump at point and time of discharge: Mass Concrete 40mm ±20 & Structural Concrete 80mm +/- 20.
.6 Air content: to Table 10.

.5 Exterior Concrete Slabs and Sidewalks:
.1 Cement: use Type 10 Portland cement.
.2 Minimum compressive strength at 28 days: 35 MPa.
.3 Class of exposure: C-2.

.4 Nominal size of course aggregate: 20 mm.
.5 Slump at point and time of discharge: 80 mm +/- 20.
.6 Air content: to Table 10.

.2 Topping at Service Bay Floor: 25mm thick Mastertop Anvil - Top 300.

.3 If requested by Consultant, provide certification that plant, equipment, and all materials to be used in concrete comply with the requirements of CAN/CSA-A23.1.

.4 Use of calcium chloride not permitted.

2.3 ADMIXTURES

.1 Admixtures will be permitted only to correct deficiency in mixture or to make correct placement requirements as recommended by Testing Laboratory and approved by Consultant.

.2 Use of accelerating admixtures, if approved by Consultant, will not relax cold weather placement requirements of CAN/CSA-A23.1. Use of calcium chloride not permitted.

2.4 POWDER PIGMENTS

.1 Color selected from manufacturers standard range by Consultant.

.2 Acceptable Material:

.1 Davis Colors powder pigments. www.daviscolors.com.

.2 MasterTop 100 with MasterKure HD 200 WB.

3 Execution

3.1 PREPARATION

.1 Obtain Consultant's approval before placing concrete. Provide 24 hours notice prior to placing of concrete.

.2 Pumping of concrete will be permitted. Place concrete in accordance with CAN/CSA-A23.1 to meet all requirements of mix design at point of placement.

.3 Ensure reinforcement and inserts are not disturbed during concrete placement.

.4 Prior to placing of concrete obtain Consultant's approval of proposed method for protection of concrete during placing and curing in adverse weather.

.5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.6 In locations where new concrete is doweled to existing work, drill holes in existing concrete. Place steel dowels of deformed steel reinforcing bars and pack solidly with shrinkage compensating grout or as noted on drawings to anchor and hold dowels in positions as indicated.

.7 Do not place load upon new concrete until authorized by Consultant.

3.2 CONSTRUCTION

.1 Do cast-in-place concrete work in accordance with CAN/CSA-A23.1.

.2 Sleeves and inserts.

.1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Consultant.

.2 Where approved by Consultant, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Consultant.

.3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Consultant before placing of concrete.

.4 Check locations and sizes of sleeves and openings shown on drawings.

.5 Sleeve, do not core required openings.

.3 Anchor bolts.

.1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.

.4 Drainage holes and weep holes:

.1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forming and Accessories.

.2 If wood forms are used, remove them after concrete has set.

.3 Install weep hole tubes and drains as indicated.

.5 Dowels: In locations where new concrete is doweled to existing concrete drill holes in existing concrete to depths, diameters and spacing indicated and install dowels using natural aggregate grout mixed to flow consistency to suit application, in strict accordance with manufacturer's instructions or as noted on drawings.

.6 Placing Grout: Place shrinkage compensating grout under base plates for structural steel and other equipment, using procedures in accordance with manufacturer's recommendations, which result in 100%, contact over grouted area.

.1 Refer to structural drawings for thickness and edge profile of grout under base plate for structural steel.

.7 Finishing.

.1 Finish concrete to CAN/CSA-A23.1 with final finishing as follows:

.1 Foundation walls: ensure that all form ties etc. are cut back to minimum 15mm below surface and depressions packed with cement mortar. Remove fins and other projections on exterior face to provide smooth surface for installation of membrane waterproofing, damp proofing, insulation or polyethylene slip sheet, as applicable at exterior and insulation on interior.

.2 Refer to Section 03 35 00 for interior & exterior slab finish.

.2 Rub exposed edges of concrete with Carborundum to produce 3mm radiused edges unless otherwise detailed.

.8 Waterstops.

.1 Install waterstops to provide continuous water seal. Do not distort or pierce water stop in such a way as to hamper performance. Do not displace reinforcement when installing waterstops. Use equipment to manufacturer's requirements to field splice waterstops. Tie waterstops rigidly in place.

.2 Use only straight heat sealed butt joints in field. Use factory welded corners and intersections unless otherwise approved by Consultant.

.9 Joint fillers.

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Consultant. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.2 Locate and form isolation joints as indicated. Install joint filler.

.3 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

.10 Under Slab Vapor Barrier.

.1 Install Under slab Vapor Barrier directly under concrete slabs-on-grade inside building.

.2 Lap membrane minimum 150 mm at joints and seal.

.3 Seal punctures in membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.

.11 Polyethylene Slip Sheet/Bond Breaker

.1 Install 10mil polyethylene slip-sheet at exterior face of all foundation walls from top of footing to future finished grade. Provide temporary support until backfilling is completed.

.2 Use 10mil polyethylene sheet as bond breaker between foundation walls and slabs-on-grade and slabs on steel floor decking. Provide temporary support until slabs are placed. Trim flush with top of slab.

3.3 SITE TOLERANCE

.1 Concrete tolerance in accordance with CAN/CSA-A23.1 straight edge method.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 - Cast-in-Place Concrete.

1.2 DESCRIPTION OF WORK

.1 The work of this section comprises the furnishing of all labor, material and equipment necessary for the following, in accordance with the requirements of this Section and as shown on the Drawings.

- .1 Finishing of all interior floor slabs, stair treads and landings and in-fill areas.
- .2 Finishing of exterior slabs at entrances, exits and walkways.
- .3 Supply and application of all curing, sealing, hardening compounds.
- .4 Saw-cutting of all saw-cut control joints.
- .5 Filling of saw-cut control joints at interior concrete floor slabs.
- .6 Sandblasting concrete finishes.

1.3 REFERENCES

.1 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-25.20-95, Surface Sealer for Floors.

.2 Canadian Standards Association (CSA)

- .1 CSA-A23.1-09, Concrete Materials and Methods of Concrete Construction.

1.4 PERFORMANCE REQUIREMENTS

.1 Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.

.2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

1.5 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content.

.3 Include application instructions for concrete floor treatments.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Work area:

- .1 Make the work area water tight protected against rain and detrimental weather conditions.

.2 Temperature:

- .1 Maintain ambient temperature of not less than 10°C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 80% during same period.

.3 Moisture:

- .1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.

.4 Safety:

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

.5 Ventilation:

.1 Contractor will arrange for ventilation system to be operated during installation of concrete floor treatment materials.
.2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
.3 Provide continuous ventilation during and after coating application.

1.7 QUALITY CONTROL

.1 Pre-Pour Meeting
.1 Attend a pre-pour quality control meeting including all relevant sub-trades to review the quality of exposed concrete finishes, hardener/sealer application, saw cuts, prepared sub-base, under floor services, pour sequence and related issues.
.2 Prior to pouring concrete, provide a 750mm high x 450mm x 450mm sample complete with chamfered corners for the purpose of establishing finish quality of exposed concrete columns, walls and ceilings.
.3 The quality of the finished concrete is to be equal or better than the accepted sample.
.4 Where the quality of finished concrete falls short of accepted sample for exposed concrete, the Contractor must pay all associated costs to achieve quality of exposed concrete as provided by approved sample.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.
.2 Place in appropriate on-site bins in accordance with Waste Management Plan.
.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.
.4 Place materials defined as hazardous or toxic waste in designated containers.
.5 Ensure emptied containers are sealed and stored safely for disposal.
.6 Use chemical hardeners that are non-toxic.
.7 Dispose of surplus chemical and finishing materials in accordance with federal, provincial and municipal regulations.
.8 Dispose of waste from stripping of floors in a manner that will not have unfavorable effects on the environment.

2 Products

2.1 CHEMICAL HARDENERS

.1 Type 1 - Sodium silicate.
.2 Water: potable.

2.2 SEALING COMPOUNDS

.1 Surface sealer: to CAN/CGSB-25.20, Type 1 - solvent-based, clear.
.2 Surface sealers may not be manufactured or formulated with aromatic solvents hexavalent chromium and their compounds.

2.3 CURING AND SEALING COMPOUNDS

.1 Curing for plain interior floor slabs: all new interior floors at ground floor level shall be moist cured in accordance with the requirements of CAN/CSA A23.1-00, Par, 21.1.6.1 (a) and/or (b). The use of proprietary curing and sealing compounds not permitted.
.1 Moist cure shall not be achieved with flooding which may cause damage to existing adjacent occupied areas.

.2 Curing and sealing compound for floor slab and housekeeping pad: liquid type, water-based acrylic to ASTM C-309.
  .1 Acceptable Material:
    .1 Meadows "Vocomp 20".
    .2 CPD Acrylic Cure and Seal (Water Based).
    .3 Sternson Florseal WB.
    .4 Master Builders "Master-Kure-100W".
    .5 Pecora DynaTrol II SG.
.3 Cementitious Saw-Cut Control Joint Filler:
  .1 One-component, non-shrink, fast-setting and drying, polymer-modified cementitious mortar, compatible with adhesive for resilient sheet flooring.
  .2 Acceptable Material:
    .1 MAPEI Planipatch.
    .2 Master Builders EMACO R-300.
.4 Flexible Saw-Cut Control Joint Filler:
  .1 Two component, non-priming, self-leveling, chemical curing polyurethane sealant.
  .2 Acceptable Material:
    .1 Tremco "THC-900".
    .2 Sonneborn "SL-2".
    .3 Pecora NR 200.
.5 Use compatible additives, admixtures, curing compounds and hardeners.
.6 Do not sprinkle dry cement or dry cement and sand mixture over concrete surfaces.

2.4 MIXES
.1 Mixing, ratios and application in accordance with manufacturer's instructions.

3 Execution

3.1 EXAMINATION
.1 Verify that slab surfaces are ready to receive work and elevations are as indicated on shop drawings. Refer also to Section 03 10 00 - Concrete Forming and Accessories.

3.2 PREPARATION OF EXISTING SLAB
.1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges unless otherwise indicated.
.2 Saw cut control joints to CSA-A23.1, 24 hours maximum after placing of concrete. Saw cuts not cut straight will be rejected and concrete replaced.
.3 Use strong solvent to remove chlorinated rubber or existing surface coatings.
.4 Use protective clothing during stripping of chlorinated rubber or existing surface coatings.

3.3 APPLICATION
.1 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with Joint Filler.
.2 Apply floor treatment in accordance with Sealer manufacturer's written instructions.
.3 Clean over spray. Clean sealant from adjacent surfaces.
.4 Co-ordinate curing and sealing compounds with floor finishes.

3.4 CONCRETE FINISHES
.1 Finish concrete in accordance with CAN3-A23.1.

.1 Interior floor slabs: Hard, smooth dense, troweled to flat tolerance classification (5mm in 3m).

.2 Finishes:

.1 Exposed concrete is to be smooth, even, joints are to be rubbed to remove joint edges and free from excess air pockets. All as evaluated against the submitted sample.

.2 Do not sprinkle dry cement or dry cement and sand mixture over concrete surfaces.

.3 Saw cut crack control joints to CAN3-A23.1, to match existing locations and to layouts indicated on drawings.

3.5 APPLICATION OF CURING AND SEALING COMPOUNDS

.1 Apply in strict accordance with manufacturer's instructions and at rate recommended by manufacturer to meet moisture-retention requirements of ASTM C309.

.2 Apply to concrete floor slab using appropriate type as specified under PART 2 of this section. Use ONLY curing and sealing compound by same manufacturer as manufacturer of hardener, and recommended by manufacturer as compatible with hardener.

.1 Where applicable apply curing and sealing compound following application of hardener at time recommended by manufacturer.

.2 Coordinate with finish schedule for applied flooring.

3.6 PROTECTION

.1 Protect finished installation in accordance with manufacturer's instructions.

3.7 FILLING OF SAW-CUT CONTROL JOINTS

.1 Clean and prepare saw-cut control joints at interior floor slabs to joint filler manufacturer's requirements.

.2 Install self-leveling sealant at the bottom of all saw-cut control joints in the concrete floor slabs.

.3 Install cementitious joint filler over flexible sealant in all joints. Strike filler flush with surface of concrete slab and leave ready for installation of floor finish.

3.8 APPLICATION OF EXTERIOR SEALING COMPOUNDS

.1 After concrete has cured for thirty (30) days apply sealing compound to all exterior concrete walks, in accordance with manufacturer's recommendations.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 04 05 13 - Masonry Mortaring.
.2 Section 04 05 19 - Masonry Anchorage and Reinforcing.
.3 Section 04 05 23 - Masonry Accessories.
.4 Section 04 22 00 - Concrete Unit Masonry.
.5 Section 05 50 00 - Metal Fabrications.
.6 Section 07 21 13 - Board Insulation.
.7 Section 07 92 00 - Joint Sealants.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).
  .1 CAN/CSA A165 Series-04, Standards on Concrete Masonry Units.
  .2 CAN/CSA A179-04, Mortar and Grout for Unit Masonry.
  .3 CAN/CSA A371-04, Masonry Construction for Buildings.

1.3 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
.2 Product Data.
  .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
.3 Samples.
  .1 Submit:
    .1 Two of each type of masonry unit specified.
    .2 Two of each type of masonry accessory specified.
    .3 One of each type of masonry reinforcement, tie and connector proposed for use.
    .4 A minimum of six for testing purposes if requested.
  .2 Submit samples tested to laboratories employing technicians certified/trained in procedures for testing masonry units.
.4 Manufacturer's Instructions.
  .1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Test Reports.
    .1 Certified test reports showing compliance with specified performance characteristics and physical properties.
    .2 Submit laboratory test reports in accordance Section 01 29 83 - Payment Procedures: Testing Laboratory Services.
    .3 Submit laboratory test reports certifying compliance of masonry units and mortar ingredients with specification requirements.
  .1 Certificates:
    .1 Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
  .2 Mock-ups.
    .1 Construct mock-up panel of exterior masonry wall and exposed interior masonry walls construction 1200 x 1800 mm showing masonry colors and textures, use of reinforcement, ties, through-wall flashing, weep holes, jointing, coursing, mortar and workmanship.

.2 Mock-up will be used:
.1 To judge workmanship, substrate preparation, operation of equipment and material application.
.3 Construct mock-up where directed.
.4 Allow 24 hours for inspection of mock-up by Consultant before proceeding with work.
.5 When accepted by Consultant, mock-up will demonstrate minimum standard for this work. If accepted, mock-up may remain as part of finished work.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
.2 Deliver materials to job site in dry condition.
.3 Storage and Protection.
.1 Keep materials dry until use except where wetting of bricks is specified.
.2 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

1.6 SITE CONDITIONS

.1 Site Environmental Requirements.
.2 Cold weather requirements:
.1 Supplement Clause 5.15.2 of CSA-A371 with following requirements.
.1 Maintain temperature of mortar between 5 degrees C and 20 degrees C until batch is used or becomes stable.
.2 Maintain ambient temperature between 5 degrees C and 20 degrees C and protect site from wind chill.
.3 Hot weather requirements.
.1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
.2 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.

2 Products

2.1 MATERIALS

.1 Masonry materials are specified in Related Sections.

3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, and data sheets.

3.2 PREPARATION

.1 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.

3.3 INSTALLATION

.1 Do masonry work in accordance with 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.

3.4 CONSTRUCTION

.1 Exposed masonry.
  .1 Remove chipped, cracked, and otherwise damaged units, in exposed masonry and replace with undamaged units in accordance with CSA A-165, Clause 82.
.2 Jointing.
  .1 Allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, joints true to line, compressed, uniformly concave joints where concave joints are indicated.
  .2 Allow joints to set just enough to remove excess water, then rake joints uniformly to 6 mm depth and compress with square tool to provide smooth, compressed, raked joints of uniform depth where raked joints are indicated.
  .3 Strike flush 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 Exposed joints: Concave.
.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.
  .2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
  .3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
.5 Wetting of bricks.
  .1 Except in cold weather, wet bricks having an initial rate of absorption exceeding 1 g/minute/1000 mm²: 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 20 MPa concrete to Section 03 30 00 - Cast-in-Place Concrete, where concrete fill is used in lieu of solid units.
  .2 Use grout to CSA A179 where grout is used in lieu of solid units.
  .3 Install building paper below voids to be filled with concrete; keep paper 25 mm back from faces of units.
.7 Provision for movement.
  .1 Leave 3 mm space below shelf angles.
  .2 Leave 40 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
  .3 Built masonry to tie in with stabilizers, with provision for vertical movement.
.8 Loose steel lintels.
  .1 Install loose steel lintels. Centre over opening width.
.9 Control joints.
  .1 Construct continuous control joints as indicated.
.10 Expansion joints.

.1 Build-in continuous expansion joints as indicated.

.11 Interface with other work.

.1 Cut openings in existing work as indicated.

.2 Openings in walls: approved by Consultant.

.3 Make good existing work. Use materials to match existing.

3.5 LATERAL SUPPORT

.1 Install all interior masonry lateral support angles supplied under the work of this contract.

3.6 SITE TOLERANCES

.1 Tolerances in notes to Clause 5.3 of CSA-A371 apply.

3.7 FIELD QUALITY CONTROL

.1 Damaged masonry and/or masonry not meeting the quality established by the accepted mock up WILL be removed at Contractor's expense.

3.8 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.9 PROTECTION

.1 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 04 05 00 - Common Work Results for Masonry.

.2 Section 04 22 00 - Concrete Unit Masonry.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CAN/CSA A179-04, Mortar and Grout for Unit Masonry.

1.3 SUBMITTALS

.1 Product Data.

.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's mortar, grout, parging, color additives and admixtures.

.2 Samples.

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit two samples of mortar.

.3 Manufacturer's Instructions.

.1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.1 Submit laboratory test reports in accordance Section 01 29 83 - Payment Procedures: Testing Laboratory Services.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MATERIALS

.1 Use same brands of materials and source of aggregate for entire project.

.2 Mortar and grout: CSA A179.

.3 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.

.4 Color: ground colored natural aggregates or metallic oxide pigments.

.5 Mortar for exterior masonry above grade:

.1 Load bearing: type S based on property specifications.

.2 Non-Load bearing: type N based on property specifications.

.3 Parapet walls, chimneys, unprotected walls: type N based on property specifications.

.4 All other applications: type N

.6 Mortar for foundation walls, manholes, sewers, pavements, walks, patios and other exterior masonry at or below grade: type M based on property specifications.

.7 Mortar for interior masonry.

.1 Load bearing: type N based on property specifications.

.2 Non-Load bearing: type N based on property specifications.

.8 Following applies regardless of mortar types and uses specified above:

.1 Mortar for calcium silicate brick and concrete brick: type O based on Proportion specifications.

.2 Mortar for stonework: type N based on proportion specifications.

.3 Mortar for grouted reinforced masonry: type S based on property specifications.

.9 White mortar: use white Portland cement, and lime to produce mortar type specified.

.10 Colored mortar: use coloring admixture not exceeding 10% of cement content by mass, or integrally colored masonry cement, to produce colored mortar to match approved sample.

.11 Non-Staining mortar: use non-staining masonry cement for cementitious portion of specified mortar type.

.12 Grout: to CSA A179, Table 3, minimum 25MPa.

2.2 MIXES

.1 Color and mix grout to semi-fluid consistency.

.2 Colored mortars: incorporate color into mixes in accordance with manufacturer's instructions.

.1 Use clean mixer for colored mortar.

3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, and data sheets.

3.2 CONSTRUCTION

.1 Do masonry mortar and grout work in accordance with CSA A179 except where specified otherwise.

.2 Grout the following masonry components:

.1 All cores of block for full height of vertical reinforcement.

.2 All cores of block for full height of dowels.

.3 All lintel blocks and continuous bond beams.

.4 All cores in which both horizontal and vertical anchor bolts and similar devices are embedded.

.5 Top two courses of block at locations where concrete block forms back up for exterior walls.

.6 Reinforce and fully grout every core of block walls, as well as door frames, as detailed.

.7 Top two courses where block walls terminate below structure and carry up as steel stud partition.

.8 All cores at block courses supporting stair landing bearing end/supports.

.9 All other locations where vertical reinforcing or grout is indicated on drawings.

3.3 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 04 05 00 - Common Work Results for Masonry.

.2 Section 04 05 13 - Masonry Mortaring.

.3 Section 04 22 00 - Concrete Unit Masonry.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

- .1 CAN/CSA A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/ Methods of Test for Concrete.
- .2 CAN/CSA A370-04, Connectors for Masonry.
- .3 CAN/CSA A371-04, Masonry Construction for Buildings.
- .4 CSA G30.14-M1983(R1998), Deformed Steel Wire For Concrete Reinforcement.
- .5 CSA G30.18-09, Carbon 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.
- .8 CAN/CSA A179-04, Mortar and Grout For Unit Masonry.

1.3 SUBMITTALS

.1 Product Data:

- .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's for epoxy coatings and galvanized protective coatings and touch-up products.

.2 Shop Drawings:

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings consist of bar bending details, lists and placing drawings.
- .3 On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.

.3 Manufacturer's Instructions:

- .1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Pre-Installation Meetings: attend pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MATERIALS

.1 Use 2-rod continuous ladder type reinforcement with adjustable hook type box ties with

side rods minimum 4.76mm and box tie rods minimum 4.76mm at all masonry cavity walls.

.2 Reinforcement sized to suit wall thickness and width of cavity.

.3 Finish, hot-dipped galvanized to ATM A153, Class B2, 457 g/m².

.4 Connectors and wire reinforcement to CSA-A370 and as follows:

.1 Use truss type reinforcement sized to suit wall thickness at all single wythe masonry walls. Finish, hot-dipped galvanized to ASTM A153 Class B2, 457 g/m².

.2 Load bearing walls: use reinforcement with two 4.76mm side rods and 4.76mm cross rods.

.3 Non-load bearing walls: use reinforcement with two 3.66mm side rods and 3.66mm cross rods.

.4 Acceptable Material:

.1 Blok-Lok adjustable Econo-Cavity Lok II, BL 30.

.2 Dur-O-Wall, adjustable DA 310 Truss.

.3 Wire Bond, 2 wire Series 200.

.4 Wire Bond, 2 wire Series 300.

.5 Use adjustable, triangular galvanized steel ties with clip type anchors with 4.76mm x length required galvanized steel ties, for securing all new masonry where ends of new masonry walls abut concrete walls.

.1 Acceptable Material:

.1 Blok-Lok, Type "C".

.2 Dur-O-Wall DA801.

.3 Wire Bond Type 1, 1000 and 1100 R tie.

.6 Use flexible rectangular ties with flat/hump plate anchors between structural steel and masonry, with 4.76 mm galvanized tie, overall length 300 mm, width of tie sized to suite wall.

.1 Acceptable Material:

.1 Blok-Lok, Adjustable Flex O Lock - Type "C" w/BLT 9.

.2 Dur-O-Wall D/A 210 w/triangle ties 700.

.7 Anchorage to existing concrete or concrete block:

.1 Acceptable Material:

.1 Blok-Lok BL-5407

.8 Bar type reinforcement:

.1 To CSA-A371 and CAN/CSA G30.18, Grade 400, deformed bars.

.9 Bolts and anchors:

.1 To CSA-A370.

.10 Corrosion protection:

.1 To CSA-S304 and as specified for horizontal reinforcing in interior walls.

2.2 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 CSA-A370.

.3 Obtain Consultant's approval for locations of reinforcement splices other than shown on placing drawings.

.4 Upon approval of Consultant, weld reinforcement in accordance with CSA W186.

.5 Ship reinforcement and connectors, clearly identified in accordance with drawings.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Consultant with 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.

3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 GENERAL

.1 Supply and install masonry connectors and reinforcement in accordance with CSA-A370, CSA-A371, CAN/CSA-A23.1 and CSA-S304.1 unless indicated otherwise.

.2 Prior to placing concrete, obtain Consultant's approval of placement of reinforcement and connectors.

.3 Supply and install additional reinforcement to masonry as indicated.

3.3 BONDING AND TYING

.1 Bond walls of two or more wythes using metal connectors in accordance with CSA-S304, CSA-A371 and as indicated.

.2 Tie masonry veneer to backing in accordance with NBC, CSA-S304.1, CSA-A371 and as indicated.

.3 Bond masonry cavity walls using metal ties spaced at 400mm o.c. vertically and in accordance with CSA-A370.

.4 Tie ends of all new concrete unit masonry walls with adjustable triangular ties spaced at 400mm o.c. vertically, anchored securely to existing wall.

.5 Tie masonry to steel columns using connectors.

.1 Attach ties to continuous hump-type anchor straps welded to structural steel at 400 mm spacing.

.2 Embed ties solidly in mortar to develop maximum resistance to design forces.

.6 Interconnect concrete block at column enclosures and elsewhere as indicated using flat plate anchors.

3.4 HORIZONTAL REINFORCING

.1 Install truss type reinforcing as follows:

.1 Interior walls:

.1 Load-bearing walls: at vertical intervals of 400mm.

.2 Non-load bearing walls: at vertical intervals of 400mm.

.2 In addition:

.1 Install reinforcing in the first and second courses immediately above and below all wall openings and at the top course immediately below roof and floor levels.

.2 Reinforcement in the second bed joint above or below openings shall extend 600mm beyond the jambs.

.3 All other reinforcement shall be continuous except that it shall not pass through vertical masonry control joints.

.4 Lap side rods minimum 150 mm at splices.

.5 Use prefabricated corner and tee sections to form continuous reinforcement around corners and for anchoring abutting walls and partitions.

.6 Material in corner and tee sections shall correspond to the type and design of reinforcement used.

3.5 VERTICAL REINFORCING

.1 For load bearing masonry walls, install vertical No. 20 rebar reinforcement in cavities of hollow concrete masonry at 600 mm spacing.

.2 Fill cores solid with grout to requirement of Section 04 05 13 - Masonry Mortar and Grout.

3.6 REINFORCED LINTELS AND BOND BEAMS

.1 Reinforce masonry lintels and bond beams as indicated.

.2 Make joints in lintels/bond beams to match adjacent walls.

.1 Includes bond beams at stair landings.

.2 Place and grout reinforcement in accordance with CSA-S304.1, CSA-A371, and CSA-A179. Use concrete of 20 MPa strength.

.1 Provide 200mm deep masonry bond beams at all floor and roof levels filled solid with grout reinforced with two 25M rebar.

.3 Provide 200mm deep masonry bond beam at all floors and roof levels filled solid with grout reinforced with two 20M rebar.

.4 Provide one 20M vertical rebar each side of all openings in masonry walls. Extend rebar minimum 800mm beyond opening.

3.7 GROUTING

.1 Grout masonry in accordance with CSA-S304.1, CSA-A371 and CSA-A179 and as indicated.

3.8 ANCHORS

.1 Supply and install metal anchors as indicated.

3.9 LATERAL SUPPORT AND ANCHORAGE

.1 Supply and install lateral support and anchorage in accordance with CSA-S304.1 and as indicated.

3.10 MOVEMENT JOINTS

.1 Reinforcement will not be continuous across movement joints unless otherwise indicated.

3.11 FIELD BENDING

.1 Do not field bend reinforcement and connectors except where indicated or authorized by 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.

3.12 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.

3.13 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 04 05 00 - Common Work Results For Masonry.

.2 Section 04 22 00 - Concrete Unit Masonry.

.3 Section 07 27 00 - Air Barriers.

1.2 SYSTEM DESCRIPTION

.1 System Description: Use the trapezoidal shaped Mortar Net with Insect Barrier technology adhered to the face of the Mortar Net.

1.3 SUBMITTALS

.1 General:

.1 Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

.2 Product Data:

.1 Submit product data, including manufacturer's product sheet, for specified products.

.3 Samples:

.1 Submit selection and verification samples.

.4 Quality Assurance Submittals: Submit the following:

.1 Certifications: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria.

.2 Manufacturer's Instructions: Manufacturer's Installation Instructions.

1.4 QUALITY ASSURANCE

.1 Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

1.5 DELIVERY, STORAGE AND HANDLING

.1 General: Comply with Division 1 Product Requirements Sections.

.2 Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid constructions delays.

.3 Packing, Shipping, Handling and Unloading:

.4 Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.5 Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1.6 SEQUENCING

.1 General: Install trapezoidal shaped Mortar Net with Insect Barrier product after flashing has been installed, the first 1 or 2 courses of brick have been laid, and weep holes have been created. Install product before third or higher courses of brick have been laid.

1.7 WARRANTY

.1 Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

.2 Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.
.2 Place in appropriate on-site bins in accordance with Waste Management Plan.
.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MATERIALS

.1 Control joint filler:
  .1 Brick masonry: purpose-made closed cell neoprene to ASTM D1056, Class RE41.
  .2 Acceptable Material:
    .1 Dur-O-Wall "Rapid Expansion Joint" - DA 2015
.2 Masonry flashing:
  .1 Minimum 40 mil thick specially compounded, plasticized polyvinyl chloride permanently bonded to 10 x 10 woven glass fiber mesh.
  .2 Acceptable Material::
    .1 Lexsuco FR-40.
  .3 At walls with air/vapor barrier membrane use through-wall flashing supplied by air vapor barrier manufacturer specifically for this purpose.
.3 Nailing Inserts:
  .1 0.6mm thick purpose made galvanized steel inserts for setting in mortar joints.
.4 Cavity Wall Drainage System:
  .1 The Mortar Net accessory.
    .1 Trapezoidal shaped Mortar Net/Insect Barrier MN 10-1: 254 mm high x 25.4 mm thick material.
    .2 Trapezoidal shaped Mortar Net/Insect Barrier MN 10-0.4: 254 mm high x 10.2 mm thick material.
    .3 Trapezoidal shaped Mortar Net/Insect Barrier MN 10-2: 254 mm high x 51 mm thick material.
  .2 Materials: Manufacturer's standard trapezoidal shaped Mortar Net material with Insect Barrier for specified product.
    .1 All dimensions are nominal. Measurements are inclusive of the continuous bottom strip and the trapezoidal shape.
    .2 Continuous bottom strip on all sizes of material is 76.2 mm high, regardless of material thickness or overall material height.
    .3 10.2 mm and 25.4 mm thick material is partial recycled nylon, and 51 mm thick material is partial recycled polyester.
    .4 Product is a 90% open weave mesh in a trapezoidal configuration connected by a continuous bottom strip.
    .5 The insect barrier fabric is made of nylon and polyester woven material and is attached to the face of the trapezoidal Mortar Net material.
  .3 Source Quality: Obtain the trapezoidal shaped Mortar Net materials with Insect Barrier from a single manufacturer.
  .4 Acceptable Materials:
    .1 Mortar Net USA, Ltd.

3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.2 EXAMINATION

.1 Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

- .1 Match product size to cavity size.
- .2 Cavity should be no more than 6.4 mm wider than 25.4 mm thick material and 51 mm thick material, and 10.2 mm thick material should touch both the outer wythe and the inner wall.
- .3 For cavities larger than 51 mm, place rigid insulation of sufficient height to extend at least 152 mm above the top of the Mortar Net® with Insect Barrier against the outside of the inner wythe and of appropriate thickness to reduce the cavity to the appropriate size or add additional layers of Mortar Net to fill width of cavity.
- .4 Inspect for and repair holes in flashing immediately prior to installing Mortar Net with Insect Barrier.

3.3 PREPARATION

.1 Preparation:

- .1 Clean flashing and weep holes so they are free of mortar droppings and debris immediately prior to installing Mortar Net with Insect Barrier.
- .2 Washing flashing with water or chemicals prior to installation is not necessary.
- .3 Mortar Net with Insect Barrier should fit snugly in cavity, so if cavity is greater than 51 mm wide, either use several thicknesses of the Mortar Net with Insect Barrier or use appropriately sized Styrofoam board not less than 406 mm high as a spacer to fill excess space.
- .4 Place spacer against the outside of the interior wall so the Mortar Net with Insect Barrier is against the inside of the exterior wythe or apply additional rows of Mortar Net with Insect Barrier to fill width of cavity.
- .5 If no spacer is used, flashing should extend not less than 152 mm above the top of the Mortar Net with Insect Barrier to avoid the possibility of mortar bridging between the exterior wythe and interior wall.
- .6 Adhesives, fasteners, specials skills or tools are not required.

3.4 INSTALLATION

.1 Mortar Net with Insect Barrier Installation:

- .1 Install one continuous row of trapezoidal shaped Mortar Net with Insect Barrier at base of wall and over all wall openings directly on flashing.
- .2 To prevent mortar bridging between the outer wythe and inner wall, install flashing extending from the bottom of the Mortar Net with Insect Barrier to at least 152 mm above the top of the Mortar Net with Insect Barrier.
- .3 Multiple thicknesses of The Mortar Net with Insect Barrier may be installed to match cavity widths and if excessive droppings are expected.
- .4 Inspection, preparation and installation procedure for multiple thicknesses is the same as for single thickness.
- .5 When installing multiple thicknesses, align the trapezoidal shaped sections with each other.
- .6 To match cavity width to product thickness without using multiple thicknesses of the Mortar Net with Insect Barrier, place rigid insulation of appropriate thickness

against outside face of inner wall.

.7 Lay the first 1 or 2 courses of brick at flashing level, then install Mortar Net with Insect Barrier continuously by placing it against the inside of the openings. Install Mortar Net with Insect Barrier with fabric facing to the exterior of the wall.

.8 No fasteners or adhesives are required, and mortar need not have set.

.9 The Mortar Net with Insect Barrier shall not come in contact with wall ties standard wall tile installations, but if it does, it may be cut or torn to accommodate wall ties, conduit, plumbing or other materials that bridge or intrude into cavity between inner and outer walls.

.10 Compress the Mortar Net with Insect Barrier horizontally so it can be forced into cavities slightly smaller than its nominal thickness without affecting Mortar Net with Insect Barrier or wall performance.

.11 When forcing the Mortar Net with Insect Barrier into a cavity, be sure mortar has set sufficiently to resist outward pressure from product.

3.5 PROTECTION

.1 Protection: Protect installed product from damage during construction.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 04 05 00 - Common Work Results for Masonry.
.2 Section 04 05 13 - Masonry Mortaring.
.3 Section 04 05 19 - Masonry Anchorage and Reinforcing.
.4 Section 04 05 23 - Masonry Accessories.
.5 Section 07 21 13 - Board Insulation.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
  .1 CAN/CSA A165 SERIES-04, CSA Standards on Concrete Masonry Units.

1.3 QUALITY ASSURANCE

.1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
.2 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.
.3 Units having a required fire resistance rating shall be identified by the manufacturer by marking each pallet or cube, or by other means.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.
.2 Place in appropriate on-site bins in accordance with Waste Management Plan.
.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MATERIALS

.1 Standard hollow concrete masonry units to CSA-A165.
  .1 Classification: H/15/A/M
  .2 Size: modular
  .3 Special shapes: provide as follows:
    .1 Bull-nosed units for all exposed corners.
    .2 Square sash-block units at all control joint locations.
    .3 Purpose-made shapes for lintels and bond beams.
    .4 Solid units at wall caps where wall terminates below ceiling.
    .5 Additional shapes as indicated.
  .4 Acceptable Materials:
    .1 E.J. Casey Concrete Limited
    .2 L.E. Shaw Limited
    .3 South Shore Ready Mix Limited
    .4 V.J. Rice Concrete Limited
.2 Exterior accent units at window surrounds and within brick panels.
  .1 Classification: H/15/A/M.
  .2 Size 90T x 190H x 390L (cut from 390L units)
  .3 Light reflectance: 20%
  .4 Special shapes: provide jamb and cap units as required to provide glazing on all

exposed surfaces of units adjacent to bull-nosed brick, etc. at window surrounds.

.5 Color selection: one (1) color only. For bidding purposes assume the color indicted under Clause 6 below.

.6 Acceptable Materials:

.1 Spectra-Glaze II - S - 47 - Deep Sierra Red.

.3 Sound absorbing concrete masonry units to CSA-A105.

.1 Size: Modular.

.2 Use in gymnasium.

.1 Standard hollow CMV's from floor level to 20 block courses high.

.2 Sound absorbing blocks from course 21 to course 36, 3 walls.

.3 Block pattern alternating courses 21 to 35 (off number courses), sound block, sound block, standard block, repeat.

.4 Block pattern alternating courses 22 to 36 (even number courses) standard block, standard block, repeat.

.5 Continue pattern from existing gym side walls and match new end wall to existing end wall.

.6 Tooth in new side wall to existing full height.

.7 Standard hollow CMV's from course 37 to course 41.

.3 Acceptable Materials:

.1 E.J. Casey Concrete Limited.

.2 L.E. Shaw Limited.

.3 South Shore Ready Mix Limited

.4 Standard semi-solid concrete masonry units to CAN-A165.1-M85.

.1 Classification: S/20/A/M

.2 Size: Modular.

3 Execution

3.1 INSTALLATION

.1 Concrete block units.

.1 Bond: running.

.2 Coursing height: 200 mm for one block and one joint.

.3 Jointing:

.1 Concave where exposed or where paint or other similar finish coating is specified

.2 Tile or similar applied finish.

.3 Flush at exterior face to receive air/vapor barrier membrane.

.4 Maintain cavity at masonry walls free from mortar droppings.

.2 Concrete block lintels.

.1 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.

.2 End bearing: not less than 200 mm as indicated on drawings.

3.2 QUALITY CONTROL

.1 Notwithstanding visual inspection requirements of CSA Standards, masonry units shall be free of surface indentations, surface cracks due to manufacture, or chipping.

.2 THE REQUIREMENTS OF CLAUSE .1 ABOVE WILL BE STRICTLY ENFORCED AND CONTRACTOR WILL BE REQUIRED TO EITHER REPLACE UNACCEPTABLE UNITS, OR AT THE CONSULTANT'S DISCRETION, DEMOLISH PART OF ALL OF A WALL DEEMED BY THE CONSULTANT, AS NOT MEETING THOSE REQUIREMENTS.

3.3 HEATING PIPING IN CONCRETE UNIT MASONRY WALLS

.1 Where heating piping supply and return lines travel vertically in concrete block walls cores of block to be aligned and/or webs cut, and masonry work coordinated with work of Mechanical Sections to permit installation of heating lines.

3.4 CONCRETE MASONRY LINTELS

.1 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.

.2 End bearing: not less than 200mm.

3.5 GROUTING-IN OF DOOR FRAMES

.1 Fill fire-rated door frames solid with mortar.

3.6 RETAINING WALL

.1 Install retaining wall to the requirements of the manufacturer's printed instructions and as indicated on the drawings.

.2 Crushed stone or gravel base: consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.

.1 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 rather than ASTM E 11.

SIEVE DESIGNATION	% PASSING
19mm	100
12.5mm	70-100
3.3mm	40-3.4
2.00mm	23-50
0.425mm	7-25
0.075mm	3-8

.3 Manufactured sand for bedding: hard, durable, crushed stone particles, conforming to the gradation of concrete sand as specified in CAN/CSA A23.1, Section 5.3.2 Sand shall be free from clay lumps, cementation, organic material, frozen material and other deleterious materials.

.1 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 rather than ASTM E 11.

SIEVE DESIGNATION	% PASSING
10mm	100
5mm	95-100
2.5mm	80-100
1.25mm	50-90
0.630mm	25-60
0.315mm	10-35
0.160mm	2-10

3.7 CLEANING

.1 Standard block: Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block and finally by brushing.

.2 Glazed block: Clean masonry as work progresses using soft, clean cloths, within few minutes after laying. Upon completion, when mortar has set so that it will not be damaged by cleaning, clean with soft sponge or clean cloths, brush, and clean water.

Polish with soft, clean cloths.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 31 00 - Steel Decking.

.2 Section 09 91 00 - Painting.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

- .1 ASTM A36/A36M-08, Specification for Carbon Structural Steel.
- .2 ASTM A325M-00, Specification for High-Strength Bolts for Structural Steel Joints Metric.
- .3 ASTM A490M-09a, Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB 85.10-99, Protective Coatings for Metals.

.3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA).

- .1 CISC/CPMA 1-73b, Quick-Drying, One-Coat Paint for Use on Structural Steel.
- .2 CISC/CPMA 2-75, Quick-Drying, Primer for use on Structural Steel.

.4 Canadian Standards Association (CSA International)

- .1 CSA G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CSA S16-09, Design of Steel Structures.
- .4 CSA S136-07, North American Specification for the Design of Cold Formed Steel Structural Members, Includes Update No. 1 (2009), Update No. 2 (2010).
- .5 CSA-S136.1-07, Commentary on CSA Standard S136.
- .6 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel.
- .7 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
- .8 CSA W55.3-08, Certification of Companies for Resistance Welding of Steel and Aluminum.
- .9 CSA W59-03(R2008), Welded Steel Construction (Metal Arc Welding).

.5 Master Painters Institute

- .1 MPI-INT 5.1-98, Structural Steel and Metal Fabrications.
- .2 MPI-EXT 5.1-98, Structural Steel and Metal Fabrications.

1.3 QUALITY CONTROL

.1 At least 4 weeks prior to fabrication of structural steel, submit eight (8) copies of mill test reports showing chemical and physical properties and other details of steel to be incorporated into work. Such mill test reports shall be certified by qualified metallurgists confirming that tests conform to requirements of CAN/CSA G40.20 and CAN/CSA G40.21.

.2 Minimum four (4) weeks before bolts, nuts and washers are required on site, the Contractor must provide the Consultant with the following:

- .1 Name of manufacturer of bolts, nuts and washers.
- .2 Certificate of Compliance issued by manufacturer stating that nuts, bolts and washers meet the standard(s) required by this specification.

.3 All structural steel and bolts, nuts and washers used on this project to be manufactured and supplied by Canadian Mills.

1.4 DESIGN REQUIREMENTS

.1 Design details and connections in accordance with requirements of CAN/CSA-S16 to resist forces, moments, shears and allow for movements indicated.

.2 Shear connections:

.1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.

.2 If shears are not indicated, select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam.

.3 For connections, submit sketches and design calculations.

1.5 SHOP DRAWINGS

.1 Submit shop drawings including fabrication and erection documents and materials list in accordance with Section 01 33 00 - Submittal Procedures.

.2 Erection drawings: indicate details and information necessary for assembly and erection purposes including:

.1 Description of methods.

.2 Sequence of erection.

.3 Type of equipment used in erection.

.4 Temporary bracings.

.3 Each shop drawing submitted shall bear stamp and signature of qualified professional engineer registered or licensed to practice in the Province of Prince Edward Island, Canada.

.4 The Consultant may provide an electronic set of documents for the Contractor's preparation of shop drawings but for a fee.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

.4 Divert unused metal materials from landfill to metal recycling facility.

.5 Divert unused paint material from landfill to official hazardous material collections site.

2 Products

2.1 MATERIALS

.1 Structural steel: to CAN/CSA-G40.20/G40.21 Grade 350W

.2 HSS Sections: Class C, Grade 350W.

.3 Structural steel cast-in-place anchor bolts: to CAN/CSA-G40.20/G40.21.

.4 Cold-rolled sections: to CSA S136-94 and ASTM A607, Grade 50.

.5 Bolts, nuts and washers: to ASTM A307.

.6 Welding materials: to CSA W48 Series and certified by Canadian Welding Bureau.

.7 Shop paint primer: to CISC/CPMA1.

.8 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 300 g/m².

.9 Anchor bolts: fabricated from material conforming to CSA -G40.21, Grade 300W, with yield strength 300 MPa; nuts and washers to be of equal or greater strength than bolts.

2.2 SHOP PAINTING

.1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16.

.2 Clean members, remove loose mill scale, rust, oil, dirt and other foreign matter. Prepare surface according to SSPC-SP-6.

.3 Apply one coat of primer in shop to steel surfaces, except:

.1 Surfaces to be encased in concrete.

.2 Surfaces and edges to be field welded.

.3 Contact surfaces of friction-type connections.

.4 Below grade surfaces in contact with soil.

.4 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.

.5 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

3 Execution

3.1 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S16.

.2 Welding: in accordance with CSA W59.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

.4 Steel fabrication companies to be Canadian Institute of Steel Construction (CISC) certified.

3.2 CONNECTION TO EXISTING WORK

.1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Consultant for direction before commencing fabrication.

3.3 FABRICATION

.1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with reviewed shop drawings.

.2 Continuously seal members by continuous welds. Grind smooth.

.3 Provide punched holes for 11 to 27mm in diameter for attachment of other work.

.4 Reinforce openings to maintain required design strength.

.5 Fabricate all closure angles at edge of deck and at all openings as indicated on drawings.

.6 Fabricate all masonry lateral support angles to lengths and in quantities required.

3.4 MARKING

.1 Mark materials in accordance with CAN/CSA G40.20/G40.21. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.

.2 Match marking: shop mark bearing assemblies and splices for fit and match.

3.5 ERECTION

.1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with reviewed shop drawings.

.2 Install all miscellaneous steel sections, plates, etc., indicated on the structural drawings.

.3 Field cutting or altering structural members: to approval of Consultant.

.4 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.

.5 Continuously seal members by continuous welds where indicated. Grind smooth.

3.6 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and workmanship if required will be carried out by testing laboratory designated by the Owner and paid for by the Owner except as follows:

.2 At the Contractor's discretion, either one of the following two (2) options may be used to confirm that the bolted connections have been properly torqued.

.1 The use of tension control bolts (TCB) in accordance with CAN/CSA S-16.1.

.2 Engage and pay for the services of a testing laboratory, acceptable to the Consultant, to carry our random torque tests on bolted connections, at locations and in numbers determined by the testing laboratory to be sufficient provide a written report confirming that from their tests, it is their opinion that all bolted connections have been torqued in accordance with the specified requirements.

.3 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Consultant.

.4 Submit test reports to Consultant within 3 weeks of completion of inspection.

3.7 FIELD PAINTING

.1 Touch up damaged surfaces and surfaces without shop coat with primer to SSPC-SP-6 except as specified otherwise. Apply in accordance with CAN/CGSB 85.10.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 12 23 - Structural Steel for Buildings.

.2 Section 05 51 00 - Metal Stairs.

.3 Section 09 91 00 - Painting.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

.1 ASTM A653/A653M-09a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM A792/A792M-09a, Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 Canadian Standards Association (CSA International)

.1 CSA C22.2 No.79-1978(R2008), Cellular Metal and Cellular Concrete Floor Raceways and Fittings.

.2 CSA S16-09, Design of Steel Structures.

.3 CSA S136-94(R2001), Cold Formed Steel Structural Members.

.4 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel.

.5 CSA W55.3-08, Certification of Companies for Resistance Welding of Steel and Aluminum.

.6 CSA W59-03(R2008), Welded Steel Construction, (Metal Arc Welding).

.4 Canadian Sheet Steel Building Institute (CSSBI)

.1 CSSBI 10M-08, Standard for Steel Roof Deck.

.2 CSSBI 12M-08, Standard for Composite Steel Deck.

1.3 DESIGN REQUIREMENTS

.1 Design steel deck using working stress design, in accordance with CSSB1 10M and CSSB1 12M as applicable.

.2 Steel deck and connections to steel framing to carry dead, live and other loads including lateral loads, diaphragm action, composite deck action, and uplift as indicated.

.3 Deflection under specified live load not to exceed 1/240 of span, except that when plaster ceilings are hung directly from deck, live load deflection not to exceed 1/360 of span.

.4 Where vibration effects are to be controlled as indicated, dynamic characteristics of decking system to be designed to be in accordance with CAN/CSA-S16.1, Appendix 'G'.

.5 All steel decking used on this project to be fabricated in Canada, from steel manufactured in Canada by Canadian Mills.

1.4 SHOP DRAWINGS

.1 Submit shop drawings erection and shoring drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Each shop drawing submitted shall bear stamp and signature of qualified professional engineer registered or licensed to practice in the Province of Prince Edward Island, Canada.

.3 Submit design calculations if requested by Consultant.

.4 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories.

.5 Indicate details of temporary shoring of steel deck, such as location, time and duration of placement and removal of shoring for concrete fill decks.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.
.2 Place in appropriate on-site bins in accordance with Waste Management Plan.
.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.
.4 Divert unused metal from landfill to metal recycling facility.
.5 Dispose of unused paint material at official hazardous material collections site.
.6 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
.7 Dispose of unused caulking material at official hazardous material collections site.

2 Products

2.1 MATERIALS

.1 Closures: as approved in accordance with manufacturer's recommendations.
.2 Cover plates, cell closures and flashings: steel sheet with minimum base steel thickness of 0.76 mm. Metallic coating same as deck material.
.3 Primer: zinc rich, ready mix to CAN/CGSB-1.181.
.4 Hilti steel deck fasteners purpose designed for the application or 20mm diameter puddle welds complete with washers.
.5 #10 Tek screws or side lap button punching.
.6 Acoustical Insulation:
.1 Acceptable material: Rockwool, Sound-absorbing trough fillers for perforated steel decks, mineral wool, trapezoidal shapes to suit width and depth of flutes.

2.2 TYPES OF DECKING

.1 Roof deck: single fluted element, with nominal base steel thickness of 0.76 mm (22 ga.) and/or 0.912 mm (20 ga.) with interlocking side laps.
.1 Acceptable Material:
.1 Canam P-3615.
.2 Canadian Metal Rolling Mills S-15.
.2 Floor deck: composite single fluted element, with nominal base steel thickness of 0.76 mm (22 ga.) with interlocking side laps.
.1 Acceptable Material:
.1 Canam P-3615 composite.
.2 Canadian Metal Rolling Mills S-15-K composite.

3 Execution

3.1 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S136 and CSSB1 10M and CSSB1 12M as applicable.
.2 Welding: in accordance with CSA W59 and with CSA W59S1, except where specified otherwise.
.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel and/or CSA W55.3 for resistance welding.
.4 Steel fabrication companies to be Canadian Institute of Steel Construction (CISC)

certified.

3.2 ERECTION

.1 Erect steel deck as indicated and in accordance with CSA S136 and CSSB1-10M and CCSB1-12M as applicable and manufacturer's instructions and in accordance with approved erection drawings.

.2 Fastening uplift resistance to CSA S136.F04, 2.09kN.

.3 Weld decking to steel joists and steel beams strictly in accordance with requirements indicated on drawings.

.4 Where underside of steel decking will be exposed in the final assembly. Exercise care during handling and installation to ensure that exposed face will be free from dents, scratches, excessive weld burns and other unsightly blemishes. Use chalk line to locate joists. Hammer marks or dents alongside of top chords not acceptable.

.5 Butt ends: to 1.5 to 3 mm gap. Install steel cover plates over gaps wider than 3 mm.

.6 Lap ends: to 50 mm minimum.

.7 Weld and test stud shear connectors through steel deck to steel joists/beams below in accordance with CSA W59.

.8 Immediately after deck is permanently secured in place, touch up metallic coated top surface with compatible primer where burned by welding.

.9 Prior to concrete placement, steel deck to be free of soil, debris, standing water, loose mil scale and other foreign matter.

.10 Temporary shoring, if required, to be designed to support construction loads, wet concrete and other construction equipment. Do not remove temporary shoring until concrete attains 75% of its specified 28 day compression strength.

.11 Place and support reinforcing steel as indicated.

.12 Deck to span minimum of 3 joist spans generally.

3.3 CLOSURES

.1 Install closures in accordance with approved details. Refer to 2.1.2.

3.4 OPENINGS AND AREAS OF CONCENTRATED LOADS

.1 No reinforcement required for openings cut in deck which are smaller than 150 mm square.

.2 Frame deck openings with any one dimension between 150 to 300 mm as recommended by manufacturer, except as otherwise indicated.

.3 For deck openings with any one dimension greater than 300 mm and for areas of concentrated load, reinforce in accordance with structural framing details, except as otherwise indicated.

3.5 CONNECTIONS

.1 Install connections in accordance with CSSBI Steel Roof Deck, 10M-86 and Composite Steel Deck. 12M-84 as applicable and in accordance with design requirements for diaphragm action.

END OF SECTION

1 General

1.1 SUMMARY

.1 Work included: Provide metal fabrications including but not limited to following:

- .1 Miscellaneous sections and framing.
- .2 Roof Ladder.
- .3 Miscellaneous mechanical equipment brackets.
- .4 Miscellaneous masonry angles, lintels & brackets.

1.2 RELATED REQUIREMENTS

.1 Following description of work is included for reference only and shall not be presumed to be complete:

- .1 Section 04 05 00 - Common Work Results for Masonry.
- .2 Section 04 05 19 - Masonry Anchorage and Reinforcing.
- .3 Section 05 31 00 - Steel Deck.
- .4 Section 05 51 00 - Metal Stairs.
- .5 Section 06 41 00 - Architectural Wood Casework.
- .6 Section 09 91 00 - Painting.
- .7 Division 10 - Specialties.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

- .1 ASTM A53/A53M-07, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .2 ASTM A269-10, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- .3 ASTM A307-07b, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .4 ASTM A123/A123M-09, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .5 ASTM A153/A153M-09, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- .6 ASTM A325M-07a, Specification for High-Strength Bolts for Structural Steel joints.
- .7 ASTM A653M-09a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .8 ASTM B117-09, Practice for Operating Salt Spray (Fog) Apparatus.
- .9 ASTM E119-09c, Test Methods for Fire Tests of Building Construction and Materials.
- .10 ASTM E736-00 (2006), Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.
- .11 ASTM F436M-10, Specification for Hardened Steel Washers.
- .12 ASTM F738M-02 (2008), Specification for Stainless Steel Metric Bolts, Screws, and Studs.
- .13 ASTM F836M-02, Specification for Style 1 Stainless Steel Metric Nuts.
- .14 ASTM F844-07a, Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB 1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
- .2 CAN/CGSB 1.181-99, Ready Mixed Organic Zinc-Rich Coating

.3 CAN/CGSB 85.10-99, Protective Coatings for Metals

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CAN/CSA S16-09, Design of Steel Structures.

.4 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.

.5 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding).

.6 CSA S136-07 - North American Specification for the Design of Cold Formed Steel Structural Members (Using Appendix B provisions applicable to Canada).

.7 CSA W47.1-09 - Certification of Companies for Fusion Welding of Steel.

.8 CSA W47.2-M1987 (R2008) - Certification of Companies for Fusion Welding of Aluminum.

.9 CSA W48.1-M1991 (R1998) - Carbon Steel Covered Electrodes for Shielded Metal Arc Welding.

.10 CSA W48-06 - Filler Metals and Allied Materials for Metal Arc Welding.

.11 CSA W59-03 (R2008) - Welded Steel Construction (Metal Arc Welding).

.12 CSA W117.2-06 - Safety in Welding, Cutting, and Allied Processes.

.13 SSPC - Steel Structures Painting Council, "Steel Structures Painting Manual, Vol. 2".

1.4 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Drawings and details are diagrammatic and are intended to show design concept, configuration, components and arrangements; they are not intended to identify nor solve completely problems of thermal and structural movements, assembly framing, fixings and anchorages.

.2 Design work to withstand within acceptable deflection limitations, variations from plumb in vertical and horizontal lines, its own weight, forces applied by movements of building structure and attached adjacent components and maximum design loads due to pressure and suction of wind, snow, ice, rain and hail.

.3 Design load bearing structures to NBC requirements and provide miscellaneous steel supports and anchors to suit design. Conform to CAN/CSA-S16.1 and CAN/CSA-S136.

1.5 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's literature, data sheets for each type of material provided under this Section for Project. Data sheets shall provide all required information. Submit 3 copies of detailed instructions for maintaining, preserving and keeping materials in clean and safe conditions and give adequate warning of maintenance practices of materials detrimental to specified materials. Submit manufacturer's installation instructions.

.2 Material Safety Data Sheets:

.1 Submit MSDS for inclusion in Operation and Maintenance Manual without limitations for adhesives, sealants, patching and leveling compound, solid polymer and as designed by Consultant.

.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 In addition to minimum requirements indicated following:
- .1 Large scale details of members, materials and connections.
- .2 Joint details.
- .3 Methods of setting, sealing, securing, anchorage.
- .4 Field connections.

.3 Each shop drawing submitted shall bear stamp and signature of qualified professional engineer registered or licensed to practice in the Province of Prince Edward Island, Canada.

.4 Samples:
- .1 Extruded and formed metals: minimum 300 mm long.
- .2 Metal sheet: minimum 300 mm square and of specified thickness.

1.6 QUALITY ASSURANCE

.1 Test Reports: Submit 6 copies of certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: Submit 6 copies of product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Welding: Provide welding in accordance with CSA W59-m performed by a fabricator and mechanics fully approved by the Canadian Welding Bureau as specified herein.

.4 Structural Design and Inspection:
- .1 Employ a professional structural engineer carrying a minimum $3,000,000.00 professional liability insurance and is registered in the province of Prince Edward Island to:
  - .1 Design components of the work of this Section requiring structural performance.
  - .2 Be responsible for full assemblies and connections
  - .3 Be responsible for determining sizes, joint spacing to allow thermal movement and loading of components in accordance with applicable codes and regulations.
  - .4 Be responsible for production and review of Shop Drawings.
  - .5 Inspect work of this Section during fabrication and erection.
  - .6 Stamp and sign each shop drawing.
  - .7 Provide site administration and inspection of this part of the Work.
- .2 Design following:
  - .1 Stairs including landings and supports.
  - .2 Balustrades, handrails, railings.
- .3 Certification:
  - .1 Submit certification from registered professional structural Engineering registered in province of Prince Edward Island, who shall affix his/her seal and signature to certificate, stating structure is capable of supporting its own weight and specified live loads.
  - .2 Welders employed on this project may be asked by Consultant at any time for their welding certificate.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Coordinate deliveries to comply with construction schedule and arrange ahead for strategic off-the-ground, undercover storage locations. Do not load areas beyond the designed limits.

.2 Handle and store metal materials at job site in such a manner to prevent damage to other materials, (to existing buildings) or property.

.3 Handle components with care, and Provide protection for surfaces against marring or other damage. Ship and store members with cardboard or other resilient spacers between surfaces. Use lifting chokers of material which will not damage surface of steel members.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MATERIALS

.1 Steel sections and plates: New Material Conforming to CAN/CSA-G40.20/G40.21, Grade 300W.

.2 Hollow Structural Sections: New material conforming to CSA G40.20 and CSA G40.21, Grade 350W, Class H.

.3 Steel Pipe: ASTM A53, Type E or S, Grade A or B, Standard weight, Schedule 40.

.4 Stainless Steel:

.1 Provide highest architectural quality in various forms, straight and true. Ensure there are no scratches, scars, creases, buckles, ripples or chatter marks. Provide finished surfaces suitable for polishing where required. Ensure finished surfaces exposed to view are free of pitting, seam marks, roller marks, oil-canning, stains, discolorations or other imperfections.

.2 Stainless Steel Sheet, Strip, Plate, and Flat Bar: ASTM A167 or ASTM A666, Type 304 and Type 316 alloy with exposed surfaces having No. 4 polished finish. Sizes as required to meet design requirements.

.3 Stainless Steel Tubing: ASTM A554, Grade MT 304.

.4 Stainless Steel Exterior Tubing: ASTM A554, Grade MT 316.

.5 Stainless Steel Pipe: ASTM A312M, Grade TP 304.

.6 Stainless Steel Exterior Pipe: ASTM A312M, Grade TP 316.

.7 Castings: ASTM A743M, Grade CF 8 or Grade CF 20. Type 304.

.8 Castings: ASTM A743M, Grade CF 8M. Type 316.

.5 Structural aluminum: to CSA HA series - M, Type 6061-T6, clear anodized.

.6 Welding Materials: Conforming to CSA W48.1-M and CSA W59-M.

.7 High Strength Bolts: Supply bolts, nuts and washers conforming with ASTM A 325M. Supply each type and size of bolt and nut of same manufacture and of same lot.

.1 Bolts: Heavy, hexagon head high strength structural bolts, of standard size, of lengths required for thickness of members joined and for type of connection.

.2 Nuts: Heavy hexagon semi-finished nuts.

.3 Washers: For general use bolt, nut and stud application to provide increased bearing surfaces, spacing and to prevent galling. Flat and smooth hardened washers, quenched and tempered to suit applications and conforms to ASTM F844. Provide AISI Type 304 stainless steel washers at exterior locations.

.4 Hardened Steel Washers: To suit applications and conforms to ASTM F436M.

.5 Stainless Steel Bolts: To suit applications and conforms to ASTM F738M.

.6 Stainless Steel Nuts: To suit applications and conforms to ASTM F836M.

.7 Lock Washers: Helical spring type steel "lock" washers to suit applications and conforms to federal specification FF-W-84. Provide AISI Type 304 stainless steel

lock washers at exterior locations.

.8 Security Fasteners: Button head Torx® Plus R screw tamper resistant # 10, 25 mm long 2 per glass stop minimum stainless steel machine screws.

.8 Common or Ordinary Bolts and Anchor Bolts: Unfinished bolts conforming with ASTM A307, Grade A, with hexagon heads and nuts where exposed in the finish work. Supply common bolts of lengths required to suit thickness of material being joined, but not projecting more than 6 mm beyond nut, without the use of washers. Supply anchor bolts of lengths noted, but projecting not less than 13 mm beyond nut unless otherwise noted.

.9 Galvanized Primer Paint: Zinc rich conforming to CAN/CGSB-1.181 for new galvanized metal.

.10 High Performance Corrosion Protection for Perimeter Steel: 1 component, moisture cured, micaceous iron oxide/zinc filled primer, UL Classified in accordance with UL 263 (ASTM E119), corrosion protection in accordance with ASTM B117, meeting Class B Slip Certification in accordance with American Institute of Steel Construction (AISC) requirements for slip critical bolted connections, tested in accordance with ASTM E736 for its suitability for application of primer over steel to receive sprayed fireproofing "Series394, Perime Prime" by Tnemec Company Incorporated; www.tnemec.com.

.11 Steel Pipe Handrails: Conforming to ASTM A53M, Type "S", Schedule 40, Grade A steel pipe of sizes down.

.12 Galvanized: Hot dipped galvanized with minimum zinc coating of 600 g/m² to CAN/CSA-G164-M.

.13 Galvanized Sheet Steel: Supply 0.91 mm (20 ga) core thickness commercial quality to ASTM A653M, CS Type A, with Z275 zinc coating designation to ASTM A653M.

.14 Perforated Sheet Steel: Commercial flattened sheet steel of thickness indicated, with machine die cut round holes of 3 mm dia. at 5.537 mm oc in 60° staggered pattern and similar to sheet stock manufactured by Greening Donald Co. Ltd., or by Unalloy WRC-a division of Samuel Manu-Tech Inc. or by Gerard Daniel Worldwide.

.15 Expanded Steel Mesh: Flattened, expanded, carbon steel mesh of 10 msg gauge thickness, weighing minimum 112 lbs/100 sq ft, style 1.330" SWD x 3.2000" LWD, 11-1/2" - No. 9 by Gerard Daniel Worldwide, Canadian Division, or Expanded Metal Corporation or Dramex International.

.16 Aluminum Extrusions: ASTM B209M, size accurately formed as shown on Drawings, extruded aluminum alloy AA-6063-T5 or T6 for aluminum. Ensure surfaces are free from defects impairing appearance, strength and durability.

.17 Aluminum Sheet: ASTM B221M, Minimum thickness 3 mm of type and characteristics to match finished extrusions; sheet which is not exposed shall be Utility Aluminum mill finished; for intricate forming with decorative finishes use AA 1100 and for siding and exposed panels use AA-3003 with specified finish.

.18 Handrail Wall Brackets: In accordance with OBC requirements and to meet design requirements indicated on Drawings.

.19 Grout:

.1 Cementitious, non shrinking, non expanding grout: 'Sika Grout 212' by Sika Canada Inc., or 'Non Shrink Structural Grout - Dry Pack Grout' by Euclid Chemical Company or 'Sealtight CG 86 Construction Grout' by W.R. Meadows.

.2 Epoxy, non-shrinking, non expanding grout: 'Sika Anchor Fix.

.3 Master Flow 100.

.4 Master Emaco ADH 1420.

2.2 FABRICATION

.1 Fabricate each item of work of this Section in accordance with following general requirements:

.1 Members square and straight.

.2 Members plumb and true.
.3 Joints accurately and tightly fitted.
.4 Intersecting members in true, finish planes.
.5 Fasteners concealed.

.2 Fabricate, fit and assemble work in shop where possible. Where shop fabrication is not possible, make trial assembly in shop.

.3 Provide hangers, rods, bars, bolts, anchors, brackets, rivets, bearing plate and bracing, fitting, drilling, stopping, soldering, as required for a complete assembly.

.4 Isolate dissimilar metals to prevent galvanic corrosion.

.5 Weld connections unless otherwise indicated.

.6 Shop Welding:

.1 Execute welding to avoid damage or distortion to work. Should there be, in the opinion of Consultant or Inspection Company, doubts as to adequacy of welds, they shall be tested for efficiency and any work not meeting Standards be removed and replaced with new work satisfactory to Consultant. Carry out welding in accordance with following standards:

.1 Fabricator shall be fully certified by Canadian Welding Bureau for fusion welding of steel structures to CSA W47.1 and for fusion welding of aluminum to CSA W47.2.

.2 CSA W48-M - for Electrodes (if rods are used, only coated rods are allowed).

.3 CSA W59-M - for design of connections and workmanship.

.4 CSA W117.2 - for safety.

.7 Thoroughly clean welded joints and steel exposed for a sufficient space to properly perform welding operation. Neatly finish welds. Ensure welds exposed to view and finish painted are continuous and ground smooth.

.8 Provide exposed metal fastenings and accessories of same material, texture, color and finish as base metal to which they are applied or fastened.

2.3 FINISHES

.1 Cleaning and Shop Painting:

.1 Clean steel to SSPC SP6 and remove loose mill scale, weld flux and splatter.

.2 Shop prime steel with 1 coat of primer paint to dry film thickness of 0.025 mm (1 mil). Paint on dry surfaces free from rust, scale, grease. Do not paint when temperature is lower than 7 deg C. Paint items under cover and leave under cover until primer is dry. Follow paint manufacturer's recommendations regarding application methods, equipment, temperature, and humidity conditions.

.3 Shop prime non galvanized perimeter steel members and structural steel members to receive sprayed fire resistive materials with 1 coat of high performance corrosion protection primer to dry film thickness of 0.025 mm (1 mil). Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 deg C. Paint items under cover and leave under cover until primer is dry. Follow paint manufacturer's recommendations regarding application methods, equipment, temperature, and humidity conditions.

.4 Shop prime galvanized steel in accordance with CAN/CGSB-85.10.

.5 Clean but do not paint surfaces being welded in the field and surfaces in contact after assembly.

.2 Hot Dip Galvanizing:

.1 After fabrication, hot dip galvanize specific miscellaneous steel items noted on Drawings and/or called for herein. Plug relief vents air tight. After galvanizing, remove plugs, ream holes to proper size and re-tap threads. Straighten shapes and assemblies true to line and plane after galvanizing. Repair damaged

galvanized surfaces with "Galvafroid" by W.R. Meadows in accordance with manufacturer's printed directions.

.2 Galvanized members exposed to elements when in final location; members embedded in concrete; members specified in this Section or noted on Drawings.

.3 Hot-dip galvanize members, in accordance with CAN/CSA-G164-M and the requirements of following ASTM standards, with minimum coating weights or thickness as specified:

.1 Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strips: ASTM A123M; average weight of zinc coating per sq/ft of actual surface, for 4.8 mm and less thickness members 2 ounces, for 6 mm and heavier members 2.3 ounces.

.2 Iron and Steel Hardware: ASTM A153M; minimum weight of zinc coating, in ounces per sq ft of surface shall be in accordance with Table 1 of ASTM A153M, for the various classes of materials used on the Project.

.3 Steel Sheet: ASTM A653M; weight of zinc coating, per sq ft on both sides of sheet. Coating designation Z275 (G90), minimized spangle and chemically treated.

.3 Color: to be selected by Consultant.

.4 Aluminum: Exposed aluminum surfaces shall have clear anodized coating (Architectural Class II). Pre-treat aluminum with caustic tech treatment prior to applying integral, clear, anodic oxide coating. Apply clear, anodic oxide coating in accordance with AAMA 611, 0.4 mils minimum coating thickness and also conforms to Aluminum Finish Designation AA-M12C22A31, Architectural Class II. Protect clear anodized coating with removable protective film.

.5 Zinc-rich primer: Ready, mixed, zinc-rich primer conforming to CAN/CGSB-1.181.

.1 Acceptable material:

.1 Sealtight Galvafroid Zinc-Rich Coating by W.R. Meadows of Canada Limited.

.2 Zinc Clad No. 7 Organic Zinc Rich Primer by Sherwin Williams Company of Canada Ltd.

.6 Isolation Coating: Bituminous paint, alkali-resistant bituminous paint or epoxy resin solution to provide dielectric separation which will dry to be tack-free and withstand high temperatures. Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers. Carboline Bitumastic 50 by Carboline Canada, or Copper Creek Top Service 760 Black by Sherwin Williams Company, 410-02 by Bakor Inc. or other Product and manufacturer acceptable to Consultant.

2.4 LADDERS, ROOF ACCESS

.1 Fabricate all ladders with 20 mm diameter steel rod rungs welded to 10 x 64 mm steel stringers at 300 mm o.c. c/w 10 x 75 mm x 240 long steel bar brackets with 75 mm long 90° bend at end pre-drilled for wall anchors, welded to stringers at maximum 1000 mm o.c. Space stringers 400 mm apart. Provide cage from 2400 mm above roof from 10x64mm straps.

.1 Exterior ladders: fabricate as indicate with steel checker plate tread over top of parapet and cage above 2438 above roof level.

.2 All components to be hot dip galvanized.

.3 Prime paint ready for finish painting by others.

.1 Use zinc rich primer at exterior ladders.

.2 Provide steel brackets c/w backing plate pre-drilled for bolting to structural framing behind metal wall cladding and to ladder stringers.

.3 Hot dip galvanize entire assembly after fabrication.

.4 Bolt brackets to structural framing prior to installation of metal wall cladding and

bolt ladder to brackets using 13 mm diameter hot-dip galvanized bolts, nuts and washers to provide, rigid secure installation.

.5 Touch-up any damage to galvanizing with zinc primer and leave ready for painting.

2.5 MILLWORK MISC. METAL PLATES, ANGLES AND BENTS

.1 Provide all miscellaneous plates, angles and bents required for support of millwork as indicated and detailed on the drawings.

2.6 MILLWORK SUPPORTS

.1 50mm x 75mm HSS supports for build-in to front edge of millwork for spans in excess of 1200mm.

.2 Prime paint.

.3 Turn over to millwork Trade for build-in.

2.7 MISCELLANEOUS SECTIONS AND FRAMING

.1 Provide miscellaneous steel sections which are not shown or identified on Structural Drawings, or specified under another Section of Specifications.

2.8 SHEET METAL BACKING

.1 18 gauge galvanized sheet metal backing.

.2 Coordinate location with drawings, Division 12 Specialties and wall mounted equipment, including Owner Supplied / Contractor Supplied and Owner Supplied /Owner Installed.

2.9 SHELF SUPPORT BRACKETS

.1 Fabricate from steel angles pre-drilled as required for fastening to wall and shelf.

.2 Prime paint ready for finish painting.

.3 Supply to Section 06 20 00 - Finish Carpentry for installation with shelves.

2.10 VANITY SUPPORT BRACKETS (TYPICAL ALL LOCATIONS)

.1 Fabricate from steel angles as detailed, pre-drill as required for fastenings to wall and counter top.

.2 Prime paint ready for finish painting.

.3 Supply to Section 06 20 00 - Finish Carpentry for installation with vanity.

3 Execution

3.1 ERECTION

.1 Do welding work in accordance with CSA W59 unless specified otherwise.

.2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.3 Provide suitable means of anchorage acceptable to Consultant such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.4 Exposed fastening devices to match finish and be compatible with material through which they pass.

.5 Provide components for building by other sections in accordance with shop drawings and schedule.

.6 Make field connections with bolts to CAN/CSA-S16.1, or weld.

.7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.

.9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.2 INSTALLATION

.1 Verify dimensions at the Place of the Work to ensure work of this Section fits to that of other parts of the Work.

.2 Erect the work of this Section plumb, square, true and level.

.3 Securely anchor work of this Section and rivet, weld or bolt to structural framing of the building. Where secured to concrete, Provide bolts for setting in concrete. Provide expansion bolt supports to masonry.

.4 Provide necessary fitting, setting and cutting required in connection with the fitting of work of this Section to other parts of the Work.

.5 Field Painting: Paint bolt heads, washers, nuts, field welds and previously unpainted items. Touch up with matching paint, shop primer damaged during transit and installation.

.6 Erect stair work to line, plumb, square, true and level, with runs of stairs registering level with floor levels.

3.3 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

.3 On completion of installation, carefully clean metal work.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 - Cast-in-Place Concrete.

.2 Section 05 50 00 - Metal Fabrications.

.3 Section 09 91 00 - Painting.

1.2 REFERENCES

.1 American National Standards Institute/National Association of Architectural Metal Manufacturers (ANSI/NAAMM)

.1 ANSI/NAAMM MBG 531-00, Metal Bar Grating Manual.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM A53/A53M-07, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A307-07b, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A325M-02, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 1.40-97, Anti-corrosive Structural Steel Alkyd Primer.

.2 CAN/CGSB 1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 CSA G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.4 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.4 Canadian Standards Association (CSA International)

.1 CSA W59-03(R2008), Welded Steel Construction (Metal Arc Welding).

.5 National Association of Architectural Metal Manufacturers (NAAMM)

.1 NAAMM AMP 510-92, Metal Stairs Manual.

.6 Steel Structures Painting Council (SSPC), Systems and Specifications Manual, Volume 2.

1.3 SYSTEM DESCRIPTION

.1 Design metal stair, balustrade and landing construction and connections to NBC vertical and horizontal live load requirements.

.2 Detail and fabricate stairs to NAAMM Metal Stairs Manual.

1.4 QUALITY ASSURANCE

.1 Structural Design and Inspection:

.1 Certification:

.1 Submit certification from registered professional structural Engineering registered in the province of Prince Edward Island, who shall affix his/her seal and signature to certificate, stating structure is capable of supporting its own weight and specified live loads.

.2 Welders employed on this project may be asked by Consultant at any time for their welding certificate.

1.5 SUBMITTALS

.1 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate construction details, dimensions, rise and run, sizes of steel sections

and thickness of steel sheet.

.3 Each shop drawing submitted shall bear stamp and signature of qualified professional engineer registered or licensed to practice in the Province of Prince Edward Island, Canada.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MATERIALS

.1 Steel sections: to CAN/CSA-G40.20/G40.21 Grade 300 W.

.2 Steel plate: to CAN/CSA-G40.20/G40.21, Grade260 W.

.3 Steel pipe: to ASTM A53/A53M, standard weight, schedule 40 seamless black.

.4 Steel tubing: to CAN/CSA-G40.20/G40.21.

.5 Metal bar grating: to ANSI/NAAMM MBG 531, steel, Type W-19-4, with checkered plate nosing.

.6 Welding materials: to CSA W59.

.7 Bolts: to ASTM A307.

.8 High strength bolts: to ASTM A325M.

.9 Wire Cloth:

.1 Type: Plain Weave.

.2 Material: Plain Steel.

.3 Mesh: 4 openings per inch.

.4 Gauge: 0.800.

2.2 FABRICATION

.1 Fabricate to NAAMM, Metal Stair Manual.

.2 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, color and finish as base material on which they occur.

.3 Accurately form connections with exposed faces flush; miters and joints tight. Make risers of equal height and treads of equal depth.

.4 Grind or file exposed welds and steel sections smooth.

.5 Shop fabricate stairs in sections as large and complete as practicable.

2.3 FINISHES

.1 Galvanizing: hot dipped galvanizing with zinc coating 600g/m² to CAN/CSA-G164.

.2 Shop coat primer: to CISC 1-73A Red Oxide Primer

.3 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.4 PIPE/TUBING BALUSTRADES, GUARDRAILS AND HANDRAILS

.1 Construct guardrails with 42mm outside diameter schedule 40 pipe, balusters with 16mm diameter bar and handrails with 33mm outside diameter schedule 40 pipe.

.2 Handrails and balustrades to comply with latest edition of NBCC for heights, openings and extensions.

.3 Provide baseplate and anchors at fixed guardrail as indicated.

.4 Provide pipe sleeves, minimum 100mm high, c/w baseplate, tie down pin, split pin and anchor bolts as detailed, where removable handrail/guardrails are indicated.

.5 Cap and weld exposed ends of balusters and handrails, pinching of pipe at intersections not acceptable.

.6 Terminate guardrails and handrails at abutting wall with end flange.

.7 Provide brackets for wall-mounted stair handrails and guardrails as detailed, where indicated or maximum 1800mm o.c., welded to wall-mounted rails c/w 75mm diameter x 6 mm thickness plate pre-drilled to receive two (2) wall anchors.

2.5 SHOP PAINTING

.1 Clean surfaces in accordance with Steel Structures Painting Council Manual Volume 2.

.2 Apply one coat of shop primer except interior surfaces of pans.

.3 Apply two coats of primer of different colors to parts inaccessible after final assembly.

.4 Use primer as prepared by manufacturer without thinning or adding admixtures. Paint on dry surfaces, free from rust, scale, grease, do not paint when temperature is below 7 degrees C.

.5 Do not paint surfaces to be field welded.

3 Execution

3.1 INSTALLATION OF STAIRS RAILS AND BALUSTRADES

.1 Install in accordance with NAAMM, Metal Stair Manual.

.2 Install plumb and true in exact locations, using welded connections wherever possible to provide rigid structure. Provide anchor bolts, bolts and plates for connecting stairs to structure.

.3 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.4 Do welding work in accordance with CSA W59 unless specified otherwise.

.5 Touch up shop primer to bolts, welds, and burned or scratched surfaces at completion of erection.

3.2 CLEANING

.1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.

.2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 - Metal Fabrications.

.2 Section 09 91 00 - Painting.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI A14.3: Ladders - Fixed - Safety Requirements.

.2 Canadian General Standards Board (CGSB)

1.3 SYSTEM DESCRIPTION

.1 Ladder to be constructed using high grade steel, incorporating a profiled rung design.

.2 Ladder side rails to extend 900mm or more above landing surface, except where a roof hatch is provided.

.3 Fall protection must be incorporated by means of an enclosed cage for all ladders where the top surface is greater than 4.9 metres above the ground, or where there is a danger of a worker falling more than 5 metres from the ladder to the ground level, roof or floor, even if the length of the climb is less than 5 metres.

.4 System applications include:

.1 Perrmanent applications providing access to elevated areas and roofs for maintenance.

.2 Safe access between varying roof levels.

.3 Safe access into ceiling spaces and machinery platforms for plant and equipment maintenance.

.5 Finish:

.1 All componentry and accessories are manufactured from high grade structural steel, shop primed for painting.

1.4 QUALITY ASSURANCE

.1 Structural Design and Inspection:

.1 Certification:

.1 Submit certification from registered professional structural Engineering registered in the province of Prince Edward Island, who shall affix his/her seal and signature to certificate, stating structure is capable of supporting its own weight and specified live loads.

.2 Welders employed on this project may be asked by Consultant at any time for their welding certificate.

.2 Design Requirements:

.1 Industrial rated, suited to high frequency usage. Recommended for single person use - 150kg rated.

.2 Ladder must meet the loads of NBCC.

.3 Verify field measurements prior to assembly and/or ordering.

1.5 SUBMITTALS

.1 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate profiles, sizes, connections, size, and type of fasteners and accessories.

.3 Submit shop drawing bearing stamp of a qualified professional engineer registered in Province of Prince Edward Island.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MODULAR LADDER SYSTEM

.1 Manufactured from high grade structural steel.

.2 Overall ladder width: 605mm.

.3 Distance between vertical side rails: 525mm.

.4 Rung diameter: 50 x 35mm (profiled).

.5 Rung spacing: 300mm.

.6 Vertical side rail extension above landing surface: 1100mm.

.7 Minimum clearance behind ladder: 200mm.

.8 Maximum distance between rest platforms: 6000mm.

.9 Rung section: 2.9kg/M (ex. fixing brackets and fixings)

.10 Cage sections: 8.3 kg/M

.11 Assembly: Upright tops shall be plugged with weather and light resistant material where required.

3 Execution

3.1 INSTALLATION

.1 Support structure integrity, suitability and fixing method to be assessed and determined by design and materials to which it is being fixed prior to installation and reflected on Shop Drawings.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 17 53 - Shop-Fabricated Wood Trusses
.2 Section 06 20 00 - Finish Carpentry
.3 Section 06 41 00 - Architectural Wood Casework
.4 Section 07 21 16 - Blanket Insulation.
.5 Section 07 26 00 - Vapor Retarders
.6 Section 09 91 00 - Painting
.7 Section 10 28 13 - Toilet Accessories
.8 Division 23 - Mechanical
.9 Division 26 - Electrical

1.2 REFERENCES

.1 American National Standards Institute (ANSI)
  .1 ANSI A208.1-1999, Particleboard, Mat Formed Wood.
.2 American Society for Testing and Materials (ASTM)
  .1 ASTM D1761-00, Standard Test Methods for Mechanical Fasteners in Wood.
  .2 ASTM D5055-00, Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
  .3 ASTM D5456-01ae1, Specification for Evaluation of Structural Composite Lumber Products.
.3 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB-11.3-M87, Hardboard.
  .2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
  .3 CAN/CGSB-51.34-M86, Vapor Barrier, Polyethylene Sheet for Use in Building Construction.
  .4 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.
.4 Canadian Standards Association (CSA)
  .1 CSA A123.2-M1979(R1999), Asphalt Coated Roofing Sheets.
  .2 CAN/CSA-A247-M86, Insulating Fiberboard.
  .3 CSA B111-1974, Wire Nails, Spikes and Staples
  .4 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
  .5 CSA O112 Series-M1977, CSA Standards for Wood Adhesives.
  .6 CSA O121-M1978, Douglas Fir Plywood.
  .7 CAN/CSA-O122-M89, Structural Glued-Laminated Timber.
  .8 CAN/CSA-O141-91, Softwood Lumber.
  .9 CSA O151-M1978, Canadian Softwood Plywood.
  .10 CSA O153-M1980, Poplar Plywood.
  .11 CAN/CSA-O325.0-92(R1988), Construction Sheathing.
  .12 CAN3-O437 Series-93, Standards on OSB and Waferboard.
.5 National Lumber Grades Authority (NLGA)
  .1 Standard Grading Rules for Canadian Lumber 2010.
.6 Truss Design and Procedures for Light Metal Connected Wood Trusses, Truss Plate Institute of Canada.

1.3 QUALITY ASSURANCE

.1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Set aside damaged wood and dimensional lumber off-cuts for approved alternative uses (e.g. bracing, blocking, cripples, bridging).
.2 Collect and separate for disposal waste material generated by this Section.
.3 Place in appropriate on-site bins in accordance with Waste Management Plan.
.4 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 FRAMING AND STRUCTURAL MATERIALS

.1 Lumber:
  .1 Unless specified otherwise, softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
    .1 CAN/CSA-O141.
    .2 NLGA Standard Grading Rules for Canadian Lumber.
  .2 Glued end-jointed (finger-jointed) lumber are not acceptable.
.2 Fence Material:
  .1 Pressure treated posts, size as shown.
  .2 Cedar board, 19mm x 140mm.
.3 Glulam in accordance with Structural Glued-Laminated Timber CAN/CSA-O122.
.4 Wood I-joists in accordance with Prefabricated Wood I-Joists ASTM D5055.
.5 Light-frame trusses in accordance with "Truss Design and Procedures for Light Metal Connected Wood Trusses", Truss Plate Institute of Canada.
.6 Structural Composite Lumber (SCL) in accordance with ASTM D5456.
.7 Framing and board lumber: in accordance with NBC.
.8 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:
  .1 S4S is acceptable.
  .2 Board sizes: "Standard" or better grade.
  .3 Dimension sizes: "Standard" light framing or better grade.
  .4 Post and timbers sizes: "Standard" or better grade.

2.2 PANEL MATERIALS

.1 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.0.
.2 Douglas fir plywood (DFP): to CSA O121, standard construction.
.3 Canadian softwood plywood (CSP): to CSA O151, standard construction.
.4 Poplar plywood (PP): to CSA O153, standard construction.
.5 Interior mat-formed wood particleboard: to ANSI 208.1.
.6 Mat-formed structural panel boards (OSB wafer): to CAN3-O437.0.
.7 Glass fiber board sheathing: non-structural, rigid, faced, fiberglass.
.8 Gypsum sheathing: to ASTM C36/C36M.
.9 Specifically:
  .1 Roof sheathing: Douglas Fir Plywood (DFP) exterior sheathing grade, square edge, to thickness indicated, to CSA O121.
  .2 OSB Structural Exterior Sheathing to meet or exceed Canadian Standards

Association requirements CSA 0325 and/or CSA 0427, to NBCC 2015.

.3 Exterior wall sheathing: Douglas Fir Plywood (DFP) exterior sheathing grade, square edge, 12.7mm thickness, to CSA 0121.

.4 Sub flooring: Douglas Fir Plywood (DFP), G1S grade, T & G, 19.0mm thickness, to CSA 0121.

.5 Plywood underlay: Douglas Fir plywood (DFP), to CSA O121 - M1978, GIS with solid wood boats, (PASTE TYPE FILLERS NOT ACCEPTABLE), 8mm thickness.

.6 Exterior soffits at roof overhangs: Douglas Fir Plywood (DFP) with medium density overlay (MDO) finish, square edge, to thickness indicated.

.7 Miscellaneous exterior facing: Douglas Fir Plywood (DFP) with medium density overlay (MDO) finish, square edge, 12.7mm thickness.

.8 Mechanical & Electrical equipment backboards: Douglas fir plywood (DFP), to CSA O121, G1S, square edge to thickness indicated.

2.3 ACCESSORIES

.1 Polyethylene film: to CAN/CGSB-51.34, Type 1, 0.15 mm thick (6 mil).

.2 Air seal sill gasket: closed cell polyurethane or polyethylene.

.3 Sealants: Section 07 92 00 - Joint Sealants.

.4 Sub flooring adhesive: to CGSB-71.26, cartridge loaded.

.5 General purpose adhesive: to CSA O112 Series.

.6 Nails, spikes and staples: to CSA B111.

.1 Use common spiral nails and spiral spikes except where indicated otherwise.

.2 Use hot galvanized finish steel for exterior work, including sheathing.

.7 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

.8 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and inorganic fiber plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

.9 Nailing discs: flat caps, minimum 25 mm diameter, minimum 0.4 mm thick, sheet metal, fiber, formed to prevent dishing. Bell or cup shapes not acceptable.

.10 Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, extruded 6063-T6 aluminum alloy type approved by Consultant.

.11 Use surface fastenings of following type except where specific type is indicated.

.1 To hollow masonry, drywall and panel surfaces, use toggle bolt.

.2 To solid masonry and concrete use expansion shield with lag screw.

.3 To structural steel use bolts through drilled hole, or welded stud-bolts or power drilled hole, or welded stud-bolts or power driven self-drilling screws, or welded stud-bolts, or explosive actuated stud-bolts.

.4 To exterior face of concrete foundation wall with galvanized power driven fasteners penetrating minimum 38mm into concrete.

.5 Joist hangers: minimum 1mm thick sheet steel, galvanized G90 coating designation, 6672N bearing strength.

.6 Roof sheathing H-clips: formed "H" shape, thickness to suit panel material, type approved by Consultant.

.12 Galvanizing: to CSA G164-M1981, use galvanized fasteners for work in exterior walls, work in high humidity areas, etc. and with pressure-preservative treated lumber.

2.4 AIR BARRIER SHEET

.1 Refer to Section 07 27 00 - Air Barriers.

2.5 WOOD PRESERVATIVE

.1 Lumber and plywood: CCA vacuum pressure impregnated to CAN/CSA 080.1-M89 and CAN/CSA 080.9-M89, Spruce species. At all framing where wood comes in contact with

earth, concrete or masonry.

.1 Acceptable Material:

.1 Wolmanizing.

3 Execution

3.1 PREPARATION

.1 Store wood products in dry environment.

3.2 INSTALLATION

.1 Comply with requirements of NBCC 2015 Part 9 supplemented by following paragraphs.

.2 Install members true to line, levels and elevations, square and plumb.

.3 Construct continuous members from pieces of longest practical length.

.4 Install spanning members with "crown-edge" up.

.5 Select exposed framing for appearance. Install lumber materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.

.6 Install sub flooring with panel end-joints located on solid bearing, staggered at least 800 mm.

.1 In addition to mechanical fasteners, drywall "Grabber" screws floor sub flooring to floor joists using glue. Place continuous adhesive bead in accordance with manufacturer's instructions, single-bead on each joist and double-bead on joists where panel ends butt.

.7 Install wall sheathing in accordance with manufacturer's printed instructions.

.8 Install roof sheathing in accordance with requirements of NBCC.

.9 Install H-clips as required by spacing of roof framing.

.10 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding electrical equipment mounting boards, and other work as required.

.11 Install furring to support siding applied vertically where there is no blocking and where sheathing is not suitable for direct nailing.

.1 Align and plumb faces of furring and blocking to tolerance of 1:600.

.12 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.13 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.

.14 Install sleepers as indicated.

.15 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

3.3 MDO PLYWOOD SOFFITS

.1 Install MDO plywood soffits at roof overhangs.

.2 Coordinate with installation of perforated metal soffits.

.3 Use galvanized finish nails to secure to strapping, set and filled with exterior grade wood filler.

.4 Leave ready for painting by Section 09 91 00 - Painting.

3.4 PARAPETS, CURBS AND RELATED BLOCKING ETC.

.1 Fabricate as detailed and to CRCA recommendations except where specifically detailed otherwise.

.2 Use pressure treated lumber and plywood throughout all external applications and as

shown.

.3 Apply two (2) coats of brush applied wood preservative to all end cuts of lumber and plywood.

.4 Install wood framing and plywood sheathing at roof parapets, curbs, etc., as indicated in longest practical lengths.

.5 Anchor to steel framing and/or concrete with galvanized bolts at spacing indicated.

.6 Supply wood spreader to Section 05 50 00 - Metal Fabrications for attachment to galvanized metal.

3.5 LOCKER BASE

.1 Construct wood base for lockers as detailed. Securely anchor to floor.

.2 Leave ready for installation of lockers by Section 10 51 13 - Metal Lockers and rubber base by Section 09 65 16 - Resilient Sheet Flooring.

3.6 MISCELLANEOUS FURRING, BLOCKING AND STRAPPING

.1 Install furring and blocking as required to space out and support casework, cabinets, toilet and bath accessories, recessed panels and cabinets for work of Electrical and Mechanical Divisions, and other work as required, which includes, but is not limited to the following:

.1 At vanity tops and counter tops/worktops provide 38 x 140 wood blocking between steel studs at each metal bracket and at each end of vanity top and counter top/worktops.

.2 At all toilet and bath accessories provide wood blocking between studs, as required.

.3 Generally both vertical and horizontal blocking will be required to secure 100 mm deep accessories recessed in 100 mm thick walls.

.4 At all wall-hung lavatories provide 37 x 285 wood blocking between double, back to back, studs to receive steel hanger.

.5 At cabinetwork provide 38 x 140 blocking between studs, as required to support cabinetwork.

.6 At wall mounted handrails provide 38 x 140 blocking between studs, located at mounting brackets for handrail.

.7 At zone valve boxes, fire hose cabinets and fire-extinguisher cabinets provide blocking between studs as required to support and secure cabinets.

.8 At lockers, as required to secure lockers to wall.

.9 At all wall mounted doorstops.

.10 At ALL other wall-mounted items provide wood blocking between studs as required.

.2 Install furring to support any sheathing type material where there is no blocking and where sheathing is not suitable for direct nailing.

.3 Spacing of furring as required to provide adequate support for material.

.4 Install strapping as indicated or required to support panel material, except where metal strapping is specifically indicated.

.5 Align and plumb faces of furring and blocking to tolerance of 1:600.

3.7 NAILING STRIPS, FRAMING AND ROUGH BUCKS

.1 Install rough bucks, nailers and linings to rough openings as required to provide backing for window frames, door frames and other work.

.2 Install continuous pressure treated wood framing as indicated under all window stools.

.3 Install sloped sill framing and water stop as required by NBCC, latest edition.

.4 Countersink bolts where necessary to provide flush surface.

3.8 FASTENERS

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.2 Provide minimum three (3) 50 mm nails at each end to secure blocking between studs.

.3 Countersink bolts where necessary to provide clearance for other work.

.4 Screws for fastening pressure treated lumber to be ceramic coated.

3.9 EQUIPMENT BACKBOARDS

.1 Provide backboards for mounting equipment. Use 19mm thick DFP.G1S on 19 x 38mm furring around perimeter and at maximum 300mm intermediate spacing.

.2 Supply and install these backboards where indicated or directed by Mechanical and Electrical Division.

3.10 ERECTION

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.2 Countersink bolts where necessary to provide clearance for other work.

.3 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

END OF SECTION

1 General

1.1 SUMMARY

.1 Provide architectural woodwork including but not limited to following:
- .1 Architectural cabinet casework.
- .2 Architectural cabinet casework drawers, doors and shelves
- .3 Countertops.
- .4 Architectural cabinet casework hardware.
- .5 Trim and moldings.

1.2 RELATED REQUIREMENTS

.1 Section 05 50 00 - Metal Fabrications.
.2 Section 07 92 00 - Joint Sealants.
.3 Section 09 21 16 - Gypsum Board Assemblies.
.4 Section 09 65 13 - Resilient Base and Accessories.
.5 Section 09 65 19 - Resilient Tile Flooring.
.6 Section 09 91 00 - Painting.
.7 Section 22 42 01 - Plumbing Specialties and Accessories
.8 Division 26 - Electrical: Outlets and Wiring

1.3 REFERENCES

.1 American National Standards Institute (ANSI)
- .1 ANSI A208.1-2009, Particleboard.
- .2 ANSI A208.2-2009, Medium Density Fiberboard (MDF).
- .3 ANSI/NEMA LD 3-2005, High-Pressure Decorative Laminates.
- .4 ANSI/NEMA LD 3-2005, Thermofused Melamine B.
- .5 ANSI/NEMA LD 3.1-2005, Application, Fabrication, and Installation of High-Pressure Decorative Laminates.
- .6 ANSI/HPVA HP-1-2004, American National Standard for Hardwood and Decorative Plywood.

.2 American Society for Testing and Materials (ASTM)
- .1 ASTM E1333-96, Test Method for Determining Formaldehyde Concentrations in Air and Emissions Rates from Wood Products Using a Large Chamber.
- .2 ASTM E84-08a, Test Method for Surface Burning Characteristics of Building Materials.

.3 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
- .1 AWMAC Quality Standards for Architectural Woodwork, latest edition.
- .2 Architectural Woodwork Standards (AWS) 2009 Edition.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-11.3-M87, Hardboard.

.5 Canadian Standards Association (CSA)
- .1 CAN/CSA-A247-M86(R1996), Insulating Fiberboard.
- .2 CAN3-A172-M79, High Pressure Paper Base, Decorative Laminates.
- .3 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
- .4 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .5 CSA O115-M82(R2001), Hardwood and Decorative Plywood.
- .6 CSA O121-M78(R2013), Douglas Fir Plywood.
- .7 CAN/CSA O141-09 (R2014), Softwood Lumber.
- .8 CSA O151-M09 (R2014), Canadian Softwood Plywood.

.9 CSA O153-M13, Poplar Plywood.
.10 CSA O112 Series-M77(R2001), CSA Standards for Wood Adhesives.
.11 CAN/ULC-S102-07, Standard Method of Test for Surface Burning.
.6 National Hardwood Lumber Association (NHLA)
.1 Rules for the Measurement and Inspection of Hardwood and Cypress January 1996.
.7 National Lumber Grades Authority (NLGA)
.1 Standard Grading Rules for Canadian Lumber 2000.
.8 Underwriters Laboratories of Canada (ULC)
.1 CAN4-S104-80(R1985), Fire Tests of Door Assemblies.
.2 CAN4-S105-85(R1992), Fire Door Frames, meeting the Performance Required by CAN4-S104.
.9 NEMA, National Electrical Manufacturers Association.
.10 Canadian Electrical Code

1.4 SYSTEM DESCRIPTION

.1 Design Requirements:
.1 Millwork casework (e.g. countertops, wall cabinets, cabinet drawers and similar items) shall be capable of supporting structural loads without deflection in accordance with Casework Integrity Tests in Appendix A of AWS.
.2 Design casework shelves for uniformly distributed loads as follow:
.1 Other horizontal surfaces: 1.9 Kilopascals
.2 Closet shelves: 1.197 Kilopascals
.3 Bookshelves: 1.915 Kilopascals
.3 Without limitations, in particular ensure:
.1 Millwork counter tops, are capable of supporting 907 kg.
.4 Minimum nominal thickness and material for cabinet components and shelf deflection, type of materials, thicknesses, span width and total load distribution shall be in accordance with Architectural Woodwork Standards.

1.5 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
.2 Product Data:
.1 Submit manufacturer's literature, data sheets for each type of material provided under this Section for project.
.2 Data sheets shall provide all required information.
.3 Submit required copies of detailed instructions for maintaining, preserving and keeping materials in clean and safe conditions and give adequate warning of maintenance practices or materials detrimental to specified materials.
.4 Submit manufacturer's installation instructions.
.3 Material Safety Data Sheets:
.1 Submit MSDS for inclusion in Operation and Maintenance Manual.
.4 Shop Drawings:
.1 Clearly indicate material being supplied and show connections, attachments, reinforcing, anchorage and location of exposed fastenings in accordance with AWS Section 1.
.5 Samples:
.1 Submit samples in following sizes:
.1 Minimum 300 mm long x 400 mm wide x 25 mm thick solid wood.
.2 Minimum 300 mm square and of specified thickness, veneer mounted on 19 mm plywood and finished as specified.

.3 Each type of hardware.
.4 Each plastic laminate and melamine in manufacturer's standard chip size.
.5 Minimum 300 mm square x 25 mm thick counter top materials.
.6 Glass cabinets sample 300 mm x 300 mm x 300 mm demonstrating glass welding techniques.

.2 Mock-ups:
.1 Shop prepare one base cabinet unit, wall cabinet, counter top, and shelving unit complete with hardware and shop applied finishes, and install on project in designated location.
.2 Allow 24 hours for inspection of mock-up by Consultant before proceeding with this work.
.3 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.
.4 Schedule preparation review and repair if required of mock-up such that schedule is not delayed.
.5 Allow 24 hours for review.
.6 Make repairs to mock-up as agreed upon prior to fabrication of the balance of the units.
.7 The approved mock may remain on site as part of the millwork and it will form the standard of acceptance for the remainder of the millwork.

1.6 QUALITY ASSURANCE

.1 Manufacturer to:
.1 Have minimum ten years' experience in the manufacture of custom wood casework.

.2 Installer to:
.1 Be approved by the manufacturer.
.2 Have minimum ten years' experience in the installation of custom wood casework and work surfaces.
.3 Provide evidence of experience and references at time of submission of shop drawings.

.3 Perform Work in accordance with AWMAC / QSF Custom Grade quality.

.4 Casework to be manufactured and installed to specified AWMAC Quality Standards and be inspected at the plant and/or site by an inspector of the local AWMAC Chapter.

.5 Inspection costs of local AWMAC Chapter to be included in the Work of this Section.

.6 Make manufacturing facility, testing facility, and quality control procedures available for local AWMAC Chapter and Architect's inspection.

.7 Work that does not meet AWMAC Quality Standards to be replaced, reworked and/or refinished at no additional cost to the Owner, and to the satisfaction of local AWMAC Chapter and Consultant.

.8 Regulatory Requirements:
.1 Fire-Test-Response Characteristics:
.1 Where fire-retardant materials are indicated, provide materials with specified fire-test-response characteristics as determined by a testing and inspecting agency acceptable to authorities having jurisdiction.
.2 Identify materials with appropriate markings of applicable testing and inspecting agency on surfaces of materials that will be concealed from view after installation.
.2 No added urea-formaldehyde during manufacturing process.

.9 Pre-Installation Meetings:

.1 Prior to start of work, arrange for site meeting of all parties associated with work of this Section presided over by Contractor, including Consultant, Subcontractor performing Work of trade involved, Testing Company's Representative and Contractor's Consultants of applicable discipline.

.2 Review Contract Documents for Work included under trade and determine complete understanding of requirements and responsibilities relative to Work included, storage and handling of materials, materials to be used, Installation of materials, sequence and quality control, project staffing, restrictions on areas of work and other matters affecting construction, to permit compliance with intent of this Section.

.10 Coordination with Mechanical, Electrical and Communication Services:

.1 As a requirement of this Section, allow access to shop by associated trades for purpose of performing pre-wiring and partial mounting of electrical and audio/ visual equipment and concealed wiring to the required by the design.

.2 Exposed wiring is not acceptable.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Do not deliver finished products during rainy or damp weather.

.2 Do not deliver Work of this Section until building and storage areas are sufficiently dry so products will not be damaged by excessive changes in moisture content.

.3 Deliver, store and handle products of this Section in accordance with AWS Section 2.

.4 Do not deliver and install damaged products. Replace in accordance with requirements of this Section.

.5 Cover finished plastic laminate surfaces and varnished surfaces with heavy kraft paper and put in cartons for protection.

.6 Protect installed plastic laminate surfaces by acceptable means.

.7 Do not remove protective covers until immediately prior to final cleaning.

1.8 PROJECT CONDITIONS

.1 Ensure project conditions conforms to requirements of AWS Section 2.

.2 Moisture contents of wood at time of installation shall be for interior locations at established Optimum Moisture Content and Optimum Indoor Relative Humidity as outlined in AWS Section 2, Item 1.2.3.

1.9 WARRANTY

.1 Architectural woodwork shall be manufactured and/or installed to the current AWMAC Architectural Woodwork Standards and shall be subject to an inspection at the plant and/ or site by an appointed AWMAC Certified Inspector. Inspection costs shall be included in the tender price for this project. (Contact your local AWMAC Chapter for details of inspection costs). Shop drawings shall be submitted to the AWMAC Chapter office for review before work commences. Work that does not meet the AWMAC Architectural Woodwork Standards, as specified, shall be replaced, reworked and/or refinished by the architectural woodwork Contractor, to the approval of AWMAC, at no additional cost to the Owner.

.2 If the woodwork contractor is an AWMAC Manufacturer member in good standing, a two (2) year AWMAC Guarantee Certificate will be issued. The AWMAC Guarantee shall cover replacing, reworking and/or refinishing any deficient architectural woodwork due to faulty workmanship or defective materials supplied and/or installed by the woodwork Contractor, which may appear during a two (2) year period following the date of issuance.

.3 If the woodwork contractor is NOT an AWMAC Manufacturer member, included with the tender, they shall provide the Owner with a two (2) year maintenance bond, in lieu of the AWMAC Guarantee Certificate, to the full value of the architectural woodwork contract.

1.10 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

.4 Remove waste materials from site in accordance with Infection Control requirements.

.5 Set aside damaged wood for acceptable alternative uses (e.g. bracing, blocking, cripples, bridging, finger-joining, or ties).

2 Products

2.1 MATERIALS

.1 Composite wood and agrifibre products, including core materials, to contain no added urea-formaldehyde resins.

.2 Adhesives used to fabricate laminated assemblies containing these products to contain no added urea-formaldehyde.

.3 Architectural Lumber:

- .1 Conform to AWS Section 3.
- .2 Clear, straight, kiln dried, Premium Grade Natural Birch for fitments and door jambs.
- .3 Provide kiln dried lumber to 7% moisture content, free from blemishes that would be apparent after finish is applied.

.4 Softwood Lumber:

- .1 Conform to requirements AWS Section 3, Premium Grade Ontario White Pine, Yellow Pine or other Pine species.
- .2 S4S, moisture content 19% or less in accordance with following standards:
  - .1 CAN/CSA O141.
  - .2 NLGA Standard Grading Rules for Canadian Lumber.
  - .3 AWMAC custom grade, moisture content as specified.

.5 Hardwood Lumber:

- .1 NHLA requirements, Hard Maple, FAS, of uniform grain and colour, Premium Grade.
- .2 Moisture content 13% or less in accordance with following standards:
  - .1 National Hardwood Lumber Association (NHLA).
  - .2 AWMAC custom grade, moisture content as specified.

.6 Concealed framing:

- .1 Sound material of any species may be used for concealed members, free from sap, shakes, knots, splits and other defects.
- .2 Concealed wood shall also be of highest grade that satisfies fabrication, utility and structural requirements.

.7 Exposed framing, solid members and trim:

- .1 Hardwood lumber as specified herein or indicated on Drawings, or where not specified or indicated, of Maple, FAS grade, matched for compatibility of grain and colour for transparent finish.

.8 Panel Products:

- .1 Conform to AWMAC AWS Section, for Panel Products which includes types of plywood, Particleboard Core Plywood, Veneer Core Plywood, Medium Density Fiberboard Core Plywood, Lumber Core Plywood and Combination Core Plywood.
- .2 For plywood conform to AWS Section 4 paragraph 1.2.31.

.1 Douglas fir plywood (DFP): to CSA 0121, standard construction.
.2 Canadian softwood plywood (CSP): to CSA 0151, standard construction.
.3 Hardwood plywood: to CSA O115.
.4 Poplar plywood (PP): to CSA 0153, standard construction.
.5 Birch plywood: to AWMAC Paint Grade, Natural, Select White, Select Red.

.3 Interior mat-formed wood particleboard: to CAN-0188.1.
.4 Hardboard: to CAN/CGSB-11.3.
.5 Medium density fiberboard (MDF): to ANSI A208.2, density 769kg/m³.

.9 Wood Cores:
.1 Medium Density Fibreboard Core (MDF).
.2 Medium density panels, meeting requirements of ANSI 208.2, balanced design, manufactured from 100% recycled materials, without the use of formaldehyde resins, meeting HUD 24 Standards for emissions, of minimum density of 770 kg/m3 and surface character to match sample in Consultant's possession.
.3 Fire retardant product shall contain fire-retardant chemicals injected with raw materials during manufacturing and achieve a maximum Flame Spread rating of 25 with a maximum Smoke Developed of 200 when tested to ASTM E84.
.4 Do not use MDF panels in moist areas.
.5 Acceptable Material:
.1 Flakeboard Company Limited; www.flakeboard.com
.2 Uniboard Canada Inc.; www.uniboard.com;
.3 Tafisa Canada and Company, Ltd.; www.tafisa.ca;

.10 Veneer Core (Plywood) post formed at Counter Tops with Sink and other Counter Tops:
.1 Softwood Plywood: Douglas Fir, CSA O121-M, good two sides Standard Grade. Poplar plywood conforming to CSA O153-M, Grades A and B.

.11 Thermofused Laminate Panels (semi-exposed locations only):
.1 Use melamine faced composition board, (TFL) with high density particle board core to CSA 0188.0, faced both sides with melamine/polyester laminate of equal thickness and density, to overall thicknesses specified.
.2 Formaldehyde Emissions: shall conform to H.U.D. formaldehyde emission 24 CFR Part 3280.308 for particleboard, emission content of 0.14PPM or less, desicator value of mg/ml. Authorized label shall be affixed to each bundle or pallet load leaving plant. Melamine finish to be minimum 120 gram cover sheet, colour to be selected by Consultant from FULL range.
.3 Uniform Thickness: to tolerance of +/- .006 inches.
.4 Product Specifications: shall exceed or meet ANSI A 2081-1979 Grade 1-M-3 and CAN3-0184. 1M Grade R.
.5 Screw Holding Capability: 300lbs/face, 225lbs/edge.
.6 Decor paper shall be thermofused to both faces to prevent warping.
.7 Thermofused laminate panels in finished (installed) condition shall show no exposed fasteners on exterior surfaces.
.8 Assemble thermofused laminate millwork using doweled/wafered-and-glued construction.
.9 Where indicated on Drawings construction system may also include assembly using hardware.
.10 Clean thermofused laminate surfaces with paint thinner or solvents for varnish or for contact glue.
.11 Do not use any abrasive substance that could damage surface of panels.
.12 Do not use acidic or alkaline products.
.13 Acceptable Material: Refer to Finishes List for Basis of Design.

.12 Edges:

.1 PVC Edge Tape: to match TFL surface adjacent. Machine-glued application, pre-glued type not acceptable. Polyester, PVC thin edge or 3mm PVC edge machine applied and radiused.

.2 Polyester, PVC thin edge or 3mm PVC edge machine applied and radiused.

.3 Solid wood or moldings (wood, plastic or metal) to meet design requirements as indicated on Drawings.

.13 Plastic Laminate Adhesive:

.1 Heat-cured urea-formaldehyde type resin in accordance with requirements of CSA O112 Series-M for all Work except as otherwise specified.

.2 Heat-cured resorcinol resin in accordance with requirements of CSA O112 Series-M for wet areas and counter tops with sinks and lavatories built-in.

.14 High Pressure Decorative Laminate (HPDL):

.1 NEMA LD 3, Class 1 flame spread rated, minimum 0.7 mm thick.

.2 Refer to Material / Finish Schedule.

.3 Acceptable Material:

.1 Formica.

.2 Arborite.

.3 Nevamar.

.4 Wilsonart.

.5 Pionite.

.15 Cabinet Liner (CLS):

.1 NEMA LD 3, not less than 0.5 mm thick.

.2 Colour: White. Concealed locations only.

.16 Plastic Laminate Adhesive:

.1 Heat-cured urea-formaldehyde type resin in accordance with requirements of CSA O112 Series-M for all Work except as otherwise specified.

.2 Heat-cured resorcinol resin in accordance with requirements of CSA O112 Series-M for wet areas and counter tops with sinks and lavatories built-in.

.17 Fire Retardant Treated Materials:

.1 Conform to AWS Section 3 Article 1.2, for Fire Retardant Wood, AWS Section 8, Item 1.2.7 for Flame Spread Classification, Built up Construction to Improve Fire Rating, Fire Retardant Treatments FRT and AWS Section 5, for Preservative Treatments.

.2 Where fire-retardant-treated lumber and plywood are indicated, use materials impregnated with fire-retardant chemicals by a pressure process or other means acceptable to authorities having jurisdiction to produce products with the following fire-test-response characteristics:

.1 Flame-spread index of not greater than 25 when tested according to CAN/ULC S102 and in accordance with OBC requirements.

.2 For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.

.3 Interior, Low-Hygroscopic-Type, Fire-Retardant Treatment:

.1 Formulation that results in treated material with an apparent moisture content of not more than 28% when tested according to ASTM D 3201 at 92% relative humidity.

.2 Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber and plywood from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting

appearance of treated woodwork.

.3 Kiln-dry material after treatment to levels required for untreated material.

.4 Do not use material that does not comply with requirements for untreated material or is warped or discolored.

.5 Provide fire retardant pressure treatment of wood against fire complying with CSA O80-C20 for lumber and O80-C27 for plywood, kiln dried after treatment to required moisture content specified in this Section.

.6 Pressure fire retardant treat lumber prior to final milling.

.7 Pressure fire retardant treat plywood to receive a natural finish before face veneer is applied and apply face veneers not thicker than 1.0 mm (6.2 mills) in the rough to treated cores.

.8 Provide ULC or WHI label for treated lumber and plywood as received from the pressure treating plant.

.9 Do not expose pressure treated material to dampness between the time the material is treated and the time the finish is applied.

.10 Carefully sand surfaces which show surface salt deposits to remove such deposits before finish is applied.

.11 Provide quality of finished Work of equal standard to that of untreated material.

.12 Provide identification on materials delivered to project site showing that these Specifications have been complied with, on each large item, and on bundles of small items.

.13 Arrange wood members in pressure treating equipment to avoid sticker marks on best face of members.

.14 Minimize reworking of fire retardant treated wood.

.15 Re-treat surfaces exposed by cutting, trimming or boring with fire retardant chemical before installation to requirements of labelling authority and other authorities having jurisdiction.

.3 Fire retardant medium density fibreboard; fire retardant MDF:

.1 Industrial grade MDF certified to meet Class 1 surface burning characteristics in accordance with ASTM E84, CAN/ULC-S102, and UL 723, with a flame and smoke development of 20.

2.2 MISCELLANEOUS MATERIALS

.1 Unframed Cork boards 6mm thick natural cork laminated directly to wall surfaces where indicated on drawings/accessories schedule.

.2 Nails and staples: to CSA B111.

.3 Wood screws: steel, type and size to suit application.

.1 Wood screws: to CSA B35.4-1972 electroplated.

.2 Zinc-plated "CUP" washers at all locations where exposed screws are indicated or required.

.3 Drywall screws: to ASTM C646-76, Type S x length to suit.

.4 Fastenings:

.1 Include all fastenings, anchors and accessories required for fabrication and erection of the Work of this Section.

.2 Fastenings include without being limited to anchor bolts, machine bolts, toggle bolts, male/female bolts, lag screws, expansion shields, sleeves, brackets, washers and nuts.

.3 Exposed fasteners, where approved and shown on reviewed Shop Drawings, shall be of same texture, colour and finish as the base material on which they occur unless otherwise shown or noted.

.4 Use stainless steel fasteners with stainless steel components.
.5 Supply bolts with all washers and nuts required for complete installation.
.6 Provide lock washers where vibration may loosen bolted fastenings.
.7 Ensure thread dimensions are such that nuts and bolts will fit without rethreading or chasing threads.
.8 Bevelled hexagon head bolts to ASTM A307.

.5 Splines: wood or as recommended by manufacturer.
.6 Sealant: Refer to Section 07 92 00 - Joint Sealant
.7 Adhesives: to CSA 0112.7-M77 resorcinol resin adhesive for laminated plastic.
.8 Sealer: water resistant sealer or glue acceptable to laminate manufacturer.
.9 Tempered Glass: to CAN/CGSB-12.1, transparent, 6mm thick.
.10 Aluminum edge mounting: 19mm x 5mm extrusions for wall protection; anodized finish; M-D A811.

2.3 CABINET MATERIALS

.1 Use thermofused laminate panel (TFL) with high density particle board core to CSA 0188.0, faced both sides with melamine/polyester laminate of equal thickness and density, to overall thicknesses specified.
.2 At the following locations a high-pressure decorative laminate, is to be used:
.1 Exposed front (public side) of all counters unless indicated otherwise.
.2 At front face and edges of all cupboard doors, of both upper and lower cabinets.
.3 At front face and edges of all drawers.
.4 At top and edges for seat of box/storage unit.
.3 Acceptable Material: Refer to Finishes List for Basis of Design.

2.4 MANUFACTURED UNITS

.1 Casework:
.1 Fabricate casework to AWMAC custom grade.
.2 Framing:
.1 Thermofused laminate panel, thickness as required.
.3 Furring, blocking, nailing strips, grounds and rough bucks and sleepers:
.1 Hardwood plywood, thickness as required.
.4 Case bodies (ends, divisions, gables and bottoms, including base, uppers and wall cabinets):
.1 Thermofused laminate panel, Grade R, 19mm thick.
.2 Edge banding: Heavy duty 3 mm PVC, color and finish to match top surface, strip same width as material.
.5 Backs: Composite Panel (thermofused laminate panel)
.1 Core: medium density M3 particleboard.
.2 Thickness 13 mm.
.6 Shelving (Adjustable, Fixed Top and Bottom) (thermofused laminate panel):
.1 Thermofused laminate panel, Grade R, 19mm thick.
.2 Use recessed standards to support shelves.
.3 Edge Banding (all edges): Heavy duty 3 mm PVC, color and finish to match top surface, same width as material.
.7 Form Shelving:
.1 Plastic laminate, standard duty grade, 16 mm thick.
.2 Two layers adhered back to back for spans up to 225mm.
.3 Three layers adhered back to back for spans over 225mm.
.8 Cork:

.1 6 mm thick natural cork, suitable for use as a tackboard.

.2 Doors and Drawer Fronts:

.1 Fabricate doors to AWMAC custom grade, full overlays, supplemented as follows:

.1 Core: Particle board, grade R, 18 mm thick.

.2 Laminated Plastic: Standard grade, 1.15 mm thick.

.3 Edge banding (all edges): Heavy duty (3 mm) PVC, color and finish to match face surface, same width as door.

.4 Glass: Tempered glass.

.3 Drawers: Fabricate drawers to AWMAC custom grade, supplemented as follows:

.1 Drawer Boxes: Dado Construction.

.2 Sides, Front & Back: 12.5mm Baltic Birch.

.3 Bottom: 6mm Baltic Birch.

.4 Core: Hardwood Veneer Core Plywood.

.5 Finishing: Clear Lacquer 35° Sheen.

.4 Laminated Plastic Counter Tops and Back Splashes:

.1 Counter tops and backsplash: one piece post formed, factory laminated, self-edged or post-formed as noted on drawings.

.1 Core: 19mm Douglas Fir plywood.

.2 Laminated plastic: Post forming Grade, 0.75 mm thick.

.3 Laminated plastic: Standard grade, 1.15 mm thick, typical countertop.

.4 Laminated plastic (non-exposed surfaces): Liner sheet, 0.75 mm thick.

.5 Splash back side returns to be installed on site, based on field conditions.

2.5 CABINET HARDWARE

.1 Shallow Drawer Slides 125mm or less:

.1 Full extension type with self-closer and capacity of 34 kg.

.2 Acceptable Material:

.1 Knape and Vogt, 1375.

.2 Accuride, 3832.

.3 Julius Blum Canada Limited, BS 430E.

.2 Deep Drawer Slides (over 125mm):

.1 Full extension type with self-closer and capacity of 68 kg.

.2 Acceptable Material:

.1 Knape and Vogt, 1485.

.2 Accuride, 4005.

.3 Door Hinges:

.1 Concealed, 170° opening, self-closing, low profile.

.2 Acceptable Material:

.1 Selekta Pro2000 by Hettich Canada Inc.

.2 Euromat; Julius Blum Canada Limited.

.4 Recessed Shelf Pilasters, Standards and Clips:

.1 Acceptable Material:

.1 KV255 pilaster and KV256 clip supports by Knape & Vogt Manufacturing Company; www.knapeandvogt.com

.2 120-10 Series pilasters and 1903-2G clip supports by Richelieu Hardware Ltd.; www.richelieu.com.

.5 Drawer and Hinged Door Bumpers:

.1 Vinyl, peel and stick, thickness 2.4 mm, color white.

.2 Acceptable Material:
.1 Richelieu-Martin No. MP4000-30.

.6 Concealed Hinges:
.1 Minimum 120 degree opening angle.
.2 Self closing.
.3 Supply manufacturer's recommended number of hinges to suit door size and thickness.
.4 Acceptable Material:
.1 Julius Blum Canada Limited.
.2 Hettich Canada Limited Partnership.
.3 Euromat Topsafe.

.7 Wire Pulls (Doors and Drawers):
.1 Brushed nickel.
.2 Size: 8mm dia, 104mm overall length.
.3 Acceptable Material:
.1 BP33205195 by Richelieu Hardware Ltd.
.2 CBH 220 by Canadian Builders Hardware.

.8 Grommets:
.1 Provide 2 grommets per workstation and locate as directed by Consultant. Cut on site.
.2 60 mm, black in colour.
.3 Acceptable Material:
.1 McFadden, PH.603510.
.2 Hafele 429.99.

.9 Continuous Z-Clips to support Wall Panels:
.1 Acceptable Material:
.1 Extrude-A-Trim, 360 Carlingview Drive, Toronto, Ontario. M9W 5X9 Tel. 1-888-557-0883, Model: FR0130
.2 Exposed fasteners for removable wall panels:
.3 Richelieu JCB-B Bolt, nickel finish with B or D nut to suit application, bolt sized to suit application.

.10 Built-in Drawer Stops:
.1 Resilient type recommended by manufacturer.

.11 Press Plugs:
.1 Provide plugs for cabinet sides and floors finished in nickel-plated steel.

.12 Shelf Clips: Base Cabinets:
.1 Zinc-finished steel.
.2 Acceptable Material:
.1 #101 by Roll-It

.13 Shelf Clips: Wall Hung and Tall Storage Cabinets:
.1 Zinc-finished steel.
.2 Acceptable Material:
.1 #103 by Roll-It.

2.6 CABINET HARDWARE ALLOCATION

.1 Supply and install all cabinet hardware. Provide the following in addition to manufacturers recommended allocation:
.1 Cupboard Hinges:
.1 2 hinges on all doors, up to 900mm in height.
.2 3 hinges on all doors over 900mm in height.

.2 Counter top hinges:
.1 2 fully concealed hinges at lift-up section of counter top.
.3 Pulls:
.1 On all doors and drawers.
.4 Drawer slides:
.1 On all drawers.
.5 Drawer locks:
.1 Allow 50% drawer locks, confirm prior to fabrication at shop drawing stage.
.6 Door Locks:
.1 Allow 50% drawer locks, confirm prior to fabrication at shop drawing stage.
.7 Cupboard Locks:
.1 Allow 50% drawer locks, confirm prior to fabrication at shop drawing stage.
.8 Elbow catches:
.1 Provide elbow catch at inactive leaf of all double doors.
.9 Door Bumpers:
.1 Two (2) at each door of cabinetwork.
.10 Adjustable shelf supports:
.1 Four (4) per shelf at all adjustable shelves.

3 Execution

3.1 COMPONENTS

.1 Supply architectural cabinet casework conforming to AWS Section 10.
.2 Casework for Plastic Laminate Finish:
.1 AWMAC Quality Grade: Premium.
.2 Construction: Casework shall conform to AWS Section 10.
.3 Exposed Surfaces Core: Composite Core (MDF)
.4 Exposed surfaces Finish: Plastic laminate; HGS for horizontal surfaces and VGS for vertical surfaces in accordance with AWS Section 10.
.5 Semi-Exposed Surfaces Core: Composite Core (MDF).
.6 Semi-Exposed Surfaces Finish: Plastic laminate; HGS for horizontal surfaces and VGS for vertical surfaces Factory finish in accordance with AWS Section 4, Rule 4.2c.
.7 Concealed Surfaces Finish: Backing sheet; BKV.
.3 Edge Banding:
.1 Provide 3mm heavy duty PVC edge bending for exposed locations and veneer semi-exposed edges.
.4 Laminate Countertops and Backsplashes:
.1 Countertops shall be postformed type to AWS Section 11.
.2 Front Edge type shall conform to AWI/AWMAC/WI Postformed Type 5 Edge Detail as per AWS Section 11 and Item 1.2.11.
.3 Backsplash shall conform to AWI/AWMAC/WI Postformed Splash and deck Detail as per AWS Section 11 Item 1.2.11.
.4 Finish edge banding other than backsplash or sidesplash with same plastic laminate material used for countertops. Provide 3mm heavy duty PVC at all exposed edges or veneer edge band at non-exposed edge as indicated.
.5 Laminate: Provide HGP post-forming for horizontal locations and VGP for vertical

locations.

.5 Plastic Laminate Wood Panelling:
- .1 AWI/AWMAC/WI Quality Grade: Premium.
- .2 Panel shall be 19mm thickness using composite (MDF) core.
- .3 Mounting: Concealed fasteners.
- .4 Panel Finish: High pressure laminate HGF.

.6 Thermofused Laminate Paneling:
- .1 AWI/AWMAC/WI Quality Grade: Premium.
- .2 Panel shall be 19mm thickness using composite (MDF) core.
- .3 Mounting: Concealed or exposed fasteners as noted on drawings.
- .4 Panel Finish: Thermofused Laminate.

.7 Standing and Running Trim:
- .1 AWI/AWMAC/WI Quality Grade: Premium.
- .2 Solid Wood: Hard Maple FAS.
- .3 Interior for Transparent Finish.

.8 Factory Finishing:
- .1 Factory finish following items: All exposed wood fabrications.
- .2 Apply finishes in accordance with AWS Section 5.

.9 Field Touch-Up:
- .1 Field touch-up is responsibility of installing trade or architectural woodwork manufacturer providing it is responsible for factory finishing.
- .2 Field touch-up includes filling and touch-up of exposed job-made nail and screw holes, refinishing of raw surface resulting from job fitting, repair of job-inflicted scratches and mars and final cleaning up of finished surfaces.

3.2 EXAMINATION

.1 Ensure woodwork is back primed immediately after delivery to site.

.2 Ensure cut ends are sealed.

3.3 PREPARATION

.1 Wood Surface Preparation for Opaque Coating:
- .1 Seal knots and sapwood in surfaces to receive paint with alcohol-based primer-sealer.
- .2 Seal door edges.
- .3 Sand smooth rough surfaces of woodwork to be finished using 150 grit paper followed by a second sanding using 220 grit paper.
- .4 Sand in direction of grain.
- .5 Clean surfaces free of dust before applying first coat using brush, compressed air or tack rags.
- .6 Fill nail holes, splits and scratches with non-shrinking filler after first coat is dry.
- .7 Remove salt deposits that may appear on wood surfaces treated with fire retarder.
- .8 Prepare plywood surface by removing dirt and debris.
- .9 Fill screw and nail holes or minor imperfections with recommended filler and sand properly to receive finish coating.
- .10 Plywood requiring stained or painted finish shall be primed with top quality alkyd primer.
- .11 Use only penetrating quality stain over plywood.

.2 Woodwork for Clear Finish or Stain:
- .1 Sand smooth all woodwork to be finished using 150 grit paper followed by a second sanding using 220 grit paper and clean surfaces free of dust using brush,

compressed air or tack rags before applying first coat.

.2 Abrade surfaces with stiff brush to remove loose fibers and splinters.

.3 Fill nail holes, splits and scratches with non-shrinking filler tinted to match local grain condition after first coat is dry.

.4 Sand lightly between coats with No. 220 sandpaper and remove dust.

.5 Remove salt deposits that may appear on wood surfaces treated with fire retarder.

.6 Ensure resilient flooring under millwork cabinets are provided prior to proceeding work of this Section unless indicated otherwise.

3.4 FABRICATION

.1 Fabricate joints accurately fitted, coped where possible, and well glued up.

.2 Fabricate joints mitred to perfect fit and alignments carefully matched.

.3 Fabricate finished woodwork in 1 piece where possible.

.4 Fabricate running members in the longest lengths obtainable.

.5 Fabricate to conceal fastenings.

.6 Provide plastic laminate Work in shop in accordance with ANSI/NEMA. LD3.

.7 Provide backer sheets to panels and counters to ensure balance.

.8 Provide metal laminate Work in shop in accordance with ANSI/NEMA. LD3, Annex A.

.9 Provide backer sheets to panels to ensure balance.

.10 Fabricate exposed gables to match the required exposed finishes.

.11 Exposed wood construction:

.1 Fabricate joints carefully matched for grain and colour.

.2 Fabricate millwork with slow fed machines free from sticker and/or sander markings, with sections and molding work cut accurately to profiles.

.3 Sandpaper woodwork, smooth removing burrs, feathers, sleeves, raised grain and sharp arises and leave exposed surfaces perfectly clean and smooth ready for finishing.

.4 Provide edges noted to be solid, as minimum 6 mm thick wood to match exposed veneer to visible and semi-exposed edges, glued to core prior to application of face veneers.

.5 Provide plastic laminate or elastomeric edges to plastic laminate work visible or semi-visible edges.

.12 Countertops:

.1 Fabricate and assemble countertops and splashbacks in shop to profiles and lengths required.

.2 Fabricate cutouts for services penetrations as required.

.3 Verify governing dimensions before fabricating items which abut wall surfaces.

.4 Provide cutouts required and round internal corners, chamfer edges and seal exposed core.

.5 Provide backer sheets on all counter construction.

.6 Provide veneer core plywood substrate to support counter spans in excess of 910mm.

.7 Provide sidesplashes at abutting ends of counters and at adjoining walls, unless otherwise indicated.

.8 Provide a 6 mm drip groove approximately 13 mm in from the underside edge.

.9 Maximum free span 1200mm. Where free span exceeds 1200mm, provide HSS supports as detailed.

.13 Plastic Laminate Wood Panelling:

.1 Use MDF Core for flat paneling to suit design requirements.

.2 Shop fabricate panels as large as possible.

.3 Provide design assembly at site to fit together. Provide supports and anchorage as required to meet design requirements.
.4 Finish for all exposed and semi-exposed surfaces and edges.
.5 High pressure laminate HGF.
.6 Parallel clip and join face veneers by tapeless splicer and edge glue.
.7 Face veneers shall not contain open joints, face depression, glue stain, patches and repair any manufacturing irregularities or defects to meet quality requirements specified herein.
.8 Provide sold wood members to core edge with same moisture content as core material.
.9 Adhere veneers to core materials and edging where applicable under pressure and heat.
.10 Pressure form curved panelling units in plywood strips and hardboard base to required profiles to meet design requirements.
.11 Apply three layers of veneers to base with adhesive under pressure and heat.
.12 Each layer shall be in perpendicular direction to preceding layer.

.14 Removable Thermofused Laminate Paneling:
.1 Use MDF Core for flat paneling to suit design requirements.
.2 Minimum panel thickness: 19mm.
.3 Shop fabricate panels as large as possible.
.4 Provide design assembly at site to fit together.
.5 Provide supports and anchorage as required to meet design
.6 Finish for all exposed and concealed surfaces:

.15 Thermofused Laminate:
.1 Parallel clip and join face veneers by tapeless splicer and edge glue.
.2 Face veneers shall not contain open joints, face depression, glue stain, patches and repair any manufacturing irregularities or defects to meet quality requirements specified herein.

3.5 INSTALLATION

.1 Do architectural woodwork to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.
.2 Install prefinished millwork at locations shown on drawings. Position accurately, level, plumb straight and true.
.3 Complete fabrication at site to comply with requirements for fabrication specified herein and to extent that it was not completed in shop.
.4 Shim as required with concealed shims.
.5 Fasten and anchor millwork securely. Provide heavy duty fixture attachments for wall mounted cabinets.
.6 Install level and plumb (including tops) to a tolerance of 3 mm in 2400 mm.
.7 Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
.8 Use draw bolts in countertop joints.
.9 Cabinets:
.1 Install without distortion so doors and drawers fit openings properly and are accurately aligned.
.10 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.

.11 Where cupboard or shelving units end within 300mm of a side wall provide a filler panel between end of unit and wall c/w closure panel at top and bottom.

.12 Form joints to conceal shrinkage.

.13 At junction of plastic laminate counter backsplash and adjacent wall finish, apply small bead of sealant.

.14 Apply water resistant building paper over wood framing members in contact with masonry or cementitious construction.

.15 Fit hardware accurately and securely in accordance with manufacturer's directions.

.16 Adjust hardware to center doors and drawers in openings and to provide unencumbered operation.

.17 Complete installation of hardware and accessory items as indicated.

.18 Site apply laminated plastic to units as indicated or required. Adhere laminated plastic over entire surface. Make corners with hairline joints. Use full sized laminate sheets. Make joints only where approved. Slightly bevel all rises.

.19 Maintain veneer sequence matching of cabinets with transparent finish.

.20 For site application offset joints in plastic laminate facing from joints in core.

.21 Vacuum clean all cavities prior to final placement of millwork.

.22 Install millwork bases after flooring is applied.

.23 Fasten wall cabinets through back, near top and bottom, at ends and not more than 400 mm o.c. with No. 10 wafer-head screws sized for 25 mm penetration into wood framing, blocking, or hanging strips.

.24 Countertops:

- .1 Scribe countertop to wall and related profiles.
- .2 Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
- .3 Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
- .4 Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- .5 Secure backsplashes to tops with concealed metal brackets at 400 mm o.c. and to walls with adhesive.
- .6 Touch up finishing work specified in this Section after installation of woodwork.
- .7 Fill nail holes with matching filler where exposed.
- .8 Provide Work of this Section true and straight and securely fastened in place.
- .9 Mitre exposed corners and butt joints.
- .10 Provide plastic laminate countertops plumb and true, neatly scribed to adjoining surfaces.
- .11 Thoroughly fix and anchor Work of this Section into position.

.25 Mechanical and Electrical Fittings:

- .1 Provide openings required to accommodate mechanical and electrical fittings as part of the Work of this Section and provide a core sealant to protect counter cores which are exposed to accommodate:
  - .1 Locate and install lenses where indicated.
  - .2 Carefully align lenses, shown in continuous lines so that appear as straight lines.
  - .3 Mount lenses perfectly level or plumb.
  - .4 Lenses shall fit tightly without showing space or light leak between frame and lenses.
  - .5 Remove improperly installed lenses and reinstall at no cost to Owner.
  - .6 Mechanical services and fittings.

.7 Washroom accessories.

.8 Mechanical and electrical fittings and services will be provided as part of the Work of Sections 21, 22 23, 26, 27 and 28.

.26 Installation of Architectural Woodwork Hardware:

.1 Install architectural woodwork hardware in accordance with AWMAC AWS and manufacturer's requirements and templates.

.2 Adjust architectural woodwork hardware to provide smooth operation and ensure clearances are maintained.

.3 Repair damage to adjacent surfaces resulting from failure to conform with this requirement.

.4 Provide lubricants required and use in manner to ensure smooth function of hardware consistent with manufacturer's recommendations.

.5 Verify fastening components are tightened securely.

.6 Align screws, bolts and similar fastenings such that relationship of screw head indentations, similar surfaces and slots are perpendicular to matching vertical or horizontal position when on same surface.

.7 Do not burr or otherwise mar edges of surfaces of hardware components.

.27 Do not burr or otherwise mar edges of surfaces of hardware components.

3.6 CONSTRUCTION

.1 Fastening.

.1 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.

.2 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.

.3 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

.2 Standing and running trim.

.1 Butt and cope internal joints of baseboards to make snug, tight, joint. Cut right angle joints of casing and base with mitered joints.

.2 Fit backs of baseboards and casing snugly to wall surfaces to eliminate cracks at junction of base and casing with walls.

.3 Make joints in baseboard, where necessary using a 45 degrees scarf type joint.

.4 Install door and window trim in single lengths without splicing.

.3 Interior and exterior frames.

.1 Set frames with plumb sides and level heads and sills and secure.

.4 Paneling.

.1 Secure paneling and perimeter trim using adhesive recommended for purpose by manufacturer. Fill nail holes caused by temporary fixing with filler matching wood in color.

.2 Secure paneling and perimeter trim using concealed fasteners.

.3 Secure paneling and perimeter trim using counter sunk screws plugged with matching wood plugs.

.5 Shelving.

.1 Install shelving on ledgers or clips as indicated.

3.7 FABRICATION OF COUNTERTOPS, WORKTOPS AND VANITY TOPS

.1 Fabricate counter tops/worktops/vanity tops continuous over multiple cabinetwork types, in as long a length as practicable, using minimum 19mm thickness plywood, except where indicated otherwise.

.2 Provide backslash at vanity tops, and elsewhere where backslash is indicated, with return backslash along side wall(s) to front edge of counter.
.3 Cut holes for fittings, accessories and equipment.
.4 Use draw bolts and splines in counter top joints. Maximum spacing 450mm, keep back 75mm from edges.
.5 All PVC edge tape to be applied by hot glue with a purpose made machine.

3.8 INSTALLATION OF COUNTERTOPS/WORKTOPS AND VANITY TOPS

.1 Install counter tops on cabinet bases. Fasten securely to cabinet. Ensure top is level, with backslash tight against abutting walls.
.2 Install worktops and Vanity tops using metal support brackets. Anchor brackets securely to wood blocking in steel stud walls using appropriate fasteners to ensure rigid installation and secure vanity top to brackets and to blocking at each end. Ensure top is level, with backslash tight against abutting walls.
.3 Finishing and sealant between backslash and wall by Section 07 92 00 - Joint Sealants.

3.9 FABRICATION OF SHELVING LEDGERS

.1 Fabricate ledgers to support miscellaneous TFL shelving from pine or poplar, sized to suit width and length of shelving. Sand and leave ready for finishing by Section 09 91 00 - Painting.

3.10 INSTALLATION OF SHELVING LEDGERS

.1 Install where required anchored securely to wood blocking between steel studs. Countersink fasteners, fill and sand ready for painting by Section 09 91 00 - Painting.
.2 Ensure level, rigid, secure installation.
.3 Leave ready for installation of shelving.

3.11 GROMMETED HOLES

.1 Locate and drill grommeted holes after countertop equipment has been arranged and located on site.

3.12 FINISHING

.1 Prime unexposed surfaces including backs of fitments against walls and underside of fitments.
.2 Before priming, treat knots and sap streaks, with a coat of shellac and then prime with a wood primer.
.3 Shop finish natural finished wood surfaces.

3.13 ADJUSTING AND CLEANING

.1 Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork.
.2 Adjust joinery for uniform appearance.
.3 Clean, lubricate, and adjust hardware.
.4 Clean millwork and cabinet work inside cupboards and drawers and outside surfaces.
.5 Touch up shop-applied finishes to restore damaged or soiled areas.

3.14 PROTECTION

.1 Protect millwork and cabinet work from damage until final inspection.
.2 Remove protection prior to Substantial Performance.

END OF SECTION

1 General

1.1 SUMMARY

.1 The work of this Section comprises the furnishing of all labour, equipment and materials necessary for the supply and installation of the following as specified in this Section and indicated on the Drawings and Schedules:

.1 FRP panels site-bonded to gypsum board wall finish after the gypsum board has been installed, seam filled and primed.

.2 FRP panels site-bonded/mechanically attached to concrete block walls.

.2 The work of this Section does NOT include FRP factory bonded to insulated metal wall and ceiling panels identified as IWP and ICP respectively under the ' Material' Column of the Finish Schedule.

1.2 RELATED REQUIREMENTS

.1 Section 07 92 00 - Joint Sealants.

.2 Section 09 21 16 - Gypsum Board Assemblies.

.3 Section 09 54 53 - Fiberglass Reinforced Panel Ceilings.

.4 Section 09 91 00 - Painting.

1.3 REFERENCES

.1 SPICPC-90/5/15, Standard Specification for Glass Fiber - Reinforced Polyester Composite Wall and Ceiling Panels.

.2 CAN/ULC-S102-M88, Standard Method of Test for Surface Burning Characteristics of Building Materials.

.3 Agriculture Canada: Acceptance for Use in Registered Establishments.

.4 Health and Welfare Canada: Acceptance

.5 USDA: Acceptance for use in Meat and Poultry Plants.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit manufacturer's literature showing compliance with specified regulatory bodies, composition, surface-texture, thickness and panel sizes.

.3 Submit layout showing walls designated to receive panels together with details at top and bottom of walls.

1.5 MAINTENANCE DATA

.1 Provide data for maintenance of FRP panels for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 FRP PANELS

.1 Fiberglass Reinforced Plastic:

.1 100% moisture resistant, shatter resistant, thermal shock and chemically resistant, stain and odor resistant.

.2 Purpose-made for interior wall finishes.
.3 Subject to cleaning with steam, detergent and water or high pressure sprayers.

.2 Size:
.1 2.2mm thickness x 1200mm wide x length required to provide single one-piece panel floor to ceiling.

.3 Finish: textured

.4 Color: White

.5 Acceptable Material:
.1 Nudo Products Inc.: FiberLite® FRP
.2 Graham Products Limited AExceliner XLX"
.3 Kemlite AGlasbord-PC1"

2.2 ACCESSORIES

.1 Moldings: white vinyl as manufactured or recommended by panel manufacturer for specific location.

.2 Rivets: white nylon, drive type.

2.3 ADHESIVES

.1 As recommended by panel manufacturer for bonding panels to gypsum board substrate.

2.4 SEALANTS

.1 One component, silicone base, solvent curing to CAN/CGSB-19.8, color to match panel.

.2 Acceptable Material:
.1 Tremco Spectrum 2"

3 Execution

3.1 PREPARATION

.1 Inspect surface of primed drywall substrate for blemishes or other defects which would adversely affect the lamination of the FRP panels. Do not proceed with installation of FRP panels until defects have been corrected.

.2 Pre-cut panels as required to fit returns to frames at head, sill and jambs of windows and head and jambs at doors.

.3 Pre-drill panels for rivets and other similar fastenings.

.4 Pre-cut openings required in panels for the work of other trades or Contracts.

3.2 INSTALLATION

.1 Install panels vertically in strict accordance with manufacturer's printed instructions and as follows:
.1 Use combination adhesive and mechanical fastening.
.2 Panels to extend down to floor behind concrete curbs at all locations where substrate is gypsum board.

.2 Provide moldings at all joints between panels, bottom of panels, outside and inside corners and elsewhere as required to make for a complete installation.

.3 Use sealant to install moldings in accordance with panel manufacturer's printed instructions.

.4 Provide nylon drive rivets as required to ensure a smooth, flat installation.
.1 Use type appropriate to specific situation.

3.3 SEALANTS

.1 Apply sealants in accordance with Article 2.4 above, at the following external locations:

.1 Between bottom molding and concrete floor slab or concrete curb.
.2 Between panels and window and door frames.
.3 Between panels and all items by other trades or Contracts penetrating panels.
.4 Elsewhere as specifically indicated or recommended by panel manufacturer.

3.4 CLEAN-UP

.1 Remove excess sealant immediately after installation.
.2 Wipe panels clean of handprints and other surface marks resultant from installation.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 - Cast-in-Place Concrete.
.2 Section 06 10 00 - Rough Carpentry.
.3 Section 07 21 16 - Blanket Insulation.
.4 Section 07 26 00 - Vapor Retarders.
.5 Section 09 21 16 - Gypsum Board Assemblies.
.6 Section 09 22 16 - Non-Structural Metal Framing.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
  .1 ASTM E96-00e1, Test Methods for Water Vapor Transmission of Materials.
  .2 ASTM C208-95(R2001), Specification for Cellulosic Fiber Insulating Board.
  .3 ASTM C591-01, Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
  .4 ASTM C612-00a, Specification for Mineral Fiber Block and Board Thermal Insulation.
  .5 ASTM C165 (2012), Standard Test Method for Measuring Compressive Properties of Thermal Insulations.
  .6 ASTM C665 (2011), Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
  .7 ASTM C728-97e1, Specification for Perlite Thermal Insulation Board.
  .8 ASTM C1126-00, Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
  .9 ASTM C1289-02, Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
  .10 ASTM C1338 (2008), Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
.2 Canadian General Standards Board (CGSB).
  .1 CGSB 71-GP-24M-77(R1983), Adhesive, Flexible, for Bonding Cellular Polystyrene Insulation.
.3 Underwriters Laboratories of Canada (ULC).
  .1 CAN/ULC-S102 (2010), Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
  .2 CAN/ULC-S604-91, Type A Chimneys.
  .3 CAN/ULC-S701-01, Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
  .4 CAN/ULC-S702 (2012), Standard for Thermal Insulation Mineral Fibre for Buildings.
  .5 CAN/ULC-S704-01, Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.

1.3 QUALITY ASSURANCE

.1 Pre-Installation Meetings: attend pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.
.2 Place in appropriate on-site bins in accordance with Waste Management Plan.
.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe

condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 ROOF INSULATION & TAPERED ROOF INSULATION

.1 Rigid Cellular Poly-isocyanurate, to thickness indicated.
  .1 Faced: to ASTM C 1289-98, glass fiber reinforced polyisocyanurate core, surfaced with glass fiber faces. Minimum two layers with joints staggered.
.2 Tapered insulation minimum 1% slope to drains.
.3 Insulation at roof drains is to be a minimum of R30 at square sump at roof drains.
.4 Thermal Resistance: R Value per inch = 6.0.
.5 Acceptable Material:
  .1 IKO Therm Poly-Isocyanurate Insulation.
  .2 Soprema, Sopra-Iso.

2.2 FOUNDATION WALLS AND CONCRETE SLABS ON GRADE

.1 Extruded polystyrene to CAN/ULC S701-97, Type IV, ship lapped, to thickness indicated.
.2 Minimum compressive strength: 210 kPA (30 psi).
.3 Thermal Resistance: R Value per inch = 5.0.
.4 Compressive Strength: 30 PSI min.
.5 Acceptable Material:
  .1 Celfort Celfortec-300
  .2 Dow Styrofoam SM.
  .3 Dow Styrofoam High Load 60.
  .4 Sopra-XPS 30 by Soprema.

2.3 ADHESIVE

.1 Synthetic rubber base insulated Type A adhesive having a moisture permeability of 1.71 ng/Pa.s.m².
.2 Insulation clips: impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.

2.4 ACCESSORIES

.1 Mechanical fasteners in accordance with insulation manufacturer's written recommendations.
.2 Insulation clips: in accordance with manufacturer's written recommendations.
.3 Foundation sealing compound: Bitumen sealing compound.
.4 Adhesive: All purpose construction adhesive in accordance with insulation manufacturer's written recommendations.

3 Execution

3.1 EXAMINATION

.1 Examine substrates and immediately inform Consultant in writing of defects.
.2 Prior to commencement of work ensure: substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.2 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written data, including product technical bulletins, product

catalogue installation instructions, product carton installation instructions, and data sheets.

3.3 WORKMANSHIP

.1 Install insulation after building substrate materials are dry.

.2 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.

.4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN4-S604 type A chimneys.

.5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

.6 Offset both vertical and horizontal joints in multiple layer applications.

.7 Do not enclose insulation until it has been inspected and approved by Consultant.

3.4 RIGID INSULATION INSTALLATION

.1 Apply adhesive in accordance with manufacturer's recommendations.

.2 Embed insulation boards into vapour barrier type adhesive, applied as specified, prior to skinning of adhesive.

.3 In addition to adhesive, install insulation boards with insulation clips and disk, per manufacturer requirements.

.4 Leave insulation board joints unbonded over line of expansion and control joints. Bond a continuous 150 mm wide 0.15 mm modified bituminous membrane over expansion and control joints using compatible adhesive and primer before application of insulation.

3.5 UNDERSLAB AND PERIMETER FOUNDATION INSULATION

.1 Under horizontal slab application: extend boards to the dimension indicated on the drawings. Lay boards on level compacted fill.

.2 Exterior vertical application: extend boards on exterior face of perimeter foundation wall with adhesive to the dimension indicated on the drawings.

3.6 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

1 General

1.1 WORK INCLUDED

.1 Provide and install all thermal and sound insulation and accessories on the interior of the building between the steel studs and as indicated above ceiling necessary to complete all as shown on the drawings or specified.

1.2 RELATED REQUIREMENTS

.1 Section 06 10 00 - Rough Carpentry.

.2 Section 09 22 16 - Non-Structural Metal Framing

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).

- .1 ASTM C167, Standard Test Method for Thickness and Density of Blanket or Batt Thermal Insulations.
- .2 ASTM C356, Standard Test Method for Linear Shrinkage of Performed High-Temperature Thermal Insulation Subjected to Soaking Heat.
- .3 ASTM C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- .4 ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- .5 ASTM C553-02, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- .6 ASTM C665-01e1, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .7 ASTM C1320-99, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
- .8 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- .9 ASTM E413, Classification for Rating Sound Insulation.
- .10 ASTM E1050, Standard Test Method for Impedance and Absorption of Acoustical Materials using a Tube, Two Microphones and a Digital Frequency Analysis System.

.2 Underwriters Laboratories of Canada (ULC).

- .1 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .2 CAN/ULC S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials.
- .3 CAN/ULC S115, Standard Method of Test Firestop Systems.
- .4 CAN/ULC-S604-1991, Type A Chimneys.
- .5 CAN/ULC-S702-1997, Standard for Thermal Insulation Mineral Fiber for Buildings.

1.4 SUBMITTALS

.1 Make submittals in accordance with Contract conditions and Section 01 33 00 - Submittal Procedures.

.2 Product Data: Submit project data including manufacturer's literature for insulation materials and accessories, indicating compliance with specified requirements and material characteristics.

- .1 Submit list on insulation manufacturer's letterhead of materials and accessories to be incorporated into the Work.
- .2 MSDS report.

.3 Include product name.

.4 Include preparation instructions and recommendations, installation methods and storage and handing requirements.

.5 Include contact information for manufacturer and their representative for this project.

.3 Samples:

.1 If requested, submit 140mm x 190mm minimum sample of insulation in thickness used on project.

.4 Test Reports:

.1 Submit evaluation service reports or other independent testing agency reports, showing compliance with specified performance characteristics and physical properties.

.5 Field Reports:

.1 Submit manufacturer's field reports within three (3) days of each manufacturer representative's site visit and inspection.

.6 Insulation Installer Qualifications:

.1 Submit letter verifying insulation installer's experience with work similar to work of this Section.

1.5 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: Supply maintenance data for insulation materials for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.2 Record Documentation: In accordance with Section 01 78 00 - Closeout Submittals.

.1 List materials used in insulation work.

.2 Warranty: Submit warranty documents specified.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver and acceptance requirements:

.1 Deliver material in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver materials and accessories in insulation manufacturer's original packaging with identification labels intact and in sizes to suit project.

.3 Ensure insulation materials are not exposed to moisture during delivery.

.4 Replace wet or damaged insulation materials.

.2 Storage and handling requirements: Store materials off ground in dry location and protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

.1 Store in original packaging until installed.

1.7 QUALITY ASSURANCE

.1 Pre-installation Meetings: attend pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.8 WARRANTY

.1 Manufacturer's warranty: Submit for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not intended to limit other rights the Owner may have under Contract conditions.

.2 Warranty period, one (1) year commencing on date of Substantial Performance of Work.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 INSULATION - ACOUSTIC

.1 Acoustical and fire batt insulation for walls and floors to CAN/ULC S702, Type 1.

.1 Fire Performance:

.1 Non-combustibility: To CAN/ULC S114.

.2 Surface burning characteristics: To CAN/ULC S102.

.1 Flame spread: 0.

.2 Smoke developed: 0.

.2 Acoustical Performance:

.1 Airborne sound transmission loss: To ASTM E90.

.2 Rating sound insulation: To ASTM E413.

.3 Sound absorption co-efficients: To ASTM E423.

.4 Impedance and absorption of acoustic materials: To ASTM E1050.

.3 Acceptable Material:

.1 Rockwool, AFB, Acoustical Fire Batt.

2.2 INSULATION FOR FIRESTOPPING

.1 Insulation for firestopping installations to ASTM C612.

.1 Fire performance:

.1 Non-combustibility: To CAN/ULC S114.

.2 Surface burning characteristics: To CAN/ULC S102.

.1 Flame spread: 0.

.2 Smoke developed: 0.

.2 Accoustical Performance:

.1 Airborne sound transmission loss: To ASTM E90.

.2 Rating sound insulation: To ASTM E413.

.3 Sound absorption co-efficients: To ASTM E423.

.4 Impedance and absorption of acoustic materials: To ASTM E1050.

.3 Acceptable Material:

.1 Rockwool, AFB, Acoustical Fire Batt.

2.3 ACCESSORIES

.1 Staples: 12.7mm minimum leg.

.2 Tape: as recommended by manufacturer.

.3 Mechanical fasteners in accordance with insulation manufacturer's written recommendations.

.4 Acoustical sealant in accordance with Section 07 92 19 - Acoustical Joint Sealants.

.5 Firestopping materials in accordance with Section 07 84 00 - Firestopping.

3 Execution

3.1 INSULATION INSTALLATION

.1 Install thermal or acoustic insulation between studs to maintain continuity of thermal or acoustical protection to building elements and spaces.

.2 Install acoustic insulation above ceiling at locations shown.

.3 Install insulation in areas as indicated. Friction-fit in position installed as recommended by manufacturer.

.4 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

.5 Do not compress insulation to fit into spaces.

.6 Keep insulation minimum 75mm from heat emitting devices such as recessed light fixtures, and minimum 50mm from sidewalls of CAN/CGA-B149.1 and CAN/CGA-B149.2 Type B vents.

.7 Seal joints with acoustical joint sealant.

.8 Do not enclose insulation until it has been inspected and approved by Consultant.

.9 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.2 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

END OF SECTION

1 General

1.1 DESCRIPTION OF WORK

.1 The work of this Section involves the provisions of a sheet vapour seals in the following locations:

.1 All locations where shown on drawings.

1.2 RELATED REQUIREMENTS

.1 Section 07 21 16 - Blanket Insulation
.2 Section 07 27 00 - Air Barriers
.3 Section 07 92 00 - Joint Sealants.
.4 Section 09 21 16 - Gypsum Board Assemblies
.5 Section 09 22 16 - Non Structural Metal Framing

1.3 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86, Vapor Barrier, Polyethylene Sheet, for Use in Building Construction.

1.4 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit product data sheets for sheet vapour retarders. Include:

.1 Product characteristics.
.2 Performance criteria.
.3 Limitations.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.
.2 Place in appropriate on-site bins in accordance with Waste Management Plan.
.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.
.4 Place materials defined as hazardous or toxic waste in designated containers.
.5 Use the least toxic sealants and adhesives necessary to comply with requirements of this section.
.6 Place used hazardous sealant tubes and adhesive containers in areas designated for hazardous materials.

2 Products

2.1 SHEET VAPOUR BARRIER

.1 Polyethylene film: 6mil thick above grade, 10mil thick below grade

2.2 ACCESSORIES

.1 Joint sealing tape: air resistant pressure sensitive adhesive tape, cloth fabric duct tape, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.
.2 Sealant: EcoLogo certified, not to contain total of volatile organic compounds in excess of 5 % by weight, asbestos-free sealant, compatible with vapour retarder materials, recommended by vapour retarder manufacturer and as specified in Section 07 92 00 - Joint Sealants.
.3 Staples: minimum 6 mm leg.

.4 Molded box vapour barrier: factory-molded polyethylene box for use with recessed electric switch and outlet device boxes.

3 Execution

3.1 INSTALLATION

.1 Ensure services are installed and inspected prior to installation of retarder.

.2 Install sheet vapour retarder on warm side of exterior wall assemblies prior to installation of gypsum board to form continuous retarder.

.3 Use sheets of largest practical size to minimize joints.

.4 Tie vapor retarder into roof membrane.

.5 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 all door and window frames.

3.3 PERIMETER SEALS

.1 Seal perimeter of sheet vapour barrier as follows:

.1 Apply continuous bead of sealant to substrate at perimeter of sheets.

.2 Lap sheet over sealant and press into sealant bead.

.3 Install staples through lapped sheets at sealant bead into wood substrate.

.4 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 150 mm and press into sealant bead.

.4 Install staples through lapped sheets at sealant bead into wood substrate.

.5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.5 ELECTRICAL BOXES

.1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:

.1 Install molded box vapour barrier.

.2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

END OF SECTION

1 General

1.1 SCOPE OF WORK

.1 Single qualified Trade to provide all firestopping for the entire project, included all mechanical & electrical penetrations, except as noted below.

.2 Fire stopping and smoke seals within mechanical assemblies (i.e. inside ducts, dampers) and electrical assemblies (i.e. inside cable trays) are specified in Divisions 21, 22, 23, 25, 26, 27 and 28 respectively.

.3 Refer to Section 09 90 00 - Painting for painting of rated wall assemblies.

.4 Tag each type of firestopping used.

1.2 REFERENCES

.1 Underwriter's Laboratories of Canada (ULC)

.1 CAN/ULC-S115-Standard Method of Fire Tests of Firestop Systems.

.2 NBC 3.1.9.1 Fire Stop Requirements

.3 NBC 3.1.9.3 Fire Stop for Penetrations, Wires & Cables.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit shop drawings indicating:

.1 ULC listed firestop drawing for each anticipated distinct fire separation penetration and joint. Each ULC system firestop drawing must indicate the actual penetrating products used on site and the required fire stop materials and their proper installation.

.2 Technical information for each material used in ULC system firestop drawing above.

.3 Construction details should accurately reflect actual job conditions.

1.4 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site. Include manufacturer's printed instructions for installation.

.3 Material Safety Data Sheets:

.1 Submit MSDS for inclusion in Operation and Maintenance Manual.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MATERIALS

.1 Use purpose designed products for application.

.2 Fire stopping and smoke seal systems: in accordance with CAN/ULC-S115.

.1 Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of CAN/ULC-S115 and not to exceed opening sizes for which they are intended and

conforming to special requirements specified in 3.5.

.2 All penetrations of fire separations must be fire stopped as per CAN/ULC-S115 standard with F rating and similar for Fire Resistant Rating for closures.

.3 All penetrations of a firewall must be fire stopped per CAN/ULC-S115 standard with FT rating and similar for Fire Resistant Rating for the fire separation.

.4 Acceptable Material:

.1 Tremco Fyre-Shield.

.2 A/D Fire Barrier Sealant.

.3 3M Fire Barrier Products.

.4 Hilti Firestops Products.

.5 DAP Fire Stop Fire-Rated Silicone Sealant.

.6 NUCO Inc. firestopping products.

.3 Service penetration assemblies: certified by ULC in accordance with ULC-S115 and listed in ULC Guide No.40 U19.

.4 Service penetration firestop components: certified by ULC in accordance with ULC-S115 and listed in ULC Guide No.40 U19.13 and ULC Guide No.40 U19.15 under the Label Service of ULC.

.5 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.

.6 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.

.7 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.

.8 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.9 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.10 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.11 Sealants for vertical joints: non-sagging.

.12 At rated partitions use 1 outlet box per stud space or where more than 1 outlet box / stud spacer is required use putty pads behind or at inside face of box.

.13 Where rated assemblies are penetrated for drains use rated fire stopping.

3 Execution

3.1 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.

.2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.2 INSTALLATION

.1 Install fire stopping and smoke seal material and components in strict accordance with ULC certification and manufacturer's written instructions.

.2 Seal holes or voids made by through penetrations, poke-through termination devices,

and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.4 Tool or trowel exposed surfaces to a neat finish.

.5 Remove excess compound promptly as work progresses and upon completion.

3.3 INSPECTION

.1 Notify Consultant when ready for inspection and prior to concealing or enclosing firestopping materials and service penetration assemblies.

.2 Anticipate destructive testing of 2% of firestopping at this Section's cost. Failure of 10% of tests will require replacement of all firestopping and retesting.

3.4 SCHEDULE

.1 Firestop and smoke seal at all penetrations of or joints in fire resistive wall and floor assemblies, including but not limited to:

.1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls as shown on wall schedule.

.2 Edge of floor slabs at curtain wall and precast concrete panels.

.3 Top of fire-resistance rated masonry and gypsum board partitions.

.4 Intersection of fire-resistance rated masonry and gypsum board partitions.

.5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.

.6 Penetrations through fire-resistive floor slabs, ceilings and roofs.

.7 Outlet boxes in rated walls more than 1 box / stud space.

.8 Openings and sleeves installed for future use through fire separations.

.9 Around mechanical and electrical assemblies penetrating fire separations.

.10 Rigid ducts without fire damper: greater than 129 cm^2: fire stopping to consist of bead of fire sealant between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

3.5 CLEAN UP

.1 Remove excess materials and debris and clean adjacent surfaces immediately after application.

.2 Remove temporary dams after initial set of fire stopping and smoke seal materials.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 - Cast-In-Place Concrete.
.2 Section 04 22 00 - Concrete Unit Masonry.
.3 Section 07 84 00 - Firestopping.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
  .1 ASTM C 321 - Standard Test Method for Bond Strength of Chemical- Resistant Mortars.
  .2 ASTM C 834 - Standard Specification for Latex Sealants.
  .3 ASTM C 882 - Standard Test Method for Bond Strength of Epoxy-R Systems used with Concrete by Slant Shear.
  .4 ASTM C 919 - Standard Specification for use of Sealants in Acoustical Applications.
  .5 ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
  .6 ASTM C 1330 - Standard Specification for Cylindrical Sealant Backing for use with Cold Liquid Applied Sealants.
  .7 Sealants and associated materials must conform with the latest version of standards and specifications referenced.
.2 Transport Canada (TC)
  .1 Transportation of Dangerous Goods Act (TDGA).
.3 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB-19.21, Sealing and Bedding Compound Acoustical.
.4 Department of Justice Canada (Jus)
  .1 Canadian Environmental Protection Act, 1999 (CEPA).
.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
  .1 Caulking Compound.
  .2 Primers.
  .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
  .4 Installation instructions, surface preparation and product limitations.
.2 Manufacturer's Technical Data Guides and application procedures.
.3 Submit cured samples illustrating colors selected.
.4 Submit laboratory tests or data validating product compliance with performance criteria specified. Include SWRI validation certificate where required.
.5 Upon completion of the project the sealant applicator must submit copies of the Manufacturer's Weatherseal and the Warranty Applicator's Workmanship Warranty.
.6 Before proceeding with work or ordering of material submit the following to the Consultant for review and acceptance:
  .1 Manufacturer's product data for sealants to be used.
  .2 Manufacturer's recommended installation procedures.
.7 Material Safety Data Sheets:
    .1 Submit MSDS for inclusion in Operation and Maintenance Manual.

1.4 QUALITY ASSURANCE/MOCK-UP

.1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.

.2 Manufacturer Qualifications: Company regularly engaged in manufacturing and marketing of products specified in this section.

.3 Installer Qualifications: Qualified to perform work specified by reason of experience or training provided by the product manufacturer.

.4 Installer must submit a reference list including a minimum of three projects of similar size and scope.

.5 Mock-ups: Include a minimum of 3m of sealant to show compatibility with substrate, proper adhesion to substrate and chosen color.

.1 Apply mock-up with specified joint filler types and with other components noted. Installer must provide both primed and un-primed mock up to assess whether a primer is required for the project.

.2 Locate where directed by Consultant.

.3 Mock-up may remain as part of the work if acceptable to Consultant.

.4 Allow 24 hours for inspection of mock-up by Consultant before proceeding with sealant work.

.5 When accepted, mock-up will demonstrate minimum standard of quality required for this Work.

.6 Adhesion pull tests: the number of adhesion pull tests is to be determined by the manufacturer's weatherseal warranty. Adhesion pull tests are to be conducted by or in the presence of the manufacturer's representative. The manufacturer is to supply the Consultant / Owner with the results of the adhesion pull tests. The sealant installer is responsible for repairing areas where adhesion pull tests are conducted.

1.5 FIELD ADHESION / COHESION TESTS

.1 Test Frequency:

.1 Perform a field test for each type of sealant and substrate combination, for all interior and exterior sealants associated with the building envelope.

.2 Perform three (3) additional tests for each failed test.

.2 Locate test joints as directed by Owner's Representative. Tests to be performed in the presence of the Owner's Representative and/or manufacturer's representative.

.3 Notify Owner's Representative seven (7) days prior to dates tests are to be performed.

.4 Test joint sealants by hand-pull methods #1 and #2. Record results in Field Adhesion / Cohesion Test Form.

.1 Test Method #1:

.1 Make a knife cut horizontally from one side of the joint to the other.

.2 Make two (2) vertical cuts (from the horizontal cut) approximately 75mm long on each side of the joint.

.3 Pry out flap created from cuts.

.4 Firmly grasp flap and slowing pull at 90 degrees from sealant plane.

.5 Pull flap until adhesive or cohesive failure occurs.

.1 Adhesive failure will be evidenced by the sealant pulling off clean from the substrate.

.2 Cohesion failure will be evidenced by the sealant ripping or failing within itself, leaving well-adhered sealant to the substrate, (cohesive failure is considered a positive result).

.2 Test Method #2:

.1 Follow steps #1 to #4 (inclusive) of Test Method #1 above.

.2 Mark a benchmark on the sealant, 25mm from the plane of the installed sealant.

.3 Firmly grasp the flap and pull slowly, while holding a ruler parallel to the sealant flap. Note the position of the benchmark on the ruler.

.4 Refer to manufacturer's printed literature for each sealant tested for the required extension factor pass criteria; (i.e. if the 25mm benchmark on the sealant can be pulled to 100mm and held with no failure of sealant, 400% elongation is achieved).

.5 If no failure occurs prior to the manufacturer's stated extension factor, the test is successful. Extension factor should be three (3) times the movement capability of the sealant.

.5 Inspect joints for:

.1 Complete fill.

.2 Absence of voids.

.3 Primer.

.4 Proper width / depth ratio.

.5 Backup material.

.6 Repair sealants pulled in test area by applying new sealants following same procedures used to original seal joints.

.7 Contactor shall repair test areas at no additional cost to the Owner.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver products in original factory packaging bearing identification of product, manufacturer, and batch number. Provide Material Safety Data Sheets (MSDS) for each product.

.3 Store products in location protected from freezing, damage, construction activity, precipitation and direct sunlight in strict accordance with manufacturer's recommendations.

.4 Condition products to approximately 16 to 21 degrees C, for use in accordance with manufacturer's recommendations.

.5 Handle all product with appropriate precautions and care as stated on Material Safety Data Sheet (MSDS).

1.7 PROJECT CONDITIONS

.1 Do not use products under conditions of precipitation or freezing weather. Use appropriate measures for protection and supplementary heating to ensure proper curing conditions in accordance with manufacturer's recommendations if application during inclement weather occurs.

.2 Ensure substrate is dry.

.3 Protect adjacent work from contamination due to mixing, handling and application.

.4 Joint-Width Conditions:

.1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

.5 Joint-Substrate Conditions:

.1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.

1.9 WARRANTY

.1 Provide manufacturer's five (5) year standard material warranty.

.2 Include coverage for replacement of sealant materials which fail to achieve water tight seal, exhibit loss of adhesion or cohesion, or do not cure.

.3 Warranty Exclusions: Failure resulting from concrete shrinkage, structural cracks or defects, faulty construction, faulty design, faulty materials (other than sealant), misuse of structure, settlement or accident, fire or other casualty, or physical damage.

1.10 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

.4 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Provincial and Municipal regulations.

2 Products

2.1 MANUFACTURERS

.1 Acceptable material:

.1 BASF Building Systems.

.2 Pecora Corporation.

.3 Tremco Sealant and Waterproofing.

.4 Sika Canada Inc.

.5 Dow Corning.

.2 Provide all joint materials of the same type form a single manufacturer.

2.2 MATERIALS

.1 Single Component, Non-Sag Polyurethane Sealant with plus or minus 25 percent movement capability for vertical joints; ASTM C 920, Type S, Grade NS, Class 35, uses NT, M, A, O & I.

.1 Acceptable Materials:

.1 MasterSeal NP1 by BASF Building Systems.

.2 Pecora DynaTrol 1-XL by Pecora Corporation.

.3 Sikaflex 1a by Sika Canada Inc.

.2 [Substrates: concrete, masonry, aluminum, wood, copper, stainless steel, galvanized steel and some stone.
Expected service life: 7 - 12 years.
Possible uses: Wall joints, window frames, precast joints, parapets etc.]

.2 Single component texturized polyurethane sealant with plus or minus 25 percent joint movement capability for horizontal or vertical joints, ASTM C 920, Type S, Grade NS, Class 25, uses NT, M, A, O.

.1 Acceptable Materials:

.1 MasterSeal TX1 by BASF Building Systems.

.2 Vulkem 116 by Tremco Sealant & Waterproofing.

.2 [Substrates: concrete, masonry, aluminum, wood, stucco, copper, stainless steel, galvanized steel and some stone.
Expected service life: 7 - 12 years.
Possible uses: Wall joints, HVAC, roofing, precast joints, parapets etc.]

.3 Single component low modulus high movement fast-curing silyl terminated polyether

sealant with plus 100 and minus 50 percent joint movement capability; ASTM C 920, Type S, Grade NS, Class 50, uses NT, M, A, G, O; ASTM C 1382.

.1 Acceptable Materials:

.1 MasterSeal NP 150 by BASF Building Systems.

.2 [Substrates: concrete, masonry, aluminum, glass, stone, EIFS, wood.
Expected service life: 20 years.
Possible uses: Wall joints, caulking windows, window & door frames, wet glazing, sanitary applications etc.]

.4 Multi-component field tintable low modulus high movement fast-curing sealant with plus 100 and minus 50 percent joint movement capability; ASTM C 920, Type M, Grade NS, Class 50.

.1 Acceptable Materials:

.1 MasterSeal 150 Tint Base by BASF Building Systems.

.2 Pecora 890FTS by Pecora Corporation.

.2 [Substrates: concrete, masonry, aluminum, glass, stone, EIFS, wood.
Expected service life: 20 years +.
Possible uses: Wall joints, caulking windows, window & door frames, wet glazing, sanitary applications etc.]

.5 Field tintable low modulus high movement fast-curing textured sealant with plus and minus 50 percent joint movement capability; ASTM C 920, Type M, Grade NS, Class 50.

.1 Acceptable Materials:

.1 Pecora 890FTS-TXTR by Pecora Corporation.

.2 [Substrates: concrete, masonry, stone, EIFS.
Expected service life: 20 years +.
Possible uses: Wall joints, mortar joints.]

.6 Multi-component, Polyurethane Sealant with plus or minus 50 percent joint movement capability; ASTM C 920, Type M, Grade NS, Class 25, uses NT, T, M, A, O, G and I; UL classified (fire resistance).

.1 Acceptable Materials:

.1 DynaTrol ll by Pecora Corporation.

.2 MasterSeal NP2 by BASF Building Systems.

.3 Dymeric 240 by Tremco Sealant & Waterproofing.

.4 Sikaflex 2C NS by Sika Canada Inc.

.2 [Substrates: concrete, masonry, aluminum, vinyl siding, copper, stainless steel, galvanized steel, marble, granite and limestone.
Expected service life: 7 - 12 years.
Possible uses: Wall joints, window frames, structural components, etc.]

.7 Single component self-leveling polyurethane sealant with plus or minus 25 percent movement capability for horizontal joints; ASTM C 920, Type S, Grade P, Class 25 uses T&M.

.1 Acceptable Materials:

.1 Urexpan NR-201b by Pecora Corporation.

.2 MasterSeal SL1 by BASF Building Systems.

.3 Vulkem 45 by Tremco Sealant & Waterproofing.

.4 Sikaflex 1C SL by Sika Canada Inc.

.2 [Substrates: concrete & metal.
Expected service life: 7 - 12 years.
Possible uses: floor joints, sidewalks, driveways, decks, parking areas, etc.]

.8 Multi-component, Self-Leveling Polyurethane Sealant with plus or minus 25 percent movement capability for horizontal joints, ASTM C 920, Type M, Grade P, Class 25 uses NT. T, A, I & M.

.1 Acceptable Materials:
.1 Urexpan NR-200 by Pecora Corporation.
.2 MasterSeal SL2 by BASF Building Systems.
.3 Vulkem THC 900 by Tremco Sealant & Waterproofing.
.4 Sikaflex 2C SL by Sika Canada Inc.

.2 [Substrates: concrete, and metal.
Expected service life: 7 - 12 years.
Possible uses: floor joints, cantilever decks, driveways, decks, parking ramps, industrial floors, precast double T's, metal expansion joints etc.

.9 Single component neutral cure silicone sealant for non-structural glazing applications with plus / minus 50 percent joint movement capability; ASTM C 920, Type S, Grade NS, Class 50, Use NT, M, G and A.

.1 Acceptable Materials:
.1 Pecora 864NST or 895NST by Pecora Corporation.
.2 Dow Corning 795 by Dow Corning.
.3 Spectrum 2 by Tremco Sealant & Waterproofing.

.2 [Substrates: concrete, masonry, aluminum, glass & plastics.
Expected service life: 20 years +.
Possible uses: conventional glazing, window & door frames, window perimeters, curtain walls, expansion & control joints etc.

.10 Single component neutral cure silicone sealant for non-structural glazing applications with plus 100% minus 50% joint movement capability; ASTM C 920, Type S, Grade NS, Class 100/50, use T, NT, M, G, A and O. SWRI validated.

.1 Acceptable Materials:
.1 Pecora 890NST by Pecora Corporation.
.2 Spectrum 1 by Tremco Sealant & Waterproofing.
.3 Dow Corning 790 by Dow Corning.

.2 [Substrates: concrete, masonry, stone, ceramics, granite, wood, steel, aluminum and plastics.
Expected service life: 20 years +.
Possible uses: precast panels, curtain walls, mullions, expansion joints, EIFS, etc.

.11 Single component mildew resistant silicone sealant plus/minus 25% movement capability; ASTM C 920, Type S, Grade NS, Class 25, Use NT, G and A.

.1 Acceptable Materials:
.1 Pecora 898 by Pecora Corporation.
.2 Tremsil 200 by Tremco Sealant & Waterproofing.
.3 Dow Corning 786.

.2 [Substrates: glass, aluminum, tile and fiberglass.
Possible uses: countertops, kitchen & bath areas, non-structural glazing, etc.

.12 Single component silicone structural adhesive with plus/minus 50% joint movement capability; ASTM C 920, Type S, Grade NS, Class 25, Use NT, G and A.

.1 Acceptable Materials:
.1 Dow Corning 995 by Dow Corning.
.2 Pecora 895NST by Pecora Corporation.

.2 [Substrates: glass, aluminum, anodized aluminum, paints.
Structural glazing applications must be reviewed by Pecora Corp Technical Service Staff. Contact your local manufacturer's representative for more information.
Possible uses: two sided or four sided structural glazing.]

.13 Single component synthetic rubber sealant purpose made for use in acoustical

applications.

.1 Acceptable Materials:

.1 Tremco Acoustical Sealant.

.2 Pecora BA-98.

.14 Single component pick resistant sealant with plus/minus 25 percent joint movement capability; ASTM C 920, Type S, Grade NS, Class 25, uses NT, T, M, A, G and I.

.1 Acceptable Materials:

.1 Pecora 896HIS by Pecora Corporation.

.2 MasterSeal CR 195 by BASF Building Systems.

.2 [Substrates: concrete, masonry, granite, marble, brick, aluminum, wood, stainless steel and galvanized steel.
Expected service life: 7 - 12 years.
Possible uses: wall joints, prisons, stadiums, schools, universities, etc.]

.15 Poured flexible 100% solids epoxy joint filler; properties:

.1 Shore A Hardness: greater than 75.

.2 Shore D Hardness: greater than 30.

.3 Elongation: 75 percent.

.4 Tensile Strength: 4.5 MPa.

.5 Acceptable Materials:

.1 MasterSeal CR 190 by BASF Building Systems.

.2 Loadflex by Sika Canada Inc.

.3 Rezi-Weld Flex (W.R. Meadows).

.16 Gunned 100% solids epoxy joint filler. Two component gun-grade pick proof epoxy joint filler for sloped, vertical areas and security applications.

.1 Tensile Strength: 13.8 MPa

.2 Slant Shear Strength: 34.5 MPa.

.3 Bond Strength: 10.3 MPa.

.4 Acceptable Materials:

.1 Dynapoxy EP-1200 by Pecora Corporation.

.2 MasterEmaco ADH 327 by BASF Building Systems.

.17 Two-component self leveling, 100 percent solids Polyurea control joint filler.

.1 Shore A Hardness: 85 to 90.

.2 Tensile Strength: 1183 psi.

.3 Elongation: 240 percent.

.4 Acceptable Materials:

.1 MasterSeal CR 100 by BASF Building Systems.

.2 Sika Loadflex Polyurea by Sika Canada Inc.

.3 PenJoint 3004 (ASTC)

2.3 ACCESSORIES

.1 Primer: Type recommended by the sealant manufacturer and compatible with joint forming materials.

.2 Joint Cleaner: Non-corrosive and non-staining type recommended by sealant manufacturer and compatible with joint forming materials.

.3 Soft Backer Rod: non-gassing, reticulated closed-cell polyethylene rod designed for use with cold-applied joint sealants.

.1 Comply with ASTM C 1330.

.2 Size required for joint design.

.4 Closed-Cell Backer Rod: closed-cell polyethylene rod designed for use with cold-applied joint sealants for on-grade or below-grade applications.

.1 Comply with ASTM C 1330.
.2 Size required for joint design.

.5 Joint Filler: closed-cell polyethylene joint filler, designed for use in cold joints, construction joints or isolation joints wider than 1/4 inch (6mm).
.1 Size required for joint design.

.6 Bond Breaker: Pressure-sensitive tape recommended by sealant manufacturer to suit application.

2.4 COLOR

.1 Sealant Colors: Selected by Consultant.
.1 Manufacturer's standard color range.
.2 Custom color matching submittal of job site substrate samples.

3 Execution

3.1 PROTECTION

.1 Protect installed Work of other trades from staining or contamination.

3.2 EXAMINATION

.1 Inspect all areas involved in work to establish extent of work, access and need for protection of surrounding construction.
.2 Conduct pre-application inspection of site verification with an authorized manufacturer's representative.
.3 Occupied areas: where high VOC materials are utilized, investigate occupants to determine the measures to be taken to accommodate them.

3.3 PREPARATION

.1 Remove loose materials and foreign matter which could impair adhesion of the sealant.
.2 Clean joint and saw cuts by grinding, sandblasting or wire brushing to expose a sound surface free of contamination and laitance.
.3 Ensure structurally sound surfaces are dry, clean, free of dirt, moisture, loose particles, oil, grease, asphalt, tar, paint, wax, rust, waterproofing, curing and parting compounds, membrane materials and other foreign matter.
.4 Where the possibility of sealants staining adjacent areas or materials exist, mask joints prior to application.
.1 Do not remove masking tape before joints have been tooled and initial cure of joint filler has taken place.
.2 Work stained due to failure of proper masking precautions will not be accepted.

3.4 INSTALLATION:

.1 Priming:
.1 Prime all surfaces to receive sealant with recommended primer unless the mockup proves otherwise.
.2 Back-Up Material:
.1 Install appropriate size backer rod, larger than joint where necessary according to manufacturer's recommendations.
.2 Install polyethylene joint filler in joints wider than 1/4 inch (6mm) to back-up material per manufacturer's recommendations.
.3 Bond Breaker:
.1 Install bond-breaker strip in joint to be sealed on top of back-up material to prevent adhesion of sealant to back-up material; install per manufacturer's recommendations.

.4 Sealant:

.1 Prepare sealants that require mixing; follow manufacturer's recommended procedures, mixing thoroughly.

.2 Mix only as much material as can be applied within manufacturer's recommended procedures, mixing thoroughly.

.3 Apply materials in accordance with manufacturer's recommendations; take care to produce beads of proper width and depth, tool as recommended by manufacturer and immediately remove surplus sealant.

.4 Apply materials only within manufacturer's specified application life period. Discard sealant after application life is expired or if prescribed application period has elapsed.

3.5 CLEANING

.1 Remove uncured sealant with Reducer 990, xylene, toluene or MEK. Remove cured sealant by razor, scraping or mechanically.

.2 Remove all debris related to application of sealants from job site in accordance with all applicable regulations for hazardous waste disposal.

3.6 APPLICATION

.1 Sealant.

.1 Apply sealant in accordance with manufacturer's written instructions.

.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.

.3 Apply sealant in continuous beads.

.4 Apply sealant using gun with proper size nozzle.

.5 Use sufficient pressure to fill voids and joints solid.

.6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.

.7 Tool exposed surfaces before skinning begins to give slightly concave shape.

.8 Remove excess compound promptly as work progresses and upon completion.

.2 Curing.

.1 Cure sealants in accordance with sealant manufacturer's instructions.

.2 Do not cover up sealants until proper curing has taken place.

.3 Cleanup.

.1 Clean adjacent surfaces immediately and leave Work neat and clean.

.2 Remove excess and droppings, using recommended cleaners as work progresses.

.3 Remove masking tape after initial set of sealant.

END OF SECTION

1 General

1.1 WORK INCLUDED

.1 All hollow metal steel frames and glazed light frames as per Door & Frame Schedule, and as detailed on Drawings.

.2 Provide steel doors and frames including but not limited to following:

.1 Hollow metal doors, swing flush type.

.2 Fire rated.

.3 Hollow metal door frames.

.4 Hollow metal window frames.

.5 Glazing stops.

.6 Preparation of hollow metal doors and frames for security system CSA approved wiring and/or conduit for electronic hardware. Include junction boxes and conduit for electronic hardware. Include system consisting of 15 conductors of 22 gauge wire complete with a modular quick connect wiring harness. Refer to Section 08 71 00 - Door Hardware for openings that require electrified hardware.

1.2 RELATED REQUIREMENTS

.1 Section 04 22 00 - Concrete Unit Masonry.

.2 Section 07 92 00 - Joint Sealants.

.3 Section 08 14 16 - Flush Wood Doors.

.4 Section 08 71 00 - Door Hardware.

.5 Section 08 80 00 - Glazing.

.6 Section 09 22 16 - Non-Structural Metal Framing.

.7 Section 09 91 00 - Painting.

.8 Division 23 - Mechanical.

.9 Division 26 - Electrical: Wiring for electronic hardware.

1.3 REFERENCES

.1 Canadian Standards Association (CSA).

.1 CSA A101-M1983, Thermal Insulation, Mineral Fibre, for Buildings.

.2 CSA W59-M1989, Welded Steel Construction (Metal Arc Welding).

.3 CSA-A440.S1, Canadian Supplement.

.4 AAMA/WDMA/CSA 101/I.S.2/A-440.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-1.181-92, Ready-Mixed Organic Zinc-Rich Coating.

.2 CGSB 51-GP-21M-78, Thermal Insulation, Urethane and Isocyanurate, Unfaced.

.3 CGSB 41-GP-19M, Rigid Vinyl Extrusions for Windows and Doors.

.4 CAN/CGSB-82.5-M88, Insulated Steel Doors.

.5 CSA W59-03, Welded Steel Construction (Metal Arc Welding).

.6 CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies.

.7 CAN4-S105-M85, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

.8 CAN4-S106-M80, Standard Method for Fire Test of Window and Glass Block Assemblies.

.9 CAN/ULC-S702-97, Standard for Mineral Fibre Thermal Insulation for Buildings.

.3 American Society for Testing and Materials (ASTM).

.1 ASTM A 525M-91b, General Requirements for Steel Sheet Zinc-Coated (Galvanized) by the Hot-Dip Process Metric.

.2 ASTM A 526M-90, Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip

Process, Commercial Quality.

.3 ASTM A 527M-90, Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality.

.4 ASTM B 29-92, Pig Lead.

.5 ASTM B 749-85(1991), Lead and Lead Alloy Strip, Sheet and Plate Products.

.6 ASTM A568M-07, Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled.

.7 ASTM A924M-07, Specification for General Requirements for Steel Sheet, Metallic- Coated by Hot-Dip Process.

.8 ASTM C177-04, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

.9 ASTM C518-04, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

.10 ASTM C578-07, Specification for Rigid, Cellular Polystyrene Thermal Insulation.

.11 ASTM C665-06, Specification for Mineral Fiber Insulation.

.12 ASTM C1289-07, Specification for faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

.13 ASTM D1622-03, Standard Test Method for Apparent Density of Rigid Cellular Plastics.

.14 ASTM E90-04, Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.15 ASTM E413-04, Classification for Rating Sound Insulation.

.16 ASTM C305-06 - Practice for Mechanical Mixing of Hydraulic Cement Paste and Mortars of Plastic Consistency.

.17 ASTM C1107-07a - Standard Specification for Packaged Dry Hydraulic Cement Grout (Nonshrink).

.4 Underwriters' Laboratories of Canada (ULC).

.1 CAN4-S104M-M80, Fire Tests of Door Assemblies.

.2 CAN4-S105M-M85, Fire Door Frames.

.3 CAN/ULC-S702-97 - Standard for Mineral Fibre Thermal Insulation for Buildings.

.5 CAN/ULC-S702-97 - Standard for Mineral Fibre Thermal Insulation for Buildings.

.1 CSDMA, Commercial Steel Doors and Frames, 2006.

.2 CSDMA, Recommended Selection and Usage Guide for Commercial Steel Doors, 1990.

.6 National Fire Protection Association (NFPA).

.1 NFPA 252-08, Standard for Fire Tests of Door Assemblies.

.2 NFPA 257-07, Standard for Fire Tests of Window Assemblies and Glass Block Assemblies.

.3 NFPA 80-1999, Standard for Fire Doors and Fire Windows.

.4 UL List of Equipment and Materials, Volume 2.

.5 WH Certification Listings.

.7 ANSI:

.1 ANSI A115-05, Hardware Preparations for Steel Doors and Frames.

.2 ANSI A115-IG 94, Installation Guide for Doors and Hardware.

.3 ANSI A224.1-94, Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

.4 ANSI A250.4-01, Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.

1.4 DESIGN REQUIREMENTS

.1 Design exterior frame assembly to accommodate expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to 35°C.

.2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.

.3 Labeled Fire-Rated Doors and Frames:

.1 Fire rated steel doors and frame products shall be provided for those openings as scheduled.

.2 Products shall bear the label of a recognized testing agency having factory inspection service, and shall be constructed as listed or classified for labeling.

.3 Doors provided for openings requiring fire rating only, or fire and temperature rise rating shall be tested in accordance with CAN4-S104.

.4 Frames, transom and sidelight assemblies provided for openings requiring fire rating, shall be tested in accordance with CAN4-S104.

.5 Window frames provided for openings requiring fire rating, shall be tested in accordance with CAN4-S106.

.6 Labeling shall be in accordance with ANSI/NFPA 80, the listing organization's policies and Follow-Up Service Procedures/Manuals.

.7 Fire rated door or frame component, not qualifying for labeling due to design, hardware or any other reason, shall be noted in the submittal documents, or prior to manufacture of product if hardware, glazing or other options affecting fire-rating are not available at time of submittal shop drawing preparation.

.4 Ensure core materials for exterior doors attains thermal resistance of R 5 when tested in accordance with ASTM C177 or ASTM C518.

.5 Provide thermally broken assemblies as indicated on Drawings and noted on Door Schedule tested in accordance with requirements of CAN/CGSB-82.5-M.

.6 Provide acoustic assemblies as indicated on Drawings and noted on Door Schedule tested as a fully operable unit in accordance with requirements of ASTM E90 and ASTM E413.

.7 Product quality shall meet standards set by (CSDMA) Canadian Steel Door and Frame Manufacturers Association.

1.5 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's product specification, construction details, material, finish descriptions and dimensions of individual components.

.2 Submit manufacturer's literature, data sheets for each type of material provided under this Section for project.

.3 Data sheets shall provide all required information.

.4 Submit required copies of detailed instructions for inclusion in maintenance manual.

.5 Submit manufacturer's installation instructions.

.3 Material Safety Data Sheets:

.1 Submit MSDS for inclusion in Operation and Maintenance Manual.

.4 Shop Drawings:

.1 Show each type of frame, door, core, metal thicknesses and finishes, openings (glazed and/or louvered), fire ratings, location of exposed fasteners, cutouts, hardware blanking, reinforcing, tapping and drilling arrangements.

.2 Show large scale frame sections and anchoring details.

.3 Submit door and frame schedule identifying each unit.

.4 Ensure each unit bears legible identifying mark corresponding to that listed in Door and Frame Schedule.

.5 Fabrication shall not proceed without receipt of reviewed submittal drawings and reviewed hardware schedule.

.5 Test Reports:

.1 Submit following test reports:

.1 Steel door and frame assemblies supplied under this Section meet acceptance criteria of ANSI A224.1 and ANSI A250.4, Level "A".

.2 Insulated door cores supplied in exterior doors under this Section meet specified thermal resistance rating.

.3 Thermally broken frames meet or exceed CAN/CGSB-82.5-M.

.4 Acoustic door and frame assemblies provide the Sound Transmission Class (STC) and sound Transmission Loss (TL) values specified with the critical frequency range, as determined and scheduled by the Consultant.

.5 Submit in addition to fire label, certificate to substantiate design and construction of firerated screen assemblies, if required by Consultant or authorities having jurisdiction.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

.1 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104M and NFPA 252 for ratings specified or indicated.

.2 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled.

.3 Test products in strict conformance with CAN4-S104, ASTM E 152 or NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

1.7 QUALITY ASSURANCE MOCK-UP

.1 Fabricate a mock-up that will demonstrate the various aspects of the air barrier / door connection / cladding (brick, steel, wood, EIFS and/or vinyl) installation and detailing.

.2 The installation is to reflect the intent to have a full tie in of the air barrier to the entire perimeter of all wall openings, including windows, doors and louvers, providing a tight air and water seal and the relationship of the cladding installation to the openings.

.3 The mock-up is to be reviewed by the Contractor, Membrane Installer, Frame Installer, Owner and Consultant prior to the Contractor moving forward with the installation of all other windows.

.4 Allow 48 hours to convene the review on site.

.5 Mock-up to be approved prior to fabrication of additional openings.

.6 Openings installed prior to review and approval will be removed at the Contractors expense and rebuilt.

.7 The approved mock-up may remain on site as part of the work and it will form the standard of acceptance for the remainder of the work.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Be responsible for supply of products under this Section to site in timely manner, so as not to delay progress of other trades.

.2 Protect doors and frames during shipping and storage.

.3 Inspect all materials thoroughly upon receipt and report all discrepancies, deficiencies and/or damages immediately in writing to the Supplier. Note all damage on carrier's Bill of Lading.

.4 Make good immediately any damage done. Clean scratches and touch up with rust-inhibitive primer. Replace damaged work which cannot be repaired, restored or cleaned.

.5 Store in a dry, secure location, on planks or dunnage. Doors and frame shall be stored in a vertical position, spaced with blocking. Materials shall be covered to protect them from damage but is such a manner as to permit air circulation. Site storage and protection of materials shall be in accordance with NAAMM-HMMA 840.

1.9 OPENING SIZES

.1 Method of measuring sizes:

.1 Width - Width of openings shall be measured from inside to inside of frame jamb rabbets.

.2 Height - Heights of openings shall be measured from the level finished floor (exclusive of floor coverings to the head rabbet of the frame.

.3 Door sizes - Doors shall be sized so as to fit the above openings and allow 3 mm maximum clearance at jambs and head of frame. A clearance of 6 mm maximum shall be allowed between the bottom of the door and the finished floor (exclusive of floor coverings). These are considered to be nominal clearances, subject to ordinary commercial variations.

1.10 WARRANTY

.1 Warrant work of this Section for period of 1 year against defects and/or deficiencies in accordance with General Conditions of the Contract. Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Consultant and at no expense to Owner. Defects include but are not limited to; buckling, opening of seams, bond failure and extensive colour fading.

1.11 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 ACCEPTABLE MATERIALS

.1 Products of following manufacturers are acceptable subject to conformance to requirements of Drawings, Schedules and Specifications:

.1 Ambico Limited; www.ambico.com

.2 Apex Machine Works Limited; www.apexmw.com

.3 Daybar Industries Limited; www.daybar.com

.4 Fleming Door Products Limited; www.flemingdoor.com

2.2 MATERIALS

.1 Hot dipped galvanized steel sheet: to ASTM A 526M or ASTM A 527M coating designation to ASTM A 525M, ZF75, minimum base steel thickness in accordance with CSDFMA Table 1 - Thickness for Component Parts.

.2 Reinforcement channel: to CAN/CSA-G40.21, Type 44W, coating designation to ASTM A 525M, ZF75.

2.3 DOORS: CORE MATERIALS

.1 Honeycomb construction:

.1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m³ minimum sanded to required thickness.

.2 Polystyrene Core:

.1 ASTM C578, Type 1, rigid extruded fire retardant, closed cell board, density 16 to 32 kg/cu m, thermal values R-6.0 minimum. All exterior doors.

.3 Stiffened: face sheets welded, honeycomb, insulated core.

.1 Fibreglass: to CSA A101, semi-rigid Type 1A density 24 kg/m³.

2.4 DOORS: CONSTRUCTION

.1 Form each face sheet for exterior doors from 18 ga sheet steel.

.2 Form each face sheet for interior doors from 18 ga sheet steel.

2.5 DOORS: FABRICATION GENERAL

.1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.

.2 Exterior doors: hollow steel styrene insulated construction. Interior doors: honeycomb construction.

.3 Fabricate doors with longitudinal edges tack welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.

.4 Blank, reinforce, drill doors and tap for mortised, templated hardware and electronic hardware.

.5 Reinforce doors where required, for surface mounted hardware. Provide flush vinyl top caps to exterior doors.

.6 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in strict conformance with CAN4-S104, ASTM E 152 or NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

.7 Manufacturer's nameplates on doors are not permitted.

.8 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.

.9 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

2.6 ADHESIVES

.1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.

.2 Polystyrene and polyurethane cores: heat resistant, epoxy resin based, low viscosity, contact cement.

.3 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/ adhesive.

2.7 PRIMERS

.1 Touch-up prime CAN/CGSB-1.181.

2.8 ACCESSORIES

.1 Door silencers: single stud rubber/neoprene type.

.2 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.

.3 Metallic paste filler: to manufacturer's standard.

.4 Sealant: Refer to Section 07 92 00 - Joint Sealants.

.5 Door bottom seal: Refer to Section 08 71 00 - Door Hardware.

.6 Glazing: Refer to Section 08 80 00 - Glazing

.7 Fire labels: metal riveted.

.8 Make provisions for glazing as indicated and provide necessary glazing stops.
  .1 Provide removable steel glazing beads for use with glazing tapes and compounds and secured with countersunk steel screws.
  .2 Design exterior glazing stops to be tamper proof.

2.9 FRAMES: WELDED TYPE

.1 Welding in accordance with CSA W59.
.2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
.3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
.4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
.5 Securely attach floor anchors to inside of each jamb profile.
.6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.
.7 When required due to site access or due to shipping limitations, frame products for large openings shall be fabricated in sections, with splice joints for field assembly by others.

2.10 FRAMES: SIDELITES AND SCREENS FABRICATION GENERAL

.1 Fire-Rated Frames: Fabricate fire-rated frames in accordance with underwriter's requirements using material not less than the thickness specified herein unless a greater thickness is stipulated by the labelling authority.
.2 Fabricate frames in accordance with CSDMA specifications.
.3 Fabricate frames to profiles and maximum face sizes and indicated.
.4 Exterior Frames: 1.5 mm wiped zinc finish steel, welded thermally broken type construction.
.5 Interior frames: 1.5 mm welded type construction.
.6 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier.
.7 Protect mortised cut outs with steel guard boxes.
.8 Manufacturer's nameplates on frames and screens are not permitted.
.9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
.10 Insulate exterior frame components with polyurethane insulation.
.11 Cut mitres and joints accurately and weld continuously all joints and seams on the inside of frame profile.
.12 Grind welded corners and joints of flat plane, fill with metallic paste filler and sand to uniform smooth finish.
.13 Stiffen frames over 1200mm unsupported width with minimum 1.2mm formed steel channel, funnel thickness and width of frame, welded into head profile.
.14 Install 2 bumpers on strike jamb for each single door and 2 bumpers at head for pair of doors.
.15 Provide 2 spreader bars per door frame of 1.5mm materials. Welded at base of frame to ensure alignment during shipment.
.16 Borrowed light and screens size as noted on drawings, with removable stop for glazing of frame, on inside room side.

2.11 FRAMES: EXTERIOR THERMALLY BROKEN

.1 Fabricate thermally broken frames separating exterior parts from interior parts with continuous interlocking thermal break.
.2 Thermal break: rigid polyvinyl chloride extrusion conforming to CGSB 41-GP-19Ma.

2.12 FRAME AND SCREEN ANCHORAGE

.1 Frame Anchors:

.1 Frame anchor shall be provided with anchorage appropriate wall and frame construction.

.2 Floor Anchors:

.1 Where frame is installed prior to construction of adjacent wall, each jamb shall be provided with 1.52 mm (16 ga) steel floor anchors.

.2 Each anchor shall be provided with 2 (two) holes for mounting to floor and shall be securely welded to inside of jamb profile.

.3 Wall Anchors:

.1 Each wall anchor shall be located immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.

.2 Provide 2 anchors for rebate opening heights up to and including 1500 mm and one (1) additional anchor for each additional 760 mm of height or fraction thereof, except as indicated below.

.3 For frames in previously placed concrete, masonry or structural steel provide anchors located not more than 150 mm from top and bottom of each jamb and intermediate anchors at 660 mm on center maximum.

.4 Frame installed in steel stud and drywall partitions shall be provided with 20 gauge steel snap-in or "Z" stud type anchors.

.5 Supply frame anchors to gypsum board installers with directions for installing steel door frames in solid gypsum board partitions.

.6 Frame for installation in new masonry walls shall be provided with steel adjustable wall anchors of the T-strap, stirrup or wire, 16 gauge minimum or 0.156 in. diameter wire.

.1 Straps shall be not less than 50mm x 254mm in size, corrugated and/or perforated.

.7 Jambs of frames in previously placed concrete, masonry or structural steel shall be punched and dimpled to accept machine bolt anchors, 6.4mm diameter, located not more than 150mm from the top and bottom of each jamb.

.8 Anchor preparations and guides shall also be located immediately above or below the intermediate hinge reinforcing and directly opposite on the strike jamb.

.9 Each preparation shall be provided with 16 gauge anchor bolt guides.

.10 On sidelights or windows exceeding 3m in width, installed in stud partitions, channel extensions shall be provided from the top of the frame assembly to the underside of the structure above.

.11 Extensions shall be fabricated from 2.66 mm (12 ga) steel formed channels, mounting angles and adjusting brackets, with mounting angles welded to the inside of frame head.

.12 Formed adjusting brackets and fasteners shall be shipped loose.

.13 Channels shall be mechanically connected to mounting angles and adjusting brackets with supplied fasteners, on site, by Subcontractor responsible for installation.

.4 Fire Rated Door and Frame Assemblies:

.1 Conform to CAN4-S104-M, CAN4-S105-M, NFPA 80 and NFPA 252.

2.13 HARDWARE PREPARATION

.1 Doors and frames shall be prepared to receive hardware.

.2 Unless otherwise shown on the drawings, locate hardware in accordance with the Recommended Locations For Architectural Hardware as published by the Door and Hardware Institute.

.3 Prepare doors and frames to receive electrified hardware.

.4 Frame preparation shall include the application of shallow back boxes suitable for EMT termination at all device locations.

.5 Back boxes shall be of sufficient size allowing for wiring, connectors, and the device to be properly installed in the mortise.

.6 Door preparation shall include the installation of conduit or suitable wire raceway within door assemblies during fabrication.

2.14 FABRICATION

.1 Permit access by an approved inspection and testing company for purpose of inspecting at random doors under fabrication.

.2 Welding: CSA W59-M.

.3 Grind exposed welds smooth and flush. Fill open joints, seams and depressions with filler or by continuous brazing or welding. Grind smooth to true sharp arises and profiles and sand down to smooth, true, uniform finish.

.4 Hardware Requirements and Preparations:

.1 Door and frame shall be blanked, reinforced, drilled and tapped at factory for fully templated hardware only in accordance with approved hardware schedule and templates provided by hardware Supplier.

.2 Check hardware list for requirements.

.3 Door and frame shall be blanked and reinforced only for mortised hardware that is not fully templated.

.4 Where surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges or non templated hardware apply, frame shall be reinforced only, with drilling and tapping done by others in field.

.5 Templated holes 12.7mm diameter and larger shall be factory prepared except mounting and through bolts holes which shall by Subcontractor responsible for installation on site, at time of application.

.6 Templated holes less than 12.7mm diameter shall be factory prepared only when required for function of device (for knobs, levers, cylinders, thumb or turn pieces) or when these holes over-lap function holes.

.7 Hinge reinforcing shall be 3.42 mm (10 ga) steel minimum, high frequency type be provided.

.8 Reinforcing for continuous hinges shall be 2.66 mm (12 ga) minimum.

.9 Cylindrical lock, ASA strike and flush bolt reinforcing shall be 2.66 mm (12 ga) steel minimum.

.10 Mortise lock and surface mounted hardware reinforcing shall be 1.52 mm (16 ga) steel minimum.

.11 Provide all hardware mortises on perimeter frame members shall be grouted.

.12 In masonry or concrete partitions with 0.76 mm (22 ga) steel grout guards. Where electrified hardware is specified on approved Hardware Schedule, steel door and frame shall have CSA approved system consisting of CSA approved conduit and junction boxes.

.13 Refer to Section 08 71 00 -Door Hardware for openings that require electrified hardware unless indicated otherwise.

.5 Frames - General:

.1 Fabricate frames for doors, screens and borrowed lights to profiles indicated.

.2 Reinforce frame as required for surface mounted hardware.

.3 For door frames wider than 1500 mm, reinforce door frame head and jamb and mullions at junction of head.

.4 Prepare each door opening for single stud door silencers: 3 for single door openings placed opposite hinges: 2 for double door openings approximately 150

mm each side of centreline of head stop.

2.15 ACCEPTABLE MATERIALS - GROUT

.1 Products of following manufacturers are acceptable subject to conformance to requirements of Drawings, Schedules and Specifications:
- .1 ChemRex Inc.; www.chemrex.com
- .2 CPD Construction Products; www.cpd.ca
- .3 Euclid Admixture Canada Inc.; www.euclidchemical.com
- .4 Sika Canada Inc.; www.sikacanada.com
- .5 W.R. Meadows of Canada; www.wrmeadows.com

.2 Spot Grout:
- .1 Proportion when used at metal door frames; 1 part hardwall plaster to not more than 2- 1/2 parts Perlite by weight, with enough water added for `hand pack' consistency.
- .2 Acceptable Materials:
  - .1 Gyproc 90 by Georgia-Pacific Canada, Inc.
  - .2 Durabond 90 by CGC Inc.

.3 Continuous Grout:
- .1 Non-shrink, non-metallic, cementitious grout, containing no chlorides, conforming to ASTM C1107 for Grade C type grouts.
- .2 Acceptable Materials:
  - .1 "Sika Grout 212" by Sika Canada Inc.
  - .2 "CG-86 Construction Grout" by W.R. Meadows of Canada Ltd.
  - .3 "Set Grout" by ChemRex Inc.

.4 Batt Insulation:
- .1 Preformed gall fibre or rockwool batt or roll insulation, conforming to CAN/ULC-S702.
- .2 Acceptable Materials:
  - .1 "QuietZone Acoustical Batts" by Owens Corning Canada Inc.
  - .2 "Roxul AFB - Acoustical Fire Batts" by Roxul Inc.
  - .3 "Fibrex Sound Attenuation Batt (SAFB) Insulation" by Fibrex Insulations Inc.
  - .4 "Thermafibre Sound Attenuation Blankets" by CGC Inc.
  - .5 Of type, minimum thickness, width to suit metal framing spacing and other miscellaneous spacings as indicated on Drawings.

.5 Threshold Sealant:
- .1 As recommended by installer in accordance with Section 07 92 00 - Joint Sealants.

3 Execution

3.1 INSTALLATION GENERAL

.1 Install labeled steel fire rated doors and frames to NFPA 80 except where specified otherwise.

.2 Install doors and frames to CSDMA Installation Guide.

3.2 FRAME INSTALLATION - GENERAL

.1 Set frames plumb, square, level and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width.

.4 Provide vertical support at center of head for openings over 1200 mm wide.
.5 Provide vertical support at center of head for openings over 1200 mm wide.
.6 Remove temporary spreaders after frames are built-in.
.7 Caulk perimeter of frames between frame and adjacent material.
.8 Maintain continuity of vapor barrier and air barrier.

3.3 DOOR INSTALLATION - GENERAL

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.
.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
  .1 Hinge side: 1.0 mm.
  .2 Latch side and head: 1.5 mm.
  .3 Finished floor, top of carpet: 13 mm.
.3 Adjust operable parts for correct function.
.4 Install louvers.

3.4 GLAZING

.1 Install glazing for doors and in accordance with Section 08 80 00 - Glazing.

3.5 FIRE LABELED DOORS AND FRAMES

.1 Install fire labeled doors and frames in accordance with manufacturer's printed instructions and NFPA 80.
.2 Verify labeled doors and frames are placed in their designated openings.
.3 Review, inspect and certify where required by authorities having jurisdiction.

3.6 HOLLOW METAL DOORS

.1 Install hollow metal doors in accordance with manufacturer's instructions.
.2 Install in accordance with following edge clearances unless otherwise indicated:
  .1 Between doors and frames at head and jambs: 3 mm.
  .2 At door bottom: 19 mm maximum to unfinished floor, 6 mm maximum to finished floor unless indicated to be undercut.
  .3 Between meeting edges of pairs of doors: 3 mm.

3.7 HOLLOW METAL FRAMES

.1 Install hollow metal frames in accordance with manufacturer's instructions.
.2 Set frames plumb, square, level and at correct elevation, maintaining uniform door width and height.
.3 Secure anchorages and connections to adjacent construction.
.4 Brace frames rigidly in position while being built in.
.5 Provide vertical supports and horizontal spreaders to prevent deflection and warping.
.6 Allow for deflection to prevent structural loads from being transmitted to frame.
.7 Provide batt insulation to completely fill pressed steel frames of exterior doors and adjacent cavities.
.8 Door Jamb Extensions:
  .1 Provide solid blocking and securement between all door frame extensions, metal stud and door frames at a minimum four locations per door jamb.

3.8 FINISH REPAIRS

.1 Touch up with primer finishes damaged during installation with zinc primer to CGSB 1-GP-181.
.2 Fill exposed frame anchors and with metallic paste filler and sand to a uniform smooth

finish.

END OF SECTION

1 General

1.1 WORK INCLUDED

.1 Supply of all wood doors noted in the Door & Frame Schedule.
.2 Wood veneer faced particle core doors for paint finish.
.3 Fire rated wood doors and glass lights.

1.2 RELATED REQUIREMENTS

.1 Section 04 22 00 - Concrete Unity Masonry.
.2 Section 06 10 00 - Rough Carpentry.
.3 Section 06 20 00 - Finish Carpentry.
.4 Section 08 11 13 - Hollow Metal Doors and Frames.
.5 Section 08 71 00 - Door Hardware.
.6 Section 08 80 00 - Glazing.
.7 Section 09 91 00 - Painting.
.8 Division 23 - Mechanical Grilles.

1.3 REFERENCES

.1 Architectural Woodwork Manufacturers Association of Canada (AWMAC).
  .1 Quality Standards for Architectural Woodwork 1998.
.2 Canadian General Standards Board (CGSB).
  .1 CAN/CGSB-71.19-M88, Adhesive, Contact, Sprayable.
  .2 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.
.3 Canadian Standards Association (CSA International).
  .1 CSA A440.2-98, Energy Performance of Windows and Other Fenestration Systems.
  .2 CSA-A440.S1, Canadian Supplement.
  .3 AAMA/WDMA/CSA 101/I.S.2/A-440.
  .4 CSA O115-M1982(R2001), Hardwood and Decorative Plywood.
  .5 CAN/CSA O132.2 Series-90(R1998), Wood Flush Doors.
  .6 CAN/CSA-O132.5-M1992(R1998), Stile and Rail Wood Doors.
  .7 CSA Certification Program for Windows and Doors 00.
.4 American National Standards Institute (ANSI):
  .1 A208.1 - Standard for Particleboard.
  .2 (ASTM): ASTM D 1761 - Screw Withdrawal Test Method.
.5 American Society for Testing and Materials (ASTM)
  .1 ASTM D 5456 - Standard Specification for Evaluation of Structural Composite Lumber Products.
  .2 (ASTM): ASTM D 1761 - Screw Withdrawal Test Method.
  .3 ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
  .4 ASTM E413 - Classification for Rating Sound Insulation.
  .5 ASTM E 1332 - Standard Classification for Determination of Outdoor-indoor Transmission Class.
  .6 ASTM E 2235 - Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods.
.6 American Society for Testing and Materials.
  .1 ASTM E 152-81a, Methods for Fire Tests of Door Assemblies.
.7 National Fire Protection Association (NFPA).
  .1 NFPA 80-1999, Standard for Fire Doors and Fire Windows.

.2 NFPA 252-1999, Standard Method of Fire Tests of Door Assemblies.

.8 Underwriters' Laboratories of Canada (ULC).

.1 CAN-4S104M-80(R1985), Fire Tests of Door Assemblies.

.2 CAN4-S105M-85 (R1992), Fire Door Frames Meeting the Performance Required by CAN4-S104.

.3 Underwriters' Laboratories (UL): UL 10B - Standard for Fire Test of Door Assemblies;

.4 Underwriters Laboratories (UL): UL 10C - Standard for Positive Pressure Fire Test of Door Assemblies.

.5 Underwriters Laboratories Canada (ULC): CAN 4-S104 - Fire Test of Door Assemblies.

.9 Uniform Building Code (UBC):

.1 UBC 7-2-1994 UBC Fire Test (Neutral Pressure).

.2 UBC 7-2-1997 UBC Fire Test (Positive Pressure).

1.4 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Manufacturer's data sheets on each type of door, including:

.1 Preparation instructions and recommendations.

.2 Storage and handling requirements and recommendations.

.3 Installation methods.

.3 Material Safety Data Sheets:

.1 Submit MSDS for adhesives for inclusion in Operation and Maintenance Manual.

.4 Shop Drawings:

.1 Include details of the following items on shop drawings:

.2 Door elevations, types, all sizes and fire ratings.

.3 Glass location, opening size, thickness, and glazing trim.

.4 Louver locations and opening size.

.5 Face material and grade.

.6 Edge material and thickness.

.7 Fire ratings and type of door cores being supplied for rated openings.

.8 Undercuts, hardware location and machining requirements.

.5 Samples:

.1 For factory finished doors, submit two sets of 300 x 300 mm selected veneer samples with the standard finish colors representing manufacturer's full range of available colors and finishes.

.2 Samples shall represent the color selected on veneer typical of grain patterns and coloration for the specified species and cut selected.

.3 Where Consultant has furnished custom color for matching, include original color sample.

.4 For each finish product specified, submit two complete sets of color chips representing manufacturer's full range of available colors and patterns.

.5 Certificates:

.1 Manufacturer's certification that doors comply with specified performance and physical properties.

1.5 QUALITY ASSURANCE

.1 Wood doors shall conform to the Quality Standards for Architectural Woodwork as published by the Architectural Woodwork Manufacturers Association of Canada (AWMAC) for the grade of door specified herein.

.2 Non-Fire-Rated Doors:

.1 Provide doors that comply with AWI Section 1300 and WDMA 1.S. 1A.

.3 Regulatory Requirements:

.1 Provide doors that comply with NEPA 80, NFPA 252, UL 10B or UL 10C, as applicable and as acceptable to authorities having jurisdiction, and that are listed and labeled by ITS-WH or a qualified testing agency.

.2 Notify Consultant prior to fabrication if fire doors required cannot qualify for labeling due to design size hardware or other requirement.

.4 Oversize Fire Rated Wood Doors:

.1 Manufacturer to provide a certificate stating that the doors conform to all standard construction requirements for tested and labeled fir door assemblies except as to size.

.2 Notify Consultant prior to fabrication if fire doors required cannot qualify for labeling due to design, size, hardware or other requirement.

.5 Single Source Responsibility:

.1 Provide doors from a single source to ensure uniformity in quality of appearance, face veneer, finish and construction.

.6 Hardware Installation Reference Standard:

.1 Standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame manufacturer's Association (CSDFMA).

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Storage and Protection:

.1 Store products in manufacturer's unopened packaging until ready for installation. Inspect for damage.

.2 Storage and Protection: Comply with door manufacturer's written recommendations and requirements of AWI Section 1300 G-23 and WDMA standards.

.3 Protect doors from dampness. Arrange for delivery after work causing abnormal humidity has been completed.

.4 Store doors in well ventilated room, off floor, in accordance with manufacturer's recommendations.

.5 Protect doors from scratches, handling marks and other damage. Wrap doors.

.6 Store doors away from direct sunlight.

.2 Marking and Packaging:

.1 Factory labels shall indicate door opening numbers and correspond with approved door schedule for size and door types.

.3 Maintain environmental conditions including temperature, humidity, and ventilation within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits. Inspect for damage prior to installation.

1.7 WARRANTY

.1 Provide manufacturer's standard warranty against defects in materials and workmanship for the following duration:

.1 Warranty Period, Interior Doors: For the lifetime of the door.

.2 Defects include, but are not limited to, bubbling, delamination of faces or edges, warp, twist bow exceeding 6mm, and telegraphing of core.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 WOOD DOORS

.1 Ultra Heavy Duty, Anti-Warping construction for intensive use.
.2 Styles:
  .1 3mm thick veneer, longitudinally laminated by hot pressing with type 1 structural glue in compliance with ASTM D5456-93 (LVL) including a 22 mm piece of hardwood, matched with faces, total width 107mm.
.3 Top and Bottom Rails:
  .1 3 mm thick veneer, longitudinally laminated by hot pressing with type 1 structural glue, as per ASTM D5456-93, for total width of 85mm.
.4 Core:
  .1 Solid particleboard. Density of 28-32 lbs per cubic foot. Complies with CSA-0188 and ANSI A208-1 standards (LD-1 / LD-2).
.5 Faces:
  .1 Wood veneer, paint grade birch veneer, rotary cut.
.6 Lock Block: Integrated
.7 Glue: Type1 PVA Cross-link (UFF).
.8 Styles & rails: to receive one (1) coat of clear sealer.
.9 Interior use.
.10 Warranty, Lifetime
.11 Clearances:
  .1 3mm top and both jambs, 19mm bottom.
.12 Acceptable Material:
  .1 Baillargeon Doors 8500

2.2 WOOD DOORS - 45 MINUTE FIRE RESISTANT RATING

.1 Ultra Heavy Duty, Anti-Warping construction for intensive use.
.2 Styles:
  .1 Minimum 36.5mm high-density mineral and /or SCL and untreated hardwood compliant with W/H label requirements. Bonded to core.
.3 Top and Bottom Rails:
  .1 Minimum 58mm high density mineral or SCL compliant with W/H label requirements.
.4 Core:
  .1 Low combustible agri-fibre. Density of 34-38 lbs per cubic square foot.
.5 Faces:
  .1 Wood veneer, paint grade birch veneer, rotary cut, 2 ply plywood.
.6 Lock Block: Integrated
.7 Glue: Type1 PVA Cross-link (UFF).
.8 Styles & rails: Clear finish sealer BC-00-25, factory applied.
.9 Interior use.
.10 Warranty, Lifetime
.11 Clearances:
  .1 3mm top and both jambs, 19mm bottom.
.12 Acceptable Material:

.1 Baillargeon Doors 8500 AF45

2.3 GLAZING

.1 Interior Glass: Refer to Section 08 80 00 - Glazing.

.2 Stops:

.1 Finish to match door colour, by Section 09 91 00 - Painting.

2.4 FABRICATION

.1 Fabricate doors and panels in accordance with CSA 0132.2 to ULC requirements where fire-rated doors are indicated.

.2 Prepare doors for glass and provide hardwood birch species glazing stops and stickings with mitred corners.

.3 Prepare doors for louvers (door grilles).

.4 Bevel vertical edges of single acting doors 3 mm on lock side.

.5 Radius vertical edges of double acting doors to be 60mm radius.

.6 Shop prepare doors for hardware installation. Templates to be supplied by Finish Hardware Supplier.

.7 Fabricate to AWMAC standards.

.8 Install glazing units with integral blinds as noted in door schedule.

3 Execution

3.1 EXAMINATION

.1 Do not begin installation until adjacent construction has been properly prepared.

3.2 PREPARATION

.1 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.4 INSTALLATION

.1 Unwrap and protect doors in accordance with CAN/CSA-O132.2 Series, Appendix A.

.2 Install labeled fire rated doors to NFPA 80.

.3 Install doors and hardware in accordance with manufacturer's printed instructions and CAN/CSA-O132.2 Series, Appendix A.

.4 Adjust hardware for correct function.

.5 Install glazing in accordance with Section 08 80 00 - Glazing.

.6 Install louvers.

.7 Secure transom and side panels by means of stops.

.8 Install all hardware in accordance with templates and manufacturer's instructions.

.9 Install all push/pull plates on doors with outer edge 75 mm from edge of door, except where glazing does not permit.

.10 Provide proper protection of all hardware items until Owner accepts project as complete.

3.5 WOOD DOORS

.1 Install in accordance with following edge clearances unless otherwise indicated:

.1 Between doors and frames: at head and jambs: 3 mm.

.2 At door bottom: 9 mm maximum unless doors are indicated to be undercut.

.3 Between meeting edges of pairs of doors: 3 mm.

.4 Cut, drill and prepare doors to template to receive hardware.

3.6 ADJUSTMENT

.1 Re-adjust doors and hardware just prior to completion of building to function freely and properly.

.2 Adjust hardware for proper door function and latching, and for smooth operation without excessive force for excessive clearance.

3.7 UNDERCUT DOORS

.1 Provide special door undercuts if indicated on door schedule.

3.8 CLEANING

.1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.

.2 Remove traces of primer, caulking; clean doors and frames.

.3 Clean glass and glazing materials with approved non-abrasive cleaner.

.4 On completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

1 General

1.1 SUMMARY

.1 Supply and deliver all finish hardware as specified in hardware sets for doors listed on door schedule. Hardware shall include all fasteners and devices necessary for the proper installation of hardware.

1.2 RELATED REQUIREMENTS

.1 Section 08 11 13 - Hollow Metal Doors and Frames.

.2 Section 08 14 16 - Flush Wood Doors.

.3 Electrical wiring.

1.3 REFERENCES

.1 Canadian Steel Door and Frame Manufacturers' Association (CSDFMA).

.1 CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frames Manufacturer's Association.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB 69.17 M86(R1993), Bored and reassembled Locks and Latches.

.2 CAN/CGSB 69.18 M90/ANSI/BHMA A156.1 1981, Butts and Hinges.

.3 CAN/CGSB 69.19 93/ANSI/BHMA A156.3 1984, Exit Devices.

.4 CAN/CGSB 69.20 M90/ANSI/BHMA A156.4 1986, Door Controls (Closers).

.5 CAN/CGSB 69.21 M90/ANSI/BHMA A156.5 1984, Auxiliary Locks and Associated Products.

.6 CAN/CGSB 69.22 M90/ANSI/BHMA A156.6 1986, Architectural Door Trim.

.7 CAN/CGSB 69.24 M90/ANSI/BHMA A156.8 1982, Door Controls Overhead Holders.

.8 CAN/CGSB 69.26 96/ANSI/BHMA A156.10 1991, Power operated Pedestrian Doors.

.9 CAN/CGSB 69.28 M90/ANSI/BHMA A156.12 1986, Interconnected Locks and Latches.

.10 CAN/CGSB 69.29 93/ANSI/BHMA A156.13 1987, Mortise Locks and Latches.

.11 CAN/CGSB 69.30 93/ANSI/BHMA A156.14 1991, Sliding and Folding Door Hardware.

.12 CAN/CGSB 69.31 M89/ANSI/BHMA A156.15 1981, Closer/Holder Release Device.

.13 CAN/CGSB 69.32 M90/ANSI/BHMA A156.16 1981, Auxiliary Hardware.

.14 CAN/CGSB 69.33 M90/ANSI/BHMA A156.17 1987, Self closing Hinges and Pivots.

.15 CAN/CGSB 69.34 93/ANSI/BHMA A156.18 1987, Materials and Finishes.

.16 CAN/CGSB 69.35 M89/ANSI/BHMA A156.19 1984, Power Assist and Low Energy Power Operated Doors.

.17 CAN/CGSB 69.36 M90/ANSI/BHMA A156.20 1984, Strap and Tee Hinges and Hasps.

.3 All hardware shall comply with requirements of the National Building Code (2010).

1.4 REQUIREMENTS OF REGULATORY AGENCIES

.1 Use ULC listed and labeled hardware for doors in fire separations and where noted on Door Schedule (located at the end of this document in the Schedules section).

1.5 SUBMITTALS

.1 Product Data:
  .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
.2 Hardware List:
  .1 Submit Finish Hardware Schedule electronically for approval.
  .2 Schedule shall be written in accordance with DHI Sequence and Format for vertical hardware schedule publication.
  .3 Schedule shall reference item and door number to hardware set specified.
  .4 Door index to be included referencing the door number to scheduled item number.
  .5 Submit electronic copies of keying schedules for approval.
  .6 Schedule shall be written in accordance with DHI Handbook Keying Schedule Systems and Nomenclature. Coordinate all keying in writing.
.3 Manufacturer's Instructions:
  .1 Submit manufacturer's installation instructions.
  .2 Provide template drawings as requested.
.4 Closeout Submittals
  .1 Provide operation and maintenance data for door closers, lockets, door holders electrified hardware and fire exit hardware for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.6 QUALITY ASSURANCE

.1 Hardware supplier must have on staff an Architectural Hardware Consultant or person of equivalent qualification and experience. Hardware supplier must have been in hardware supply for a minimum of two (2) years, have supplied similar type projects, and have adequate facilities to service project.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Trade Contractor to provide clean, dry locked room for storage of hardware on shelving.
.2 Each hardware item shall be delivered to site in manufacturers original packaging. Each item shall be labeled with door and item number to correspond with hardware schedule.
.3 All hardware will be delivered to one receiving are on site.

1.8 WARRANTY

.1 Furnish a one-year written warranty for all products with exceptions of door closers, Mortise locksets and latchsets which shall be warranted for ten (10) years, and exit devices and trim, overhead holders and stops which shall be warranted for five (5) years.

1.9 WASTE DISPOSAL AND MANAGEMENT

.1 Collect and separate for disposal waste material generated by this Section.
.2 Place in appropriate on-site bins in accordance with Waste Management Plan.
.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MANUFACTURERS

.1 Acceptable Material: Specified in Hardware Sets.

2.2 FINISH

.1 Finish for this project in general shall be 626 (Satin Chrome). Exceptions are as noted in

hardware packages.

2.3 KEYING

.1 All cylinders construction, master keyed.

.2 Provide three (3) master keys for each MK or GMK group.

.3 Stamp keying code numbers on keys and cores.

2.4 FASTENINGS

.1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.

.2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.3 Exposed fastening devices to match finish of hardware.

.4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.5 Use fasteners compatible with material through which they pass.

3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

.2 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.3 Recommend mounting heights shall be in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturer's Association.

.4 Furnish manufacturers' instructions for proper installation of each hardware component.

3.2 INSTALLATION

.1 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.

.2 Where door stop contacts door pulls, mount stop to strike bottom of pull.

.3 Install key control cabinet.

.4 Use only manufacturer's supplied fasteners. Failure to comply may void manufacturer's warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

.5 Remove construction cores when directed by Consultant; install permanent cores and check operation of locks.

3.3 ADJUSTING

.1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety, weather tight closure and to provide tight fit at contact points with frames.

3.4 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware

in accordance with manufacturer's instructions.

.3 Remove protective material from hardware items where present.

3.5 PROTECTION

.1 Provide proper protection of all hardware items until Owner accepts project as complete.

END OF SECTION

1 General

1.1 DESCRIPTION OF WORK

.1 The work of this Section comprises the provision of all equipment, labour and materials necessary for the supply and installation of all interior glazing as follows:

- .1 Glazing for interior flush wood doors.
- .2 Glazing for interior hollow metal windows (borrowed lights).
- .3 Window film.
- .4 Miscellaneous specialty glass, gaskets, tapes and glazing materials.

1.2 RELATED REQUIREMENTS

.1 Section 06 41 00 - Architectural Wood Casework.

.2 Section 08 11 13 - Hollow Metal Doors and Frames

.3 Section 08 14 16 - Flush Wood Doors

1.3 REFERENCES

.1 American National Standards Institute (ANSI).

- .1 ANSI/ASTM E330-02, Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

.2 American Society for Testing and Materials International, (ASTM).

- .1 ASTM C542-94(1999), Specification for Lock-Strip Gaskets.
- .2 ASTM D1003-00, Test Method for Haze and Luminous Transmittance of Plastics.
- .3 ASTM D2240-02b, Test Method for Rubber Property - Durometer Hardness.
- .4 ASTM E84-01, Test Method for Surface Burning Characteristics of Building Materials.
- .5 ASTM F1233-98, Test Method for Security Glazing Materials and Systems.
- .6 ASTM C509-06, Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
- .7 ASTM C510-05a, Standard Test Method for Staining and Colour Change of Single or Multicomponents Joint Sealants.
- .8 ASTM C794-06, Standard Test Method for Adhesion in Peel of Elastomeric Joint Sealants.
- .9 ASTM C864-05, Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- .10 ASTM C920-05, Standard Specification for Elastomeric Joint Sealants.
- .11 ASTM C1036-06, Standard Specification for Flat Glass.
- .12 ASTM C1048-04, Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
- .13 ASTM C1115-06, Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.
- .14 ASTM C1349-04, Specification for Architectural Float Glass Clad Polycarbonate.
- .15 ASTM C1376-03, Specification for Pyrolytic and Vacuum Deposition Coatings on Glass.
- .16 ASTM E1300-07e1, Practice of Determining Load Resistance of Glass in Buildings.

.3 Canadian General Standards Board (CGSB).

- .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
- .2 CAN/CGSB-12.2-M91, Flat, Clear Sheet Glass.
- .3 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.

.4 CAN/CGSB-12.4-M91, Heat Absorbing Glass.
.5 CAN/CGSB-12.8-97, Insulating Glass Units.
.6 CAN/CGSB-12.9-M91, Spandrel Glass.
.7 CAN/CGSB-12.10-M76, Glass, Light and Heat Reflecting.
.8 CAN/CGSB-12.11-M90, Wired Safety Glass.
.9 CAN/CGSB-12.12-M90, Plastic Safety Glazing.
.10 CAN/CGSB-12.13-M91, Patterned Glass.
.11 CAN/CGSB-12.20-M89, Structural Design of Glass for Buildings.
.12 CAN/CGSB-19.13-M87, Sealing Compound, One-Component, Elastomeric, Chemical Curing.
.13 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
.14 CAN4-S104-M80, Fire Test of Door Assemblies.
.15 CAN4-S106-M80, Fire Test of Windows and Glass Assembles.

.4 Canadian Standards Association (CSA International).
.1 CSA A440.4, Energy Performance Evaluation of Windows and Sliding Glass Doors.
.2 CSA Certification Program for Windows and Doors 2000.

.5 Flat Glass Manufacturers Association (FGMA).
.1 FGMA Glazing Manual - 1997.

.6 Laminators Safety Glass Association (LSGA).
.1 LSGA Laminated Glass Design Guide 2000.

.7 NFPA
.1 NFPA 80-99, Standard for Fire Doors and Fire Windows.
.2 ULC, Underwriters Laboratories of Canada Building Materials and Systems Directory, Fire Resistance Directory, Current Edition including Supplements to date.

1.4 DEFINITIONS

.1 Pattern Glass: One type of glass having pattern impressed on 1 or both sides for decorative purpose. Sometimes called “rolled”, “figured”, or “Obscure” glass.
.2 United Inches: Total of 1 width and 1 height of glass panels in inches.

1.5 SYSTEM DESCRIPTION

.1 Design Requirements:
.1 Design glass and glazing to CAN/CGSB-12.20-M.
.2 Provide accessories, closures and trims required and necessary to complete work.

.2 Performance Requirements:
.1 Ensure solvents and/or other volatile elements in glazing system do not affect properties and performance of materials used for edge seal and sealant glass bond.
.2 Ensure materials used for edge seals are compatible with other materials they come in contact within glazing system. If required, perform compatibility tests to ASTM C510, ASTM C794 and ASTM C1087, or others as applicable.
.3 Use sealants and other materials in glazing system which are unaffected by long term UV light exposure.

1.6 SUBMITTALS

.1 Submit Product Data, Samples, Manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheets.

.3 Samples:

.1 Submit duplicate 300 mm size samples of each sealed glazing unit.

.2 Submit duplicate 100 x 100 mm size samples of colored glass unit specified.

.4 Material Safety Data Sheets:

.1 Submit MSDS for inclusion in Operation and Maintenance Manual.

.5 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

.6 Closeout Submittals:

.1 Provide maintenance data including cleaning instructions for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.7 QUALITY ASSURANCE

.1 Test Reports: provide certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: provide product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Pre-installation Meetings: attend pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

.4 Provide maintenance data including cleaning instructions for incorporation into manual specified in Section 01 78 00 - Closeout Submittals

.5 Perform work in accordance with FGMA Glazing Manual, IGMAC and Laminators Safety Glass Association - Standards Manual for glazing installation methods.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Deliver glass and associated materials to site in original crates and containers with manufacturer's name and brand distinctly marked thereon and with glass labelled as to types. Do not remove labels on glass until after work is accepted by Consultant.

.2 Store materials within the building, in a clean, dry location, acceptable or as designated by Consultant. Fully protect materials from damage of any kind until ready for use.

1.9 PROJECT CONDITIONS

.1 Environmental Requirements: No glazing done when temperature is less than 7 deg C or sash or frames are wet, damp or frosted.

.2 Protect work of other trades from damage resulting from work of this Section.

.3 Identify glazed openings immediately following glass installation. Use coloured tapes or flags suspended near, but not in contact with glass. Attach to frames or surround with suitable non-staining strippable adhesives or tapes.

1.10 WARRANTY

.1 Warrant factory sealed insulating units for period of 10 years against defects and/or deficiencies in accordance with General Conditions of the Contract.

.2 Warrant that factory sealed insulating units be free from material obstruction of vision as result of dust or film formation on internal glass surfaces by any cause, under normal conditions anticipated under this Project, other extrinsic glass breakage, but including breakage due to thermal shock and temperature differential due to inherent glass or glazing fault.

1.11 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 ACCEPTABLE MATERIALS

.1 Products of following manufacturers are acceptable subject to conformance to requirements of Drawings, Schedules and Specifications:

- .1 AGC Flat Glass North America, Ltd.; www.na.agc-flatglass.com.
- .2 Ace Security Laminates; www.acesecuritylaminates.com.
- .3 Barber Glass Industries; www.barberglass.com.
- .4 GE Silicones; www.gesilicones.com.
- .5 Guardian Industries Corp.; www.guardian.com.
- .6 PPG Canada Inc.; www.ppgglass.com.
- .7 Pilkington Special Glass Limited; www.pilkington.com.
- .8 Prelco Inc.; www.prelco.com.
- .9 Schott North America Inc.; www.us.schott.com.
- .10 Viracon Inc.; www.viracon.com.
- .11 Tremco Canada; www.tremcosealants.com.
- .12 Trulite Industries Limited; www.trulite.com.

2.2 MATERIALS: FLAT GLASS

.1 Glass: Free from bubbles, waves, discolouration and other defects and of following types for locations indicated on Drawings or noted on Door Schedule. Ensure glass bears manufacturer's label indicating quality. Leave labels in place until final cleaning.

.2 Single Glazed Glass Types:

- .1 Float Glass: Conforming to CAN/CGSB-12.3-M, clear transparent float glass, minimum 6 mm.
- .2 Tempered Glass:
  - .1 Minimum 6 mm.
  - .2 Conforming to ASTM C1048, CAN/CGSB-12.1-M, Type 2 tempered, Class B float glass, Category II.
  - .3 Perform heat strengthening using horizontal tong free method; surface compression not less than 7500 psi.
- .3 Tempered Laminated Glass:
  - .1 Minimum 6 mm.
  - .2 Two layers of fully tempered safety glass conforming to ANSI Z97.1, ASTM C1048 and CAN/CGSB-12.1-M, Type 2, Class B, Category II laminated together under heat and pressure with clear PVB interlayer of 0.8 mm thick between them to create single unit.
  - .3 Perform heat strengthening using horizontal tong free method; surface compression less than (7500 psi).
- .4 Wired Glass (GWG):
  - .1 Minimum 6 mm, Georgian Wire Glass.
  - .2 Conforming to CAN/CGSB-12.11-M, Type 1, Style 3.
- .5 Clear, ceramic, wireless safety glass: to CAN4-S104, CAN4-S-106, ASTM-E-152, ASTM-E-163, of 5 mm thickness, with polished surfaces.
  - .1 Acceptable Material:
  - .2 Premium Firelite.

.3 Window Film:

.1 Translucent opacity, transparent synthetic liner, clear pressure sensitive adhesive.
.2 Film shall have cutouts to suit design and be located as indicated on Drawings.
.3 Provide "3M Scotchcal ElectroCut Special Effects Film" by 3M; www.3m.com in colour "7725-314 Dusted Crystal".

.4 Glazing, Sealing Compounds and Accessories:
.1 Ensure glazing, sealing compounds and accessories are compatible with all contact surfaces of frames, other accessories used in glazing system and contact surfaces of compounds used on insulated glass units.
.2 Wood or other organic materials are not acceptable for use in glazing systems including spacer blocks.
.3 Glazing Compound:
.1 Non-hardening modified oil type.
.2 Colour to match adjacent surfaces unless indicated otherwise.
.4 Sealant Compound: One component type, elastomeric chemical curing, CAN/CGSB- 19.13-M, Class G-2-25-A-N. Colour to match adjacent surfaces unless indicated otherwise.
.5 Sealant Compound:
.1 CAN/CGSB-19.24-M, multi-component chemical curing, Type 2, Class A.
.2 Colour to match adjacent surfaces.
.6 Sealant Compound:
.1 One component, silicone base solvent curing.
.2 Colour to match adjacent surfaces.
.7 Elastomeric Joint Sealants: ASTM C920.
.8 Sealant for Interior Glass-to-Glass Butt Glazing Installation:
.1 Translucent 1 part silicone sealant conforming to U.S. Federal Specification TT-S-001543 (Silicone Building Sealant) and TT-S-0230, CAN/CGSB-19.13-M and ASTM C920, (One Component Building Sealant).
.2 "Tremsil 200" by Tremco Canada;
.3 "DC 999" by Dow Corning Canada.

.5 Sealant for Use With Plastic Polymer Glazing:
.1 One component silicone base sealant, chemical curing conforming to CAN/CGSB-19.13- M, Classification MGC-2-25-A-N or BN unless otherwise directed.
.2 Acceptable Material;
.1 "LexSil SPS 2900 Primerless Silicone.
.2 Plastic Sealant" by GE Silicones
.3 "Spectrum I" by Tremco Canada.

.6 Cellular Gaskets for Compression Glazing:
.1 ASTM C509 cellular, elastomeric, preformed, black.
.2 Closed cell neoprene or EPDM extrusions including molded corners where applicable by Cellular Rubber Extrusions Tremco Canada.

.7 Dense Gaskets for Compression Glazing:
.1 ASTM C864, Option II or ASTM C1115, Type C, dense neoprene or EPDM extrusions, 60 and 70 Durometer density including molded corners where applicable.
.2 Poly-Wej Gaskets Tremco Canada.

.8 Glazing Splines:
.1 Neoprene or EPDM manufacturer's standard dry glazing splines to suit aluminum extrusions.

.2 Colour to match adjacent surfaces unless indicated otherwise

.9 Glazing Points and Wire Spring Clips:

.1 Corrosion resistant, manufacturer's standards.

.10 Edge Blocking, Setting Blocks, Later Shims, Gaskets and Tapes:

.1 Edge Blocking for Glass:

.1 60 - 70 Durometer neoprene, silicone or EPDM, channel shaped, 100 mm - 150 mm long.

.2 Setting Blocks:

.1 7 mm x 100 mm EPDM or extruded 80-90 Durometer neoprene; at insulating glass, use EPDM only. At fire-rated glazed doors and partitions, use similar sized fire-rated silicone GE "Gel 516" or asbestos cement blocks.

.2 Width; 1.6 mm to 3 mm less than design glazing pocket width.

.3 For 4 sided structural glazing, use silicone compatible rubber or silicone.

.3 Lateral Shims:

.1 Neoprene, silicone or EPDM, 40 - 60 Durometer, 100 mm long or as required.

.4 Non-Compression Glazing Tape for Interior Aluminum Screen Glazing:

.1 Preformed, 100% solids, cross linked butyl rubber, polyisobutylene, hardness 65 Durometer, unaffected by UV through glass.

.2 Tape shall be sufficiently wide and thick as to completely cover bite area of glazing unit when the unit is pushed into place.

.3 Acceptable Material shall be "Tremco 440 Tape" by Tremco Canada.

.5 Compression Glazing Gaskets for Interior Aluminum Screen Glazing:

.1 EPDM, neoprene, thermoplastic or other acceptable material with Shore A Durometer of 35, ± 5.

.2 Dual Durometer gaskets of a specific acceptable type are also acceptable.

.3 Ensure material has sufficient thickness or be of a configuration to allow 25% compression when installed, have a minimum 2000 psi (1500 psi for silicone) tensile strength, resistance to permanent set of 30% maximum, minimum elongation at break of 300% (700% for silicone) and resistance to ozone showing no cracks. "VISIONstrip®" by Tremco Canada.

.4 Acceptable material: Armet, Dow Corning and PTI.

.6 Compression Glazing Tape:

.1 Preformed, ribbon-shaped, non-skinning, 100% solids, non-oxidizing polyisobutylene: butyl, paper release, EPDM shim with continuous synthetic rubber spacer rod of 60 Durometer hardness.

.2 Ensure tape is sufficiently wide and thick to completely cover bite area of glazing unit when unit is pushed into place.

.3 Acceptable material: Polyshim II Tape" by Tremco Canada.

.11 Primer Sealers and Cleaners: To glass and plastic glazing manufacturer's standards.

2.3 ACCESSORIES

.1 Qualified products: only compounds listed on the CGSB Qualified Products list are acceptable for use on this project.

.2 Glazing compound: oil base, to CAN/CGSB-19.6, Type 1, color to match adjacent metal.

.3 Sealant compound: one component acrylic base, to CGSB 19-GP-5M, gun grade, color to match adjacent material.

.4 Sealant compound: two-component polysulphide base, to CAN2-19.24, gun grade, color to match adjacent metal.

.5 Glazing splines: E.P.D.M. or neoprene. Manufacturer's standard dry glazing splines to suit aluminum extrusions, black color.

.6 Glazing points and wire spring clips: corrosion resistant, manufacturer's standard.

.7 Cap bead: one component silicone, neutral cure, CGSB 19-GP-23, gun grade, color white.

.1 Acceptable material:

.1 Tremco "Spectrum 2".

.2 Sonneborn "Omniseal".

.8 Setting blocks: Neoprene, 80-90 Shore A durometer hardness to ASTM D2240, length of 25 mm for each square meter of glazing.

.9 Spacer shims: Neoprene, 50-60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.

.10 Glazing tape:

.1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper; size as required; black/ bronze color.

.11 Glazing clips: manufacturer's standard type.

.12 Glazing points and wire spring clips: corrosion resistant, manufacturer's standard.

.13 Lock-strip gaskets: to ASTM C542.

.14 Cap bead: one component silicone, neutral cure, to CGSB 19-GP-23, gun grade, color white.

Acceptable material:

.1 Trecmo "Spectrum 2"

.2 Sonneborn "Omniseal"

.15 Primer-sealers and cleaners: to glass manufacturer's standard.

3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 FABRICATION

.1 Label each light of glass and/or plastic glazing with registered name of Product and weight and quality of glass and/or plastic glazing.

.2 Check dimensions on job site before cutting materials.

.3 Ensure minimum bite or lap of glass and/or plastic glazing on stops and rabbets as recommended by glass and/or plastic glazing manufacturer.

3.3 EXAMINATION

.1 Verify that openings for glazing are correctly sized and within tolerance.

.2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.4 PREPARATION

.1 Thoroughly clean glass rebates and glass of dust, dirt, mortar and other foreign materials prior to glazing. Remove oils and grease with non-staining solvents such as Xycol or Methyl Ethyl Ketone solutions.

3.5 WORKMANSHIP

.1 Remove protective coatings and clean contact surfaces with solvent and wipe dry.
.2 Apply primer-sealer to contact surfaces.
.3 Place setting blocks as per manufacturer's instructions
.4 Install glass, rest on setting blocks, ensure full contact and adhesion at perimeter.
.5 Install removable stops, without displacing tape or sealant.
.6 Provide edge clearance of 3 mm minimum.
.7 Insert spacer shims to center glass in space. Place shims at 600 mm oc and keep 6 mm below sight line.
.8 Apply cap bead of sealant at full perimeter of exterior, at all aluminum window glazing.
.9 Apply sealant to uniform and level line, flush with sight line and tooled or wiped with, solvent to smooth appearance.
.10 Do not cut or abrade tempered, heat treated, or coated glass.

3.6 INSTALLATION: INTERIOR GLAZING

.1 If required, thoroughly mix glazing compound as recommended by manufacturer. Thinning of glazing compound will not be permitted.
.2 Carefully remove glazing stops and replace after glazing. Take care to prevent damage to stops.
.3 Doors, Screens, Sidelites and Interior Windows:
  .1 Place setting blocks on sill at 1/4 points from each corner unless otherwise directed by glazing manufacturer.
  .2 Place continuous glazing gaskets on edges of glass.
  .3 Centre and space each piece of glass with spacers located and installed according to manufacturer's directions.
  .4 Place glass so no voids occur between glass and glazing material, and glazing stops.
  .5 Secure glass in place with stops, secured in place with screws.
.4 Glazing Sealant:
  .1 Apply glazing sealant to clean, dry, grease and oil free surfaces. Provide exposed glazing sealant smooth, free from ridges, wrinkles, air pockets and embedded foreign materials.
  .2 Prime surfaces if required by glazing sealant manufacturer.
  .3 Trim glazing sealant flush with tops of stops and glazing channels.
  .4 Remove excess glazing sealant or droppings which would set up or become difficult to remove from finished surfaces. Remove excessive sealant immediately. Do not use chemicals, scrapers, or other tools which would affect finished surfaces.
.5 Interior Glazing:
  .1 Fire Rated Hollow Metal Doors and Screens:
    .1 Set glass in fire rated metals doors and screens on continuous setting block with 3 mm gap between glazing stop glass and embed in glazing compound in accordance with NFPA 80 and OBC requirements. Strike and point exposed joints between metal and glass or Install glass in accordance to ULC tested proprietary methods of installation.
  .2 Combination Method-Tape/Sealant:
    .1 Cut glazing tape to proper length and Install against permanent stop projecting 1.5 mm above sightline.
    .2 Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass to uniform and level line.
    .3 Trim off excess tape to sightline.

.3 Two Sided Butt - Joint Glazing:

.1 2 side glazing at head and sill use wet, dry, or wet/dry glazing systems.

.2 Position glazing so that vertical edges are spaced slightly apart and seal with silicone sealant.

.3 Grind vertical joint with slight kerf and polish for aesthetics.

.6 Window Film:

.1 Install window film in accordance with manufacturer's printed instructions by experienced film applicators as recommended by glass film manufacturer.

.2 Ensure glass surfaces are clean and ambient temperature is between 16 deg C and 38 deg C.

.3 Whenever 2 or more pieces of same colour translucent film are seamed together as a continuous band of colour, they shall be matched to assure uniform reflected daytime colour and transmitted night appearance.

.7 Sealed Units with Integral Blinds:

.1 Ensure sealed units at ICU doors are provided at locations indicated. Cooperate and coordinate with respective Sections providing blinds. Blinds shall be sealed within a double-glazed thermal unit, tilt only system by magnetic slider.

3.7 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Remove traces of primer, caulking.

.3 Remove glazing materials from finish surfaces.

.4 Remove labels after work is complete.

.5 Clean glass using approved non-abrasive cleaner in accordance with manufacturer's instructions.

.6 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.8 PROTECTION OF FINISHED WORK

.1 Provide and maintain necessary protection of completed work against damage.

.2 Do not mark or attach anything directly to exposed glass and framing surfaces.

.3 If welding is to take place above or near completed glazing work, protect glass with plywood or other suitable means to reduce likelihood of weld spatter damaging glass surfaces.

.4 Protect glass from other trades, workers, tools and other similar materials.

.5 Replace cracked, broken, or defective glass at no additional cost to the Owner and to Consultant's satisfaction.

.6 Identification of Glazing: Mark glass lites with temporary, easily removable, large safety markings, immediately after glass installation. Maintain safety markings until final clean-up.

END OF SECTION

1 General

1.1 WORK INCLUDED

.1 All drywall work shown or implied on drawings and/or specifications. The work includes but is not necessarily limited to the following:

- .1 Supply and installation of gypsum wallboard to all stud partitions, ceilings and bulkheads, as indicated on the drawings.
- .2 Supply and installation of fiberglass thermal insulation and acoustic blankets in walls and ceiling, as indicated on the drawings.
- .3 Supply and installation of gypsum wallboard on strapping.
- .4 Allow openings for equipment installed in drywall construction by others.
- .5 Supply and installation of gypsum board column enclosure.
- .6 Installation of access panels in gypsum wallboard partitions and ceilings as supplied by Mechanical and Electrical trades.
- .7 Provide supplementary steel supports for ceilings, as required.
- .8 Supply and installation of corner beads, casing beads, trim, control joints and corner reinforcement.
- .9 Supply and installation of taping and filling.
- .10 Supply and installation of acoustic caulking to acoustically insulated gypsum board partitions.
- .11 Supply and installation of fire rated wall assemblies.
- .12 Supply and installation of access hatches, panels and door frames supplied by other trades.

1.2 RELATED REQUIREMENTS

.1 Section 05 50 00 - Metal Fabrications.
.2 Section 07 21 16 - Blanket Insulation.
.3 Section 07 26 00 - Vapor Retarders.
.4 Section 08 11 13 - Steel Doors and Frames.
.5 Section 09 22 16 - Non-Structural Metal Framing.
.6 Section 09 91 00 - Painting.
.7 Division 23 - Mechanical - Supply of access doors.
.8 Division 26 - Electrical - Supply of access doors.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

- .1 ASTM C36/C36M-01, Specification for Gypsum Wallboard.
- .2 ASTM C79/C79M-01, Standard Specification for Treated Core and Non-treated Core Gypsum Sheathing Board.
- .3 ASTM C442/C442M-01, Specification for Gypsum Backing Board, Gypsum Coreboard, and Gypsum Shaftliner Board.
- .4 ASTM C475-01, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .5 ASTM C514-01, Specification for Nails for the Application of Gypsum Board.
- .6 ASTM C557-99, Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
- .7 ASTM 1396, Specification for Water-Resistant Gypsum Backing Board.
- .8 ASTM C840-01, Specification for Application and Finishing of Gypsum Board.
- .9 ASTM C931/C931M-01, Specification for Exterior Gypsum Soffit Board.
- .10 ASTM C954-00, Specification for Steel Drill Screws for the Application of

Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

.11 ASTM C1002-01, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

.12 ASTM C1047-99, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

.13 ASTM C1280-99, Specification for Application of Gypsum Sheathing Board.

.14 ASTM C1177-01, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

.15 ASTM C1178/C1178M-01, Specification for Glass Mat Water-Resistant Gypsum Backing Board.

.2 Association of the Wall and Ceilings Industries International (AWEI)

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86(R1988), Vapor Barrier, Polyethylene Sheet for Use in Building Construction.

.2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

.4 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102-1988(R2000), Surface Burning Characteristics of Building Materials and Assemblies.

1.4 DEFINITIONS

.1 Drywall = Gypsum Board = Gypsum Wall Board = GB = GWB

1.5 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Obtain services of professional engineer with experience in type of work of comparable complexity and scope, licensed to practice in Province of Prince Edward Island to design, review and Provide professional services for work of this Section.

.2 Design ceiling suspension system in accordance with manufacturer's printed directions and conforming to ASTM C754 requirements. Do not suspend any items from structural steel deck. Do not support work of this Section from, nor make attachments to, ducts, pipes, conduits or support framing of other trades.

.3 Design exposed to view ceiling suspension system for 'floating ceiling' and take extra care to ensure that hanger rods are vertically plumb, evenly and neatly spaced and neatly tied with tie wire free of any kinks complete with fascia trim. Install fascia trim in accordance with manufacturer's recommendations.

.4 Design suspended ceiling system for adequate support of electrical fixtures as required by current bulletin of Electrical Inspection Authority.

.5 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

.6 Design suspension system to support weight of mechanical and electrical items such as air grilles, lighting fixtures, drapery track, drapes and with adequate support to allow rotation / relocation of light fixtures.

.7 Design exterior soffit and ceiling system where applicable to withstand positive and negative wind loads effect to suit Project design requirements.

.8 Design sub-framing as necessary to accommodate, and to circumvent, conflicts and interferences where ducts or other equipment prevent regular spacing of hangers.

.9 Design metal stud reinforcements from hollow structural steel, stud, angle and

steel plate sections, galvanized sheet steel minimum 1.214 mm (designation thickness 43 mils/minimum base steel thickness 1.087 mm (colour yellow / 18 ga) where required to support of manufactured components without limitations items such as washroom accessories, expansion control covers and similar items. Design weld connections ensuring rigid and secure installation capable of offering resistance to minimum 227 kg pull force. Consider galvanized items in moist areas. Do not design using wood blocking for this purpose.

.10 Design fire rated construction including ceiling, partition or fire protective membranes and furring to approved ULC design or other design acceptable to authorities having jurisdiction, to provide design fire rating indicated and/or required. Submit written evidence of acceptable test design.

.11 Provide sound rated construction having STC rating indicated and tested in accordance with ASTM E90.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Maintain temperature minimum 10°C, maximum 21°C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.

.2 Ensure relative humidity in building is acceptable to material suppliers prior to commencement of installation.

.3 Apply board and joint treatment to dry, frost free surfaces.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site with manufacturer’s original labels intact. Do not remove wrappings until ready for use.

.2 No outside storage permitted. Store in clean, dry area, off ground. Provide adequate ventilation to avoid excess moisture, surface relative humidity and mould or fungal growth. Remove immediately any board showing signs of mould, mildew or fungal growth.

.3 Stack gypsum board flat on level and dry surface without overhanging boards. Prevent sagging and damage to edges, ends and surfaces. Protect bagged products from moisture or wetting.

1.8 SUBMITTALS

.1 Make submittal in accordance with Section 01 33 00 - Submittals Procedures.

.2 Product Data:

.1 Submit manufacturer's literature, data sheets for each type of material provided under this Section for Project. Data sheets shall provide all required information. Submit manufacturer's installation instructions.

.3 Material Safety Data Sheets:

.1 Submit MSDS for inclusion in Operation and Maintenance Manual without limitations for adhesives, sealants, patching and leveling compound, solid polymer and as designated later by Consultant.

.4 Shop Drawings:

.1 Submit Shop Drawings showing design, construction, sound attenuating construction, adjacent construction, locations of access panels, elevations, finishes and relevant details of furring, enclosures and partitions which require fire rating.

.5 Certificates:

.1 Submit certification from structural engineer registered in Province of Prince Edward Island, who shall affix his/her seal and signature to certificate, stating that installed suspended ceiling system is capable of supporting its own weight and weight of lighting, grilles and other mechanical and electrical fixtures

required by Mechanical and Electrical Divisions.

.2 Obtain approval of electrical utility authorities having jurisdiction for support of light fixtures, by ceiling grid and supports, to satisfy requirements of electrical inspection authority having jurisdiction. Adjust grid, fixing devices and support hangers as required to obtain approval.

.3 Samples:

.1 When requested, submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Each trim accessory minimum 300 mm long.

.6 Quality Assurance:

.1 Applicator Qualifications: Provide work of this Section executed by competent installers with minimum of 5 years experience in application of Products, systems and assemblies specified.

.2 Comply with ASTM C840 for application and finishing gypsum board and manufacturer's written information.

.3 Comply with following guide recommendations unless specified otherwise:

.1 Applications Guide CGC folder SA-130;

.2 Fire Resistant Assemblies CGC folder SA-100;

.3 Acoustical Assemblies CGC folder SA-200;

.4 Abuse-Resistant Assemblies CGC folder SA-929;

.5 Moisture Resistant Assemblies CGC folder SA-934;

.6 Gypsum Fire Wall Systems CGC folder SA-925.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MANUFACTURERS

.1 Products of following manufacturers are acceptable subject to conformance to requirements of Drawings, Schedules and Specifications:

.1 Bailey Metal Products Ltd.; www.bmp-group.com.

.2 CertainTeed Gypsum Canada Inc.; www.certainteed.com

.3 CGC Inc.; www.cgcinc.com

.4 Georgia-Pacific Canada, Inc.; www.gpgypsum.com

.5 Acadia Drywall Supplies Ltd; www.acadiadrywall.com

.6 Gordon Incorporated; www.gordongrid.com

.7 Roll Formed Specialty; www.rollformed.com

.8 Cabot Gypsum.

2.2 ACCEPTABLE MATERIALS

.1 Fire Rated Gypsum Board (where identified):

.1 Fire Rated Gypsum Board having Testing Agency Fire Rating Identification Stamp on Each Sheet

.2 ASTM C1396M, Type X, 15.9 mm thick gypsum board 1200 mm wide, maximum practical length and tapered edge as required by each fire resistance assembly.

.3 Acceptable Material:

.1 CGC Gyproc Firecode C.
.2 Georgia Pacific Gyproc Fireguard Type X.
.3 CertainTeed Fi-Rock Type X.
.4 Temple-Inland Gypsum Board Fire-Resistant Type X.

.2 Standard Gypsum Board:
.1 To ASTM C 3696. 15.9 mm thick, 1219 mm wide x maximum practical length, Ends square cut, edges tapered.
.2 Acceptable Materials:
.1 CGC Inc.
.2 CertainTeed Gypsum Canada.
.3 G-P Gypsum.
.4 Temple Island.
.5 Cabot Gypsum.

.3 Moisture Resistant Gypsum Board:
.1 Use Type X where rating requires ASTM C 1658 regular, 15.9 mm thick, 1219 mm wide x maximum practical length. Use in rooms containing a shower (except where shown to receive cementitious backer board), all washrooms, shower rooms, tubroom, soiled utility and behind sinks (450 mm from center line of fixture, both directions to above ceiling.
.2 Sink area at janitor closets (1219 mm both directions from center line of sink to above ceiling).
.3 Acceptable Materials:
.1 Georgia Pacific DensArmor Plus.
.2 Georgia Pacific DenShield Tile Backer.
.3 CertainTeed ProRoc Moisture and Mold Resistant Board.
.4 CertainTeed M2 Tech.
.5 GreenGlass Interior Gypsum Board by Temple-Inland.
.6 Fiberock Aqua Tough by CGC.
.7 Sheetrock Mold Tough, by CGC.

.4 Tile and Seamless Wall Coating Backer:
.1 Use behind all ceramic tile wall finishes.
.2 Conform to ASTM C1178M and ASTM C1396M, paperless, glass mat reinforced, water resistant treated core gypsum board.
.3 Rating of 10,' no mold growth' as tested for 4 weeks according to ASTM D3273.
.4 Permeance of < 1.2 ng/(PaCsCm²) or Perms (with no tile or coating) according to ASTM E96, 6 mm for floor, 12.7 mm or Type X, 15.9 mm for walls.
.5 Acceptable Materials:
.1 DensShield Tile Backer™ by Georgia-Pacific Canada, Inc.
.2 Green Glass Tile Backer by Temple-Inland.
.3 Sheetrock Mold Tough, by CGC.

.5 Cementitious Backer Board:
.1 Use at locations noted.
.2 Glass mesh mortar unit to ANSI A11/.9, 12.7 mm thick, 914 mm width, round tapered edges.
.3 Acceptable Materials:
.1 Canadian Gypsum Durock Tile Backer Board;
.2 Domtar DonCrete Cementitious Tile Backer Board;
.3 Laticrete International Inc. Wonderboard;
.4 Louisiana-Pacific Canada Ltd. Gypsheathing.
.5 National Gypsum Perma Base Cement Board.

.6 Impact Resistant Gypsum Board:
- .1 Multipurpose board, core of fibre-reinforced gypsum and perlite between layers of fibre- reinforced gypsum with fibreglass mesh reinforcement embedded; 12.7 mm or 15.9 mm thickness equivalent to Type X gypsum board when tested in accordance with ASTM E119 and CAN/ULCS101-M.
- .2 To CAN/CAS-A82.27, 16 mm thick, 1219 mm wide x maximum practical lengths to be used where indicated on finish schedule and:
  - .1 All corridors to 1219mm Above Finished Floor.
  - .2 All janitor closets to 1219mm Above Finished Floor (except sink area) to be moisture resistant.
  - .3 All soiled utility rooms to 1219mm Above Finished Floor (except sink areas) to be moisture resistant.
- .3 Acceptable Materials:
  - .1 Fiberock VHI Firecode Core Gypsum Panels as manufactured by CGC,
  - .2 Air Renew Extreme Impact Gypsum Board as manufactured by CertainTeed,
  - .3 ToughRock Fireguard Type X Abuse Guard Gypsum Board as manufactured by Dens Armour Plus,
  - .4 ComfortGuard IR by Temple-Inland

.7 Drywall Furring Channels:
- .1 0.5 mm (25 gauge) core thickness galvanized steel channels for screw attachment of gypsum board.

.8 Resilient Drywall Furring Channels:
- .1 0.5 mm (25 gauge) base steel thickness galvanized steel for resilient attachment of gypsum board.

.9 Nails:
- .1 To ASTM C 514.

.10 Steel drill screws:
- .1 To ASTM C 1002.

.11 Polyethylene:
- .1 To CAN/CGSB-51.34, 10 mil.

.12 Insulating Strip:
- .1 Rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, 13 mm wide, with self sticking permanent adhesive on one face, lengths as required.

.13 Plywood:
- .1 19 mm Douglas Fir Shop Grade.

.14 Laminating compound:
- .1 To CSA A82-31 asbestos free.

.15 Joint Compound:
- .1 Special setting type compound: chemically setting, sandable, to ASTM C475.
- .2 Acceptable Material:
  - .1 Canadian Gypsum Company Sheetrock 90.
  - .2 CertainTeed ProRoc Moisture and Mould resistant 90 Setting Compound with M2Tech.
  - .3 Acadia Drywall Sandable 90.

.16 Taping compound:
- .1 Pre-mixed, to ASTM C475.
- .2 Acceptable Materials:
  - .1 Canadian Gypsum Company All Purpose Ready-to-Use Joint Compound.

.2 CertainTeed ProRoc Moisture and Mould resistant 90 Setting Compound with M2Tech.

.3 Acadia Drywall Platinum Lite.

.17 Tape:

.1 50mm wide x 0.25mm thick, perforated paper, with chamfered edges.

.18 Bonding Adhesive:

.1 Type for purpose intended and as recommended and approved by manufacturer (Lepage PL 200 or PL 400).

.19 Metal Accessories:

.1 Corner Beads Minimum 0.40mm, Z180 zinc coated sheet steel to ASTM A525; beaded angle; flanges 32mm for 16mm board.

.2 Casing Beads: Minimum 0.40mm, Z180 zinc coated sheet steel to ASTM A525; "L" type; beaded angle or casing with one (1) side knurled for joint filling; suitable for 15.9mm wallboard, as specified.

.3 Casing Beads, corner beads, control joints and edge trim: to ASTMC 1047, Zinc metal, zinc-coated by hot-dip process zinc-coated by electrolytic process aluminum coated phosphatized, 0.5mm base thickness, perforated flanges, one piece length per location.

.4 Flexible Casing Beads:

.1 0.531 mm (designation thickness 18mils/minimum base steel thickness 0.455 mm /25 ga) steel, wipe coated, angle shaped in size to fit over edge of gypsum board, to suit curved applications.

.5 Control joint strip: Roll formed from galvanized steel sheet, with a tape-protected recess, 6mm wide x 41mm deep.

.20 Access Doors and Panels:

.1 Supplied as part of Division 21, 22 23 and 26 for installation as part of this Section.

.2 Sized to suit requirements of other Sections, but minimum size 406 mm x 406 mm with drywall bead frame and key operated cylinder lock.

.3 Provide closed cell neoprene gaskets to provide air tight fit.

.4 Fire rated access panels shall conform to requirements of authorities having jurisdiction under law and shall be labeled.

.21 Extruded Aluminum Inside/Outside Corner Fillets:

.1 Aluminum extrusions consisting of aluminum alloy 6063-T5 incorporating continuous fins for fastening and gypsum board joint compound filling. Punch fins with staggered holes to facilitate screw securement. Ensure aluminum is primed to accept materials associated with wall finishes.

.2 Inside Corner:

.1 Model SI-9-075 by Pittcon Softforms Corp. for 19 mm radius.

.2 Final Forms I, 600 Series, Part No. 634-90 by Gordon Incorporated; www.gordongrid.com for 19 mm radius.

.3 Outside Corner:

.1 Model SO-9-075 by Pittcon Softforms Corp. for 19 mm radius.

.2 Final Forms I, 100 Series, Part No. 134-90 by Gordon Incorporated; www.gordongrid.com for 19 mm radius.

.4 Reveals:

.1 Gordon #312-1/2 by Gordon; www.gordongrid.com or "STR-050-050" by Pittcon Softforms Corp. aluminum trim reveal at back of aluminum window insulated panels, mill finish for site painting.

.22 Water:

.1 Fresh clean potable water, free from deleterious matter, acids or alkalies.

.23 Fire Wall Identification:
- .1 Paint to be ICI Dulux 14030 Interior Acrylic Low sheen eggshell.

.24 Acoustical/Fire Insulation:
- .1 Thickness (R Value) as indicated on drawings.
- .2 Acceptable Materials:
  - .1 "QuietZone Acoustical Batts" by Owens Corning Canada Inc.;
  - .2 "Roxul AFB - Acoustical Fire Batts" by Roxul Inc.;
  - .3 "Fibrex Sound Attenuation Batt (SAFB) Insulation" by Fibrex Insulations Inc.;
  - .4 "Thermafibre Sound Attenuation Blankets" by CGC Inc."
  - .5 CertainTeed Insulation Canada, NoiseReducer Sound Attenuation Batts;
  - .6 Knauf Insulation - Ecobatt Thermal / Acoustical Batt Insulation.

.25 Sound Control Materials:
- .1 Sound Attenuation Batts: Refer to and conform to requirements of Section 07 21 16 - Blanket Insulation to meet design requirements.
- .2 Strip Impalement Clips:
  - .1 25 mm wide strip of Insul-Hold by Insul-Hold Canada Ltd., fabricated from 0.531 mm (designation thickness 18mils / minimum base steel thickness 0.455 mm (25 ga) galvanized sheet metal in 30 m rolls with punch-out insulation securement arrows. Alternatively, use special studs with punch-out impalement strips.
- .3 Acoustic Sealant: ASTM C834 and ASTM C920, Class 25, Non-hardening.
  - .1 "QuietZone Acoustic Sealant" by Owens-Corning Canada Inc.
  - .2 "Tremco Acoustical Sealant" by Tremco Ltd.
- .4 Elastomeric Sealant:
  - .1 As recommended by manufacturer of fibre-reinforced gypsum sheathing board.
- .5 Gaskets:
  - .1 Closed cell neoprene, 3 mm thick x 64 mm wide.
- .6 Asphalt Felt:
  - .1 CSA A123.3; No. 15 Type.

.26 Sealants:
- .1 In accordance with Section 07 92 00 - Joint Sealants

3 Execution

3.1 PARTITION TYPES

.1 Refer to Drawings for partition types.

.2 Provide partitions complete to underside of structure, unless otherwise indicated on Drawings.

3.2 EXAMINATION

.1 Examine substrate for compliance with applicable requirements, installation tolerances and other conditions affecting installation of fibre-reinforced gypsum board or sheathing. Do not proceed until unsatisfactory conditions have been corrected. Beginning of installation shall indicate acceptance of substrate conditions.

3.3 INSTALLATION

.1 Give minimum 48 hours notice for Consultant's inspection of internal wall insulation, vapour barriers and services prior to concealing with gypsum board.

.2 Carry out work using skilled tradesmen carefully supervised by competent foremen.

.3 Take all measurements accurately.

.4 Comply with ASTM C754 and with ASTM C840 requirements that apply to framing installation. Install framing, blocking and furring in accordance with ASTM C645, ASTM C1280.

.5 Maintain wallboard panels minimum 6 mm and maximum 13 mm above floor to prevent moisture transfer.

.6 Extend panels to underside of deck or structure and at fire rated and sound control partitions.

.7 Do taping and filling of concealed surfaces above ceiling line, except at fire rated and sound control partitions and walls.

.8 For isolation and pressurized room control areas conform to requirements specified herein.

.9 Erect plain wallboard vertically or horizontally, whichever results in fewer end joints.

.10 Keep end joints away from prominent locations and central portions of ceilings.

.11 Locate vertical joints at least 300 mm from jamb lines of openings.

.12 Space screws for regular wallboard at 300 mm oc along board edges and in board field on walls and ceilings; at fire-rated assemblies, reduce spacings to comply with labelling authorities assembly listings.

.13 For other specialty boards screw spacing shall be in accordance with manufacturer's recommendations.

.14 Drive screws with power screw-gun and set with countersunk heads slightly below surface of board.

.15 Do not secure gypsum board by installing screws into aluminum or steel window and door frames.

.16 At partitions except shaft walls, apply 1 continuous 6 mm bead of acoustical sealant to each side of partition where gypsum board meets dissimilar materials.

.17 Where 2 layers of gypsum board per face are required, apply bead of sealant at perimeter of base layer only.

.18 Apply sealant beads at perimeter of all other services and like objects which penetrate wallboard in accordance with manufacturer's directions.

.19 Install access panels in locations to be determined by coordination with Trades installing mechanical, electrical and other building services.

.20 Consultant reserves right to relocate access panels up to 3600 mm from locations shown on Drawings due to site conditions, providing ample warning is given prior to installation.

.21 Install in accordance with manufacturer's instructions.

.22 Provide access panels in locations and sizes required by other Sections.

.23 Coordinate with other Sections for locations and sizes. Install in accordance with manufacturer's instructions.

.24 At impact resistant gypsum board Provide 0.914 mm (designation thickness 33mils/ minimum base steel thickness 0.836 mm (colour - White/20 ga) metal studs. Provide control joints 9000 mm on centre maximum and at both sides of door jambs.

.25 Access Doors and Panels:

- .1 Install access doors and panels where required as part of work of this Section in walls, bulkheads, ceilings and soffits.
- .2 Cooperate and coordinate delivery of access doors and panels supplied as part of work of Divisions 21, 22. 23. 24 and 26.
- .3 Install access doors and panels supplied as part of work of Divisions 21, 22. 23. 24 and 26 in walls, bulkheads, ceilings and soffits.

.26 Gypsum Board Application:

- .1 Provide gypsum board in accordance with manufacturer's written installation

instructions and finish to requirements of ASTM C840. Ensure moisture resistant gypsum board is installed on any wall/partition containing a plumbing fixture (i.e. water closets, sinks, tubs, etc.).

.2 Provide metal trim casing bead at junctions with dissimilar materials.

.3 Provide reveals at junctions with dissimilar materials and where indicated.

.4 Provide curved uniform surfaces by wetting or dampening board or scoring back gypsum board and form to profiles indicated Provide additional screws and framing members to maintain design curve.

.5 Apply joint compound and trowel smooth to provide continuous, smooth radius free from flat spots, facets and trowel marks.

.6 Allow gypsum boards to dry thoroughly before handling.

.7 Provide finished work plumb, level and true, free from perceptible waves or ridges and square with adjoining work.

.8 Cut and fit gypsum board to accommodate or fit around other parts of Work.

.9 Provide work of this Section accurately and neatly.

.10 Butt gypsum board sheets together in moderate contact.

.11 Do not force into place.

.12 Place tapered or wrapped edges next to 1 another.

.13 Provide gypsum board perpendicular to framing and in lengths that will span ceilings and walls without creating end (butt) joints.

.14 If butt joints do occur stagger and locate them as far from centre of walls and ceilings as possible.

.15 Accurately fit exposed butt joints together and make edges smooth.

.16 Support ends and edges on framing.

.17 Fasten gypsum board to furring and studs with screws. Space screws at 200 mm oc at board edges and 300 mm oc on board field. Ensure perimeter screws are not less than 9 mm nor more than 13 mm from edges and ends are opposite screws on adjacent boards.

.18 Gypsum Board - Single Layer:

.1 Ceilings:

.1 Apply gypsum board to metal furring with screws. Erect board with long dimension parallel to supports. Locate end joints over supporting members.

.2 Space screws at 200 mm oc.

.2 Partitions:

.1 Apply gypsum board to metal studs with screws. Erect board with long dimension parallel to supports. Locate end joints over supporting members. Locate vertical joints at least 300 mm from jamb lines of openings. Space screws at 200 mm oc at board edges and 300 mm oc on board field.

.3 Ceiling and Partition Fasteners:

.1 Ensure perimeter screws are not less than 9 mm nor more than 13 mm from edges and ends are opposite screws on adjacent boards. Drive screws with power screw gun and set with countersunk head slightly below surface of board.

.4 Joints: Finish all joints unless specified otherwise.

.19 Gypsum Board - Curved Layer:

.1 Provide board length such that one single board covers curved surface. Provide either 2 layers of 6 mm or 12 mm flexible boards for minimum bending radius, for dry application or thickness as recommended by manufacturer for wet application. If wet application is used, evenly spray

water on surface to be compressed when board is hung. Stack boards with wet surfaces facing each other and cover stack with polyethylene sheet. Allow boards to set at least one hour before application. Install boards perpendicular to framing. On concave installations, start fastening board at center of curve and work outward to ends of boards. On convex installations, begin board installation at one end of curved surface and fasten board to framing as it is wrapped around curve. Do not cut openings for penetrations until boards are installed and thoroughly dry.

.20 Gypsum Board - Double Layer:

.1 Lay out work to minimize end joints on face layer; to offset parallel joints between face and base layers by at least 250 mm and to apply face layer at right angles to base layer.

.2 Base Layer: Base layer shall be same as face layer, or backing board, and applied at right angles to framing members. Secure base layer with screws spaced 300 mm oc to each member. Ensure perimeter screws are not more than 13 mm from edges and ends are opposite screws on adjacent boards. Ensure surface of erected base layer is straight, plumb or level and without protrusions before face layer is applied.

.3 Face Layer: Apply face layer at right angles to base layer with adhesive. Apply adhesive with notched spreader to leave 9 mm x 13 mm ribbons, 38 mm apart over entire back side of face layer. Erect board immediately after spreading adhesive. Supplement adhesive with screw fasteners. Provide temporary support for board until adhesive bond has fully developed. As alternative to adhesive specified, joint cement mixed with water in accordance with manufacturer's directions may be used. Allow joint cement and water mixture to stand 30 minutes before using.

.4 Joints: Finish joints in face layers only, unless otherwise required to achieve fire resistant ratings indicated, as hereinafter specified. Setting compound for fire rated construction shall conform to requirements of authorities having jurisdiction to obtain fire rating shown on Drawings.

.27 Gypsum Board Laminated to Concrete and/or Concrete Block Masonry:

.1 Gypsum Board Laminated to Concrete and/or Concrete Block Masonry:

.2 Mix laminating adhesive in accordance with manufacturer's directions.

.3 Allow to stand 30 minutes before using.

.4 Apply adhesive with notched trowel to leave 9 mm x 13 mm ribbons, 32 mm apart over entire back side of face layer.

.5 Erect gypsum board immediately after spreading adhesive.

.6 Use moderate pressure to develop full adhesive contact with substrate.

.7 Temporarily secure gypsum board in place with concrete nails or bracing.

.8 Ensure joints are accurately aligned.

.9 Avoid impact or movement of boards until adhesive sets firmly.

.10 Remove temporary support when adhesive has set.

.11 Do not treat joints of laminated gypsum board for at least 24 hrs after lamination.

.28 Exterior Sheathing:

.1 Provide exterior sheathing in accordance with manufacturer's instructions.

.2 Minimum Fastening Requirements:

.1 Perimeter Edge of Each Board: 200 mm oc max.

.2 Intermediate Supports: 300 mm oc max.

.3 Provide exterior sheathing neatly with tight butt joints and without gaps and holes.

.4 Bear edges of exterior sheathing fully onto structural framing.

.5 Do not crush exterior sheathing edges.

.6 Secure exterior sheathing to exposed leg of inner track of telescopic 2-piece top track.

.7 Provide ready to receive air/vapour barrier membrane.

.29 Interior Ceilings:

.1 Comply with recommendations of CGC Drywall Steel-Framed Systems Folder 09250-SA 923.

.2 Provide hanger wires spaced at maximum 1200 mm oc along carrying channels and within 150 mm of ends of carrying channel runs.

.3 Secure hanger wires to inserts in structure above.

.4 Provide carrying channels maximum 1200 mm oc and within 150 mm of walls.

.5 Secure with hanger wire saddle-tied along channels.

.6 Provide 25 mm clearance between runners and walls.

.7 Provide splicers behind joints. Level channels to a maximum tolerance of 3 mm over 3600 mm.

.8 Provide metal furring channels at right angles to carrying channels at maximum 600 mm oc and within 150 mm of walls.

.9 Provide 25 mm clearance between furring ends and abutting walls.

.10 Attach furring channels to carrying channels with saddle-tie of double strand tie wire.

.11 Provide additional cross-reinforcing at bulkheads and at other openings.

.12 Provide additional reinforcement for ceiling mounted miscellaneous accessories and signage.

.13 Provide ceiling gypsum board, smooth and level.

.30 Metal Trim and Accessories:

.1 Provide metal trim casing beads at reveals; at ceiling-wall intersections and partition perimeters; and at intersection of dissimilar constructions such as gypsum board to concrete.

.2 Provide metal trim casing beads where gypsum board abuts against a surface having no trim concealing junction.

.3 Provide ceiling fascia suspension trims at perimeter of "floating" suspended gypsum board ceilings as indicated on the Drawings.

.4 Provide a 13 mm separation gasket between metal trim casing beads and window frames or other cold surfaces, where such framing abuts exterior door or window frame.

.5 Tape shall be either full width or 1 strip 9 mm wide on each side of framing member.

.6 Provide casing bead where gypsum board abuts materials other than itself and acoustic tile ceilings including at exterior door and window frames, where juncture is not concealed with trim; or elsewhere where indicated on Drawings.

.7 Unless indicated otherwise, use tape 3 mm narrower than casing bead to provide recess at exposed side. Compress tape by 25%.

.8 Unless indicated otherwise, use tape 3 mm narrower than casing bead to provide recess at exposed side. Compress tape by 25%.

.9 Provide prefinished metal angle trim supports and Provide light pockets and eggcrate grilles and/or louvres in accordance with manufacturer's instructions.

.10 Install light pockets and eggcrate grilles and/or louvre units square, straight and in 1 piece where possible or with inconspicuous joints at long runs.

.31 Control Joints:

.1 Provide pre-fabricated, pre-manufactured control joints and/or prepared to suit site conditions control joints and in accordance with manufacturer's instructions

and in accordance with ASTM C840.

.2 Set in gypsum facing board, supporting control joints with studs or furring channels on both sides of joint.

.3 Ensure double studs with discontinuous tracks and double suspended ceiling furring channels have been installed prior to commencing board and bead application at control joints.

.4 Provide control joints at following locations:

.1 Support construction changes.

.2 Partition, ceiling or furring runs exceed 9000 mm.

.5 Provide control joints full height floor to ceiling or door header to ceiling in partitions and furring runs.

.6 Provide control joints from wall to wall in ceiling areas.

.7 Provide continuous polyethylene dust barrier behind and across control joints.

.8 Obtain Consultant's acceptance of exact location of control joints.

.32 Sound Control:

.1 Where indicated on Drawings, provide sound rated partitions and ceiling in locations indicated to meet required minimum Sound Transmission Class STC rating.

.2 Gypsum board shall be applied on both sides of sound-proofed partitions.

.3 Follow manufacturer's details and recommendations.

.4 Provide sound attenuation insulation to completely fill height of stud cavities.

.5 Tightly butt ends and sides of blankets within cavities.

.6 Cut blankets to fit small spaces.

.7 Carefully fit blankets behind electrical outlets, bracing, fixture attachments and mechanical and electrical services.

.8 Staple blankets to back of gypsum board as recommended by gypsum board manufacturer.

.9 At sound attenuating suspended ceiling and enclosures having spring isolator hangers, terminate ceiling or enclosure at adjacent construction by providing continuous isolator strip and sealed joint.

.33 Sealant:

.1 Conform to ASTM C919 for use of sealants in sound attenuation partitions.

.2 Apply acoustical sealant around partition cutouts including, but not limited to, electrical outlets and boxes, plumbing and duct outlets, and other miscellaneous wall and floor penetrations or gaps.

.3 Apply acoustical sealant to every air gap, such as gaps around perimeter of wall, between wall panels and around any penetrations made for plumbing or electrical wiring. Seal off any piping, electrical output boxes, and duct work with acoustical treatments. Treat junction boxes with acoustic putty, treat piping and duct work either with fiberglass duct liner or damping material or both.

.4 Treat frame with gasket material (weather-strip) and install security flap on bottom of door to seal it off.

.5 Apply minimum 13 mm diameter bead of acoustic sealant continuously around periphery of each face of partition to seal gypsum board/structure junction where partitions abut fixed building components in accordance with recommendations of "CGC Drywall/Steel Framed Systems, Folder SA923 09250".

.34 Joint Treatment - Gypsum Board:

.1 Verify board is firm against framing members and screw heads are properly depressed.

.2 Mix joint compound or ready-to-use compounds according to manufacturer's directions. Use pure, unadulterated, clean water for mixing.

.3 Permit mixed material to stand 30 minutes before using.

.4 Do not mix more material than can be used within 1 hour.

.5 Do not use set or hardened compound.

.6 Clean tools and equipment after mixing each batch.

.7 Tape and fill joints and corners in accordance with gypsum board manufacturer's printed instructions.

.8 Fill either manually, using hand tools of trade, or by a mechanical taping and filling machine of proven efficiency.

.9 Remove plastic tape from control joints after finishing with joint compound.

.10 After final coats of filler have dried at least 24 hours, sand surface lightly with No. 00 sandpaper to leave it smooth, ready for decoration.

.11 Provide finished work smooth, seamless, plumb and true, flush and with square plumb neat corners.

.12 Levels of Finish: Provide following levels of finish in accordance with ASTM C840:

.1 Level 0: No taping, finishing or accessories required for temporary construction or areas where final decoration is not required.

.2 Level 1: Use this level in plenum areas above ceilings, attics, areas where assembly would generally be concealed or in building service corridors and other areas.

.3 Level 2: Use this level where water resistant gypsum backing board (ASTM C630M) is used as substrate for tile; may be used in garages, warehouse storage, or other similar areas where surface appearance is not of primary concern.

.4 Level 3: Use this level in appearance areas which are to receive heavy or medium texture spray or hand applied finishes before final painting or where heavy grade wall coverings are to be applied as final decoration.

.5 Level 4: Use this level where light textures or wall coverings including paint are to be applied.

.6 Level 5: Use this level to provide a uniform surface and minimize possibility of joint telegraphing and of fasteners showing through final decoration. Use this Level of finish when using gloss, semi-gloss or enamel paint finish or when working in a critical (severe) lighting areas including but not limited to walls and ceiling areas near windows, skylights, long hallways and atriums with large surface areas exposed to artificial and natural light. Refer to ASTM C840 for additional locations for Level 5 applications.

.7 Exposed Moisture Resistant Gypsum Board Joint Finish: All joints and interior angles shall have fiberglass tape embedded in setting 90 joint compound and 2 separate coats of joint compound applied over all flat joints and 1 separate coat of joint compound applied over interior angles. Cover fasteners heads and accessories with three (3) separate coats of joint compound. Ensure surface is smooth and free of tool marks and ridges.

3.4 FIRE RATED PARTITIONS

.1 Ensure materials for fire rated construction conform to requirements of Authorities Having Jurisdiction to obtain fire rating shown on Drawings.

.2 Where dissimilar components are built into fire rated assemblies ensure continuity of fire separation by boxing in elements with gypsum board and framing to suit Authorities Having Jurisdiction.

.3 Work in cooperation with Section providing firestopping work.

.4 Provide fire rated enclosures, separations and assemblies as indicated on Drawings conforming to requirements of Authorities Having Jurisdiction.

.5 Where required, secure sound attenuation blanket insulation between studs as specified in Article on Sound Control Partitions.

3.5 CUTTING AND PATCHING

.1 Cooperate and coordinate with other Sections to obtain satisfactory gypsum board finish work. Do all cutting, patching and make good as required by installation of work of other Sections.

3.6 CLEANING

.1 Clean off beads, casings, joint cement droppings and similar items and remove surplus materials and rubbish on completion and as directed.

3.7 FIRE WALL IDENTIFICATION

.1 Following installation of gypsum board and painting.

.2 Provide identification on fire walls.

.3 Using three (3) stencils cut out to read "Smoke Sealed", "1-Hour Fire Rated" and "2-Hour Fire Rated" in 75mm high letters.

.4 Using stencil and spray can of paint to transfer the information to the appropriate walls above the ceiling level at 3000 mm o/c on both sides of wall.

END OF SECTION

1 General

1.1 WORK INCLUDED

.1 Supply and install non-load bearing steel stud systems, and furring systems for walls and drywall work included in Section 09 21 16 - Gypsum Board Assemblies, all as indicated in the contract documents.

.2 Supply and install suspension systems for drywall ceilings, coves and bulkheads.

.3 Supply and install metal blocking.

.4 Supply and install wind load bearing steel stud systems for exterior walls and drywall work included in Section 09 21 16 - Gypsum Board Assemblies, all as indicated in the contract documents.

.5 This Contractor is responsible for the following:

- .1 Supply and installation of all steel stud partitions, ceilings and bulkheads, as indicated on the drawings including exterior walls.
- .2 Supply and installation of metal strapping.
- .3 Allow openings for equipment installed in drywall construction by others.
- .4 Installation of access panels in gypsum wallboard partitions and ceilings as supplied by Mechanical and Electrical trades.
- .5 Supplementary steel supports for ceilings.
- .6 Reinforcement for suspension systems for lighting fixtures, access hatches, etc.
- .7 Steel studs and furring channels.
- .8 Concealed reinforcements in partitions and ceilings to support washroom accessories and miscellaneous specialties.
- .9 Ceiling, bulkhead and soffit suspension system.

1.2 RELATED REQUIREMENTS

.1 Section 06 10 00 - Rough Carpentry

.2 Section 07 21 16 - Blanket Insulation

.3 Section 07 26 00 - Vapor Retarders

.4 Section 08 11 13 - Hollow Metal Doors and Frames.

.5 Section 09 21 16 - Gypsum Board Assemblies

.6 Division 10 - Specialties

.7 Division 23 - Heating, Ventilation and Air Conditioning (HVAC)

.8 Division 26 - Electrical

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).

- .1 ASTM C645-00, Specification for Nonstructural Steel Framing Members.
- .2 ASTM C754-00, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

1.4 SUBMITTALS

.1 Shop Drawings:

- .1 Submit shop drawings including fabrication and erection documents and materials list inaccordance with Section 01 33 00 - Submittal Procedures.
- .2 Include on Shop Drawings, all connection details, stud and track gauges.
- .3 Each shop drawing submitted shall bear stamp and signature of qualified professional engineer registered or licensed to practice in the Province of Prince Edward Island, Canada.

1.5 QUALITY ASSURANCE

.1 Execute Work of this section by a Contractor who has adequate plant, equipment and skilled tradesman to perform it expeditiously, and who has been responsible for satisfactory installations similar to that specified, during a period of at least the immediate past three (3) years.

.2 Attend pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 NON-LOAD BEARING WALL FRAMING

.1 Non-load bearing channel stud framing: to ASTM C645, stud sizes as noted on drawings, roll formed from 0.84 mm (20 gauge) thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock-out service holes at 460 mm centers.

.2 Deflection for interior stud walls to be L/240 maximum.

.3 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, 32 mm flange height.

.4 Metal channel stiffener: 13 x 38 mm size, 1.4 mm (18 gauge) thick cold rolled steel, coated with rust inhibitive coating.

.5 Acoustical sealant: to CAN/CGSB-19.21 to perimeter of walls with acoustic insulation.

.6 Insulating strip: rubberized, moisture resistant 3 mm thick foam strip, 12 mm wide, with self sticking adhesive on one face, lengths as required.

.7 Wall Reinforcement metal blocking: 14 ga. X 610 mm wide galvanized metal sheet reinforcement to ASTM A924 at locations including, but not limited to the following:

.1 All washroom accessories.

.2 Millwork.

.3 Zone valve boxes, fire hose cabinets and fire extinguisher cabinets.

.4 Lockers.

.5 Wall-mounted door stops.

.6 All other wall-mounted specialties, including Owner-supplied items.

2.2 STEEL STUDS

.1 Steel Studs:

.1 ASTM C645, Galvanized sheet steel, minimum 0.531 mm (designation thickness 18mils/minimum base steel thickness 0.836 mm/colour-White/20 ga) thickness, zinc coating Z275, screw able with crimped web and returned flange, of depth shown in maximum continuous lengths practicable.

.2 Provide heavier gauges where required due to height.

.2 Heavy Duty Studs at Openings and Unrestrained Height:

.1 ASTM C645, Galvanized sheet steel, minimum 1.087mm, 18ga thickness, zinc coating Z275, screw able with crimped web and returned flange, of depth shown in maximum continuous lengths practicable.

.2 Provide heavier gauges where unrestrained height exceeds 3600 mm.

.3 Concealed Reinforcement in Partitions:

.1 Sheet Steel Reinforcing in Partitions:

.1 Commercial quality cold rolled galvanized sheet steel to ASTM A653M with zinc coating designation of ASTM A653M, Z275 in minimum thickness of 1.087 mm /colour-yellow/18 ga).

.2 Must be specially treated by phosphate conversion process if steel is to be exposed and finish painted.

.3 Concealed Structural Shapes, Plates, Reinforcements: 3 mm new material conforming to CSA G40.20 and CSA G40.21, Grade 300W. Hot dipped galvanizing with minimum zinc coating of 600 g/m² to CAN/CSA-G164-M.

.2 Concealed Knee Brace for Low Wall Partitions:

.1 Concealed welded steel assembly made up of 50 mm x 50 mm tube and 3 mm wall and 88 mm x 127 mm x 9 mm base plate with 4 holes 10 mm diameter.

.2 Assembly shall be provided with flat black primer to yield corrosive resistant surface compatible with joint compounds and interior finishes.

.3 Height to suit low wall partitions.

.4 SKB Knee Brace Kit by Pittcon Softforms Corp.

.5 Provide hollow structural steel, stud, angle and steel plate sections, galvanized sheet steel minimum 1.214 mm (designation thickness 43mils/minimum base steel thickness 1.087 mm /colour-yellow/18 ga) where required to support manufactured components.

.6 Weld connections.

.4 Provide knockout openings in web at 460 mm oc to accommodate (if required) horizontal mechanical and electrical service lines and bracing.

.5 Floor and Ceiling Partition Track for Gypsum Board:

.1 ASTM C645, Galvanized sheet steel, 0.836 mm /colour-White/20 ga) overall thickness zinc coating Z275, with minimum 30 mm legs, top track having longer legs where required to compensate for deflection of structure above.

.2 Width to suit metal studs.

.6 Furring Channels:

.1 Galvanized sheet steel, minimum 0.914 mm (designation thickness 33mils/ minimum base steel thickness 0.836 mm /colour-White/20 ga) overall thickness zinc coating Z275 screw channels, 67 mm wide x 22 mm deep.

.7 Carrying Channels for Gypsum Board:

.1 ASTM C645, galvanized sheet steel, minimum 1.214 mm (designation thickness 43mils/minimum base steel thickness 1.087 mm /colour-yellow/18 ga) overall thickness zinc coating Z275, 38 mm high with 19 mm flanges, for primary carrying member in suspended ceilings and as horizontal stiffeners or bracing in metal stud systems.

3 Execution

3.1 ERECTION NON-LOAD BEARING WALL FRAMING

.1 Align partition tracks at floor and ceiling and secure at 600 mm o.c. maximum.

.2 Install dampproof course under stud shoe tracks of partitions on slabs on grade.

.3 Place studs vertically at 400 mm o.c. and not more than 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.

.4 Erect metal studding to tolerance of 1:1000.

.5 Attach studs to bottom track using screws. Do not fix top of studs to ceiling track.

.6 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.

.7 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.

.8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centers specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.

.9 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs. For door widths greater than 1219 mm, incorporate diagonal braced stud at head of opening.

.10 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.

.11 Install steel studs or furring channel between studs for attaching electrical and other boxes.

.12 Extend all partitions to underside of deck above except where noted otherwise on drawings. Where partitions occur under and parallel to ductwork, provide steel stud frames around ductwork to secure partition head. Maintain 12 mm clearance between ductwork, piping or equipment which might transmit vibration to metal framing.

.13 Maintain 19 mm clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use 88 mm leg ceiling tracks.

.14 Install continuous insulating strips to isolate studs from uninsulated surfaces.

.15 Install two lines of stiffeners in partitions up to 2440 mm high and three lines in partitions over 3660 mm high. Install stiffeners snugly in knock out service holes, extended horizontally across entire length of each braced partition and across two full stud spaces at each side of door and screen openings. Wire stiffeners at splices.

.16 Install metal blocking for the attachment of accessories and equipment as required by individual sections and drawings. Blocking to be sized to suit vertically a minimum of 150 mm higher, 150 mm lower than the attachment points and horizontally a minimum of one stud beyond attachment point each way.

.17 Provide and install 18ga wall reinforcement metal sheet on all washroom walls secured to 'flanges' of steel studs with sheet metal screws. Locate bottom of metal sheet at 600 mm AFF.

.18 Install 75mm X 75mm metal angle blocking vertically to all non-90° corners for full height to 150 mm above ceiling and to all corners designated to receive corner guards for height of guard.

.19 Conform to manufacturer recommendations for installation of fire dampers.

.20 Provide diagonal bracing at maximum 1220mm o.c. at large door and screen openings 1200mm and wider in interior partitions between top of frame and floor structure above.

3.2 INSTALLATION

.1 Metal Framing for Partitions and Bulkheads:

.1 Comply with ASTM C754 and with ASTM C840 requirements that apply to framing installation and recommendations of CGC Drywall Steel-Framed Systems for metal stud partition, ceiling, column fireproofing and bulkhead detailing.

.2 Install members true to lines and levels and to maintain surface flatness with maximum variation of 3 mm in 300 mm in any direction.

.3 Provide partition tracks at floor and underside of ceiling or structure above.

.4 Align accurately. Lay out to partition layout.

.5 Curved partitions: Erect partial height and curved partitions as indicated.

.6 Cut top and bottom runners through leg and web at 50 mm intervals for arc length.

.7 Bend runners to uniform curve of radius indicated and locate straight lengths tangent to arcs. Support outside (cut) leg of runners by clinching a 25 mm high x 0.914 mm (designation thickness 33mils/minimum base steel thickness 0.836 mm /colour-White/20 ga)thick sheet steel strip to inside of cut legs using metal lock fasteners.

.8 Attach studs to runners with 9.5mm long pan head framing screws.

.9 On straight lengths at ends of arcs, place studs 150 mm on center with last stud left free standing.

.10 Place studs vertically at 400 mm oc unless otherwise specified, not more than 50 mm from abutting walls, and at each side of openings and corners.

.11 Position studs in tracks.

.12 Cross brace studs as required to provide rigid installation.

.13 Provide heavy duty double boxed studs at each side of openings to extend in 1 piece from floor to underside of structure above.

.14 Co-ordinate erection of studs and installation of service lines.

.15 Provide continuous gasket to separate metal framing from masonry and concrete.

.16 Do not secure studs to exterior window framing, or to ceiling grid members.

.17 Provide continuous gasket between ceiling and floor tracks, and structure.

.2 Concealed Reinforcements in Partitions:

.1 Provide concealed steel reinforcing in gypsum board partitions where scheduled on Drawings or required to meet design requirements which may include without limitations, concealed hot dipped galvanized structural shapes, plates reinforcements and concealed knee brace for low wall partitions.

.2 Ensure rigid and secure installation capable of offering resistance to minimum 227 kg pull force.

.3 Provide continuous horizontal furring channels as backing to wall cabinets.

.4 Galvanize stud reinforcements in moist areas.

.5 Do not use wood blocking for this purpose.

.6 Provide additional reinforcing framing studs, backer plates or furring channels secured between studs for attachment and support without limitations following:

.1 Washroom accessories.

.2 Fire hose cabinets.

.3 Access panels.

.4 Architectural woodwork.

.5 Miscellaneous specialties including but not limited to:

.1 Plastic corner guards.

.2 Stainless steel corner guards.

.3 Continuous handrailing.

.4 Stainless steel handrailing.

.5 Chair railing.

.6 Bumper railing.

.7 Baby change station.

.8 Coat rack.

.9 Wall mounted lights.

.10 Signage zones - architectural dimension lettering.

.11 Fitments and fixtures.

.12 System furniture
.13 Equipment.
.14 Wall mounted equipment.
.15 Owner provided wall mounted bin system or bins.

.3 Access Doors and Panels:
.1 Install access doors and panels where required as part of work of this Section in walls, bulkheads, ceilings and soffits.
.2 Cooperate and coordinate delivery of access doors and panels supplied as part of work of Divisions 21, 22. 23. 24 and 26.
.3 Install access doors and panels supplied as part of work of Divisions 21, 22. 23. 24 and 26 in walls, bulkheads, ceilings and soffits.

.4 Metal Furring:
.1 Erect furring in accordance with manufacturer's directions and as specified herein.
.2 Provide furring rigid, secure, square, level or plumb, framed and erected to maintain finish dimensions and contours indicated.
.3 Allow for thermal movement.
.4 Furr around ducts, pipes and dropped beams occurring in finished areas and for vertical gypsum board breaks within or at termination of ceilings.
.5 Provide metal furring channels fastened to masonry or concrete surfaces in parallel rows at 400 mm oc unless gypsum board is indicated to be adhered directly to masonry or concrete surfaces. Shim metal furring channels to provide a level surface.

3.3 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

1 General

1.1 SUMMARY

.1 Provide acoustic tile ceilings including but not limited to following:

.1 Ceiling Suspension Systems.

1.2 RELATED REQUIREMENTS

.1 Section 09 21 16 - Gypsum Board Assemblies: Suspension systems for gypsum board ceilings.

.2 Section 09 51 00 - Acoustical Ceilings.

.3 Division 23 - HVAC, trim for recessed mechanical fixtures.

.4 Section 26 50 00 - Lighting.

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C423-02a, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

.2 ASTM E1264-98, Standard Classification for Acoustical Ceiling Products.

.3 ASTM E1477-98a(2003), Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.

.4 ASTM C635M-07 Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

.5 ASTM C636M-06, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

.6 ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

.7 ASTM E1264 Standard Classification for Acoustical Ceiling Products.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86, Vapor Barrier, Polyethylene Sheet, for Use in Building Construction and Amendment No. 1 1988.

.2 CAN/CGSB-92.1-M89, Sound Absorptive Prefabricated Acoustical Units.

.3 CAN/ULC-S101-07, Standard Methods of Fire Endurance Tests of Building Construction and Materials.

.4 CAN/ULC-S102-07, Surface Burning Characteristics of Building Materials and Assemblies.

.5 CAN/ULC S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials.

.6 CAN/ULC-S702-97, Standard for Mineral Fibre Thermal Insulation for Buildings

.3 Underwriter's Laboratories of Canada (ULC)

.1 CAN/ULC-S102-2003, Surface Burning Characteristics of Building Materials and Assemblies.

.4 Ceilings and Interior Systems Construction Association (CISCA):

.1 CISCA Code of Practices.

1.4 DESIGN REQUIREMENTS

.1 Design all systems for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority. Systems are not designed to carry the weight of electrical equipment.

.2 Suspension Systems:

.1 Maximum deflection: 1/360th of span to ASTM C635 deflection test.

.2 Design ceilings to resist safely and effectively all loads and effects of loads in accordance with part 4.0 of the National Building Code.

.3 Design ceiling suspension systems in accordance with ASTM C636, ASTM C754 and manufacturer's printed directions.

.4 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

.5 Design suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures.

.6 Acoustic panel system is not designed to carry the weight of mechanical and electrical equipment.

.7 Design sub framing as necessary to accommodate, to circumvent, and to avoid conflicts and interferences where ducts or equipment prevent regular spacing of hangers.

.3 Coordinate installation and cooperate with Mechanical and Electrical Subcontractors, to accommodate mechanical and electrical items, or any other work required to be incorporated in or coordinated with the ceiling system.

1.5 SUBMITTALS

.1 Make all submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:

.1 Submit suspension and acoustic panel systems layouts - include bulkheads, hangers, supports, carriers, and panel sizes, locations patterns and termination at walls.

.2 Indicate insert and hanger spacing and fastening details, location of mechanical and electrical components, splicing method, and details of changes in level and junctions with dissimilar materials.

.3 Ceiling system to show basic construction and assembly, treatment at walls, recessed fixtures, splicing, interlocking, finishes, acoustical unit installation.

.4 Submit conditions at abutting, intersecting, and penetrating construction.

.5 Submit dimensioned locations of lighting fixtures, diffusers, sprinkler heads, P.A. system speakers, and other items that pierce the ceiling plane.

.3 Product Data:

.1 Submit manufacturer's technical literature and installation instructions describing components, materials and finishes.

.4 Material Safety Data Sheets:

.1 Submit MSDS for inclusion in Operation and Maintenance Manual.

.5 Samples:

.1 Submit one representative model of each type ceiling suspension system.

.6 Certificates:

.1 Submit written certification stating that suspended ceiling systems are designed for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

.2 Submit certificate attesting installed acoustical ceiling systems meet fire resistance ratings required for this project.

.3 Submit independent test data and certificate confirming system meets or exceeds specified STC rating.

.4 Submit independent test data and design tables for each type of insert to be employed on this project for hanger supports.

1.6 REGULATORY REQUIREMENTS

.1 Fire-resistance rated suspension system: certified by a Canadian Certification

Organization accredited by Standards Council of Canada.

1.7 EXTRA MATERIALS

.1 Provide extra materials of acoustic units in accordance with Section 01 33 00 - Closeout Submittals.

.2 Provide extra suspension system materials in unopened clearly marked cartons of 12 pieces each of 1220mm long tees and 610mm long tees.

.3 Extra materials to be from same production run as installed materials.

.4 Deliver to site, upon completion of the Work of this Section.

.5 Store where directed by Consultant

1.8 WARRANTY

.1 Submit a written warranty executed by the manufacturer, agreeing to repair or replace grid system components that fails within the warranty period. Failure includes but not limited to:

.1 Rusting and manufacturer defects.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MATERIALS

.1 Intermediate Grid System. Unless otherwise indicated, ceiling suspension products shall be manufactured to minimum requirements of ASTM C635, for Heavy Duty, modified as required to suit grid design shown.

.2 Exposed Grid System:

.1 Factory finished satin white on hot dipped galvanized cold rolled steel.

.2 Acceptable Material: Refer to Material / Finish Schedule.

.3 Basic Steel Material and Finish:

.1 Commercial quality cold rolled steel 0.179" (26 ga) minimum thickness, and heavier gauge for Heavy Duty as necessary, galvanized to zinc coating designation Z275.

.2 Exposed surfaces of metal Products shall be factory finished in non-yellowing, low sheen satin white enamel to Consultant's acceptance to match whiteness in panels.

.3 Provide paint formulation of grid system to lighting fixture, speaker grille, sprinkler and diffuser manufacturers to ensure consistency of colour, sheen and texture of all exposed metal components in the ceiling assemblies.

.4 Provide slip-on trim mouldings or metal mouldings with baked enamel finish, as standard with grid manufacturer, to trim around light fixtures.

.4 Accessories for Suspension System:

.1 Complete with splices, clips, and perimeter moulding, of manufacturer's standard and aluminum types to suit the applicable conditions unless special conditions and access areas are shown or specified.

.2 In high humidity areas provide galvanized suspension system.

.5 Hangers:

.1 Minimum 0.104" (12 ga) overall thickness galvanized steel wire to zinc coating

designation Z275, meeting "Heavy-duty" classification of ASTM C635.

.6 Main Tees:
- .1 3.66 m long, 23.8 mm face width double web design, rectangular bulb at top of web, 38 mm web height.
- .2 Expansion cut-outs in main tees controlling buckling caused by heat expansion.

.7 Main Tee Splices:
- .1 Designed to lock lengths of main tees together so that joined lengths of tee function structurally as single unit with tee faces at joint perfectly aligned and presenting tight seam.

.8 Cross Tees:
- .1 1220 mm long, 25 mm web height structural cross-section, design same as main tees, designed to connect at main tees forming positive lock without play, loss or gain in grid dimensions with offset over-ride of face flange over main tee flange to provide flush joint.
- .2 Provide 38 mm web height of cross-tee for fire rated assemblies.

.9 Edge Moulding Around Ceiling Perimeters:
- .1 Materials and finish to match tees.

.10 Panel Hold-Down Clips:
- .1 As recommended by lay-in panel manufacturer.

.11 Radiant Panel Perimeter Mouldings:
- .1 38 mm X 25 mm edge moulding, 22 ga. thick steel with slotted holes at 203 mm centres to allow for expansion at building perimeter.
- .2 Radiant panel edges adjacent to metal acoustic tile suspension system are fit into suspension system tees.
- .3 Note: Radiant panels are structurally supported by Division 23 and not by perimeter mouldings.
- .4 Provide 3 mm gap between edge moulding lengths to allow for expansion.
- .5 At curved building perimeter sections, provide 5 mm gap between edge moulding lengths to allow for increased geometric expansion.

.12 Metal Closures and Trim:
- .1 Bonderized and with factory-applied white baked enamel finish.
- .2 Provide anchors as standard with manufacturer.

.13 Sound Attenuation Batts (Acoustical Ceiling Insulation): Conform to requirements of Section 07 21 16 - Blanket Insulation to meet design requirements.

.14 Suspended GWB Ceiling System:
- .1 Where "GWB" is indicated under ceiling material on finish schedule.
- .2 Acceptable Material:
  - .1 CGC - Drywall suspension system.
  - .2 Armstrong - Drywall suspension system.

.15 Metal Ceiling Transition Piece:
- .1 Aluminum perimeter trim channel. Color as selected by Consultant from manufacturer STD Color Range.
- .2 Acceptable Material:
  - .1 Armstrong - Axiom Perimeter Trim.
  - .2 CGC - Compasso

3 Execution

3.1 INSTALLATION

.1 Installation: in accordance with ASTM C636 except where specified otherwise.

.2 Install suspension system to manufacturer's instructions and Certification Organizations tested design requirements.

.3 Do not erect ceiling suspension system until work above ceiling has been inspected by Consultant.

.4 Secure hangers to overhead structure using attachment methods as indicated.

.5 Install hangers spaced at maximum 1200 mm centers and within 150 mm from ends of main tees.

.6 Lay out center line of ceiling both ways, to provide balanced borders at room perimeter.

.7 Ensure suspension system is coordinated with location of related components.

.8 Install wall molding to provide correct ceiling height.

.9 Completed suspension system to support super-imposed loads, such as lighting fixtures and speakers.

.10 Support at light fixtures with additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.11 Interlock cross member to main runner to provide rigid assembly.

.12 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.

.13 Install access splines to provide 10 percent ceiling access.

.14 Finished ceiling system to be square with adjoining walls and level within 1:1000.

.15 Expansion joints.

.1 Erect two main runners parallel, 25 mm apart, on building expansion joint line. Lay in strip of acoustic tile/board, painted black, 25% narrower than space between 2 T bars.

.2 Supply and install "Z" shaped metal trim pieces at each side of expansion joint.

.3 Design to accommodate plus or minus 25 mm movement and maintain visual closure.

.4 Finish metal components to match adjacent exposed metal trim.

.5 Provide backing plates behind butt joints.

3.2 CLEANING

.1 Touch up scratches, abrasions, voids and other defects in painted surfaces.

END OF SECTION

1 General

1.1 DESCRIPTION OF WORK

.1 The work of this Section comprises the furnishings of all labour, equipment and materials necessary for the supply and installation of the Tile as indicated on the Drawings and Schedules, which includes but is NOT necessarily limited to:
- .1 Wall Tile
- .2 Floor Tile

.2 Work Included: Provide tile including but not limited to following:
- .1 Grouting control joints in floor slab under tile.
- .2 Waterproof membrane.
- .3 Anti-fracture membrane.
- .4 Leveling bed.
- .5 Thin set mortar bed.
- .6 Floor tile, base, trims and fittings.
- .7 Wall tile and trims.
- .8 Installation systems, mortars and grouts.
- .9 Sealing tile control joints and other accessories.
- .10 Sealing penetrations through wall and floor tile.

1.2 RELATED REQUIREMENTS

.1 Section 03 30 00 - Cast-in-Place Concrete.
.2 Section 07 92 00 - Joint Sealants.
.3 Section 09 21 16 - Gypsum Board Assemblies.
.4 Section 10 28 13 - Toilet Accessories.
.5 Section 10 80 00 - Other Specialties.

1.3 REFERENCES

.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 Portland 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).
- .6 ANSI A108.1-05, Installation of ceramic tile with Portland cement mortar.
- .7 ANSI A108.4-99(R2005), Installation of ceramic tile with organic adhesives.
- .8 ANSI A108.5, Installation of ceramic tile with dry-set Portland cement/latex Portland cement mortar.
- .9 ANSI A108.6-99(R2005), Installation of ceramic tile with chemical resistant, water cleanable tile setting/grouting epoxy.
- .10 ANSI A108.9-99(R2005), Installation of ceramic tile with modified epoxy emulsion mortar/ grout.
- .11 ANSI A108.10-99(R2005), Installation of grout in tile work
- .12 ANSI A108.11-99(R2005), Installation of cementitious backer unit.
- .13 ANSI A108.12-99(R2005), Installation of ceramic tile with EGP (Exterior Glue

Plywood) Latex Portland Cement Mortar.

.14 ANSI A108.13-05, Installation of load bearing, bonded, waterproofing membranes for thin set ceramic tile and dimension stone.

.15 ANSI A118.3-99(R2005), Specification for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive.

.16 ANSI A118.4-99(R2005), Specification for Latex-Portland Cement Mortar.

.17 ANSI A118.5-99(R2005), Specification for Furan Mortars and Grout.

.18 ANSI A118.6-99(R2005), Specification for Ceramic Tile Grouts.

.19 ANSI A118.7-99(R2005), Polymer modified cement grouts for tile Installation.

.20 ANSI A108.9-99(R2005), Cementitious backer unit.

.21 ANSI A118.10-99(R2005), Specification for Load Bearing, Bonded Waterproof Membrane for Thin-set Ceramic Tile and Dimension Stone Installation.

.22 ANSI A118.11-99(R2005), Standard for EGP (Exterior Glue Plywood) Latex Portland Cement Mortar.

.23 ANSI A136.1-99(R2005), Specification for Organic Adhesives for the Installation of Ceramic Tile.

.24 ANSI A137.1, Recommended Standard Specification for Ceramic Tile.

.2 American Society for Testing and Materials (ASTM International) International

.1 ASTM C144-99, Specification for Aggregate for Masonry Mortar.

.2 ASTM C 207-91(1997), Specification for Hydrated Lime for Masonry Purposes.

.3 ASTM C979-99, Specification for Pigments for Integrally Colored Concrete.

.4 ASTM A185M-07, Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.

.5 ASTM C144-04, Specification for Aggregate for Masonry Mortar.

.6 ASTM C207-06, Specification for Hydrated Lime for Masonry Purposes.

.7 ASTM C373-88(06), Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products.

.8 ASTM C503-08, Specification for Marble Dimension Stone (Exterior)

.9 ASTM C627-93(99), Evaluating ceramic tile installation systems.

.10 ASTM C648-04, Specification for Standard Test Method for Breaking Strength of Ceramic Tile.

.11 ASTM C650-04, Test Method for Resistance of Ceramic Tile to Chemical Substances.

.12 ASTM C847-06, Specification for Metal Lath.

.13 ASTM C1027-99(04), Determining visible abrasion resistance of glazed ceramic tile.

.14 ASTM C1028-07, Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86(R1988), Vapor Barrier, Polyethylene Sheet for Use in Building Construction.

.2 CGSB 71-GP-22M-78, 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.

.5 CGSB 71-GP-22M, Adhesive, Organic, for Installation of Ceramic Wall Tile.

.6 CGSB 71-GP-29M, Adhesive, Elastomeric, for Installation of Quarry Tiles.

.7 CGSB 71-GP-30M, Adhesive, Epoxy and Modified Mortar Systems for Installation of Quarry Tiles.

.8 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.9 CAN/CGSB-75.1-M88, Tile, Ceramic.

.4 Canadian Standards Association (CSA International)

.1 TTMAC - Terrazzo Tile & Marble Association of Canada - Specification Guide 09 30 00; Tile Installation Manual 2006 - 2007

1.4 DEFINITIONS

.1 Ceramic Tile: Ceramic surfacing unit relatively thin in relation to facial area, made from clay or mixture of clay and ceramic materials, fired at temperature sufficiently high enough to produce specific physical properties and characteristics conforming to Standards specified herein above

.2 Porcelain Tile: Porcelain tile manufactured in various thickness and sizes having matt or unglazed or high polish finish is ceramic tile that is generally made by dust pressed method from a composition which results in tile that is dense, impervious, fine grained, smooth and textured with sharply formed face. Water absorption conforming to ASTM C373.

1.5 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Manufacturer's Instructions:

.1 Provide to indicate special handling criteria, installation sequence, cleaning procedures.

.3 Material Safety Data Sheets:

.1 Submit MSDS for inclusion in Operation and Maintenance Manual.

.4 Shop Drawings:

.1 In addition to minimum requirements indicate following:

.1 Details of construction.

.2 Joint layouts.

.3 Dimensions.

.4 Patterns and makings where applicable.

.5 Samples:

.1 Wall tile: submit duplicate sample of each color, texture, size, and pattern of tile.

.2 Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, color, and size.

.3 Submit individual sample panels of each colour of tile, set with adhesive, grouting and bonding method as specified, showing quality, colour and finish of material, grout and pattern of tiles. Each panel shall be minimum 600 mm x 600 mm.

.6 Maintenance Instructions:

.1 Submit maintenance instructions in accordance with Section 01 78 00 - Closeout Submittals. Provide Owner with required copies of TTMAC Maintenance Guide.

.2 Include specific warnings of any maintenance practice or materials which may damage or disfigure tile work.

.3 Include cleaning methods, cleaning solutions recommended, stain removal methods, polishes and waxes recommended.

1.6 QUALITY ASSURANCE

.1 Qualifications:

.1 Provide Product of company specializing in manufacture of tile, mosaics, pavers, trim units and thresholds with minimum experience of 5 years. Provide test reports if requested to substantiate that Products supplied on this Project will be

of consistent quality in appearance and physical properties.

.2 Execute work of this Section using a company who is a member in good standing with TTMAC and has minimum 5 years successful experience in application of Products, systems and assemblies specified. Perform tile work using skilled mechanics trained and experienced in work of this complexity. Install waterproofing system using an applicator approved by system manufacturer.

.3 Use proprietary Products in full compliance with manufacturer's recommendations. As far as possible obtain Product from single manufacturer ensuring single source responsibility for consistent quality in appearance and physical properties, compatibility with adjacent components while maintaining quality. If requested, manufacturer of installation system shall provide laboratory confirmation to identify proper usage of specified materials. Have manufacturer's representative visit site at commencement of tile work to give proper direction and thereafter at regular interval to ensure proper workmanship.

.2 Mock-Ups:

.1 Where designated or requested, Provide Mock-Ups on site, of each type, style, finish, size, colour of tile, trims and threshold along with respective installation system.

.2 All pertinent remarks, observations and recommendations shall be discussed in presence of all participants shall be recorded.

.3 Sample flooring area, once accepted, including recorded remarks and recommendations shall become a permanent part of Project and shall be the standard of workmanship against which balance of tile work will be judged.

.3 Pre-Installation Meetings:

.1 Arrange pre-installation meeting one (1) week prior to commencing work with all parties associated with trade as requested by Consultant. Presided over by Contractor, include Consultant, Subcontractor performing work of this trade and Owner's representative.

.2 Review Contract Documents for work included under this trade and determine complete understanding of requirements and responsibilities relative to work included, storage and handling of materials, materials to be used, installation of materials, sequence and quality control, Project staffing, restrictions on areas of work and other matters affecting construction, to permit compliance with intent of work of this Section.

.3 In particular ensure Division 3 requirements for concrete are compatible with requirements of this Section; floor flatness and floor levelness requirements for various floor finishes and their acceptability by tile manufacturer; surface texture of finished floor required; acceptable approaches to remediation of high moisture and high pH floors; adhesive application and tile installation.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Comply with material manufacturer’s ordering instructions and lead time requirements to avoid delays.

.2 Coordinate deliveries to comply with construction progress schedule and arrange for above ground, under cover storage before materials are delivered to site.

.3 Store packaged materials in original containers with seals unbroken complete with labels in accordance with manufacturer’s instructions.

.1 Prevent damage to materials and Products during handling and storage.

.2 Keep delivered material dry and free from stains inside weatherproof structure or otherwise protected from freezing and elements.

.3 Store cementitious material off damp surfaces.

.4 Protect organic and epoxy adhesives, additives, mortar mixes and grouts from

freezing, moisture and excessive heat during transportation and storage. Maintain temperatures in storage area between 15 deg C and 20 deg C.

1.8 EXTRA MATERIAL

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide minimum 2% of each type and color of tile required for project for maintenance use.

.3 Deliver extra stock to Owner as soon as permanent, locking storage facilities are available. Place extra stock in designated storage area where directed.

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Safety:

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of materials.

.2 Ventilation:

.1 Provided continuously during and after installation. Run system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of installation.

.3 Temperature:

.1 Maintain air temperature and structural base temperature at tile installation area above 12 °C for 48 h before, during, and 48 h after, installation.

.2 Do not install tiles at temperatures less than 12 °C or above 38 °C.

.4 Do not apply epoxy mortar and grouts at temperatures below 15 °C or above 25 °C.

1.10 WARRANTY

.1 Warrant work of this Section for a period of 3 years against defects, excessive wear, and loss of adhesion including replacement of defective tile work, materials, labour costs for demolition of defective work, accessories, and installation systems at Owner's convenience.

.2 Defective work includes without limitation, tiles broken in normal use due to deficiencies in setting bed, loose tiles or grout and similar defects which can be attributed to poor performance of work or defective materials.

.3 Warrant waterproofing work of this Section against defects of workmanship and materials, and against any actual leakage, for a period of 5 years.

.4 Leakage due to structural failure of concrete shall be excepted.

.5 Cracks arising from normal shrinkage and/or expansion of concrete shall not be considered as structural failure.

.6 Hairline cracks which result from these causes shall be considered normal and warranty shall not be voided as a result of these minor defects.

1.11 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 TILE - GENERAL

.1 Tile:

.1 Conforming to ANSI A137.1, CAN/CGSB-75.1-M.

.2 Provide tile trims and accessories such as bullnoses, copings, caps, cove base, nosings, corner pieces, and other special units as specified, indicated, and required.

.3 Without limitations and unless noted otherwise, Provide tile trim and accessories for each type of tile including:

.1 Rounded and squared finished edges.

.2 Inside and outside corners.

.3 Cove bases, outer and inner.

.4 Sanitary caps and corners.

.4 Provide tile with minimum following characteristics:

.1 Water Absorption: ASTM C373 -

.2 Breaking Strength: ASTM C648 - > 250 lbs.

.3 Abrasion Resistance: ISO 10545-7 - Class Four Heavy Traffic.

.4 Scratch Hardness: MOH's - 7.

.5 Chemical Resistance: ASTM C650 - Resistant.

.6 Coefficient of Friction: ASTM C1028 - Wet: 0.60; Dry: 0.80.

2.2 TILE

.1 Refer to Material / Finish schedule.

2.3 TRIM SHAPES

.1 Conform to applicable requirements of adjoining floor and wall tile.

.2 Use slip resistant trim shapes for horizontal surfaces of showers, overflow ledges, recessed steps, shower curbs, drying area curbs, and stools.

.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 Coved shapes for internal corners.

.2 Special shapes for:

.1 Base to floor internal corners to provide integral coved vertical and horizontal joint (Shower only).

.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 (Shower only).

.3 Wall top edge internal corners to provide integral coved vertical joint.

2.4 GROUT

.1 Ready to use grout with color-coated quartz, confirming to ANSI A118.3.

.2 Acceptable material: Refer to finishes list.

2.5 MORTARS AND ADHESIVE:

.1 Mortar and Adhesive

.1 Polymer modified dryset mortar to ASTM C627-10.

.2 Mix to manufacturers requirements.

.3 Acceptable Material:

.1 Flextile 56 SR Premium Polymer - Modified, SAG-Resistant Mortar.

.2 Mapei Ultraflex LFT.

.3 TEC Ultimate Large Tile Mortar.

2.6 SITE PREPARED SANDED CEMENT MORTAR MIXTURE

.1 Mortar Bed:
  .1 A mixture of cement, sand and water (latex additive may be included) installed to thickness as required to provide an even substrate on which to apply tile.
  .2 Use mortar to correct irregularities in subsurface planes and slope accurately as required to meet design requirements.
  .3 Reinforce mortar beds on floors with 50 mm x 50 mm x 1.6 mm gauge galvanized or stainless steel square wire mesh and walls on expanded metal lath weighing not less than 1.4 kq/m².
  .4 Apply scratch coat where expanded metal lath is used before mortar bed is applied.
  .5 Conform to admixture manufacturer's recommendations for Products and mixtures.

.2 Cement:
  .1 CSA A3000 grey or white Portland cement; white for grout.

.3 Sand:
  .1 CSA A179, ASTM C144 or CSA A23.1, sharp, screened mortar sand free from organic and deleterious materials.

.4 Water:
  .1 Potable and free of minerals detrimental to mortar and grout mixes.

.5 Lime:
  .1 ASTM C207, Type S, hydrated lime.

.6 Acrylic Latex Additive Formulated for use in cement mortar beds:
  .1 Acceptable Material:
    .1 Flextile #43 by Flextile Ltd.
    .2 Planicrete AC by Mapei Inc.

.7 Quick setting, self-leveling underlayment, mortar screed for interior concrete floor preparation, repair and leveling from 10 mm to 38 mm thickness or for building slopes and metal reinforced floating screeds up to 50 mm thickness over polyethylene cleavage membrane.
  .1 Acceptable Material:
    .1 Ultraplan Easy, High-Hydrated Cement Technology HCT underlayment and repair mix by Mapei Inc.
    .2 Flex-Flo Plus by by Flextile Ltd.

.8 Accessories:
  .1 Reinforcing Mesh:
    .1 Non corrosive, 50 mm x 50 mm x 16 ASW gauge or 1.5 mm diameter galvanized steel welded wire mesh complying with CSA G30.5 or ASTM A185 or ASTM A821.
  .2 Reinforcing Metal Lath:
    .1 ASTM C847.
  .3 Cleavage Membrane:
    .1 CAN/CGSB-51.34-M, 0.10 mm (4 mil) thick polyethylene film or CSA A123.3, Type 1, asphalt saturated roofing felt.

2.7 WATERPROOFING, CRACK SUPPRESSION AND ANTI-FRACTURE MEMBRANE SYSTEM

.1 Extra heavy duty, cold applied, seamless, load bearing, non-toxic, non-flammable, non-hazardous during storage, mixing, application and when cured, conforming to ANSI A118.10, for installation of tile and quarry tile for areas such as bathrooms, plazas, showers, kitchens, fountains, swimming pools and balconies.

.2 Reinforcing fabric shall be non-woven, rot-proof fabric specially for use with waterproofing membrane.

.3 All system materials shall be non-toxic, non-flammable and non- hazardous during storage, mixing, application and when cured.

.4 Waterproofing, crack suppression and anti fracture membrane shall meet following physical requirements:

.1 Water Permeability at 91.2 kPa (30 ft hydro/0.9 atoms): Nil.

.2 Elongation at break in accordance with ASTM D-751: 40%.

.3 Service Temperature: -28 deg C to +137 deg C.

.4 Tensile breaking strength: 20.4 Mpa.

.5 Thickness: 0.5 mm (20 mils).

.6 Bonding strength to concrete: 2.4 Mpa.

.7 Acceptable Material:

.1 Flextile WP-980 Waterproof & Crack Isolation Membrane with Reinforcing Fabric by Flextile Ltd.

.2 Laticrete 9235 waterproof membrane system with Laticrete's fiberglass cloth reinforcement.

.3 Mapelastic PRP 315 by Mapei Inc.

.4 Uncoupling membrane, Ditra by Schluter.

.5 Surface Preparation:

.1 Self leveling and smoothing underlayment for rapid leveling of concrete, portland cement mortar bed, plywood, terrazzo and existing tile floors.

.2 Acceptable Material:

.1 Flex-Flo up to 12 mm, by Flextile Ltd.

.2 Laticrete 86 up to 12 mm, by Laticrete International, Inc.

.3 Ultra lan/Ultra Plan MB up to 5 mm.

.4 Planicrete M20 up to 50 mm by Mapei Inc.

2.8 ACCESSORIES

.1 Cleavage plane:

.1 Polyethylene film to CGSB 51-34 .

.2 Metal lath:

.1 To ASTM C847 galvanized finish, 10 mm rib at 2.17 kg/m².

.3 Extruded Aluminum components:

.1 With height of profile and type to suit design requirements and installation requirements.

.2 Refer to finishes list for acceptable material.

2.9 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.

3 Execution

3.1 EXAMINATION

.1 Verify existing conditions and finishes are ready to receive specified tile work.

.2 Ensure backings are structurally sound, level, and plumb within required tolerances.

.3 Ensure concrete is cured, has no structural cracks, openings and projects not required to meet design requirements.

.4 Concrete shall be cured for a minimum of 28 Days and shall have steel trowel finish if installation to include load bearing waterproof membrane over concrete and thin set

application; fine broom or wood float finish for thin set application; shall have screed finish for mortar bed applications.

.5 Notify Consultant in writing of unacceptable substrate conditions.

.6 Beginning of installation implies acceptance of existing conditions.

.7 Ensure compatibility of adhesives, waterproofing, reinforcing and fillers with adjacent substrate and component coming in contact with these Products.

.8 Ensure waterproofing and adhesive manufacturers; examine substrate conditions, verify conditions are suitable for installation prior to commencement, and review application procedures. If requested submit written report.

3.2 PREPARATION

.1 Clean substrate surfaces to receive tile. Surface shall be dimensionally stable, cured free of contaminants such as oil, sealants, and curing compound.

.2 Mortar bed application substrate surface variation shall not exceed 6 mm in 3000 mm.

.3 Thin set application substrate surface variation shall not exceed 3 mm in 3000 mm.

.4 Apply latex cementitious leveling coat to correct substrate irregularity up to 8 mm thickness. Above 8 mm correct irregularity by mortar bed method.

.5 Review setting out point with Consultant for each location, verify patterns and edge condition.

.6 Verify expansion joints have been installed properly.

.7 Verify service fittings, floor drains, rough-ins and similar requirements are completed and are at proper levels to receive work.

3.3 MIXES - GENERAL

.1 Mix mortars and grouts to comply with requirements of referenced Standards and manufacturer's recommendations for accurate proportioning of materials, water or additive content, mixing equipment and mixer speeds, mixing containers, mixing time, pot life and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics.

.2 Prepare and mix latex cement leveling bed/scratch coat mortar using recommended mixing proportions to achieve proper consistency in accordance with manufacturer's instructions.

.3 Prepare and mix dry-set cement mortar, latex cement mortar using recommended mixing proportions to obtain proper consistency in accordance with manufacturer's instructions and requirements of ANSI A108.5.

.4 Prepare and mix tile grout using recommended mixing proportions to obtain proper consistency in accordance with manufacturer's instructions and requirements of ANSI A108.10.

.5 Prepare and mix modified epoxy emulsion mortar using factory proportioned adhesive units to obtain proper consistency in accordance with manufacturer's instructions and requirements of ANSI A108.9.

.6 Prepare and mix chemical resistance, water cleanable, tile setting epoxy adhesive using factory proportioned adhesive units to obtain proper consistency in accordance with manufacturer's instructions and requirements of ANSI A108.6.

.7 Prepare and mix chemical resistance, water cleanable, grouting epoxy using factory proportioned epoxy grout units to obtain proper consistency in accordance with manufacturer's instructions and requirements of ANSI A108.6.

3.4 INSTALLATION

.1 Provide tile in accordance with Terrazzo Tile & Marble Association of Canada - Specification Guide 09 30 00; Tile Installation Manual 2006 - 2007 unless specified otherwise.

.2 Lay out tile so field or patterns are centered on wall and floor areas, or conform

architectural details so no tile less than 1/2 size occurs.

.3 No cut tiles are allowed at finished ceiling level.

.4 Align joints in walls, bases and floors, where tile sizes accommodate.

.5 Provide uniform joint widths throughout.

.6 Prior to installation ensure back of each tile is free of contaminants.

.7 Distribute production run variations evenly, maintaining continuity of appearance.

.8 Arrange accessories in tile work so they are spaced evenly, centered with joints and set true with proper and adequate projection conforming to manufacturer's recommendations.

.9 Make sure tile has adequate solid backing.

.10 Ensure corner and edges are fully supported by bonding material. Avoid slippage.

.11 Tile installation shall have a minimum of 95% bond coverage by backbuttering or other approved technique.

.12 Fit tile units around corners, fitments, fixtures, drains and other built-in-objects to maintain uniform joint appearance.

.13 Cut, drill and set anchors, bolts for fastening fixtures and fittings in tile work.

.14 Make cut edges smooth, even and free from chipping. Do not split tile.

.15 Grout to match colour of tile unless indicated otherwise. Fill joints.

.16 Control Joints: Provide control joints in accordance with following layout guidelines and as indicated:

- .1 Slabs-on-Grade:
  - .1 Over saw cut control joints.
  - .2 Around columns.
  - .3 Over perimeter joints.
  - .4 Every 4500 mm to 6000 mm in a grid.
- .2 Suspended Slabs:
  - .1 Over beam locations.
  - .2 Around columns.
  - .3 Every 4500 mm to 6000 mm in a grid.

.17 Anti-Fracture Membrane:

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

.18 Waterproof Membrane:

- .1 Pre cut reinforcing fabric allowing 50 mm for overlap at ends and sides. Extend fabric 150 mm through door openings.
- .2 Roll up fabric so that each piece can be placed when ready. Reinforce joints.
- .3 Spread layer of waterproofing liquid at joints and cracks.
- .4 Embed 150 mm wide strip of reinforcing fabric into liquid. Spread coat of liquid over fabric to seal it.
- .5 At flash cove spread layer of waterproofing liquid in coves.
- .6 Embed 150 mm wide strip of reinforcing fabric and allow 100 mm of fabric to be flashed up walls.
- .7 Spread coat of liquid over fabric to seal it.
- .8 Flash fabric and waterproofing liquid into any drain and around all projections.
- .9 Use roller or brush to apply a liberal coat of waterproofing liquid to floor and/or wall slightly wider than reinforcing fabric width.
- .10 Include joints and covers which have been previously reinforced. While surface is still wet, unroll pre cut piece of fabric into it.
- .11 Embed fabric and smooth out any wrinkles.
- .12 Ensure liquid shall bleed through fabric.
- .13 Seal fabric.

.14 Immediately apply liberal coat of liquid to completely cover fabric. Lap fabric 50 mm at seams.

.15 Allow to dry until dry to touch.

.16 Apply final application of liquid to entire surface.

.17 If requested, flood test installation in designated locations after allowing membrane to cure fully for 7 Days at 21 deg C. Allow more cure time during cold weather.

.18 Flood test installation for 24 to 48 hours before setting of tile to ensure no water penetration.

.19 Repair and retest if required.

.20 Do not allow traffic on exposed waterproof membrane.

.19 Leveling Bed:

.1 Provide minimum 1.6 mm leveling bed to surfaces to receive waterproof membrane, in accordance with manufacturer's instructions.

.2 Provide ramped leveling bed beneath finish flooring adjacent to tile, for minimum 600 mm strip, to achieve flush finished surfaces at finished flooring transition.

.20 Tile:

.1 Provide setting bed in accordance with manufacturer's printed instructions and as specified herein.

.2 Prepare gypsum board and cement board surfaces, by applying a scratch coat of setting bed material.

.3 Provide setting compound in 1 layer with notched trowel to provide a continuous 3 mm to 6 mm bed, in accordance with tile manufacturer's written instructions.

.4 Place tiles to achieve uniform:

.1 Shading.

.2 Colouring.

.3 Jointing.

.5 Lay tiles in true lines, conforming to lines of building and arrange symmetrically in accordance with Drawing layouts.

.6 Review layout and slopes with Consultant prior to setting of tiles.

.7 When tiles are laid by thin-set method on exterior surfaces, in wet areas or laying large size tiles, achieve minimum of 95% coverage.

.8 Bonding shall be notched in horizontal straight lines.

.9 Lay tile on freshly notched thin-set mortar, slide tile back and forth at 90 degree to notches.

.10 Ensure tiles are set while bond coat is wet and in tacky stage without skin.

.11 Provide back buttering by applying thin troweled coat to back side of tile using flat side of trowel immediately before laying to achieve minimum 95% adhesion for exterior work, or large tile area or wet areas.

.12 Lay tile with 1.6 mm joints, with joints running through in both directions.

.13 Lay out work to produce a symmetrical pattern with minimum amount of cutting. Cut tile at room perimeter shall be not less than 1/2 full size.

.14 Install divider strips and/or trims to suit design requirements at junction of flooring and dissimilar materials.

.15 Provide space or control or expansion joints in widths and depth as located and detailed on Drawings

.16 Existing joints in concrete sub floors shall be carried through to surface of tile work in accordance with details shown on Drawings.

.17 Install expansion joints where tile work abuts restraining surfaces such as perimeter walls, curbs, columns, wall corners and similar components, directly over joints in structural surfaces to details indicated.

.18 Provide slopes to floor drains using leveling bed material.
.19 Set wall tile in a true vertical plane with edges of tiles flush with each other.
.20 Provide uniform slopes to floor drains.
.21 Neatly and closely fit tiles around pipes, accessories and other items occurring in floor and walls.
.22 Provide necessary cutting without marring tile.
.23 Provide tile bases to work of Architectural Woodwork and Modular Casework Sections as indicated.
.24 Replace cracked, discoloured, chipped, and damaged tile.
.25 Align joints of floor, wall and base tiles.

.21 Grouting:
.1 Apply grout in accordance with manufacturer's printed instructions.
.2 Minimum of 2/3 of joint depth shall be kept open for grouting and grout shall penetrate joint to bond coat.
.3 When tiles have set, fill joints full with grout.
.4 Wipe clean surplus grout from face of tile, down to sharp edge of cushion edge of tile.
.5 After grout has attained slight initial set, completely clean-up and polish surfaces of tile.

3.5 CLEANING

.1 Upon completion remove protective coverings and clean down finished work of this Section leaving it in perfect condition, satisfactory to Consultant. Correct defective pointing and other unsatisfactory conditions.
.2 Clean adjacent surfaces which have been soiled or otherwise marred, to completely remove evidence of material causing same.

3.6 PROTECTION

.1 Protect other parts of Work from spatters.
.2 Remove and replace with perfect materials, sections of work which have become stained, soiled, broken, chipped or otherwise damaged.
.3 Prohibit traffic during installation and for 96 hours after completion.

3.7 SCHEDULES

.1 Install tiles according to TTMAC, Specification Guide 09 30 00 - Tile Installation Manual 2006/2007.
.2 Expansion and Control Joints for Tile Installation: TTMAC Detail 301MJ-2006 Movement Joints.
.3 Wall Tile:
.1 Tile Installed on Cement Mortar Over Masonry or Concrete Walls TTMAC Detail 302W- 2006.
.2 Tile Installed Over Masonry or Concrete walls - Thin Set Method TTMAC Detail 303W-2006.
.3 Tile Installed Over Gypsum Board - Thin Set Method, Dry Areas Only TTMAC Detail 304W-2006.
.4 Tile Installed on Cementitious Backer Unit (CBU), Thin Set Method, Walls, for Interior Wet/Dry Areas and Exterior Use; TTMAC Detail 305W-2006.
.5 Tile Installed on Cementitious Backer Unit (CBU)/ Coated Glass Mat Backer Board, on Bath Tub/Walls, Thin Set Method, TTMAC Detail 306W-2006.
.6 Tile Installed Over Cementitious Backer Unit (CBU) and Tile Installed on Coated Glass Mat Backer Board, on Bath Tub/Walls, Thin Set Method Detail A and Detail B respectively, TTMAC Detail 306W-2006.

.7 Tile installed on cement mortar over solid backing on interior/exterior walls, TTMAC Detail 307W-2006.

.8 Tile installed on interior/exterior walls on cement mortar over wood or metal studs, TTMAC Detail 308W-2006.

.4 Floor Tile:

.1 Tile Installed on Interior/Exterior Cement Mortar Bed on Concrete Slab. TTMAC Detail 310F-2002; Detail A and Detail B Chemical Resistance as applicable.

.2 Tile Bonded to Concrete Slab - Thin Set Method, TTMAC Detail 311F-2002; Detail A and Detail B Epoxy Method as applicable.

.3 Tile installed on cement mortar bed on concrete slab, TTMAC Detail 310F-2006.

.4 Tile bonded to concrete slab - Thin-set method, TTMAC Detail 311F-2006.

3.8 JOINT PATTERN

.1 As indicated on Drawings.

END OF SECTION

1 General

1.1 SUMMARY

.1 Provide acoustic tile ceilings including but not limited to following:

.1 Lay-In Acoustic Ceiling Panels.

1.2 RELATED REQUIREMENTS

.1 Section 09 22 26 - Suspension Systems.

.2 Mechanical Divisions

.3 Electrical Divisions

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

.2 ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

.3 ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

.4 ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

.5 ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

.6 ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.

.7 ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

.8 ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.

.9 ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material.

.1 Armstrong Fire Guard Products.

.10 ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint.

.11 ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.

.12 ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.

.13 ASTM E 1264 Classification for Acoustical Ceiling Products.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86, Vapor Barrier, Polyethylene Sheet, for Use in Building Construction and Amendment No. 1 1988.

.2 CAN/CGSB-92.1-M89, Sound Absorptive Prefabricated Acoustical Units.

.3 CAN/ULC-S101-07, Standard Methods of Fire Endurance Tests of Building Construction and Materials.

.4 CAN/ULC-S102-07, Surface Burning Characteristics of Building Materials and Assemblies.

.5 CAN/ULC S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials.

.6 CAN/ULC-S702-97, Standard for Mineral Fibre Thermal Insulation for Buildings

.3 Underwriter's Laboratories of Canada (ULC)
.1 CAN/ULC-S102-2003, Surface Burning Characteristics of Building Materials and Assemblies.
.4 Ceilings and Interior Systems Construction Association (CISCA):
.1 CISCA Code of Practices.

1.4 SUBMITTALS

.1 Make all submittals in accordance with Section 01 33 00 - Submittal Procedures.
.2 Shop Drawings:
.1 Submit acoustic panel systems layouts - include bulkheads and panel sizes, locations patterns and termination at walls.
.2 Indicate insert and hanger spacing and fastening details, location of mechanical and electrical components, splicing method, and details of changes in level and junctions with dissimilar materials.
.3 Submit conditions at abutting, intersecting, and penetrating construction.
.3 Product Data:
.1 Submit manufacturer's technical literature and installation instructions describing components, materials and finishes.
.4 Material Safety Data Sheets:
.1 Submit MSDS for inclusion in Operation and Maintenance Manual.
.5 Samples:
.1 Minimum 300mm x 300mm samples of specified acoustical panel. Submit duplicate full size samples of each type acoustical units.
.2 Submit one full-size sample of each type of tile panel to be used.
.6 Certificates:
.1 Submit written certification stating that suspended ceiling systems are designed for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.
.2 Submit certificate attesting installed acoustical ceiling systems meet fire resistance ratings required for this project.
.3 Submit independent test data and certificate confirming system meets or exceeds specified STC rating.
.4 Submit independent test data and design tables for each type of insert to be employed on this project for hanger supports.

1.5 DESIGN REQUIREMENTS

.1 Performance Requirements:
.1 Provide acoustical ceiling assembly designed and tested to provide surface burning characteristics (ASTM E84) as follows:
.1 Flame Spread: 0.
.2 Smoke Development: 0.
.2 Provide acoustical ceiling system which has been manufactured, fabricated and installed to provide Noise Reduction Coefficient (NRC) rating.
.2 Design all systems for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority. Systems are not designed to carry the weight of electrical equipment.

1.6 QUALITY ASSURANCE

.1 Applicator Qualifications: Provide work of this Section executed by competent installers with minimum of 5 years' experience in application of Products, systems and assemblies specified and with approval and training of the Product manufacturers.

1.7 COORDINATION OF WORK

.1 Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.8 REGULATORY REQUIREMENTS

.1 Fire resistance: NFPA Class A fire retardant treated wood required by code, to conform to ASTM E84.

1.9 MOCK-UP

.1 Construct mock ups in accordance with Section 01 33 00 - Submittal Procedures.

.2 Construct mock-up 10 square meters minimum of each type acoustical tile ceiling including one inside corner and one outside corner.

.3 Construct mock-up where directed.

.4 Allow 24 hours for inspection of mock-up by Consultant before proceeding with ceiling work.

1.10 ENVIRONMENTAL REQUIREMENTS

.1 The building shall be enclosed, the air conditioning system shall be operating with proper filters in place, and the proper temperature and humidity conditions shall be established before, during, and following installation.

.2 Building areas to receive ceilings shall be free of construction dust and debris.

.3 Do not install the Work of this Section until:

.1 Mechanical and Electrical Work above the ceiling is complete.

.2 Maintain uniform humidity of 20-40% before and during installation.

.3 Ventilation is adequate to remove excess moisture.

.4 Uniform Temperature 13-21 degrees C.

.4 Permit wet work to dry before commencement of installation.

.5 Store materials in work area 48 hours prior to installation.

.6 Areas are closed and protected against weather and maintained at no less than 10 degrees C.

1.11 DELIVERY, STORAGE, AND HANDLING

.1 Transport, handle and store material in manner to prevent warp, twist, and damage to panel edges and surfaces in accordance with Manufacturer's recommendations.

.2 Any bent, twisted, warped, or otherwise damaged tee grid suspension components, panels, and or trim shall not be used under any circumstances. Replace such damaged items with new straight, undamaged and acceptable material at no cost to 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 manufacturer's wrappers and containers with labels and seals intact. Cartons for all fire rated materials shall bear U.L label.

1.12 EXTRA MATERIALS

.1 Provide extra materials of acoustic units in accordance with Section 01 33 00 - Closeout Submittals.

.2 Provide acoustical units amounting to 2% of gross ceiling area for each pattern and type specified to nearest full carton, minimum two cartons.

.3 Extra materials to be from same production run as installed materials.

.4 Clearly identify each type of acoustic unit, including color and texture.

.5 Deliver to site, upon completion of the Work of this Section.
.6 Store where directed by Consultant

1.13 WARRANTY

.1 Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replacement of acoustical panels that falls within the Warranty period. Failure include, but are not limited to:
  .1 Acoustical Panels: Sagging or warping
  .2 Grid System: Rusting and manufacturers defects
.2 Warranty period for acoustical panels is ten (10) years from date of Substantial Completion.
.3 The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.14 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.
.2 Place in appropriate on-site bins in accordance with Waste Management Plan.
.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 ACOUSTICAL CEILING PANELS

.1 Acceptable material: Refer to Material / Finish Schedule.
.2 Adhesive: low VOC type recommended by acoustic unit manufacturer.
.3 Staples, nails and screws: to CSA B111 non-corrosive finish as recommended by acoustic unit manufacturer.
.4 Polyethylene: to CAN/CGSB-51.34, 0.15 mm thick.

3 Execution

3.1 INTERFACE WITH OTHER WORK

.1 Co-ordinate with Section 07 21 16 - Blanket Insulation and 09 22 26 - Suspension Systems.
.2 Co-ordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, speakers, sprinkler heads, to be built into acoustical ceiling components.

3.2 EXAMINATION

.1 Examine surfaces scheduled to receive suspended or directly attached acoustical units for unevenness, irregularities and dampness that would affect quality and execution of work.

.2 Do not proceed with installation of ceiling system until unacceptable conditions are corrected.

3.3 MANUFACTURER'S INSTRUCTIONS

.1 Comply with the instructions and recommendations of the ceiling system manufacturer.
.2 Install materials in accordance with governing regulations, fire resistance rating

requirements and industry standards applicable to work.

.1 Comply with CISCA Code of Practices.

3.4 INSTALLATION

.1 General: Do not begin installation until materials sufficient to complete an entire room are received and prepared for installation.

.2 Ensure wet work is completed and dried out to a degree acceptable to panel manufacturer before installation is commenced. Maintain uniform temperatures of at least 21°C for 72 hours prior to commencement of work and maintain temperature until 72 hours after completion.

.3 Install ceiling panels and metal suspension system in accordance with applicable requirements of ASTM C636 and manufacturer's directions.

.4 Where manufacturer's directions are at variance with Contract Documents, notify Consultant before proceeding with work.

.5 Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders.

.6 Recessed items shall replace or be centred on acoustical panels, except where shown otherwise.

.7 Consult with Mechanical and Electrical Divisions to co-ordinate work.

.8 Provide additional supports where required.

.9 Space hangers for suspended ceilings to support grillage independent of walls, columns, pipes and ducts at maximum 1220mm centres along support grillage and not more than 150mm from ends.

.10 Provide additional hangers at light fixtures and diffusers.

.11 Attach hangers to inserts in overhead concrete slab. Bend top of hangers at right angles, turn down and securely fasten. Turn bottom of hangers upwards and securely wrap 3 times.

.12 Suspension to Metal Deck:

- .1 Punch lower part of metal deck with special puncher at required distances.
- .2 Put hanger wire through holes, turn down, make a loop and securely wrap 3 times

.13 Provide written confirmations to Mechanical and Electrical Divisions that suspended ceiling is capable of supporting additional weight of mechanical and electrical fixtures specified in Mechanical and Electrical Divisions.

.14 Run main tees at right angles to length of light fixtures.

.15 Space main tees 1220mm oc in 1 direction and securely tie to hangers.

.16 Space cross tees 610mm oc at right angles to main tees and properly lock at intersections.

.17 Level suspended systems with a maximum tolerance of 3mm over 3m.

.18 Use longest practical lengths of tees, furring and running channels to minimize joints.

.19 Make joints square, tight, flush and reinforced with concealed splines.

.20 Assemble framework to form a rigid and interlocking system.

.21 Design suspension system to accommodate movement caused by thermal expansion or contraction.

.22 Design and space hangers and carrying members to support entire ceiling system, including lighting fixtures, diffusers and equipment openings in locations indicated on reflected ceiling drawings and related Mechanical and Electrical Division drawings.

.23 Use edge moulding where ceiling abuts vertical surface.

.24 Use corner moulding along external edges at ceiling steps.

.25 Install direct-hung exposed grid lay-in acoustic panel ceilings where shown.

.26 Install main tees, cross tees, and wall mouldings so bottom flanges are in flat, level plane at finish ceiling elevations.

.27 Arrange grid so opposite wall edge panels are of equal width but not less than 1/2 panel width and lay out and erect grid system to provide following panel pattern as shown:

.1 Pattern of 2'-0" x 4'-0" with main beam tees spaced 4'-0" oc and cross tees 2'-0" oc unless reviewed otherwise (imperial measure).

.2 Pattern of 2'-0" x 2'-0" with main beam tees spaced 2'-0" oc, primary cross tees at 2'-0" oc and secondary cross tees at 610 mm oc (imperial measure).

.28 Erect main beams parallel to main wall and to each other; space uniformly at centres specified. Stop ends of main beams 13 mm from walls allowing for expansion.

.29 In ceilings having recessed lighting fixtures, modify grid framing to provide main beams along and parallel to both long sides of lighting fixtures; at each 300 mm wide fixture.

.30 Provide an additional main beam along the long side of fixture. At other items recessed in ceiling and designed to be framed by main beams, provide additional main beams necessary.

.31 Rest ends of main beams on horizontal leg of wall mouldings.

.32 Support main beams with hangers along each run, spaced at not more than 1220mm centres; except in areas of steel framing, provide hangers at each intersection of main beam and framing.

.33 If ductwork or equipment located in ceiling plenum area interferes with hanger spacing, provide a trapeze or other arrangement reviewed by Consultant to support main beams at proper spacing.

.34 Do not secure hangers to metal roof deck, ductwork, conduit, piping, equipment or support system for any of these.

.35 Provide an additional hanger at each corner of each opening to receive a recessed lighting fixture and each opening that has been framed by main beam members.

.36 Provide additional hangers at each diffuser, grille and other points of extra loading.

.37 Secure hangers to main beams to develop full strength of hangers and per manufacturer's published directions.

.38 Install primary cross tees at right angles to main beam tees and space uniformly at centres specified. Join ends of cross tees to web of main beams with a positive interlock; except at light fixtures, secure members together with concealed steel clips and bolts.

.39 Field paint cut edges to match surface color and sheen.

.40 Arrange acoustical units and orient directionally patterned units, if any, in manner shown on reflected ceiling plans.

.41 Clip down acoustic panels at fire rated rooms or at locations shown on Room Finish Schedule against wind uplift.

3.5 CLEANING

.1 Clean exposed surfaces of acoustical ceilings, trim, edge moldings and suspension members to comply with manufacturer's instructions for cleaning.

.2 Touch up any minor finish damage.

.3 Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.6 PROTECTION

.1 Protect installed work from damage due to subsequent construction activity, including temperature and humidity limitations and dust control, so that the work will be without damage and deterioration at the time of acceptance by the Owner.

END OF SECTION

1 General

1.1 SUMMARY

.1 Provide resilient base including but not limited to following:

.1 Surface fillers, primer and adhesive.

.2 Resilient base as indicated as the base on the Material / Finish Schedule.

1.2 RELATED REQUIREMENTS

.1 Section 07 92 00 - Joint Sealants.

.2 Section 09 65 19 - Resilient Tile Flooring.

1.3 REFERENCES

.1 ASTM F1861-02 - Standard Specification for Resilient Wall Base.

.2 CAN/CSA-A126.5-87, Resilient Wall Base.

.3 ASTM F2170-02 -Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

1.4 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's literature, data sheets for each type of material provided under this Section for Project.

.2 Data sheets shall provide all required information.

.3 Submit required copies of detailed instructions for maintaining, preserving and keeping materials in clean and safe conditions and give adequate warning of maintenance practices or materials detrimental to specified materials.

.4 Submit manufacturer's installation instructions.

.3 Data sheets:

.1 Submit manufacturer's data sheets for each type of resilient base, resilient base adhesive, surface fillers and primers.

.2 Data sheets shall provide all required information.

.4 Material Safety Data Sheets:

.1 Submit MSDS for inclusion in Operation and Maintenance Manual for adhesives and sealants.

.5 Samples:

.1 Submit duplicate 610 mm long sample of each type of resilient bases.

.6 Operating and Maintenance Instructions Manual:

.1 Provide maintenance data for resilient bases for incorporation into maintenance manual specified in Section 01 78 00 - Closeout Submittals.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Surface burning characteristics to CAN/ULC-S102.2-M. Flame Spread 25 or less; Smoke Developed 50 or less.

.2 Applicator Qualifications:

.1 Provide work of this Section executed by competent installers with minimum of 5 years experience in application of products, systems and assemblies specified, including 2 years in heat welding of seams and with approval and training of the product manufacturers.

.2 Upon request, provide proof of manufacturer's certificate to Consultant prior to commencement of installation.

.3 Pre-Construction Meeting:

.1 Prior to start of work, arrange for project site meeting of all parties associated with work of this Section, including Contractor, resilient base installer, trade or substrates to which flooring is applied and manufacturer's representative.

.2 Review Specification for work included under this Section and determine complete understanding of requirements and responsibilities relative to work included, storage and handling of materials, materials to be used, installation of materials, sequence and quality control, project staffing, restrictions on areas of resilient base installation and other matters affecting construction, to permit compliance with intent of this Section.

.4 Site Sample Mock-Up Area:

.1 Install minimum 3600 mm long sections of each type of resilient base as directed at the site by Consultant.

.2 Do not proceed with resilient base work until quality control Mock-Up has been reviewed and accepted by Consultant.

.3 Reviewed and accepted quality control Mock-Up shall be retained and serve as minimum acceptable standard for the resilient base work.

.4 Quality control Mock-Up shall be incorporated into finished resilient base work if so accepted by Consultant.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials in good condition to site in manufacturer's original unopened containers that bears name and brand of manufacturer, project identification, shipping and handling instructions.

.2 Store on site in designated space at minimum temperature of 20 deg C for period of 48.

1.7 PROJECT CONDITIONS

.1 Provide each flooring Product in accordance with manufacturer's recommended tolerances for:

.1 Substrate moisture content.

.2 Temperature and ventilation.

.3 Maintain Relative Humidity at application to % recommended by manufacturer when tested in accordance with ASTM F2170, Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

.2 Environmental Requirements: Air temperature and structural base temperature at base installation are shall be above 20 deg C for 72 hours before, during and 48 hours after installation.

.3 Allow base materials and application adhesives to acclimatize to these temperatures for 48 hours.

1.8 WARRANTY

.1 Warranty resilient bases for a period of 3 years from date of Substantial Performance of the Work against defects and/or deficiencies in accordance with General Conditions of the Contract.

.2 Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Consultant and at no expense to Owner.

.3 Defects include but are not limited to; failure in adhesive bond and extensive colour fading.

1.9 MAINTENANCE MATERIALS

.1 Extra Materials: Supply to Owner at completion of job 6000 mm of coil stock of each type of resilient base in colours specified for future repairs, boxed in original containers and clearly labeled.

.2 Extra stock shall be same production run as installed products.
.3 Store extra stock in location as directed later by Consultant.

1.10 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.
.2 Place in appropriate on-site bins in accordance with Waste Management Plan.
.3 A weekly clean-up is mandatory and is to be undertaken the day prior to job site meeting.
.4 Failure to comply will result in clean-up and administrative costs being allocated and backcharged on a pro rated basis.

2 Products

2.1 MATERIALS

.1 Resilient Base:
  .1 PVC- Free: Supply rubber cove base 3 mm thick x 100 mm high, vulcanized rubber, in coil lengths, top set with coved toe with pre-manufactured inside and outside corners.
  .2 Base shall meet performance and dimensional requirements of ASTM F-1861, Type TS, PVC free, Group 1, Class C Fire Resistance Rating.
  .3 Colours selected by Consultant from manufacturer's full range including designer colours.
  .4 Acceptable material: Refer to Material / Finish Schedule.
.2 Surface fillers and primers:
  .1 Types and brands approved, acceptable to resilient base manufacturers for applicable conditions. Use non-shrinking latex compound.
.3 Resilient base adhesives:
  .1 Waterproof, clear setting type and brands as recommended by resilient base manufacturer.
.4 Edge Strips:
  .1 Extruded vinyl.
  .2 Colour to be selected by the Consultant.

3 Execution

3.1 EXAMINATION

.1 Examine wall surfaces to ensure that they are dry, clean, level and free from cracks, ridges a dusting, scaling and carbonation, which might preclude a satisfactory installation.
.2 Remove irregularities and fill depressions with non-shrinking latex (epoxy) compound.
.3 This Subcontractor shall check that the primer, adhesive and filler of this section are compatible. Report in writing, all errors, defects and discrepancies immediately to Consultant.
.4 Do not commence with work until unsatisfactory conditions have been corrected.
.5 Failure to report unsatisfactory conditions will be construed acceptance and approval of substrate conditions.
.6 Commencement of work shall imply acceptance of substrate with regard to conditions of substrate at time of installation.

3.2 INSTALLATION

.1 Resilient base work shall be performed by experienced and competent workers in strict

accordance with manufacturers written instructions for material concerned.

.2 Fill cracks or irregularities with crack filler approved by resilient base manufacturer.

.3 Provide a solid backing over entire area behind resilient base.

.4 Apply primer in strict accordance with manufacturer's written instructions.

.5 Permit primer to dry.

.6 Apply adhesive evenly and continuously with an approved notch tooth spreader at the recommended rate for full base adhesion and contact.

.7 Mechanical spreader not approved.

.8 Do not apply adhesive in a manner which promotes induced waviness in resilient base.

.9 Do not spread more adhesive than can be covered before initial set takes place.

.10 Use waterproof adhesive throughout.

.11 Mix and spread adhesive evenly, in quantities which can be covered by resilient base within the adhesive's working time.

.12 If the adhesive over-dries, completely remove it using solvents compatible with adhesive and re-apply adhesive.

.13 Do not soil walls, bases, fitments, finish carpentry work or adjacent surfaces with adhesive.

.14 Promptly remove all excess and spillage of adhesive.

.15 Unroll coils of resilient base.

.16 Place resilient base flat to loosen coil set.

.17 Set wall base in adhesive tightly against wall and floor surfaces.

.18 Use lengths as long as practicable and not less than 500 mm long.

.19 Install resilient bases to walls, columns and fitments as indicated on the Drawings and Room Finish Schedule, during final stages of completion of work, when ceilings and permanent partitions are finished, when prime paint coats are applied and when surface conditions are suitable for installation.

.20 Set resilient base in adhesive to produce a positive, permanent bond without gaps, tight against vertical and floor surfaces for a uniform fit.

.21 Install resilient base straight and level with maximum height variation of 1:1000, having vertical, tight and flush "hairline" butt joints with no two joints closer than 610mm apart.

.22 Provide mitred internal corners.

.23 External corners shall be wrapped around corners as sharp as possible by scoring the back.

.24 Install pre-molded end stops where end of base is exposed or does not butt against a vertical surface in the finished work.

.25 Accurately scribe and fit resilient base to metal frames and other obstructions.

.26 Roll resilient base with clean, polished 2.27 kg roller, against vertical and floor surfaces to ensure full bonding to surfaces.

.27 Ensure that installation of resilient base is tight, firm, and free of bubbling and separation of any kind from surfaces.

.28 Remove defective installation as directed by Consultant and install new resilient base as specified herein.

.29 Resilient base work shall be handed over to Owner free of blemishes and in perfect condition.

3.3 CLEANING

.1 Remove excess adhesive from floor, base and wall surfaces without damage.

.2 Clean, seal and wax floor and base surface to flooring manufacturer's instructions.

END OF SECTION

1 General

1.1 SUMMARY

.1 The work of this Section comprises the furnishing of all equipment, labour and materials necessary for the supply and installation of the following, including all accessories, as specified in this Section and indicated on the Room Finish Schedule and Drawings:

1.2 RELATED REQUIREMENTS

.1 Section 09 65 13 - Resilient Base and Accessories.

1.3 REFERENCES

.1 CSA-A126.1-M1984, Vinyl Composition Floor Tile

.2 CAN/ULC-S102-2-M88, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies.

.3 CGSB 25-GP-21M-78, Floor Polish, Water Emulsion, Detergent Resistant, Non-buffable.

1.4 SAMPLES

.1 Submit samples complete with full range of available colors in accordance with Section 01 33 00 - Submittal Procedures.

1.5 MAINTENANCE DATA

.1 Provide data for maintenance of resilient flooring for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.6 MAINTENANCE MATERIAL

.1 Deliver 2% of each color, pattern and type flooring material including base required for this project for maintenance use. Identify each box. Store where directed by owner.

.2 Maintenance materials to be of same production run as installed materials.

1.7 ENVIRONMENTAL REQUIREMENTS

.1 Maintain air temperature and structural base temperature at flooring installation area above 20 C for 48 hours before, during and for 48 hours after installation.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MATERIALS

.1 Vinyl composition tile (VCT):

- .1 To CSA A-126.1 and CAN/ULC-S102.2
- .2 Type: A
- .3 Fire test data:
  - .1 Flame spread: 75 or less
  - .2 Smoke developed: 300 or less
- .4 Size: 305 mm x 305 mm
- .5 Thickness: 3.18 mm
- .6 Pattern: medium.

.7 Texture: smooth

.8 Colour: four (4) colours to be selected by Consultant from manufacturer's standard color range.

.9 Acceptable Materials:

.1 Flextile "Flex-Thru" (Canada Classic).

.2 Amtico "Fortress".

.3 Armstrong "Excelon".

.2 Primers and adhesives:

.1 Primers and adhesives: as recommended by resilient flooring manufacturer for specific installation, except products with VOC's not permitted.

.3 Sub-floor filler and leveller: while premix latex requiring water only to produce cementitious paste.

.4 Edge strips: extruded or formed metal.

.1 VCT-to-concrete: Prefinish metal binder bar, Roberts 16-100.

.2 VCT-to-porcelain tile: vinyl reducer, Johnsonite CRS-XX-A

.5 Sealer: type recommended by flooring manufacturer.

.6 Wax: type recommended by flooring manufacturer.

3 Execution

3.1 INSPECTION

.1 Ensure concrete floors are dry using test methods recommended by flooring manufacturer, and exhibit negative alkalinity, carbonization or dusting.

3.2 PREPARATION OF RESILIENT TILE FLOORING

.1 Prepare concrete floors to receive resilient tile flooring in accordance with requirements of ASTM F710.

.2 Consult individual manufacturer for their specific recommendations and follow them as required.

.3 For existing floors conduct non-chemical methods of removal, such as abrasive cleaning or blast cleaning, including methods described in ASTM D4259 on existing concrete slabs with deleterious residues.

.4 Mechanically prepare concrete substrate using dustless approved method to ICRI requirements to:

.1 CSP: Concrete Surface Profile.

.2 Diamond Cup Ground.

.3 Shot Blast.

.5 Remove sub-floor ridges and bumps.

.6 Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

.7 Clean floor free of paint, oil, dirt or any other foreign matter detrimental to sheet flooring application.

.8 Clean floor and apply filter; trowel and float to leave smooth, flat hard surface.

.9 Prohibit traffic until filler has cured.

.10 First apply moisture reduction barrier coating on prepared concrete by rolling in crisscross direction across entire surface being treated including up to and around perimeter of any restrained surfaces such as walls and columns in accordance with manufacturer's recommendations.

.11 Clean floor and apply fast setting cement based compound filler mixed with high performance acrylic latex additive to form skim coat; fill low spots, cracks, joints, holes and other defects with sub-floor filler, trowel and float to leave smooth, flat hard surface ready for direct glue down installation of floor covering.

.12 Vacuum, prime and seal substrate to resilient tile flooring manufacturer's recommendations.

3.3 FLOORING-APPLICATION GENERAL

.1 Lay flooring in strict accordance with manufacturer's printed instructions for substrate over which material is being laid.

.2 Lay flooring with joints parallel to building lines to produce symmetrical tile pattern. Border tiles minimum half width of tile.

.3 Install flooring in staggered grid pattern with continuous joints and pattern grain parallel for all units and parallel to width or room.

.4 Roll flooring to ensure full adhesion in accordance with flooring manufacturer's recommendations.

.5 Cut flooring neatly around fixed objects.

.6 Install flooring in pan type floor access covers. Maintain floor pattern.

.7 Terminate flooring at centerline of door openings where adjacent floor finish or color is dissimilar.

.8 Install metal edge strips at unprotected or exposed edges where flooring terminates and between flooring and dissimilar materials, in accordance with Par. 2.1.5 above.

3.4 CLEANING AND WAXING

.1 Remove excess adhesive from floor, base and wall surfaces without damage.

.2 Clean, seal and wax floor surface to flooring manufacturer's instructions.

3.5 PROTECTION OF FINISHED WORK

.1 Protect new floors from after initial waxing until just before final waxing and final inspection.

.2 Prohibit traffic on floor for 48 hours after installation.

3.6 JOINT PATTERN

.1 Straight.

END OF SECTION

1 General

1.1 SUMMARY

.1 Work Included: Provide painting including but not limited to following:

- .1 Interior:
  - .1 Exposed building surfaces as indicated on Room Finish Schedules.
  - .2 Hollow metal doors, frames and transom panels.
  - .3 Fire doors and frames.
  - .4 Wood doors including trim of lites in same doors.
  - .5 Borrowed light frames.
  - .6 Glazed screen frames, mullions and closures.
  - .7 Glazing stops in wood doors.
  - .8 Exposed miscellaneous metal and steel items for the work of all trades, including hangers, etc., for mechanical and electrical works.
  - .9 Steel stairs, landings and railings.
  - .10 Gypsum board bulkheads and walls.
  - .11 Mechanical and electrical backboards.
  - .12 Access panels and doors.
  - .13 Screens.

.2 Work Excluded:

- .1 Do not paint pre-finished metal siding, fascia and soffit, coping cap flashing and similar components. Refer to dedicated trade Sections for special finishes specified therein and their effects on your trade.
- .2 Do not paint chrome, stainless steel, vinyl, plastic laminate and aluminum surfaces throughout unless specified otherwise.
- .3 Do not paint internal surfaces of steel tanks and stacks.
- .4 Do not paint equipment, furnished completely primed and finish painted by manufacturer.

1.2 RELATED REQUIREMENTS

.1 Section 05 50 00 - Metal Fabrications.
.2 Section 06 10 00 - Rough Carpentry.
.3 Section 06 41 00 - Architectural Wood Casework.
.4 Section 08 11 13 - Hollow Metal Doors and Frames.
.5 Section 08 14 16 - Flush Wood Doors.
.6 Section 09 21 16 - Gypsum Board Assemblies.
.7 Mechanical Sections.
.8 Electrical Sections.

1.3 REFERENCES

.1 Department of Justice Canada (Jus)

- .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33
- .2 Environmental Protection Agency (EPA)
  - .1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - 1995, (for Surface Coatings).
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .4 Master Painters Institute (MPI)
  - .1 MPI Architectural Painting Specifications Manual, 2004.

.5 National Fire Code of Canada - latest edition.

.6 Society for Protective Coatings (SSPC)

.1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.

1.4 DEFINITIONS

.1 "Exposed" means visible in completed work. In case of closets, cabinets and drawers, it includes their interiors. Exposed surfaces in underground parking areas are considered "Exterior" for purpose of this Contract.

.2 "Surface Preparation" means cleaning or treating of surface to be painted to ensure best possible bond between surface to and painting to be applied; remove surface contaminants that will affect performance of painting, without limitations such as oil, grease, salts, dust, dirt, rust, rust scale, ill scale, and old coatings where applicable; remove surface imperfections without limitations such as weld spatter, sharp edges, burrs, silvers, laminations, pits, porosities and crevices; prepare surfaces to provide anchor profile or surface profile which improve mechanical bonding of coating to prepared surface by increasing surface area.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Contractor: minimum of five years proven satisfactory experience.

.2 Journeymen: qualified journeymen who have "Tradesman Qualification Certificate of Proficiency" engaged in painting work.

.3 Apprentices: working under direct supervision of qualified trades person in accordance with trade regulations.

.2 Pre-Installation Meeting:

.1 Attend pre-installation meeting one week prior to beginning work of this Section.

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other building subtrades.

.4 Review quality expectations.

.3 Standard of Acceptance:

.1 Walls: No defects visible from a distance of 1000 mm at 900 to surface.

.2 Soffits: No defects visible from floor at 450 to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of color and uniformity of sheen across full surface area.

1.6 HEALTH AND SAFETY

.1 Occupational Health and Safety in accordance with Section 01 35 29 - Health, Safety, and Emergency Response Procedures.

1.7 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

.1 Environment Choice Program:

.1 Provide paint products certified to meet the requirements of the Environmental Choice Program, Department of the Environment.

.2 Submit CSA Certification Reports that products proposed for use are certified under the Environmental Choice Program.

1.8 INSPECTION REQUIREMENTS

.1 Interior surfaces requiring painting shall be inspected by Paint Inspection Agency who shall notify Consultant and Construction Manager in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.

.2 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Owner.

.3 Exterior painting and decorating work shall be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and local Painting Contractor's Association. Painting contractor shall notify the Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.

.4 Exterior surfaces requiring painting shall be inspected by the Paint Inspection Agency who shall notify Consultant and Construction Manager in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.

1.9 QUALITY CONTROL

.1 Provide mock up in accordance with Section 01 45 00 - Quality Control.

.2 Prepare and paint one (1) designated wall of one (1) room to requirements specified herein, with specified paint with selected colors, gloss/sheen, textures and workmanship to MPI Painting Specification Manual standards for review and approval.

.3 On completion have paint thickness tested for proper film thickness. Do not proceed with balance of project until test results are in compliance with MPI Painting Specification Manual standards.

.4 When approved, surface, area, room and/or items shall become acceptable standard of finish quality and workmanship for similar on site work.

1.10 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's literature, data sheets for each type of material provided under this Section for Project. Data sheets shall provide all required information. Submit manufacturer's installation instructions.

.2 Material Safety Data Sheets: Submit MSDS for inclusion in Operation and Maintenance Manual without limitations for adhesives, sealants, patching and leveling compound, solid polymer and as designated later by Consultant.

.3 Progress Reports:

.1 Materials: Submit in writing list of proposed materials prepared by paint manufacturer, for approval at least 60 Days before materials are required. List shall bear manufacturer's official certification that materials listed meet or exceed requirements specified herein.

.4 Samples:

.1 Submit full range color sample chips to indicate where color availability is restricted.

.2 Submit duplicate 200 mm sample panels of each paint with specified paint or coating in colors, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:

.1 3 mm plate steel for finishes over metal surfaces.

.2 13 mm birch plywood for finishes over wood surfaces.

.3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.

.4 13 mm gypsum board for finishes over gypsum board and other

smooth surfaces.

.5 10 mm cedar for finishes over wood surfaces.

.6 When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.

.5 Manufacturer's Instructions:

.1 Submit manufacturer's installation and instructions.

.6 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include following:

.1 Product name, type and use.

.2 Manufacturer's product number.

.1 Color numbers and associated locations.

1.11 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver and store materials in original containers, sealed, with labels intact.

.3 Labels shall clearly indicate:

.1 Manufacturer's name and address.

.2 Type of paint or coating.

.3 Compliance with applicable standard.

.4 Color number in accordance with established color schedule.

.4 Remove damaged, opened and rejected materials from site.

.5 Provide and maintain dry, temperature controlled, secure storage.

.6 Observe manufacturer's recommendations for storage and handling.

.7 Store materials and supplies away from heat generating devices.

.8 Store materials and equipment in a well ventilated area with temperature range 7°C to 25°C.

.9 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.10 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Consultant. After completion of operations, return areas to clean condition to approval of Consultant.

.11 Remove paint materials from storage only in quantities required for same day use.

.12 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

1.12 FIRE SAFETY REQUIREMENTS

.1 Provide one - 3kg Type ABC fire extinguisher adjacent to storage area.

.2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.13 SITE CONDITIONS

.1 Environmental Requirements: Paint and finish in clean, dust-free, properly ventilated and adequately lit areas (minimum 100 lx (9.3 ft candles).

.2 Maintain minimum interior temperature of 18 deg C during application and drying of paint and maintain until building occupancy occurs.

.3 Do not undertake exterior painting if air and surface temperature are expected to fall below 10 deg C before coating has dried. Avoid painting during winds, weather

conditions which may affect paint application or following rain. Wait until frost, dew or condensation has evaporated. Avoid painting surfaces exposed directly to hot summer sun.

.4 Do not undertake interior painting on surfaces where condensation has or will form due to presence of high humidity and lack of proper ventilation.

.5 Ventilate enclosed spaces.

.6 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".

.7 Perform no painting work when maximum moisture content of substrate exceeds:

.1 12% for concrete.

.2 12% for clay and concrete brick and block.

.3 15% for wood.

.4 12% for stucco, plaster and gypsum board.

.8 Test concrete, masonry and plaster surfaces for alkalinity as required.

.9 Surface and Environmental Conditions:

.1 Apply paint finish only in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint only to adequately prepared surfaces and to surfaces within moisture limits noted herein.

.3 Apply paint only when previous coat of paint is dry or adequately cured.

.4 Apply paint finishes only when conditions forecast for entire period of application fall within manufacturer's recommendations.

.5 Do not apply paint when:

.1 Temperature is expected to drop below 10°C before paint has thoroughly cured.

.2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.

.3 Surface to be painted is wet, damp or frosted.

.6 Provide and maintain cover when paint must be applied in damp or cold weather.

.7 Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer.

.8 Protect until paint is dry or until weather conditions are suitable.

.9 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.

.10 Paint occupied facilities in accordance with approved schedule only. Schedule operations to approval of the Consultant such that painted surfaces will have dried and cured sufficiently before occupants are affected.

1.14 EXTRA MATERIAL

.1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Submit one - one liter can of each type and color of primer, identified color and paint type in relation to established color schedule and finish system.

.3 Deliver and store where directed.

1.15 SCHEDULING OF THE WORK

.1 Submit work schedule for various stages of painting to Consultant for approval. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization from Consultant for changes in work schedule.

.3 Schedule painting operations to prevent disruption of occupants in and about the

building.

1.16 WARRANTY

.1 Warrant work of this Section for period of 2 years against defects and/or deficiencies in accordance with General Conditions of the Contract.

.2 Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Consultant and at no expense to Owner.

.3 Defects include but are not limited to; material shrinkage, cracking, splitting and defective workmanship including but are not limited to failure in bubbling, blistering and delamination.

1.17 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

.4 Separate for reuse and place in designated containers steel waste in accordance with Waste Management Plan.

.5 Handle and dispose of hazardous materials in accordance with CEPA, regulations.

.6 Unused paint materials must be disposed of at official hazardous material collections site.

2 Products

2.1 MATERIALS

.1 Provide paint materials for paint systems from single manufacturer.

.2 Conform to latest MPI requirements for painting work including preparation and priming.

.3 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing.

.4 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.

.5 Provide paint products meeting MPI "Environmentally Friendly", E2 ratings based on VOC (EPA Method 24) content levels.

.6 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.

.7 Water-borne surface coatings and recycled water-borne surface coatings must have a flash point of 61.00C or greater.

.8 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:

.1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.

.2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.

.9 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.

.10 Recycled water-borne surface coatings must contain 50 % post-consumer material by

volume.

.11 Recycled water-borne surface coatings must not contain:
- .1 Lead in excess of 600.0 ppm weight/weight total solids.
- .2 Mercury in excess of 50.0 ppm weight/weight total product.
- .3 Cadmium in excess of 1.0 ppm weight/weight total product.
- .4 Hexavelant chromium in excess of 3.0 ppm weight/weight total product.
- .5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.

.12 The following must be performed on each batch of consolidated post-consumer material before surface coating is reformulated and canned. These tests must be performed at a laboratory or facility which has been accredited by the Standards Council of Canada.
- .1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
- .2 Mercury is to be determined by Cold Vapor Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.

.13 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique No. 8081 as defined in EPA SW-846.

.14 Painting products: except where specifically specified otherwise all paint to be latex base with the following manufacturer's product lines as Acceptable Material for use on this project.
- .1 Interior Latex: Refer to the material / finish schedule.
- .2 Exterior: Refer to the material / finish schedule.
  - .1 Colour Your World - 5600 Series.
- .3 Primers
  - .1 Latex or alkyd as recommended by paint manufacturer except where specifically indicated otherwise.

2.2 COLOURS

.1 For colours refer to Material / Finish Schedule.

.2 Second coat in three coat system to be tinted slightly lighter color than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

.1 Perform color tinting operations prior to delivery of paint to site in strict accordance with manufacturer's written instructions.

.2 Paste, powder or catalyzed paint mixes shall be mixed

.3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.

.4 Thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Consultant.

.5 Re-mix paint prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and color and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

.1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

	Gloss @ 60 degrees	Sheen @ 85 degrees
Gloss Level 1	Matte Finish (flat)	Max. 5 Max. 10
Gloss Level 2	Velvet-Like Finish	Max.10 10 to 35

Gloss Level 3	Eggshell Finish	10 to 25 10 to 35
Gloss Level 4	10 to 25 10 to 35	20 to 35 min. 35
Gloss Level 5	20 to 35 min. 35	35 to 70
Gloss Level 6	Traditional Gloss	70 to 85
Gloss Level 7	High Gloss Finish	More than 85

.2 Gloss level ratings of painted surfaces as indicated.

2.5 INTERIOR PAINTING SYSTEMS

.1 Concrete masonry units: smooth and split face block and brick:
  .1 INT 4.2D - High performance architectural latex gloss level 5-semi-gloss finish.
.2 Structural steel and metal fabrications:
  .1 INT 5.1R - High performance architectural latex gloss level 5-semi-gloss finish.
.3 Galvanized metal: doors, frames, misc. steel, pipes, and ducts.
  .1 INT 5.3L - Alkyd gloss level 5-semi-gloss finish (over non-cementitious primer).
.4 Dressed lumber: including doors, door and window frames, casings, mouldings:
  .1 INT 6.3A - High performance architectural latex gloss level finish.
.5 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:
  .1 INT 9.2B - High performance architectural latex gloss level finish.

3 Execution

3.1 TOPCOAT AND INTERMEDIATE COAT THICKNESSES

.1 Latex & Acrylics (Interior): 0.03 mm (1.2 mils) DFT/coat.
.2 Latex & Acrylics (Exterior): 0.038 mm (1.5 mils) DFT/coat.
.3 Epoxys (Interior): 0.076 mm (3 mils) DFT/coat.
.4 Urethanes (Interior and Exterior): 0.076 mm (3 mils) DFT/coat.

3.2 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.3 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual.
.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.4 EXAMINATION

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Consultant damages, defects, unsatisfactory or unfavorable conditions before proceeding with work.
.2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

3.5 PREPARATION

.1 Protection:

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking.

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.2 Surface Preparation:

.1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.

.2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.3 Place "WET PAINT" signs in occupied areas as painting operations progress.

.3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:

.1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.

.4 Clean following surfaces with high pressure water washing: ___.

.5 Prevent contamination of cleaned surfaces by salts, acids, alkalies, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.6 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.

.7 Apply wood filler to nail holes and cracks.

.8 Tint filler to match stains for stained woodwork.

.9 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

.10 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements.

3.6 APPLICATION

.1 Method of application to be as approved by Consultant.

.2 Brush and Roller Application:

.1 Apply paint in uniform layer using brush and/or roller type suitable for application.

.2 Work paint into cracks, crevices and corners.

.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins.

.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.

.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray application:

.1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.

.2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.

.3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.

.4 Brush out immediately all runs and sags.

.5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.

.5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.7 Sand and dust between coats to remove visible defects.

.8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

.9 Finish inside of cupboards and cabinets as specified for outside surfaces.

.10 Finish closets and alcoves as specified for adjoining rooms.

.11 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.7 MECHANICAL/ELECTRICAL EQUIPMENT

.1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with color and finish to match adjacent surfaces, except as indicated.

.2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.

.3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.

.4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

.5 Do not paint over nameplates.

.6 Keep sprinkler heads free of paint.

.7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matte black paint.

.8 Paint fire protection piping red.

.9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.

.10 Paint natural gas piping yellow.

.11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

.12 Do not paint interior transformers and substation equipment.

3.8 FIELD QUALITY CONTROL

.1 Interior painting and decorating work shall be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and local Painting Contractor's Association. Painting contractor shall notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.

.2 Interior surfaces requiring painting shall be inspected by Paint Inspection Agency who shall notify Consultant and General Contractor in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.

.3 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection

and approval of their paint or coating system application as required at no additional cost to Consultant.

.4 Field inspection of painting operations to be carried out by independent inspection firm as designated by Consultant.

.5 Advise Consultant when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

.6 Cooperate with inspection firm and provide access to areas of work.

.7 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Consultant.

3.9 RESTORATION

.1 Clean and re-install hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Consultant. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Consultant.

END OF SECTION

1 General

1.1 SECTION INCLUDES

.1 Provide corner guards including, but not limited to following:

.1 Surface-mounted corner guards.

.2 Mounting hardware, accessories, and trim.

1.2 RELATED REQUIREMENTS

.1 Section 06 10 00 - Rough Carpentry, Blocking.

.2 Section 09 21 16 - Gypsum Board Assemblies.

1.3 REFERENCES

.1 ANSI/CABO A117.1 - American National Standard for Buildings and Facilities - Providing Accessible and Usable Buildings and Facilities.

.2 ASTM A 176 - Standard Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip.

.3 ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

.4 ASTM D 256 - Standard Test Methods for Determining the Pendulum Impact Resistance of Notched Specimens of Plastics.

.5 ASTM D 543 - Standard Test Methods for Resistance of Plastics to Chemical Reagents.

.6 ASTM D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.

.7 ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.

.8 ASTM D 648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load.

.9 ASTM D 785 - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials.

.10 ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

.11 ASTM D 792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.

.12 ASTM D 1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

.13 ASTM D 1822 - Standard Test Method for Tensile-Impact Energy to Break Plastics and Electrical Insulating Materials.

.14 ASTM D 2240 - Standard Test Method for Rubber Property--Durometer Hardness.

.15 ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

.16 ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

.17 CAN/ULC S102.2 - Standard Method of Test for Surface Burning Characteristics of Building Materials.

.18 SAE J-1545 - Recommended Practice; Society of Automotive Engineers.

.19 UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.4 SUBMITTALS

.1 Make submittals in accordance with requirements of Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Manufacturer's complete and current Product Data for each product required,

including complete installation requirements.

.3 Shop Drawings:
- .1 Show locations of each item and installation details.
- .2 Provide elevations of non-standard conditions.

.4 Selection Samples:
- .1 Color charts consisting of actual product pieces, demonstrating full range of available colors, for initial color selection.

.5 Verification Samples:
- .1 305 mm long assemblies, including one end cap, in color specified.

1.5 QUALITY ASSURANCE

.1 Provide test reports showing compliance with the performance specified including.
- .1 Fire-related properties.
- .2 Accessibility and safety properties.
- .3 Impact strength.

.2 Fire Resistance: Where fire ratings are specified for flush mounted corner guards, provide assemblies that have been tested and rated in accordance with ASTM E 119.

.3 Corner Guards - Performance Requirements:
- .1 Pull out capacity complying with State of California requirements, as administered by the Office of Statewide Health Planning and Development (OSHPD), and ANSI A117.1 requirements.

1.6 MAINTENANCE

.1 Extra Materials: Supply following quantity of maintenance material in accordance with Section 01 78 00 - Closeout Submittals:
- .1 Quantity: 5% of the Work.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MANUFACTURERS

.1 The specification is based on Pro-Tek Systems Inc. Corner Guards, CG-51, with concealed fastening.

.2 Requests for equal are to be submitted in accordance with provisions of Section 00 21 13 - Instructions to Bidders.

2.2 MATERIALS

.1 Stainless Steel:
- .1 16 gauge, Type 304, #4 Satin Stainless Stee.

2.3 CORNER GUARDS

.1 Height of corner guards: 1220mm.

.2 Wing: 50mm.

.3 Locations: all outside corners of new GWB throughout building.

2.4 ACCESSORIES

.1 Fasteners: concealed mounting.

.2 Adhesive: water resistive type as recommended by manufacturer for the applicable substrate.

3 Execution

3.1 EXAMINATION

.1 Verify that walls are in proper condition to receive installation of corner guards.

.2 Surface mounted corner guards must be installed after wall finishes have been completed.

3.2 INSTALLATION

.1 Install corner guards in full compliance with manufacturer's installation instructions.

3.3 ADJUSTING AND CLEANING

.1 Verify that corner guards are plumb and rigidly secured to substrate; make any adjustments required.

.2 Clean corner guards and immediate areas of installation, using materials and methods recommended by manufacturer.

.3 Remove from project site packaging and debris caused by installation.

END OF SECTION

1 General

1.1 SUMMARY

.1 Provide accessories per this specification section and as per the Accessories Schedule included in the appendices.

1.2 RELATED REQUIREMENTS

.1 Section 05 50 00 - Metal Fabrications

.2 Section 06 10 00 - Rough Carpentry.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM)

- .1 ASTM A167-99, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 ASTM B456-95, Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- .3 ASTM A653/A653M-99, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .4 ASTM A924/A924M-99, Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- .5 ASTM A666-03 - Specification for Annealed or Cold-Worked Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar.
- .6 ASTM B456-03 - Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-1.81-M90 - Air Drying and Baking Alkyd Primer for Vehicles and Equipment.
- .2 CAN/CGSB-1.88-92 - Gloss Alkyd Enamel, Air Drying and Baking
- .3 CGSB 31-GP-107Ma - Non-inhibited Phosphoric Acid Base Metal Conditioner and Rust Remover.
- .4 CAN/CSA-G164-M92 (R2003) - Hot Dip Galvanizing of Irregularly Shaped Articles.
- .5 CSA W59-03 - Welded Steel Construction (Metal Arc Welding)
- .6 CAN/CGSB-12.5-M86, Mirrors, Silvered.

.3 Canadian Standards Association (CSA)

- .1 CSA Standards\CSA-B561-04, Barrier-Free Design.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

- .1 Submit manufacturer's literature, data sheets for each type of material provided under this Section.
- .2 Data sheets shall provide all required information.
- .3 Submit required copies of detailed instructions for maintaining, preserving and keeping materials in clean and safe conditions and give adequate warning of maintenance practices or materials detrimental to specified materials.
- .4 Submit manufacturer's installation instructions.

.3 Material Safety Data Sheets:

- .1 Submit MSDS for inclusion in Operation and Maintenance Manual.

.4 Shop Drawings:

- .1 Shop drawings shall be in the form of catalogue cuts and fully illustrate specified

materials with description of components, surface finishes, hardware and securement devices.

.2 Submit a full schedule of accessories and identify Contractor Supplied / Contractor Installed and Owner Supplied / Contractor Installed accessories.

.5 Samples:

.1 Submit complete samples of each accessory and modular unit to Consultant for review of construction quality, materials and finish prior to delivery of required quantities of items.

.2 Submit sample of each colour where applicable.

.3 No trademark and/or labels shall be accepted on exposed finishes.

.6 Maintenance Instructions:

.1 Submit an accessories schedule, keys and parts manual as part of project closeout documents.

.2 Submit 2 sets of following items of manufacturer's literature:

.1 Technical Data Sheets of each item used for the project.

.2 Service and Parts Manuals.

.3 Name of local representative to be contacted in the event of need of field service of consultation.

.4 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.

1.5 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.2 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 78 00 - Closeout Submittals.

.3 Deliver special tools to Owner.

1.6 EXTRA MATERIALS

.1 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 78 00 - Closeout Submittals.

.2 Deliver special tools to Consultant.

1.7 WARRANTY

.1 Warrant work of this Section for period of 10 years against defects and/or deficiencies in accordance with General Conditions of the Contract.

.2 Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Consultant and at no expense to Owner.

.3 Defects include but are not limited to; deterioration of mirror's silvering.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

2 Products

2.1 MATERIALS

.1 Sheet steel: commercial quality to ASTM A653/A653M with ZF001 designation zinc coating.

.2 Stainless steel sheet metal type 302 or 304: to ASTM A167, with #4 finish. minimum 0.8mm thick except where noted otherwise.

.3 Stainless steel tubing type 304: commercial grade, seamless welded, 1.2 mm wall thickness.

.4 Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion shields fiber, lead or rubber as recommended by accessory manufacturer for component and its intended use.

2.2 BLOCKING

.1 Provide blocking for all accessories regardless of supply or installation responsibilities.

2.3 FINISHES

.1 Chrome and nickel plating: to ASTM B456 79 satin polished finish.

.2 Baked enamel: condition metal by applying one coat of metal conditioner to CGSB 31 GP 107M, apply one coat Type 2 primer to CGSB 1 GP 81M and bake, apply two coats Type 2 enamel to CGSB 1 GP 88M and bake to hard, durable finish. Sand between final coats. Color selected from standard range by Consultant.

.3 Manufacturer's or brand names on face of units not acceptable.

2.4 SCHEDULE OF ACCESSORIES

.1 Supply and install each item in quantities shown on Accessories Schedule.

.2 Confirm Owner Supplied / Contractor Installed or Contractor Supplied / Contractor Installed accessories prior to preparing shop drawings and ordering.

2.5 FABRICATION

.1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.

.2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.

.3 Brake form sheet metal work with 1.5 mm radius bends.

.4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

.5 Back paint components where contact is made with building finishes to prevent electrolysis.

.6 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CSA G164.

.7 Shop assemble components and package complete with anchors and fittings.

.8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.

.9 Provide steel anchor plates and components for installation on studding and building framing.

3 Execution

3.1 INSTALLATION

.1 Install and secure accessories rigidly in place as follows:

- .1 Stud walls: install wood blocking in stud space prior to plaster or drywall finish.
- .2 Hollow masonry units or existing plaster/drywall: use toggle bolts drilled into cell/ wall cavity.
- .3 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.

.2 Install grab bars on built-in anchors provided by bar manufacturer.

.3 Use tamper proof screws/bolts for fasteners.

.4 Fill contractor supplied units with necessary supplies shortly before final acceptance of building.

.5 Install Owner supplied washroom accessories.

.6 Install mirrors in accordance with Section 08 80 00 - Glazing.

END OF SECTION

1 General

1.1 SUMMARY

.1 Work of this Section consists of furnishing all labour, materials, equipment and services necessary to complete the work indicated:

.1 Interior, manually operated roll down blinds.

1.2 RELATED SECTIONS

.1 Section 06 10 00 - Rough Carpentry

.2 Section 07 92 00 - Joint Sealants

.3 Section 09 51 00 - Acoustic Ceilings

.4 Section 09 21 16 - Gypsum Board Assemblies

1.3 REFERENCES

.1 American Society for Testing Materials (ASTM)

.1 ASTM D 1784-99, Specifications for Rigid PVC Poly Vinyl Chloride Compounds (PVC) and Chlorinated Poly Vinyl Compounds (CPVC).

.2 ASTM G-22-80 Results for ATCC6538 and ATCC13388 indicating minimum 5mm "No Growth Contact Area"

.3 ASTM G-285 results for ATCC9642, ATCC9644, ATCC9348 and ATCC9645 indicating "No Growth".

.4 ASTM B209M-07, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.5 ASTM B221M-07, Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

.6 CAN/ULC-S109-03, Flame Tests of Flame Resistant Fabrics and Films.

.7 NFPA 701- 04, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

.8 CEC - Canadian Electrical Code

1.4 PERFORMANCE REQUIREMENTS

.1 Fire: Provide shade fabrics tested in accordance with NFPA 701-vertical burn test and rate "pass".

.2 Toxicity: Provide shade fabrics tested in accordance with University of Pittsburg Toxicity Protocol including LC50 analysis and toxicity characteristics.

1.5 DESIGN REQUIREMENTS

.1 Design roller shades to following requirements:

.1 Be designed in a manner that allows wear susceptible parts to be replaceable by either the user or the manufacturer.

.2 A guarantee of at least (5) five-years of available replacement parts following discontinue of the products manufacture.

.3 Be accompanied by instruction for replacing or repairing worn parts, including inventory numbers for parts and procedures for ordering replacement parts.

.4 Include stamps on all major plastic components indicating composition code to facilitate recycling efforts.

1.6 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Manufacturer's data sheets on each product specified, including:

.1 Preparation instructions and recommendations.

.2 Installation and maintenance instructions.
.3 Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
.4 Storage and handling requirements and recommendations.
.5 Mounting details and installation methods.
.6 Typical wiring diagrams including integration of motor controllers and switching.

.3 Shop Drawings:
.1 Submit shop drawings which clearly indicate shade sizes, locations, operation, methods of attachment, and description of components, indicating for each component, size, shape, material, thickness, gauge, finish, methods of joining, joint locations, and methods of attachment and relationship with adjacent components and construction, fastening devices, anchorage components and adjacent materials.
.2 For all roller shades use same room designations as indicated on the Drawings, field verified window dimensions, quantities, type of shade, controls, fabric, and color, and include opening sizes and key to typical mounting details.

.4 Selection Samples:
.1 For each finish product specified, two complete sets of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.

.5 Fabric Samples:
.1 Submit 75mm x 125mm fabric samples of manufacturer's full range of colors and fabrics.

.6 Test Data:
.1 Submit test data substantiating that proposed shade fabric meets all performance criteria specified herein.
.2 Submit independent test results showing properties and acceptable fire hazard classification of shade fabric.

.7 Manufacturers Literature:
.1 Manufacturer's standard installation instructions.
.2 Submit maintenance instructions.

.8 Maintenance Data:
.1 Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

.9 Manufacturer's Certificates:
.1 Certify products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

.1 Qualifications:
.1 Manufacturer: 10 years minimum experience manufacturing products comparable to those specified in this section.
.2 Installer: 5 years minimum experience installing products comparable to those specified in this section.

.2 Do not fabricate shades without obtaining field dimensions for each opening. Coordinate construction of surrounding conditions to allow for timely field dimension verification.

.3 Screen fabric shall have a compliance to M1 and NFPA 701 flame retardant tests.

.4 Opaque fabric shall have a compliance to NFPA 701 flame retardant tests.

.5 Mock-Up:
.1 Provide a mock-up of one of each type roller shade assembly specified for evaluation of mounting, appearance and accessories.

.2 Locate mock-up in window(s) designated by Consultant.

.3 Do not proceed with remaining work until mock-up is accepted by Consultant.

.4 Acceptable mock may be incorporated into the work.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Do not deliver items to project until all concrete, masonry, plaster, painting and other wet work has been completed and is dry.

.2 Deliver shades to project in labeled protective packaging. Uniquely labeled to identify each shade for each opening. Schedule delivery to prevent delays to completion of work but to minimize on site storage time.

.3 Store materials in a dry secure place. Protect from weather, surface contaminants, corrosion, construction traffic and all other potential damage.

1.9 WARRANTY

.1 Manual and Motorized Operating Components:

.1 Provide Manufacturer's Warranty under provisions of Division 1 - General Requirements. Warranty period to be 5 years from Date of Substantial Completion and contain provisions that installation is to remain operational without fault for the warranty period and include all operating parts, including shade cloth, except for the bead chain which is not covered by the Warranty and is deemed to be a maintenance / service item.

.2 Installation:

.1 Provide Contractor's warranty under provisions of Division 1 - General Requirements that installation shall be free from defects for a period of not less than 1 year.

.3 Shadecloth:

.1 Provide Warranty under provisions of Division 1 - General Requirements.

.2 Warranty shall be for a minimum period of 5 years from date of Substantial Completion.

.3 Warranty shall contain provisions that the shadecloth will not deteriorate, sag or warp and will not be unfit for the use intended for the warranty period.

.4 In the event of a warranted product failure, the Shade Contractor will, at no cost to Owner, facilitate acquisition and deliver of all necessary components to the Owner and will promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Consultant and at no expense to Owner.

.5 Defects include but are not limited to deformation of members, mechanical failure, failure of system to operate as designed or faulty or poor quality of work.

1.10 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal waste material generated by this Section.

.2 Place in appropriate on-site bins in accordance with Waste Management Plan.

.3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

.4 Remove waste materials from site in accordance with Infection Control requirements.

2 Products

2.1 COMPONENTS - MANUAL OPERATION

.1 Operation Type:

.1 Bead chain and clutch operated, vertical roll-up, fabric, opaque window shade system, complete with headbox, side and sill channels for total opacity.

.2 Operation:

.1 Bead chain and clutch operating mechanism allowing shade to stop when chain is released.

.2 Designed never to need adjustment or lubrication.

.3 Provide limit stops to prevent shade from being raised or lowered too far.

.3 Clutch Mechanism:

.1 Fabricated from high carbon steel and molded fiberglass reinforced polyester.

.4 Bead Chain Loop: Stainless steel bead chain hanging at side of window.

.5 Idler Assembly:

.1 Provide roller idler assembly of molded nylon with adjustable length pin to facilitate easy installation, and removal of shade for service.

.6 Roller Tube:

.1 Fabricated from extruded aluminum, galvanized steel, or enameled steel.

.2 Diameter, wall thickness, and material selected by manufacturer to accommodate shade type and size.

.3 Fabric connected to the roller tube with LSE (low surface energy) double sided adhesive specifically developed to attach coated textiles to metal.

.4 Adhesive attachment to eliminate horizontal impression in fabric.

.7 Headbox:

.1 Consists of extruded aluminum sections with endcaps and opacity plates.

.2 Size: 105mm high by 89mm wide by length required for shade being provided.

.3 L-shaped removable front face and bottom cover and L-shaped back and top.

.8 Endcaps:

.1 Stamped steel with universal design suitable for mounting to ceiling, wall, and jamb. Provide size compatible with roller size.

.9 Slat bar:

.1 Extruded aluminum bar attached to bottom of shade. Bar does not retract into headbox.

.10 Fabric Retainer:

.1 System designed to prevent disengagement of fabric from side channels due to normal variations of air pressure caused by doors opening, HVAC systems, and temperature differences between room and window well.

.2 System consists of horizontal steel stays installed in shade.

.3 Covered with fabric, and spaced at regular intervals.

.4 Grommets installed through stays are held within groove of side channel chamber.

.11 Opacity Plates:

.1 Steel plates with rubber O rings installed on end caps to eliminate light leakage.

.12 Exposed Aluminum Finish: Finish: Clear anodized aluminum.

.13 Acceptable Material:

.1 Light Flex Shade System by Draper Inc., www.draperinc.com.

.2 Interior Visions Roller Shade Blackout & Side Track IV45-B Series, Dieppe N.B.

.3 Altex Chain Roller Shade with aluminum valance by Altex Ltd.

.4 Draper Shade & Screen Co. Inc., FlexShade Systems

.5 Nysan Shading Systems, distributed by Nysan Eastern Ltd.

.6 Solarfective Products Ltd., Distributed by Patry Products Inc.

.7 SunProject Roller Shades, by SunProject of Canada Inc.

.8 Hunter-Douglas Contract Manual Roller Shades, by Hunter Douglas

2.2 FABRICS

.1 Fabric fraying control:
- .1 Fabric will be cut by ultrasound, by pressure or thermally sealed to control fraying.

.2 Fabric Performance:
- .1 Shade fabric shall hang flat without buckling or distortion.
- .2 Edge when trimmed, shall hang straight without ravelling.
- .3 Unguided roller shade cloth shall roll true and straight without shifting sideways more than + 3 mm in either direction due to wrap distortion or weave design.

.3 Flame Retardance:
- .1 Fabric shall be certified by an independent laboratory to pass the Small Scale Vertical Burn Requirements of CAN/ULC-S109-M87.

.4 Manual Blackout Channels:
- .1 Extruded aluminum 28 mm by 38 mm complete with 12 mm fuzz.
- .2 Provide blackout channels at sides and sills.
- .3 Galvanizing of odd shaped components: CAN/CSA-G164.
- .4 Die-electric approved material: To provide die-electric separation between two dissimilar metals to prevent galvanic reaction.
- .5 Best grade, quick drying non-staining alkali resistant bituminous paint or epoxy resin solution or membrane type acceptable to Consultant.

2.3 MOUNTING - MANUAL OPERATION

.1 Inside mounted within window returns. Mount to head of window liner. Do not attach to windows.

2.4 FABRICATION

.1 Coordinate and verify job site dimensions affecting this work.

.2 Submit in writing dimensions or conditions which vary from those on reviewed shop drawings or detrimental to installation.

.3 Obtain corrective measures from Consultant prior to fabrication.

.4 Ensure suitability of adjacent building components in relationship to work of this Section.

.5 Submit in writing defects in work prepared under other Sections.

.6 Commencement of work shall imply acceptance of substrates and conditions.

.7 Roller Window Shade Assembly:
- .1 Design and fabricate heavy duty roller window shade assembly to keep maintenance to minimum.
- .2 Chain and sprocket operated roller window shade assembly shall operate smoothly having capability to control rate of fall, to adjust stop and hold at an infinite number of positions as required.
- .3 Assembly at highest and lowest shade position shall have automatic stop to prevent over winding or unrolling.
- .4 Provide built-in, internal limit control winding stop contained within roller tube for shades as recommended by manufacturer.
- .5 Limit stop shall be adjustable without special tools.
- .6 Assembly shall allow finger tip control with built-in shock absorber system to prevent chain breakage under normal operating conditions.
- .7 Factory set for size and travel of shades.
- .8 Assembly mechanism shall have structural capacity to accommodate specified shades in window sizes required for this project.
- .9 Design assembly mechanism to suit size of windows and mass of system.

.8 Shade Mounting Brackets:

.1 Fabricate from minimum 3 mm thick sheet steel and minimum 11 mm welded steel shaft which serves as axis for entire sprocket and spring clutch assembly.

.2 Make reversible for left or right hand operation as directed by Consultant on shop drawings.

.3 Chain fall shall always be located away from an abutting partition to avoid marking of partition.

.4 Provide mounting in accordance with reviewed shop drawings as required to keep mechanism and brackets totally concealed from view when fully assembled.

.5 Mechanically attached cover plates to sheet steel brackets.

.6 Provide means of attaching fabric without exposed hardware.

.7 Use guides to retain chain gear assembly.

.8 Brackets shall act as protective retainer for tube and shade assembly preventing accidental dislocation of tube and shade.

.9 Roller Tube:

.1 Design extruded aluminum alloy roller tube to suit assembly design with either end of tube to engage drive system through internal or external extruded keyway.

.2 Extruded roller tube shall have wall thickness to suit design requirements with minimum wall thickness of 1.39 mm with reinforcement for fabric to provide anti-deflection support for wide span shades.

.3 Formed aluminum tube is unacceptable.

.4 Design tubes to be removable without removing the drive assembly, block resetting, or readjusting the pre-set stops. Shade tube shall be self-aligning.

.5 Roller tube shall be sized and reinforced internally as necessary to prevent excessive deflection in span of tube.

.6 Excessive deflection is defined by observation whereby shades in their open position reveal puckering, sagging or billowing, or where the tube deflects beyond 4% of roller length.

.7 Each roller tube shall be identified to its location in accordance with reviewed shop drawings.

.10 Fabric Mounting Spline:

.1 Fabricate snap-in-place spline of extruded vinyl with asymmetrical insertion locking channels and embossed fabric guide.

.2 Spline shall have sufficient capacity to hold shades when spline is snapped and locked into the tube.

.3 Fabric shade shall be readily removable without removing the tube from the retainer brackets, or removing the brackets from the wall.

.11 Fabric-Guide End Cap:

.1 Fit delrin end cap with steel pin which permits up to 7 mm lateral adjustment in tube width.

.2 End cap shall have 55 mm outside diameter minimum fabric guide tapered disc feature to assure alignment and protection of shade cloth.

.3 Provide integral stainless steel eyelet at guide cables.

.12 Snap-In-Place Fascia:

.1 Provide rectangular formed metal fascia where shown of minimum 1.29 mm thick formed aluminum or extruded aluminum of minimum 2 mm thick housing.

.2 Fascia shall snap onto shade bracket without any exposed fastening devices.

.3 Visible edges of ceiling brackets shall be continuous.

.4 Clearance between arc of fascia and end of bracket shall be a minimum of 9 mm, a minimum reveal of 10 mm will be permitted when two shades with fascia

are butted together.

.5 Finished fascia shall return back at bottom to permit a maximum opening of 50 mm.

.6 Furnish in lengths of up to 3000 mm unsupported without any visible sag or distortion.

.7 Fascia members are not required for overhead concealed application.

.8 Where shades are face mounted to faceted window arrangement, provide matching closure section and bridging clips between ends of abutting units.

.13 Shade Fabric Hem Tube:

.1 Provide full shade width, single piece, prefinished, extruded aluminum section of approximately 15 mm od with additional non-corrosive weight to maintain a weight of 1.4 kg/m except for shades having a height dimension greater than the width, in which case weight shall be 2.0 kg/m.

.2 At manufacturer's option, hem tube may be extruded aluminum, rectangular in shape, designed to hang perfectly perpendicular, and to totally conceal any heat-set or sewn seams within the tube.

.3 The internal spline shall secure the fabric evenly across its full width.

.4 Provide a separate port within the tube to allow storage of non-corrosive weight.

.14 Shade Fabrication:

.1 Do necessary cutting and sewing of fabric to produce finished product having neat, even appearance and meeting performance requirements specified.

.2 Fabricate shades with no vertical seams, and with a maximum of 2 horizontal seams per shade. Furnish fabric in adequate width to avoid horizontal seams at spacings of less than 1900 mm. Seams shall be straight, even and offer minimum visual obstruction.

.3 Fabric shall track perfectly straight in its movement to within ±1% of its width from fully open to fully closed position, and when rolled onto tube, it shall be stacked in layers to within ± 3 mm of edge alignment.

.4 Provide clear, 10-12 mm wide plastic edge tape reinforcing to prevent ravelling of raw edge of shades having glass fibre cores.

.5 Bottom edge shall hang straight and true, with hem weights totally enclosed in extruded hem tube. Heat sealing alone is not acceptable.

.6 All sewing shall incorporate heavy denier polyester yarn and machine stitching shall be straight and neatly finished with no loose threads visible in finished work.

.7 Heat seaming is not acceptable in areas in which fabric is exposed.

2.5 FINISHES

.1 Aluminum Components: Consultant shall select from manufacturer's standard or anodized aluminum finish in selected colors.

3 Execution

3.1 EXAMINATION

.1 Examine substrate and conditions for installation.

.2 Do not commence installation until conditions are satisfactory. Commencement of installation indicates acceptance of site conditions by Contractor.

.3 Notify the Consultant upon inspection when the project conditions are unacceptable for shade installation. "Commencement of Work" means acceptance of substrate and project conditions.

3.2 INSTALLATION

.1 Install units to comply with the Manufacturer's instructions for the type mounting and operation required. Provide units plumb, true, and securely anchored in place with recommended hardware and accessories to provide smooth operation without binding.

.2 Install units within the following tolerances:

.1 Maximum variation of gap at window opening perimeter: 6mm, per 2440mm (+/- 3mm) of shade height.

.2 Maximum offset from level: 1mm per 1520mm of shade width.

3.3 ADJUSTING

.1 Adjust drive / brake mechanism of units for smooth operation. Adjust shade and shadecloth to hang flat without buckling or distortion. Replace any units or components which do not hang properly or operate smoothly.

3.4 CLEANING

.1 Touch up damaged finishes and repair minor damage in order to eliminate evidence of repair. Remove and replace work that cannot be satisfactorily repaired.

.2 Clean exposed surfaces, including metal and shadecloth, using non-abrasive materials and methods recommended by the Shadecloth Manufacturer. Remove and replace work which cannot be satisfactorily cleaned.

3.5 TESTING

.1 Test motorized window shades to verify that controls, limit switches and other operating components are functional. Correct deficiencies.

.2 Test window shades to verify that operating mechanism, fabric retainer, and other operating components are functional. Correct deficiencies.

.3 During daylight hours, lower shades and turn off interior lights. Verify that there are no light leaks at perimeter or within shade assembly. Correct deficiencies.

3.6 DEMONSTRATION

.1 Demonstrate operation of shades to Owner's designated representatives.

3.7 SCHEDULE

.1 Provide black out manual blinds with channels at all new S-1 window screens.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 21 05 01 - Common Work Results - Mechanical.

1.2 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings; submit drawings stamped and signed by a Contractor as reviewed.

.3 Shop drawings to show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances.

.4 Shop drawings and product data accompanied by:

- .1 Detailed drawings of bases, supports, and anchor bolts.
- .2 Acoustical sound power data, where applicable.
- .3 Points of operation on performance curves.
- .4 Manufacturer to certify current model production.
- .5 Certification of compliance to applicable codes.

.5 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.6 Closeout Submittals:

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Operation and maintenance manual approved by, and final copies deposited with, consultant before final inspection.
- .3 Operation data to include:
  - .1 Control schematics for systems including environmental controls.
  - .2 Description of systems and their controls.
  - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
  - .4 Operation instruction for systems and component.
  - .5 Description of actions to be taken in event of equipment failure.
  - .6 Valves schedule and flow diagram.
  - .7 Colour coding chart.
- .4 Maintenance data to include:
  - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
  - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .5 Performance data to include:
  - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
  - .2 Equipment performance verification test results.
  - .3 Special performance data as specified.
  - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .6 Approvals:
  - .1 Submit electronic copies of draft Operation and Maintenance Manual to Owner's Representative for approval 4 weeks prior to Substantial Completion. Submission of individual data will not be accepted unless

directed by Consultant.

.2 Make changes as required and re-submit as directed by Consultant.

.7 Additional data:

.1 becomes apparent during specified demonstrations and instructions.

.8 Site records:

.1 Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour water proof ink for each service.

.4 Make available for reference purposes and inspection.

.9 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Owner's Representative for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.10 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.4 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction Waste Management Disposal.

2 Products

2.1 MATERIALS

.1 All materials used on this project shall be new and CSA approved unless noted

otherwise.

3 Execution

3.1 PAINTING, REPAIRS AND RESTORATION

.1 Do painting in accordance with Section 09 91 00 - Painting.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

3.2 CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.

.1 Perform tests as specified in other sections of this specification.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 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 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 DEMONSTRATION

.1 Owner's Representative will use equipment and systems for test purposes prior to acceptance. Contractor to supply labour, material, and instruments required for testing.

.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Owner's Representative may record these demonstrations on video tape for future reference.

3.5 PROTECTION

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

END OF SECTION

1 General

1.1 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.2 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.

.2 Submit WHMIS MSDS to Consultant for each hazardous material prior to bringing hazardous material to site. Indicate VOC's for adhesive and solvents during application and curing.

.3 Shop Drawings.

.1 Submit shop drawings to indicate:

.1 Equipment, including connections, fittings, control assemblies and ancillaries. Identify whether factory or field assembled.

.2 Wiring and schematic diagrams.

.3 Dimensions and recommended installation.

.4 Pump performance and efficiency curves.

.5 Operating and Maintenance Clearances.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Manufacturers' Field Reports: manufacturers' field reports specified.

.7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals, include:

.1 Manufacturers name, type, model year, capacity and serial number.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list with names and addresses.

1.3 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with Section 02 61 00 - Hazardous Facilities.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction Waste Management Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Consultant.

.5 Unused sealant materials must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.6 Fold up metal banding, flatten and place in designated area for recycling.

2 Products

2.1 DOMESTIC HOT WATER CIRCULATING PUMPS

.1 Capacity: as indicated.

.2 Construction: closed-coupled, in-line centrifugal, all bronze or stainless steel construction, stainless steel shaft, stainless steel or bronze shaft sleeve, two oil lubricated bronze sleeves or ball bearings. Design for 860 kPa and 105°C continuous service.

.3 Motor: drip-proof, with thermal overload protection.

.4 Supports: provide as recommended by manufacturer

.5 Acceptable Material: Bell & Gosset, Grundfos, Taco, Armstrong.

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 data sheet.

3.2 INSTALLATION

.1 Make piping and electrical connections to pump and motor assembly and controls as indicated.

.2 Ensure pump and motor assembly do not support piping.

.3 Place 150 mm sand under sump pit tank.

3.3 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

.1 Check power supply.

.2 Check starter protective devices.

.2 Start-up, check for proper and safe operation.

.3 Check settings and operation of hand-off-auto selector switch, operating, safety and limit controls, audible and visual alarms, over-temperature and other protective devices.

.4 Adjust flow from water-cooled bearings.

.5 Adjust impeller shaft stuffing boxes, packing glands.

3.4 START-UP

.1 General:

.1 In accordance with Section 01 91 13 - General Commissioning Requirements, supplemented as specified herein.

.2 Procedures:

.1 Check power supply.

.2 Check starter O/L heater sizes.

.3 Start pumps, check impeller rotation.

.4 Check for safe and proper operation.

.5 Check settings, operation of operating, limit, safety controls, over-temperature, audible/visual alarms, other protective devices.

.6 Test operation of hands-off-auto switch.
.7 Test operation of alternator.
.8 Adjust leakage through water-cooled bearings.
.9 Adjust shaft stuffing boxes.
.10 Adjust leakage flow rate from pump shaft stuffing boxes to manufacturer's recommendations.
.11 Check base for free-floating, no obstructions under base.
.12 Run-in pumps for 12 continuous hours.
.13 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.
.14 Adjust alignment of piping and conduit to ensure full flexibility.
.15 Eliminate causes of cavitation, flashing, air entrainment.
.16 Measure pressure drop across strainer when clean and with flow rates as finally set.
.17 Replace seals if pump used to degrease system or if pump used for temporary heat.

3.5 DOMESTIC HW CIRCULATING PUMPS

.1 Balance flows using circuit setter balancing valve or lock shield globe valve.

3.6 REPORTS

.1 In accordance with Section 01 91 31 - Commissioning (cx) Plan: reports, supplemented as specified.
.2 Include:
.1 PV results on approved PV Report Forms.
.2 Product Information report forms.
.3 Pump performance curves (family of curves) with final point of actual performance.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 21 05 01 - Common Work Results - Mechanical.
.2 Section 23 05 01 - Installation of Pipework.
.3 Section 23 05 22 - Valves - Bronze.
.4 Section 23 05 23 - Valves - Cast Iron.
.5 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
.6 Section 23 20 21 - Thermal Insulation for Piping.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME).
  .1 ANSI/ASME B16.15, Cast Bronze Threaded Fittings, Classes 125 and 250.
  .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
  .3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  .4 ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.
.2 American Society for Testing and Materials International, (ASTM).
  .1 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  .2 ASTM A536 Standard Specification for Ductile Iron Castings.
  .3 ASTM B88M, Standard Specification for Seamless Copper Water Tube (Metric).
  .4 AST M - Standard Specification for cross linked Polyethylene (PEX) tubing.
  .5 ASTM F877 Standard specification for cross-linked polyethylene (PEX) plastic hot and cold water distribution systems.
  .6 ASTM F 1960 Standard Specification for cold expansion fittings with PEX reinforcing rings for use with cross-linked polyethylene (PEX) tubing.
.3 American Water Works Association (AWWA).
  .1 AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  .2 AWWA 6606 Grooved and Shouldered Joints.
.4 Canadian Standards Association (CSA International).
  .1 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings.
  .2 CSA B137.5 Cross-linked polyethylene (PEX) tubing systems for pressure applications.
.5 Department of Justice Canada (Jus).
  .1 Canadian Environmental Protection Act, (CEPA).
.6 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  .1 Material Safety Data Sheets (MSDS).
.7 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
  .1 MSS-SP-67, Butterfly Valves.
  .2 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.
  .3 MSS-SP-71, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
  .4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.
.8 National Research Council (NRC)/Institute for Research in Construction.
  .1 NRCC 38728, National Plumbing Code of Canada (NPC).
.9 Transport Canada (TC).
  .1 Transportation of Dangerous Goods Act, (TDGA).
.10 American National Standards Institute/National Sanitation Foundation (ANSI/NSF).

.1 ANSI/NSF 61 Drinking Water System Components.
.2 ANSF/NSF14 Plastic Piping System Components and Related Materials.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit product data for following: piping, fittings, valves and adhesives.
.1 Provide manufacturers printed product literature and data sheets including product characteristics, performance criteria, physical size, finish and pressure/ temperature limitations.
.3 Submit WHMIS MSDS - Material Safety Data Sheets to Consultant for each hazardous material prior to bringing hazardous materials to site.
.4 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
.5 Grooved joint couplings and fittings to be indicated on product submittals and to be specifically identified with the applicable style or series designation.
.6 Cross linked polyethylene (PEX) tubing.
.1 Contractor to provide full layout drawings, details, riser diagrams, calculations including fixture pressure, building pressure critical path, longest run pressure drop, pipe sizing, balancing valves pipe carrying capacity velocities and fixture units. Contractor must also provide installation diagrams, guidelines, hanger spacing, support details, support details thermal expansion contract on details, expansion joints and typical suite/unit details.

1.4 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse in accordance with Section 01 74 19 - Construction Waste Management Disposal.
.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
.3 Separate for reuse and recycling and place in designated containers Steel waste in accordance with Waste Management Plan.
.4 Place materials defined as hazardous or toxic in designated containers.
.5 Handle and dispose of hazardous materials in accordance with CEPA and local or municipal regulations.
.6 Fold up metal banding, flatten and place in designated area for recycling.

1.6 QUALITY ASSURANCE

.1 Cross Linked Polyethylene (PEX) tubing
.1 Qualifications:
.1 Installer Qualifications: Installer shall be experience in performing work of this section and has specialized in installation of work similar to that required for this project.
.2 Installer Qualifications: Installer shall be recognized by the tubing/fitting manufacturer as a "Trained Installer".
.3 Installation Qualifications: Installation must be by skilled tradesmen holding trade qualification license or apprentices under the supervision of a licensed tradesman.
.4 PEX manufacturer will ensure pressure drops for critical paths will feed furthest fixtures with the specified pressure. Any costs to upsize piping as required will be the responsibility of this trade.

.2 Regulatory Requirements: PEX tubing and components shall be installed in full compliance with all Federal, Provincial and Municipal codes, standards and requirements.

.3 Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.

.2 Press Joint Copper Systems.

.1 Installer shall be a qualified, licensed within the jurisdiction, and factory trained with the installation of copper press joint systems. Certificate of factory training shall be submitted prior to starting work.

.2 Copper press fittings shall be installed using the proper tool, actuator, jaws and rings as instructed by the press fitting manufacturer.

.3 The installation of copper tubing for hot and cold water distribution systems shall conform to the requirements of the National Plumbing Code of Canada.

2 Products

2.1 PIPING

.1 Domestic hot, cold and recirculation systems, within building.
(Note - copper is to be used where required to interface with the existing, or plumbing specialties, PEX is to be used primarily, and where economical.)

.1 Above ground:

.1 Copper tube, hard drawn, type L: to ASTM B88M.

.2 Cross-linked Polyethylene (PEX), non-air barrier type: to ASTM F 876 and ASTM F 877.

.3 PEX tubing to be S102.2 Plenum Rated, and meet 25/50 Smoke and Flame ratings up to 3".

.2 Buried or embedded:

.1 Cross-linked Polyethylene (PEX), non-air barrier type: to ASTM F 876 and ASTM F 877 with no buried joints.

.2 Pipe sleeve shall be provided where piping passes through concrete.

2.2 FITTINGS

.1 Bronze pipe flanges and flanged fittings, Class 150: to ANSI/ASME B16.24.

.2 Cast bronze threaded fittings, Class 125: to ANSI/ASME B16.15.

.3 Cast copper, solder type: to ANSI/ASME B16.18.

.4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

.5 NPS 2 and larger: roll grooved to CSA B242. Cast bronze to ANSI/ASME B16.18 or wrought copper to ANSI/ASME B16.22.

.1 Fittings to be manufactured to copper tube dimensions, flaring of tube or fitting ends to accommodate IPS sized couplings is not permitted.

.6 PEX fittings to ASTM F 877, ASTM F 1807 and/or ASTM F 1960, as appropriate.

.7 NPS 1 1/2 and under: Last copper, ANSI/ASMS B16.12 of wrought copper, ANSI/ASME B16.22 with stainless steel internal components, EPDM seal and push to comment or press fit joints for hand drawn copper tube type L or type K rated for 1300 KPA at ASTM B88

.8 NPS 1½ and under: Cast copper, ANSI/ASME B16.18 or wrought copper, ANSI/ASME B16.22; with 301 stainless steel internal components. EPDM seal and push to connect or press fit joints, hand drawn copper tube type L or K rated for 1300 kPA at ASTM B88.

2.3 JOINTS

.1 Rubber gaskets, latex free, 1.6 mm thick: to AWWA C111.
.2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
.3 Solder: 95/5 tin copper alloy lead free.
.4 Teflon tape: for threaded joints.
.5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket. Gasket to be classified in accordance with ANSI/NSF 61 for potable water service. Couplings to be manufactured to copper tube dimensions. Flaring of tube or fitting ends to accommodate IPS sized couplings is not permitted.
.6 Dielectric connections between dissimilar metals: dielectric fitting to ASTM F492, complete with thermoplastic liner.
.7 Push to connect: EPDM gasket, UL classified in accordance with ANSI/NSF 61 for potable water service.

2.4 GATE VALVES

.1 DN50 and under, soldered:
  .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 22 - Valves - Bronze
.2 DN50 and under, screwed:
  .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 22 - Valves - Bronze
.3 DN65 and over, in mechanical rooms, flanged:
  .1 Rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, OS&Y bronze trim specified Section 23 05 23 - Valves - Cast Iron
.4 DN65 and over, other than mechanical rooms, flanged:
  .1 Non-rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, bronze trim, bolted bonnet specified Section 23 05 23 - Valves - Cast Iron.

2.5 GLOBE VALVES

.1 DN50 and under, soldered:
  .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc, screwed over bonnet as specified Section 23 05 22 - Valves - Bronze
  .2 Lockshield handles: as indicated.
.2 DN50 and under, screwed:
  .1 To MSS-SP-80, Class 150, 1 MPa, bronze body, screwed over bonnet, renewable composition disc as specified Section 23 05 22 - Valves - Bronze
  .2 Lockshield handles: as indicated.

2.6 SWING CHECK VALVES

.1 DN50 and under, soldered:
  .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 22 - Valves - Bronze.
.2 DN50 and under, screwed:
  .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 22 - Valves - Bronze.
.3 DN65 and over, flanged:
  .1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, regrind seat, bronze disc, bolted cap specified Section 23 05 23 - Valves - Cast Iron: Gate, Globe, Check.

2.7 BALL VALVES

.1 DN50 and under, screwed:
  .1 Class 150.

.2 Bronze body, chrome plated brass ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle as specified Section 23 05 22 - Valves - Bronze.

.2 DN50 and under, soldered:

.1 To ANSI/ASME B16.18, Class 150.

.2 Bronze body, chrome plated brass ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle, with NPT to copper adaptors as specified Section 23 05 22 - Valves - Bronze.

.3 DN50 and under, ASTM F1960.

.1 Cold Expansion by Pipe Manufacturer with Lead Free Brass body, ball, and stem, working pressure up to 250 PSIG.

3 Execution

3.1 INSTALLATION

.1 Install in accordance with NPC and local authority having jurisdiction.

.2 Install pipe work in accordance with Section 23 05 05 Installation of Pipework.

.3 Assemble piping using fittings manufactured to ANSI standards.

.4 Grooved joint couplings and fittings to be installed in accordance with the manufacturer's written installation instructions. Grooved ends to be clean and free from indentations, projections and roll marks in the area from pipe end to groove. Gaskets to be verified as suitable for the intended service prior to installation. Gaskets to be molded and produced by the coupling manufacturer. Contractor to move and replace any joints deemed improperly installed.

.5 Push-to Connect and Press Fit Piping: Prepare copper tube and install in strict accordance with installation instructions. Pipe ends to be cleaned, free from indentations, projections, burrs, and foreign matter. Use a tube preparation tool to clean and make installation mark. Push copper tube into fittings to installation depth mark, per installation instructions. Keep fittings free of dirt and oil.

.6 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.

.7 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

.8 Install pipe work in accordance with Section 23 05 05 -Installation of Pipework and by certified Journey Person supplemented as specified herein.

.9 PEX Potable Water Distribution:

.1 Install PEX tubing in accordance with tubing manufacturer's recommendations, installation manuals and technical bulletins and as indicated on Contract Drawings.

.2 PEX tubing shall not be exposed to direct sunlight for more than 30 days.

.3 Insulation must cover the PEX tubing when exposed to a direct UV light source such as fluorescent light bulbs or any UV generating device.

.4 Ensure that no glues, solvents, sealants or chemicals come in contact with the tubing without prior permission from the tube manufacturer.

.5 PEX tubing passing through structural concrete slabs shall be pre-sleeved with corrugated polyethylene as supplied by the manufacturer.

.6 PEX tubing passes through metal studs shall use grommets or sleeves at the pentration.

.7 Protect PEX tubing with sleeves where abrasion may occur.

.8 Use strike protectors where PEX tubing has the potential for being struck with a screw or a nail.

.9 Bends are preferred to elbows where space allows. Manufacturer's bend supports shall be used where bends are less than six (6) times outside pipe diameter.

.10 All horizontal runs of DN25 and greater PEX tubing runs shall be supported by PEX-a galvanized support channels. Install as per manufacturer's recommendations with additional supports where required.

.11 All fitting connections to the PEX tubing shall be made to the requirements ASTM F1960.

.12 Multi-port Tee's shall be used in-suite wherever possible instead of straight or reduced tee's to minimize pressure drops in the plumbing distribution system.

.13 A mid-story support shall be installed in all PEX risers.

.14 An epoxy coated riser clamp shall be installed on top of every floor and against every second ceiling for all PEX risers.

.15 Manufacturer's wall penetration brackets shall be used at all wall membrane penetrations.

.10 Grooved joint couplings and fittings to be installed in accordance with the manufacturer's written installation instructions. Groove ends to be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets to be verified as suitable for the intended service prior to installation. Gaskets to be moulded and produced by the coupling manufacturer. Contractor to remove and replace any joints deemed improperly installed.

.11 Push to connect piping: Prepare copper tube and install in strict accordance with installation instructions. Pipe ends to be cleaned, free from indentations, projections, burns, and foreign matter. Use tube preparation tool to clean and make installation mark. Push copper tube into fittings to installation depth mark, per installation instructions. Keep fittings free of dirt and oil.

.12 Buried Tubing:

.1 Lay in well completed washed sand in accordance with AWWA Class B bedding.

.2 Bed tubing without crimping or constriction. Minimized us of fittings.

.3 Buried fittings shall be approved for direct burial by the manufacturer and not affect the warranty period or benefits.

3.2 VALVES

.1 Isolate equipment, fixtures and branches with ball valves.

.2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.3 PRESSURE TESTS

.1 Conform to requirements of Section 21 05 01 - Common Work Results - Mechanical

.2 Test pressure: greater of DN40 times maximum system operating pressure or 860 kPa.

3.4 FLUSHING AND CLEANING

.1 Flush entire system for 8 h. Ensure outlets flushed for 2 h. Let stand for 24 h, then draw one sample off longest run. Submit to testing laboratory bacterialogical and chemical testing to verify that system is clean to provincial potable water guidelines. Let system flush for additional 2 h, then draw off another sample for testing.

3.5 PRE-START-UP INSPECTIONS

.1 Systems to be complete, prior to flushing, testing and start-up.

.2 Verify that system can be completely drained.

.3 Ensure that pressure booster systems are operating properly.

.4 Ensure that air chambers, expansion compensators are installed properly.

3.6 DISINFECTION

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction and approval of Consultant.

.2 Upon completion, provide laboratory test reports on water quality for Consultant approval.

3.7 START-UP

.1 Timing: Start up after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:

.1 Establish circulation and ensure that air is eliminated.

.2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.

.3 Bring HWS storage tank up to design temperature slowly.

.4 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.

.5 Check control, limit, safety devices for normal and safe operation.

.4 Rectify start-up deficiencies.

3.8 PERFORMANCE VERIFICATION

.1 Timing:

.1 After pressure and leakage tests and disinfection completed, and certificate of completion has been issued by authority having jurisdiction.

.2 Procedures:

.1 Verify that flow rate and pressure meet Design Criteria.

.2 TAB HWC in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.

.4 Sterilize HWS and HWC systems for Legionella control.

.5 Verify performance of temperature controls.

.6 Verify compliance with safety and health requirements.

.7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut off water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.

.8 Confirm water quality consistent with supply standards, verifying that no residuals remain as a result of flushing and/or cleaning.

.3 Reports:

.1 In accordance with Section 01 91 31 - Commissioning (cx) Plan: Reports, using report forms as specified.

.2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

.3 Chemical and biological water testing report.

.4 Pressure testing report signed off by Contractor and witness for each section of piping tested.

.5 Flushing and cleaning report signed off by Contractor and witness for each section of piping.

END OF SECTION

1 General

1.1 SCOPE OF WORK

.1 Cast iron and copper DWV piping is to be used where required to interface with existing, or where economical. Plastic drain piping is preferred per Section 22 13 18.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
- .1 ASTM B32, Specification for Solder Metal.
- .2 ASTM B306, Specification for Copper Drainage Tube (DWV).
- .3 ASTM C564, Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.2 Canadian Standards Association (CSA International).
- .1 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.
- .2 CAN/CSA-B125, Plumbing Fittings.

1.3 QUALITY ASSURANCE

.1 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.4 DELIVERY STORAGE AND DISPOSAL

.1 Waste Management and Disposal:
- .1 Collect and separate for disposal paper packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

2 Products

2.1 COPPER TUBE AND FITTINGS

.1 Above ground sanitary, storm and vent Type DWV to: ASTM B306.
- .1 Fittings.
  - .1 Cast brass: to CAN/CSA-B125.
  - .2 Wrought copper: to CAN/CSA-B125.
- .2 Solder: lead free, 95:5 antimonial tin solder, type TA, to ASTM B32.

2.2 CAST IRON PIPING AND FITTINGS

.1 Buried sanitary, storm and vent minimum DN80 to: CAN/CSA-B70, with one layer of protective coating of bitumous.
- .1 Joints.
  - .1 Mechanical joints.
    - .1 Neoprene or butyl rubber compression gaskets: to ASTM C564 or CAN/CSA-B70.
    - .2 Stainless steel clamps.
  - .2 Hub and spigot.
    - .1 Neoprene Gasket to CSA B70.
    - .2 Cold caulking compounds.

.2 Above ground sanitary, storm and vent: to CAN/CSA-B70.
- .1 Joints.
  - .1 Mechanical joints.
    - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

3 Execution

3.1 INSTALLATION

.1 In accordance with Section 23 05 01 - Installation of Pipework and by a Certified Journey Person.

.2 Install in accordance with Canadian Plumbing Code and local authorities having jurisdiction.

3.2 TESTING

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.3 PERFORMANCE VERIFICATION

.1 Cleanouts:

- .1 Ensure accessible and that access doors are correctly located.
- .2 Open, cover with linseed oil and re-seal.
- .3 Verify that cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Storm water drainage:

- .1 Verify domes are secure.
- .2 Ensure weirs are correctly sized and installed correctly.
- .3 Verify provisions for movement of roof system.

.4 Ensure that fixtures are properly anchored, connected to system and effectively vented.

.5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

.6 Provide copies of test reports for maintenance manuals.

END OF SECTION

1 General

1.1 SCOPE OF WORK

.1 Use of Plastic DWV piping where economical is preferred, where required use cast iron or copper as outlined in Section 22 13 17

1.2 RELATED SECTIONS

.1 Section 23 05 05 - Installation of Pipework.

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
- .1 ASTM D2235, Specification for Solvent Cement for Acrylonitrille-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- .2 ASTM D2564, Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.

.2 Canadian Standards Association (CSA International).
- .1 CSA-Series B1800, Plastic Nonpressure Pipe Compendium.
- .2 CSA-B181.2, PVC Drain, Waste and Vent Pipe and Pipe Fittings.
- .3 CSA-B182.1, Plastic Drain and Sewer Pipe and Pipe Fittings.

.3 Underwriters Laboratory of Canada (ULC)
- .1 CAN/ULC-S102.2 Method of Testing for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate for disposal paper packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

2 Products

2.1 PIPING AND FITTINGS

.1 For buried DWV piping to:
- .1 CSA-B181.1.
- .2 CSA-B181.2.
- .3 CSA-B182.1.
- .4 Acceptable material: PVC, ABS.

.2 For above ground DWV piping for combustible construction, or concealed above-ground (chases):
- .1 CSA-B181.2.
- .2 Acceptable material: IPEX System 15 or approved equal

.3 For above ground DWV piping for non-combustible construction:
- .1 Flame spread rating less than 25 and smoke developed classification less than 50.
- .2 CSA B181.2.
- .3 Acceptable material: IPEX System XFR or approved equal

2.2 JOINTS

.1 Solvent weld for PVC: to ASTM D2564.

.2 Solvent weld for ABS: to ASTM D2235.

3 Execution

3.1 INSTALLATION

.1 Install in accordance with Canadian Plumbing Code and the local authority having jurisdiction.

.2 In accordance with Section 23 05 05 - Installation of Pipework and certified Journey Persons.

3.2 TESTING

.1 Pressure test buried systems before backfilling in accordance with Canadian Plumbing Code.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.3 PERFORMANCE VERIFICATION

.1 Cleanouts:

- .1 Ensure accessible and that access doors are correctly located.
- .2 Open, cover with linseed oil and re-seal.
- .3 Verify cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Storm water drainage:

- .1 Verify domes are secure.
- .2 Ensure weirs are correctly sized and installed correctly.
- .3 Verify provisions for movement of roof system.

.4 Ensure fixtures are properly anchored, connected to system and effectively vented.

.5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

.6 Provide copies of test reports for maintenance manuals.

END OF SECTION

1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.

.2 CAN/CSA C22.2 No.110, Construction and Test of Electric Storage Tank Water Heaters.

.3 CAN/CSA-C191 Series, Performance of Electric Storage Tank Water Heaters for Household Service.

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate:

.1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals .

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction Waste Management Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Consultant.

2 Products

2.1 ELECTRIC

.1 To CAN/CSA C22.2 No.110, CAN/CSA-C191 and CAN/CSA-C309 for glass-lined storage tanks, with immersion type elements, kW rating as indicated, and surface mounted or immersion type adjustable thermostats.

.2 Tank: L, glass lined steel or stainless steel, 50 mm mineral wool or fibreglass insulation, enamelled steel jacket, 3 year warranty certificate. Capacity and size as indicated.

.3 Complete with tank-mounted line-voltage thermostats matching the kW rating of the elements.

.4 Acceptable Material: Bradford-White, John Wood, A.O. Smith.

2.2 INDIRECT DHW HEATER

.1 DHW heater:

.1 General: Indirect heater shall heat water from external hydronic heating source as indicated. Where applicable, provide ASME tag as required by authority having jurisdiction.

.2 Capacity: as indicated.

.3 Heat exchanger: tank-in-tank design c/w corrugated stainless steel inner liner tank and steel outer tanks. Inlet and outlet headers to include drain valves and thermowells.

.4 Cathodic protection: magnesium anodes, number and size to provide for 20 years protection of tank material.

.5 Thermal insulation: HCFC free.
.6 Extended warranty: 15 years. Provide certificate.
.7 Acceptable material: Triangle Tube, Weil McLain, Superstore.

2.3 TRIM AND INSTRUMENTATION

.1 Drain valve: DN25 with hose end.
.2 Thermometer to Section 23 05 21 - Thermometers and Pressure Gauges.
.3 Pressure gauge to Section 23 05 21 - Thermometers and Pressure Gauges.
.4 ASME rated temperature and pressure relief valve sized for full capacity of heater, having discharge terminating over floor drain and visible to operators.
.5 Supply anchor bolts and templates for installation by other Divisions.
.6 Magnesium anodes adequate for 20 years of operation and located for easy replacement.

3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.
.2 Provide structural steel for horizontal mounted tanks.
.3 Provide insulation between tank and supports.
.4 Install propane gas fired domestic water heaters in accordance with CSA-B149.2.

3.2 FIELD QUALITY CONTROL

.1 Commissioning:
  .1 Manufacturer to:
    .1 Certify installation.
    .2 Start-up and commission installation.
    .3 Carry out on-site performance verification tests including system capacity control function and alarm/safety device function.
    .4 Demonstrate operation and maintenance.
  .2 Provide Consultant at least 24 hours notice prior to inspections, tests and demonstrations. Submit written report of inspections and test results.

END OF SECTION

1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CAN/CSA-B45 Series, Plumbing Fixtures.
- .2 CAN/CSA-B125, Plumbing Fittings.
- .3 CAN/CSA-B651, Barrier-Free Design.

1.2 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 62 00.01 - Hazardous Materials.
- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Indicate, for all fixtures and trim:
    - .1 Dimensions, construction details, roughing-in dimensions.

.3 Closeout Submittals:
- .1 Submit maintenance data in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Include:
  - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
  - .2 Details of operation, servicing, maintenance.
  - .3 List of recommended spare parts.

1.3 QUALITY ASSURANCE

.1 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Waste Management and Disposal:
- .1 Separate waste materials for reuse in accordance with Section 01 74 19 - Construction Waste Management Disposal.
- .2 Collect and separate for disposal paper packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

1.5 ACCEPTABLE MATERIAL

.1 Fixtures: American Standard, Kindred, Fiat, AMI Novanni, Elkay, Zurn.

.2 Trim: Delta, Chicago Faucet, Powers, Crane, Sloan, Zurn.

2 Products

2.1 MANUFACTURED UNITS

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: architectural drawings to govern.

.5 Fixtures in any one location to be product of one manufacturer and of same type.

.6 Trim in any one location to be product of one manufacturer and of same type.

.7 Stainless steel counter-top sinks.
- .1 SC-1: single compartment, ledge-back.
  - .1 From 1.0 mm thick type 302 stainless steel, self-rimming, undercoated, clamps. Overall sizes: 21" x 20" x 7".
  - .2 Trim: chrome plated brass, with swing spout, aerator, single lever handle, washerless controls, accessories to limit maximum flow rate to 8.35 litres/minute at 413 2 GPM @ 50 PSI.
  - .3 Waste fitting: integral stainless steel basket strainer/stopper, tailpiece, cast brass P-trap with cleanout.
  - .4 Acceptable material: Kindred QSL 20/20/7, with American Standard Colony Pro Faucet; or equal.

.8 Fixture piping:
- .1 Hot and cold water supplies to each fixture:
  - .1 Chrome plated flexible metal supply pipes each with quarter-turn angle ball valve stop, chrome plated pipe nipple or copper tube with chrome cover and escutcheon to properly cover all pipe & fittings exposed through the wall.
- .2 Waste:
  - .1 Brass P trap with clean out on each fixture not having integral trap.
  - .2 Chrome plated in all exposed places.
  - .3 Escutcheon to properly cover all exposed pipe & fittings through the wall.

.9 Chair carriers:
- .1 Factory manufactured floor-mounted carrier systems for all wall-mounted fixtures.

3 Execution

3.1 INSTALLATION

.1 Mounting heights:
- .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
- .2 Wall-hung fixtures: as indicated, measured from finished floor.
- .3 For barrier-free washroom: to comply with most stringent of either NBCC or CAN/CSA B651.

3.2 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:
- .1 Adjust water flow rate to design flow rates.
- .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Checks:
- .1 Aerators: operation, cleanliness.
- .2 Vacuum breakers, backflow preventers: operation under all conditions.
- .3 Wash fountains: operation of flow-actuating devices.

.4 Thermostatic controls:
- .1 Verify temperature settings, operation of control, limit and safety controls.

END OF SECTION

1 General

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM).
- .1 ASTM A126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
- .2 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.

.2 American Water Works Association (AWWA).
- .1 AWWA C700, Cold Water Meters-Displacement Type, Bronze Main Case.
- .2 AWWA C701, Cold Water Meters-Turbine Type for Customer Service.
- .3 AWWA C702-1, Cold Water Meters-Compound Type.

.3 Canadian Standards Association (CSA International).
- .1 CSA-B64 Series, Backflow Preventers and Vacuum Breakers.
- .2 CSA-B79, Floor, Area and Shower Drains, and Cleanouts for Residential Construction.
- .3 CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .1 Material Safety Data Sheets (MSDS).

.5 Plumbing and Drainage Institute (PDI).
- .1 PDI-G101, Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.
- .2 PDI-WH201, Water Hammer Arresters Standard.

1.2 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.
- .2 Indicate dimensions, construction details and materials for specified items.
- .3 Submit WHMIS MSDS material safety data schools. Indicate VOC's for adhesive and solvents during application and curing.

.3 Instructions: submit manufacturer's installation instructions.

.4 Manufacturers' Field Reports: manufacturers' field reports specified.

.5 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals, include:
- .1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
- .2 Details of operation, servicing and maintenance.
- .3 Recommended spare parts list.

1.3 QUALITY ASSURANCE

.1 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse in accordance with Section 01 74 19 - Construction Waste Management Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper packaging material in appropriate on-site bins

for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Consultant.

.5 Fold up metal banding, flatten and place in designated area for recycling.

2 Products

2.1 FLOOR DRAINS

.1 Floor Drains and Trench Drains: to CSA B79.

.2 Type 1: general duty; cast iron body round, adjustable head, 125 mm, sediment basket, nickel bronze strainer, integral seepage pan and trap primer connection.

.1 Acceptable Material: Zurn ZN-415-B5-P, J.R. Smith, Mifab, Watts.

.3 Type 2: heavy duty; cast iron body, heavy duty non-tilting or hinged lacquered cast iron grate, integral seepage pan, trap primer connection, and clamping collar.

.1 Acceptable Material: Zurn ZN-536-P-Y, J.R. Smith, Mifab, Watts.

.4 Type 3: combination funnel floor drain; cast iron body with integral seepage pan, trap primer connection and nickel-bronze adjustable head strainer with integral funnel.

.1 Acceptable Material: Zurn ZN-415-BF-P, J.R. Smith, Mifab, Watts.

2.2 ROOF DRAINS

.1 Type 1: Standard coated roof drain with cast iron body 381 mm diameter, with polyethylene dome, under-deck clamp to suit roof construction, flashing clamp ring with integral gravel stop.

.1 Acceptable Material: Zurn Z-100-C, J.R. Smith, Mifab, Watts.

.2 Type 2: parapet or scupper drain; cast iron body with bronze strainer/grate and flashing clamp.

.1 Acceptable Material: Zurn Z-187, J.R. Smith, Mifab, Watts.

2.3 CLEANOUTS

.1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.

.1 Acceptable Material: Zurn, Z1400, J.R. Smith, Mifab, Watts.

.2 Access Covers:

.1 Wall Access: face or wall type, stainless steel square or round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.

.1 Acceptable material: Zurn ZANB-1460, Mifab, Enpoco, J.R. Smith.

.2 Floor Access: cast iron body and frame with adjustable secured nickel bronze top and:

.1 Plugs: bolted bronze with neoprene gasket.

.2 Cover for Unfinished Concrete Floors: cast iron round, gasket, vandal-proof screws.

.1 Acceptable material: Zurn ZN-1400-VP, Mifab, Enpoco, J.R. Smith.

.3 Cover for Terrazzo Finish: polished nickel bronze with recessed cover for filling with terrazzo, vandal-proof locking screws.

.1 Acceptable material: Zurn ZN-1400-Z, Mifab, Enpoco, J.R. Smith.

.4 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.

.1 Acceptable material: Zurn ZN-1400-X, Mifab, Enpoco, J.R. Smith.

.5 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking

screws.

.3 Stack Cleanout:

.1

2.4 WATER HAMMER ARRESTORS

.1 Stainless steel or copper construction, bellows or piston type: to PDI-WH201.

.1 Acceptable Material: Zurn Z-1700, J.R. Smith, Mifab, Precision Plumbing Products.

2.5 BACK FLOW PREVENTERS

.1 Preventers: to CSA-B64 Series, application as indicated.

.1 Reduced Pressure Principle Type: up to NPS 10 c/w isolation valves on inlet and outlet, two independent check valves, test cocks, internal relief valve, acess cover, inlet strainer and air gap drain.

.1 Acceptable Material: Watts 909, Conbraco, Wilkins 375 or 975.

2.6 VACUUM BREAKERS

.1 Breakers: to CSA-B64 Series, vacuum breaker atmospheric.

.1 Acceptable Material: Watts 288A, Zurn 35, J.R. Smith, Mifab.

2.7 PRESSURE REGULATORS

.1 Capacity: as indicated.

.1 Inlet pressure: 1034 kPa.

.2 Outlet pressure: 413 kPa.

.3 Capacity: as indicated.

.2 Up to NPS1-1/2 bronze bodies, screwed: to ASTM B62.

.3 Semi-steel spring chambers with bronze trim.

.4 Acceptable material: Watts LF 25 AUB.

2.8 HOSE BIBBS

.1 Bronze construction complete with integral hose connection vacuum breaker, hose thread spout, replaceable composition disc, and chrome plated in finished areas.

.1 Acceptable Material: Watts IHB-1, Zurn..

2.9 TRAP SEAL PRIMERS

.1 For single fixtures only: Brass, with integral vacuum breaker, NPS1/2 solder ends, NPS1/2 drip line connection.

.1 Acceptable material: Precision plumbing products PR-500, Mifab MR-500

.2 Up to four fixtures: Metered water quantity from distribution unit. Locate maximum 3 m from fixture.

.1 Acceptable material: Precision plumbing product, PI-5006/w DV-4, Mifab M2-500 c/w MI-DU

.3 Up to 12 fixtures: Electronic trap priming manifold with:

.1 Backflow Preventer or Air Gap

.2 Pre-set 24 hour time clock

.3 Manual override switch

.4 120V solenoid valve

.5 120V or 3-wire connection

.6 NPS 3/4 inlet connection

.7 Calibrated manifold

.8 Water hammer arrestor

.9 Mounted in steel cabinet

.10 Compression outlet fittings
.11 Inlet shutoff valve
.12 Supplies minimum 59 ml at 138 kPa.
.1 Acceptable material: Mifab MI-300

2.10 STRAINERS

.1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.
.2 NPS2 and under, bronze body, screwed ends, with brass cap, tapped blow-off connection and plug.
.3 NPS2 1/2 and over, cast iron body, flanged ends, with bolted cap and tapped blow-off connection with bronze ball valve.

2.11 TRAP SEAL PRIMER: PRESSURE ACTUATED WITH BLEED DRIP

.1 Brass or Bronze construction.
.2 Spring loaded element opening with a 20kPa differential.
.3 Inline screen strainer.
.4 NPT Connections
.5 Adjustable bleed screw for continuous feeder drip.
.6 Outlet vision gap holes drilled into body
.7 Acceptable Material: MIFAB M3-500-NPB

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 data sheet.

3.2 INSTALLATION

.1 Install in accordance with National Plumbing Code of Canada, and.
.2 Install in accordance with manufacturer's instructions and as specified.

3.3 CLEANOUTS

.1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.
.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.
.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS4.

3.4 WATER HAMMER ARRESTORS

.1 Install on branch supplies to fixtures or group of fixtures where indicated.

3.5 BACK FLOW PREVENTORS

.1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code or the Authority Having Jurisdiction.
.1 Reduced pressure type where backflow would constitute health hazard.
.2 Double check type where backflow would constitute a nuisance or be aesthetically objectionable or material which would not constitute a health hazard.
.2 Pipe discharge to terminate over nearest drain and/or service sink.

3.6 HOSE BIBBS

.1 Install at bottom of risers, at low points to drain systems, and as indicated.

3.7 TRAP SEAL PRIMERS

.1 Install for floor drains and elsewhere, as indicated.

.2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Consultant.

.3 Install PEX piping to floor drain or fixture.

3.8 STRAINERS

.1 Install with sufficient room to remove basket.

3.9 START-UP

.1 General:

.1 In accordance with Section 01 91 13 - General Commissioning Requirements: General Requirements, supplemented as specified herein.

.2 Timing: start-up only after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Certificate of static completion has been issued.

.4 Water treatment systems operational.

.3 Provide continuous supervision during start-up.

3.10 TESTING AND ADJUSTING

.1 General:

.1 In accordance with Section 01 91 13 - General Commissioning Requirements : General Requirements, supplemented as specified.

.2 Timing:

.1 After start-up deficiencies rectified.

.2 After certificate of completion has been issued by authority having jurisdiction.

.3 Application tolerances:

.1 Pressure at fixtures: +/- 70kPa.

.2 Flow rate at fixtures: +/- 20%.

.4 Adjustments:

.1 Verify that flow rate and pressure meet design criteria.

.2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

.5 Floor drains:

.1 Verify operation of trap seal primer.

.2 Prime, using trap primer. Adjust flow rate to suit site conditions.

.3 Check operations of flushing features.

.4 Check security, accessibility, removeability of strainer.

.5 Clean out baskets.

.6 Vacuum breakers, backflow preventers, backwater valves:

.1 Test tightness, accessibility for O&M of cover and of valve.

.2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.

.3 Verify visibility of discharge from open ports.

.7 Roof drains:

.1 Check location at low points in roof.

.2 Check security, removeability of dome.

.3 Adjust weirs to suit actual roof slopes, meet requirements of design.

.4 Clean out sumps.

.5 Verify provisions for movement of roof systems.

.8 Access doors:
- .1 Verify size and location relative to items to be accessed.

.9 Cleanouts:
- .1 Verify covers are gas-tight, secure, yet readily removable.

.10 Water hammer arrestors:
- .1 Verify proper installation of correct type of water hammer arrester.

.11 Wall, Ground hydrants:
- .1 Verify complete drainage, freeze protection.
- .2 Verify operation of vacuum breakers.

.12 Pressure regulators, PRV assemblies:
- .1 Adjust settings to suit locations, flow rates, pressure conditions.

.13 Strainers:
- .1 Clean out repeatedly until clear.
- .2 Verify accessibility of cleanout plug and basket.
- .3 Verify that cleanout plug does not leak.

.14 Hose bibbs:
- .1 Verify operation at all low points.

.15 Hydronic system water Make-up Assembly:
- .1 Verify operation.

.16 Water meters:
- .1 Verify calibration certificate.

.17 Commissioning Reports:
- .1 In accordance with Section 01 91 13 - General Commissioning Requirements: Reports, supplemented as specified.

.18 Training:
- .1 In accordance with Section 01 91 13 - General Commissioning Requirements: Training of O&M Personnel, supplemented as specified.
- .2 Demonstrate full compliance with Design Criteria.

3.11 TRAP SEAL PRIMER: PRESSURE ACTUATED WITH BLEED DRIP

.1 Install with external plumbing code compliant external air gap fitting.

.2 Adjust bleed screw for continuous drip amounting to approximately 30mL/hour.

END OF SECTION

1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CAN/CSA-B45 Series-02, Plumbing Fixtures.
- .2 CAN/CSA-B125-01, Plumbing Fittings.
- .3 CSA Standards\CSA-B561-04, Barrier-Free Design.

1.2 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets.

.3 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

.4 Indicate fixtures and trim:
- .1 Dimensions, construction details, roughing-in dimensions.
- .2 Factory-set water consumption per flush at recommended pressure.
- .3 For water closets, urinals: minimum pressure required for flushing.

.5 Closeout Submittals:
- .1 Provide maintenance data including monitoring requirements for incorporation into manuals specified in Section 01 78 00 - Closeout Submittals.
- .2 Include:
  - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
  - .2 Details of operation, servicing, maintenance.
  - .3 List of recommended spare parts.

1.3 QUALITY ASSURANCE

.1 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.4 DELIVERY STORAGE AND DISPOSAL

.1 Waste Management and Disposal:
- .1 Separate waste materials for reuse in accordance with Section 01 74 19 - Construction Waste Management Disposal.
- .2 Collect and separate for disposal paper packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

1.5 ACCEPTABLE MATERIAL

.1 Fixtures: American Standard, AMI Novanni, Eljer, Toto, Kindred, Caroma, Kohler, Zurn.

.2 Trim: Delta, Chicago Faucets, Powers, Crane, Sloan, Zurn.

2 Products

2.1 MANUFACTURED UNITS

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: architectural drawings to govern.

.5 Fixtures in any one location to be product of one manufacturer and of same type.
.6 Trim in any one location to be product of one manufacturer and of same type.
.7 Water closets:
.1 WC-1 : Barrier-Free, Floor-mounted, flush tank.
.1 Top of seat to be between 400mm - 450mm from finished floor.
.2 Bowl: vitreous china, floor mounted, syphon jet, elongated rim, close-coupled, bolt caps.
.3 Closet tank: vitreous china with tank liner, flapper type flush valve assembly for ultra low flush cycle: factory set to 4.8 Litres/Flush.
.4 Acceptable material: American Standard Colony-Pro Elongated Right-Height, or equal.
.8 Water Closet Seats
.1 Seat: white, elongated, open front, moulded solid plastic, less cover, stainless steel check hinges, stainless steel insert post.
.2 Acceptable material: CENTOGO AM 500 ST5CC.
.9 Washroom Lavatories:
.1 L-1: Barrier-Free, wall-hung.
.1 Vitreous china, low shelf, with integral back, contoured front, shallow front basin, front overflow, soap depressions, supply openings on 200mm centres, concealed supports. Sizes: 546mm x 540mm.
.2 Acceptable material: American Standard Murro.
.10 Washroom Lavatory Trim:
.1 Chrome plated brass, combination supply and waste fittings, mixing spout, washerless, aerator, pushbutton metering type.
.1 Provide accessories to limit maximum flow rate to 0.5 GPM at 50 PSI.
.2 Acceptable material: Gerber G0044346.
.11 Fixture piping:
.1 Hot and cold water supplies to fixtures:
.1 Chrome plated flexible metal supply pipes with screw driver stop, reducer, escutcheon.
.2 Waste:
.1 Brass P trap with clean out on fixtures not having integral trap.
.2 Chrome plated in exposed places.
.3 Escutcheon to properly cover all exposed pipe & fittings through the wall.
.12 Chair carriers:
.1 Factory manufactured floor-mounted carrier systems for wall-mounted fixtures.
.2 Acceptable material: J.R. Smith or Equal.

3 Execution

3.1 INSTALLATION

.1 Mounting heights:
.1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
.2 Wall-hung fixtures: as indicated, measured from finished floor.
.3 For barrier-free washroom: to comply with most stringent of either NBCC or CAN/CSA B651.

3.2 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:
  .1 Adjust water flow rate to design flow rates.
  .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
  .3 Adjust flush valves to suit actual site conditions.
  .4 Adjust urinal flush timing mechanisms.
.3 Checks:
  .1 Water closets, urinals: flushing action.
  .2 Aerators: operation, cleanliness.
  .3 Vacuum breakers, backflow preventers: operation under all conditions.
.4 Thermostatic controls:
  .1 Verify temperature settings, operation of control, limit and safety controls.

END OF SECTION

1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CAN/CSA-B45 Series-02, Plumbing Fixtures.
- .2 CAN/CSA-B125-F01, Plumbing Fittings.
- .3 CSA Standards\CSA-B561-04, Barrier-Free Design.

1.2 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 61 33 - Hazardous Materials.
- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate, for all fixtures and trim:
  - .1 Dimensions, construction details, roughing-in dimensions.

.3 Closeout Submittals:
- .1 Provide maintenance data including monitoring requirements for incorporation into manuals specified in Section 01 78 00 - Closeout Submittals.
- .2 Include:
  - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
  - .2 Details of operation, servicing, maintenance.
  - .3 List of recommended spare parts.

1.3 QUALITY ASSURANCE

.1 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.4 DELIVERY STORAGE AND DISPOSAL

.1 Waste Management and Disposal:
- .1 Separate waste materials for reuse in accordance with Section 01 74 19 - Construction Waste Management Disposal.
- .2 Collect and separate for disposal paper packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

2 Products

2.1 MANUFACTURED UNITS

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: architectural drawings to govern.

.5 Fixtures in any one location to be product of one manufacturer and of same type.

.6 Trim in any one location to be product of one manufacturer and of same type.

2.2 INDIVIDUAL SHOWER STALL SHOWERHEAD

.1 SH-1 : individual showerhead.
- .1 Chrome plated brass, non-clog, with adjustable spray, ball joint, standard chrome

plated bent arm and escutcheon. Limit maximum flow rate to 7.6l/minute at 550 kPa.

.2 Shower supply valve:

.1 Push-button metering type, volume control, strainer and check-stops on each inlet, complete with single temperature thermostatic mixing valve adjusted to 40° C.

.2 Acceptable material: Chicago Faucets 770 series

2.3 FIXTURE PIPING

.1 Hot and cold water supplies to each fixture.

.1 Chrome plated flexible metal supply pipes each with quarter-turn angle ball valve stop, chrome plated pipe nipple or copper tube with chrome cover and escutcheon to properly cover all pipe & fittings exposed through the wall.

.2 Waste:

.1 Brass P trap with cleanout on each fixture not having integral trap.

.2 Chrome plated in all exposed places.

.3 Escutcheon to properly cover all exposed pipe & fittings through the wall.

3 Execution

3.1 INSTALLATION

.1 Mounting heights:

.1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.

.2 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA B651.

3.2 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:

.1 Adjust water flow rate to design flow rates.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Checks:

.1 Aerators: operation, cleanliness.

.2 Vacuum breakers, backflow preventers: operation under all conditions.

.4 Thermostatic controls:

.1 Verify temperature settings, operation of control, limit and safety controls.

END OF SECTION

1 General

1.1 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings; submit drawings stamped and signed for review by Owner's representative.

.3 Shop drawings to show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.4 Shop drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

.5 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.6 Closeout Submittals:

.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.2 Operation and maintenance manual approved by, and final copies deposited with, Consultant before final inspection.

.3 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.4 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.5 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.6 Approvals:

.1 Submit electronic copies of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.

.2 Make changes as required and re-submit as directed by Consultant.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records:

.1 Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.9 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Consultant for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.10 Submit copies of as-built drawings for inclusion in final TAB report.

1.2 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.3 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One head gasket set for each heat exchanger.

.4 One glass for each gauge glass.

.5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

.2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance with Section 01 74 00 - Cleaning and Waste Management.

2 Products

2.1 MATERIALS

.1 All materials used on this project shall be new and CSA approved unless noted otherwise.

3 Execution

3.1 PAINTING REPAIRS AND RESTORATION

.1 Do painting in accordance with Section 09 91 00 - Painting.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

3.2 CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units. Protect open ends of ducts, diffusers, grilles and registers during construction to prevent ingress of dust and dirt into interior of ducts.

3.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.

.1 Submit tests as specified in other sections of this specification.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 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 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 DEMONSTRATION

.1 Consultant will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Consultant will record these demonstrations on video tape for future reference.

3.5 PROTECTION

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

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 00 - Cleaning & Waste Management.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Consultant.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.1 Unions are not required in installations using grooved mechanical couplings (the coupling shall serve as the union).

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

.4 The flexible ground joint couplings may be used in lieu of a flexible connector at equipment connections for vibration attenuation and stress relief, coupling shall be placed in close proximity to the source of vibration.

3.2 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, components.

3.3 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain. Discharge to be visible.

.4 Drain valves: DN20 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.4 AIR VENTS

.1 Install automatic air vents at high points in piping systems.

.2 Install isolating valve at each automatic air valve.

.3 Install drain piping to approved location and terminate where discharge is visible.

3.5 DIELECTRIC COUPLINGS

.1 General: Compatible with system, to suit pressure rating of system.

.2 Locations: Where dissimilar metals are joined.

.3 DN50 and under: isolating unions or bronze valves.

.1 Waterway fittings shall be complete with thermoplastic liner.

.4 Over DN50: Isolating flanges.

.1 Waterway fittings shall be complete with thermoplastic liner.

3.6 PIPEWORK INSTALLATION

.1 Installed by certified journey person.

.2 Screwed fittings jointed with Teflon tape.

.3 Protect openings against entry of foreign material.

.4 Grooved joint couplings and fittings shall be installed in accordance with the manufacturer's written installation instructions.

.1 Gaskets shall be verified as suitable for the intended service prior to installation. Gaskets shall be molded and produced by the coupling manufacturer.

.2 The grooved coupling manufacturer's factory trained representative shall provide , Contractor shall remove and replace any joints deemed improperly installed.

.5 Push-to-connect piping: Prepare copper tube and install in strict accordance with installation instructions. Pipe ends shall be cleaned, free from indentations, projections, burrs and foreign matter. Use a tube preparation tool as supplied by the manufacturer to clean and make installation mark. Push copper tube into fittings to installation depth mark, per installation instructions. Keep fittings free of dirt and oil.

.6 Saddle type branch fittings may be used on mains if branch line is no larger than half the size of main.

.1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.

.7 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.8 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.10 Install, except where indicated, to permit separate thermal insulation of each pipe.

.11 Group piping wherever possible and as indicated.

.12 Ream pipes, remove scale and other foreign material before assembly.

.13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.14 Provide for thermal expansion as indicated.

.15 Valves:

.1 Install in accessible locations.

.2 Remove interior parts before soldering.

.3 Install with stems above horizontal position unless otherwise indicated.

.4 Valves accessible for maintenance without removing adjacent piping.

.5 Install globe valves in bypass around control valves.

.6 Use ball or butterfly valves at branch take-offs for isolating purposes except

where otherwise specified.

.7 Install butterfly valves between weld neck flanges to ensure full compression of liner.

.8 Install ball valves for glycol service.

.9 Use chain operators on valves DN65 and larger where installed more than 2400 mm above floor in Mechanical Rooms.

.16 Check Valves:

.1 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and elsewhere as indicated.

.2 Install swing check valves in horizontal lines on discharge of pumps and elsewhere as indicated.

3.7 SLEEVES

.1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.

.2 Material: Schedule 40 black steel pipe.

.3 Construction: Foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.

.4 Sizes:

.1 Provide 12mm clearance, all around, between sleeve and pipes or between sleeve and insulation.

.2 Through footings use sleeves large enough to accommodate hub of CI soil pipe.

.3 Where piping passes below footings, provide minimum all-round clearance of 50mm between piping and sleeves. Backfill upto underside of footing with concrete of same strength as footing.

.4 Unless otherwise specified, terminate sleeves flush with walls.

.5 Sleeves shall be sized to accommodate the insulated pipe diameter.

.5 Installation:

.1 Concrete, masonry walls, concrete floors on grade: Terminate flush with finished surface.

.2 Other floors: Terminate 25 mm above finished floor.

.3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.

.6 Sealing:

.1 Foundation walls and below grade floors: Fire retardant, oakum and waterproof non-hardening mastic or manufactured seals equal to "link seal".

.2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.

.3 Sleeves installed for future use: Fill with lime plaster or other easily removable filler.

.4 Ensure no contact between copper pipe or tube and sleeve.

.7 Unless otherwise indicated for pipes passing through roofs, use Thaler Industries Model MEF-3A or MEF-4A aluminum mechanical flashings, height 300mm. anchor flashings in roof construction. Install in accordance with manufacturers recommendations. Make watertight durable joint.

3.8 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: One piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.

.3 Sizes: Outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

3.9 PREPARATION FOR FIRESTOPPING

.1 Material and installation within annular space between pipes, ducts, insulation and adjacent fire separation to Section 07 84 00 - Firestopping.

.2 Uninsulated unheated pipes not subject to movement: No special preparation.

.3 Uninsulated heated pipes subject to movement: Wrap with non-combustible smooth material to permit pipe movement without damaging firestopping material or installation.

.4 Insulated pipes and ducts: Ensure integrity of insulation and vapour barriers.

3.10 FLUSHING OUT OF PIPING SYSTEMS

.1 In accordance with Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

.2 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 00 - Cleaning and Waste Management, supplemented as specified in relevant sections of Division 23.

.3 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.11 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Consultant 48 hours minimum prior to performance of pressure tests.

.2 Pipework: Test as specified in relevant sections of Division 23.

.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant sections of Division 23.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Conduct tests in presence of Consultant. Work to be carried out in off hours after 5 p.m., weekends or holidays.

.6 Pay costs for repairs or replacement, retesting, and making good. Consultant to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests by Consultant.

3.12 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Consultant. Work to be carried out in off hours after 5 p.m., weekends or holidays.

.2 Request written approval 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

.4 Ensure daily clean-up of existing areas.

END OF SECTION

1 General

1.1 REFERENCES

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)

.1 ASHRAE 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA cosponsored; ANSI approved; Continuous Maintenance Standard).

.2 Electrical Equipment Manufacturers' Association Council (EEMAC)

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.2 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of work.

.3 Closeout Submittals

.1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 QUALITY ASSURANCE

.1 Regulatory Requirements: work to be performed in compliance with Provincial Regulations.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance with Section 01 74 00 - Cleaning & Waste Management.

2 Products

2.1 GENERAL

.1 Motors: premium efficiency, in accordance with local utility company standards and to ASHRAE 90.1.

2.2 MOTORS

.1 Provide motors for mechanical equipment as specified.

.2 Motors under 560 W (3/4 HP): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

.3 Motors 560 W (3/4 HP) and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40 degrees C, 3 phase, 208 V, unless otherwise specified or indicated.

2.3 TEMPORARY MOTORS

.1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Consultant for temporary use. Work will only be accepted when specified motor is installed.

2.4 BELT DRIVES

.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.

.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise indicated.

.3 For motors under 10 HP: standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.

.4 For motors 10 HP and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.

.5 Correct size of sheave determined during commissioning.

.6 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.7 Motor slide rail adjustment plates to allow for centre line adjustment.

.8 Supply one set of spare belts for each set installed in accordance with Section 01 78 00 - Closeout Submittals.

2.5 DRIVE GUARDS

.1 Provide guards for unprotected drives.

.2 Guards for belt drives;

- .1 Expanded metal screen welded to steel frame.
- .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
- .3 38 mm dia holes on both shaft centres for insertion of tachometer.
- .4 Removable for servicing.

.3 Provide means to permit lubrication and use of test instruments with guards in place, provide extended grease lines on grease nipples to locations outside of guards.

.4 Install belt guards to allow movement of motors for adjusting belt tension.-

.5 Guard for flexible coupling:

- .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
- .2 Securely fasten in place.
- .3 Removable for servicing.

.6 Unprotected fan inlets or outlets:

- .1 Wire or expanded metal screen, galvanized, 19 mm mesh.
- .2 Net free area of guard: not less than 80% of fan openings.
- .3 Securely fasten in place.
- .4 Removable for servicing.

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 datasheet.

3.2 INSTALLATION

.1 Fasten securely in place.

.2 Make removable for servicing, easily returned into, and positively in position.

3.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.

.1 As specified in other sections of this specification.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 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 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Management.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 03 20 00 - Concrete Reinforcing.
.2 Section 03 30 00 - Cast-in-Place Concrete.
.3 Section 03 05 10 - Cast-in-Place - Short Form.
.4 Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.
.5 Section 23 08 01 - Performance Verification Mechanical Piping Systems.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
  .1 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  .2 ASTM A105/A105M, Standard Specification for Carbon Steel Forgings, for Piping Applications.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit product data and indicate for items as applicable:
  .1 Manufacturer, model number, line contents, pressure and temperature rating.
  .2 Movement handled, axial, lateral, angular and the amounts of each.
  .3 Nominal size and dimensions including details of construction and assembly.
.3 Submit maintenance data in accordance with Section 01 78 00 - Closeout Submittals.
.4 Data to include:
  .1 Servicing requirements, including special requirements, stuffing box packing, lubrication and recommended procedures.

1.4 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse in accordance with Section 01 74 00 - Cleaning and Waste Management.
.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
.3 Collect, separate and place in designated containers for reuse packaging Steel in accordance with Waste Management Plan.
.4 Unused sealant materials must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
.5 Fold up metal banding, flatten and place in designated area for recycling.

2 Products

2.1 FLEXIBLE CONNECTION

.1 Application: to suit motion as indicated.
.2 Minimum length in accordance with manufacturer's recommendations to suit offset.
.3 Inner hose: bronze or stainless steel corrugated.
.4 Braided wire mesh bronze or stainless steel outer jacket.
.5 Diameter and type of end connection: threaded or flanged same as pipe joint for the pipe size.
.6 Operating conditions:

.1 Working pressure: 1034 kPa.
.2 Working temperature: To match system requirements.

2.2 ANCHORS AND GUIDES

.1 Anchors:
.1 Provide as indicated.
.2 Alignment guides:
.1 Provide as indicated
.2 Concrete: to Section 03 30 00 - Cast in Place Concrete.
.3 Reinforced: to Section 03 20 00 - Concrete Reinforcing.

3 Execution

3.1 INSTALLATION

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

3.2 CLEANING AND START-UP

.1 In accordance with Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

3.3 PERFORMANCE VERIFICATION

.1 In accordance with Section 23 08 01 - Performance Verification Mechanical Piping Systems: Mechanical Piping Systems.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 23 05 54 - Mechanical Identification.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME).
- .1 ASME B40.100, Pressure Gauges and Gauge Attachments.
- .2 ASME B40.200, Thermometers, Direct Reading and Remote Reading.

.2 Canadian General Standards Board (CGSB).
- .1 CAN/CGSB-14.4, Thermometers, Liquid-in-Glass, Self Indicating, Commercial/ Industrial Type.
- .2 CAN/CGSB-14.5, Thermometers, Bimetallic, Self-Indicating, Commercial/ Industrial Type.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit manufacturer's product data for following items:
- .1 Thermometers.
- .2 Pressure gauges.
- .3 Stop cocks.
- .4 Syphons.
- .5 Wells.

.3 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Cleaning & Waste Management.

.2 Collect, separate and place in designated containers for reuse and recycling, paper, plastic, polystyrene, corrugated cardboard packaging, steel, metal, in accordance with Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

.4 Place materials defined as hazardous or toxic waste in designated containers.

.5 Ensure emptied containers are sealed, labelled and stored safely for disposal away from children.

2 Products

2.1 GENERAL

.1 Design point to be at mid point of scale or range.

.2 Ranges: as indicated.

2.2 DIRECT READING THERMOMETERS

.1 Industrial, variable angle type, liquid filled, accuracy +/- scale division 225 mm scale length: to CAN/CGSB14.4 or ASME B 40, 200.
- .1 Acceptable material: Trerice, Ashcroft, Wika, Winters, Marsh.

2.3 THERMOMETER WELLS

.1 Copper pipe: copper or bronze.
.2 Steel pipe: brass.

2.4 REMOTE READING THERMOMETERS

.1 100mm diameter liquid filled or vapor activated dial type: to CAN/CG SB - 14.4 or ASME B40-200, accuracy within one scale division. Brass movement, stainless steel capillary, stainless steel spiral armour, stainless steel bulb, and polished brass or stainless steel case for wall mounting.
  .1 Acceptable material: Trerice, Ashcroft, Wika, Winters, Marsh.

2.5 PRESSURE GAUGES

.1 Dial type 112 mm, dial type: to ASME B40.100, Grade 2A, stainless steel or phosphor bronze bourdon tube having 0.5% accuracy full scale, 1% accuracy for liquid filled.
  .1 Acceptable material: Trerice, Ashcroft, Wika, Winters, Marsh.
.2 Provide bronze stop cock and :
  .1 Siphon for steam service.
  .2 Snubber for pulsating operation.
  .3 Diaphragm assembly for corrosive service.
  .4 Gasketed pressure relief back with solid front.
  .5 Oil filled for high vibration applications such as pumps.
  .6 Bronze ball valve to Section 23 05 22 - Valves - Bronze.

3 Execution

3.1 GENERAL

.1 Install so they can be easily read from floor or platform. If this cannot be accomplished, install remote reading units.
.2 Install between equipment and first fitting or valve.

3.2 THERMOMETERS

.1 Install in wells on piping arrange so that at least 25mm (1") of the stem of the thermometer is immersed in flowing fluid. Provide heat conductive material inside well.
.2 Install on inlet and outlet of equipment:
  .1 Heating and cooling coils.
  .2 Boilers.
  .3 DHW tanks.
.3 Install wells in other locations as indicated.
.4 Use extensions where thermometers are installed through insulation.

3.3 PRESSURE GAUGES

.1 Install in following locations:
  .1 Suction and discharge of pumps (liquid filled).
  .2 Upstream and downstream of PRV's.
  .3 Upstream and downstream of control valves.
  .4 Inlet and outlet of coils.
  .5 Inlet and outlet of heat exchanger.
  .6 Outlet of boilers.
  .7 In other locations as indicated.
.2 Install ball valves to Section 23 05 22 - Valves - Bronze.
.3 Use extensions where pressure gauges are installed through insulation.

3.4 NAMEPLATES

.1 Install engraved lamicoid nameplates as specified in Section 23 05 54 - Mechanical Identification, identifying medium.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 23 05 01 - Installation of Pipework.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME).
- .1 ANSI/ASME B1.20.1 (R2001), Pipe Threads, General Purpose (Inch).
- .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ANSI/ASME B16-22 Wrought Copper and Copper Alloy Soldier Joint Pressure Fittings.

.2 American Society for Testing and Materials International, (ASTM).
- .1 ASTM A276, Specification for Stainless Steel Bars and Shapes.
- .2 ASTM A536, Specifications for Ductile Iron Castings.
- .3 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.
- .4 ASTM B16 Specifications for Free Cutting Brass Rod Bar and Shapes for use in Screw Machines.
- .5 ASTM B283, Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).
- .6 ASTM B505/B505M, Specification for Copper-Base Alloy Continuous Castings.

.3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
- .1 MSS-SP-25, Standard Marking System for Valves, Fittings, Flanges and Unions.
- .2 MSS-SP-80, Bronze Gate Globe, Angle and Check Valves.
- .3 MSS-SP-110, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
- .4 Canadian Standards Association (CSA)
  - .1 CSA B242, Groove and Solder type mechanical pipe couplings.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets.
- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit data for valves specified in this section.
- .3 Groove joint couplings and fittings to be indicated on product submittals and to be specifically identified with applicable style or series designation.

.3 Closeout Submittals:
- .1 Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.5 DELIVERY STORAGE AND DISPOSAL

.1 Waste Management and Disposal:
- .1 Separate and recycle waste materials in accordance with Section 01 74 00 - Cleaning & Waste Management.
- .2 Collect and separate for disposal paper packaging material in appropriate on-site

bins for recycling in accordance with Waste Management Plan.

1.6 MAINTENANCE

.1 Extra Materials:

.2 Furnish following spare parts:

.1 Valves: One (1) for every 10 valves of each size & type, minimum 1.

.2 Gaskets for flanges: one for every 10 flanged joints.

.3 Grooved Couplings: IPS and copper tube dimensions, one for every 10 (ten) ground joints.

2 Products

2.1 MATERIALS

.1 Valves:

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

.2 End Connections:

.1 Connection into adjacent piping/tubing:

.1 Steel pipe systems: Screwed ends to ANSI/ASME B1.20.1.

.2 Copper tube systems:

.1 Solder ends to ANSI/ASME B16.18.

.2 Grooved ends to copper tube dimension and CSMB242

.3 Push-to-connect ends to ANSI/ASME B16.22 and manufacturers standards.

.3 Lockshield Keys:

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

2.2 CHECK VALVES

.1 Requirements common to check valves, unless specified otherwise:

.1 Standard specification: MSS SP-80.

.2 Connections: screwed with hexagonal shoulders.

.1 Class 125, WP = 860 kPa (125 psi) 1.4 MPa (200psi) WOG

.2 Class 150, WP = 1.03 MPa

.3 200 6WP, WP = 1.4 MPa (200psi) Water.

.2 DN50 and under, non-rising stem, solid wedge disc, Class 125

.1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.

.2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.

.3 DN50 and under, swing type, bronze disc:

.1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.

.2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.

.4 DN50 and under, swing type, composition disc, 200 CWP:

.1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.

.2 Disc: renewable rotating disc of number 6 composition to suit service conditions, bronze two-piece hinge disc construction.

.5 DN50 and under, horizontal lift type, composition disc, Class 150:

.1 Body: with integral seat, union bonnet ring with hex shoulders, cap.

.2 Disc: renewable PTFE for steam, #6 composition rotating disc for water, oil, or gas service in disc holder having guides top and bottom, of bronze to ASTM B62.

.6 DN50 and under, vertical lift type, bronze disc, Class 125:
  .1 Disc: rotating disc having guides top and bottom, disc guides, retaining rings.
.7 DN50 and under vertical on horizontal lift type 1380kPa CWP:
  .1 Disc type 301 stainless steel, center guided.

2.3 BALL VALVES

.1 DN50 and under:
  .1 Body and cap: cast high tensile bronze to ASTM B62.
  .2 Pressure rating: Class125, 860 kPa steam.
  .3 Connections: Screwed ends to ANSI B1.20.1 and with hexagonal shoulders, push to connect press fit ends.
  .4 Stem: tamperproof ball drive.
  .5 Stem packing nut: external to body.
  .6 Ball and seat: replaceable stainless steel solid ball of hand chrome plated brass solid ball and teflon seats.
  .7 Stem seal: TFE EPDM, Nitrile, Flooroelustomer with external packing nut.
  .8 Operator: removable lever handle.
  .9 Cup and drain for service.
  .10 Acceptable material: Jenkins Fig 201J or equal.

2.4 BUTTERFLY VALVES

.1 DN65 to DN150
  .1 Body: cast bronze per CDA-836 (85-5-5-5).
  .2 Pressure rating: 2065-kPa CWP.
  .3 Connections: copper tube dimensioned grooved ends.
  .4 Disc: ductile iron per ASTM A536 with elastomer coating.
  .5 Stem: integrally cast with disc.
  .6 Stem Nuts: nickel plated 416 stainless steel.
  .7 Operator: gear operator, NPS and over.

2.5 GATE VALVES

.1 Requirements common to all gate valves, unless specified otherwise:
  .1 Standard specification: MSS SP-80.
  .2 Bonnet: with hex. shoulders.
  .3 Connections: with hex. shoulders.
  .4 Inspection and pressure testing: to MSS SP-80. Tests to be hydrostatic.
  .5 Packing: high grade non-asbestos packing.
  .6 Handwheel: non-ferrous.
  .7 Handwheel Nut: bronze to ASTM B62.
  .8 Class 125, WP = 860 kPa steam, 1.4 mPa WOG.
  .9 Class 150 WP = 1.03 mPa steam, 2.07 mPa WOG.
.2 DN50 and under, non-rising stem, solid wedge disc, Class 125:
  .1 Body: with long disc guides, screwed bonnet with stem retaining nut.
  .2 Operator: Handwheel.
.3 DN50 and under, non-rising stem, solid wedge disc, Class 150:
  .1 Body: with long disc guides, screwed bonnet with stem retaining nut.
  .2 Operator: Handwheel.
.4 DN50 and under, rising stem, split wedge disc, Class 125:
  .1 Body: with long disc guides, screwed bonnet.
  .2 Disc: split wedge, bronze to ASTM B283, loosely secured to stem.

.3 Operator: Handwheel

.5 DN50 and under, rising stem, solid wedge disc, Class 125:
- .1 Body: with long disc guides, screwed bonnet.
- .2 Operator: Handwheel.

.6 DN50 and under, rising stem, solid wedge disc, Class 150:
- .1 Body: with long disc guides, screwed bonnet.
- .2 Operator: Handwheel.

2.6 GLOBE VALVES

.1 Requirements common to all globe valves, unless specified otherwise:
- .1 Standard specification: MSS SP-80.
- .2 Bonnet: union with hex. shoulders.
- .3 Connections: screwed with hex. shoulders.
- .4 Inspection and pressure testing: to MSS SP-80. Tests to be hydrostatic.
- .5 Packing: non-asbestos.
- .6 Handwheel: non-ferrous.
- .7 Handwheel Nut: bronze to ASTM B62.
- .8 Class 125, WP = 860 kPa steam, 1.4 MPa WOG.
- .9 Class 150 WP = 1.03 mPa steam, 2.07 MPa WOG.

.2 DN50 and under, composition disc, Class 125:
- .1 Body and bonnet: screwed bonnet.
- .2 Disc and seat: renewable rotating PTFE disc regrindable bronze seat, loosely secured to bronze stem to ASTM B505.
- .3 Operator: Handwheel.

.3 DN50 and under, composition disc, Class 150:
- .1 Body and bonnet: union bonnet.
- .2 Disc and seat: renewable rotating PTFE disc in easily removable disc holder, regrindable bronze seat, loosely secured to bronze stem to ASTM B505.
- .3 Operator: Handwheel.
- .4 Acceptable material: Jenkins Figure 106BJ or equal.

.4 DN50 and under, plug disc, Class 150, screwed ends:
- .1 Body and bonnet.
- .2 Disc and seat ring: tapered plug type with disc stem ring of stainless steel to ASTM A276, loosely secured of stem.
- .3 Operator: Handwheel.
- .4 Acceptable material: Jenkins Figure 2032J or equal

.5 Angle valve, DN50 and under, composition disc, Class 150:
- .1 Body and bonnet: union bonnet.
- .2 Disc and seat: renewable rotating PTFE disc in slip-on easily removable disc holder having integral guides, regrindable bronze seat, loosely secured to stem.
- .3 Operator: Handwheel.
- .4 Acceptable material: Jenkins Figure 108BJ or equal.

2.7 ACCEPTABLE MATERIAL

.1 Jenkins, Crane, Watts, Newman Hattersley, Milwaukee, Conbraco, Kitz, Red White, M.A. Stewart, Nibco, Victaulic, Boshart.

3 Execution

3.1 INSTALLATION

.1 Install rising stem valves in upright position with stem above horizontal.

.2 Remove internal parts before soldering.

.3 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

.1 Unions are not required in Installations using ground mechanical couplings. The couplings shall serve as unions.

.4 Add joining tube, couplings and fittings with grooved joint valves shall be copper tube dimensioned. Tlaring tube or fitting ends to accommodate IPS sized valves is not permitted.

3.2 COMMISSIONING

.1 As part of commissioning activities, develop a schedule and valves and record there on there as identifier, location, services, purchase order number and date, manufacturer, identification data specified above.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 23 05 01 - Installation of Pipework.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME).
  .1 ANSI/ASME B16.1-, Cast Iron Pipe Flanges and Flanged Fittings.

.2 American Society for Testing and Materials International (ASTM).
  .1 ASTM A49-, Specification for Heat-Treated Carbon Steel Joint Bars.
  .2 ASTM A126-, Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
  .3 ASTM B61-, Specification for Steam or Valve Bronze Castings.
  .4 ASTM B62-, Specification for Composition Bronze or Ounce Metal Castings.
  .5 ASTM B85-, Specification for Aluminum-Alloy Die Castings.
  .6 ASTM B209-, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
  .1 MSS SP-67 Butterfly Valves.
  .2 MSS SP-70-, Cast Iron Gate Valves, Flanged and Threaded Ends.
  .3 MSS SP-71-, Grey Iron Swing Check Valves, Flanged and Threaded Ends.
  .4 MSS SP-82-, Valve Pressure Testing Methods.
  .5 MSS SP-85-, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets.
  .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
  .2 Submit data for valves specified in this section.

.3 Closeout Submittals:
  .1 Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Health and Safety:
  .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.5 DELIVERY STORAGE AND DISPOSAL

.1 Waste Management and Disposal:
  .1 Separate and recycle waste materials in accordance with Section 01 74 00 - Cleaning & Waste Management.
  .2 Collect and separate for disposal paper packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

1.6 MAINTENANCE

.1 Extra Materials:

.2 Furnish following spare parts:
  .1 Valves: one (1) for every 10 valves of each size and type, minimum 1.
  .2 Gaskets for flanges: one for every 10 flanged joints.

2 Products

2.1 MATERIAL

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

.2 Standard specifications:
- .1 Gate valves: MSS SP-70.
- .2 Globe valves: MSS SP-85.
- .3 Check valves: MSS SP-71.

.3 Requirements common to valves, unless specified otherwise:
- .1 Body, bonnet: cast iron to ASTM B209 Class B.
- .2 Connections: flanged ends plain face to ANSI B16.1.
- .3 Inspection and pressure testing: to MSS SP-82.
- .4 Bonnet gasket: non-asbestos.
- .5 Stem: to have precision-machined Acme or 60 degrees V threads, top screwed for handwheel nut.
- .6 Stuffing box: non-galling two-piece ball-jointed packing gland, gland bolts and nuts.
- .7 Gland packing: non-asbestos.
- .8 Handwheel: Die-cast aluminum alloy to ASTM B85 or malleable iron to ASTM A49. Nut of bronze to ASTM B62.
- .9 Identification tag: with catalogue number, size, other pertinent data.

.4 All products to have CRN registration numbers.

.5 Bronze trim for steam, water, air or glycol services. Iron trim for oil, gas or gasoline.

.6 Acceptable material: Crane, Jenkins, Milwaukee, Newman Hattersley, Kite, M.A. Stewart, NIBCO.

2.2 GATE VALVES

.1 NPS DN65-DN200, non rising stem, inside screw, bronze or iron trim, solid wedge disc:
- .1 Body and multiple-bolted bonnet: with bosses in body and bonnet for taps and drains, full length disc guides designed to ensure correct re-assembly. Class 125.
- .2 Bronze trim.
  - .1 Disc: solid offset taper wedge, bronze to ASTM B62.
  - .2 Seat rings: renewable bronze to ASTM B62, screwed into body.
  - .3 Stem: bronze to ASTM B62.
    - .1 Disc: solid offset taper wedge, cast iron to ASTM A126 Class B, secured to wrought steel stem.
    - .2 Seat: Integral with body.
    - .3 Stem: wrought steel.
    - .4 Operator: Handwheel.

.2 NPS DN65-DN200, outside screw and yoke (OS&Y), bronze trim, solid wedge disc:
- .1 Body and multiple-bolted bonnet: with bosses in body and bonnet for taps and drains, full length disc guides designed to ensure correct re-assembly, yoke, yoke hub, yoke sleeve and nut. Class 125.
- .2 Bronze trim.
  - .1 Disc: solid offset taper wedge, bronze to ASTM B62 up to NPS 3, cast iron with bronze disc rings on other sizes, secured to stem through integral forged T-head disc-stem connection.
  - .2 Seat rings: renewable bronze screwed into body.

.3 Stem: manganese bronze.

.3 Iron trim.

.1 Disc: solid offset taper all-cast iron, secured to stem through integral forged T-head disc-stem connection.

.2 Seat rings: integral with body.

.3 Stem: nickel-plated steel.

.4 Pressure-lubricated operating mechanism.

.5 Operator: Handwheel.

2.3 GLOBE VALVES

.1 NPS DN65-DN200, OSY:

.1 Body: with multiple-bolted bonnet.

.2 WP: 860 kPa steam, 1.4 MPa CWP.

.3 Bonnet-yoke gasket: non-asbestos.

.4 Disc: bronze to ASTM B62, fully guided from bottom, securely yet freely connected to stem for swivel action and accurate engagement with disc.

.5 Seat ring: renewable, regrindable, screwed into body.

.6 Stem: bronze to ASTM B62.

.7 Operator: Handwheel.

2.4 VALVE OPERATORS

.1 Install valve operators as follows:

.1 Handwheel: on valves except as specified.

2.5 CHECK VALVES

.1 Swing check valves, Class 125:

.1 Body and bolted cover: with tapped and plugged opening on each side for hinge pin. Flanged ends: plain faced with smooth finish.

.1 Up to DN400: cast iron to ASTM A126 Class B.

.2 Ratings:

.1 NPS DN65 - DN300: 860 kPa steam; 1.4 MPa CWP.

.3 Bronze trim.

.1 Disc: rotating for extended life.

.1 Up to DN150: bronze to ASTM B 62.

.2 Seat rings: renewable bronze to ASTM B62 screwed into body.

.3 Hinge pin, bushings: renewable bronze to ASTM B62.

.4 Iron trim.

.1 Disc: A126 Class B, secured to stem, rotating for extended life.

.2 Seat: cast iron, integral with body.

.3 Hinge pin: exelloy; bushings: malleable iron.

.5 Identification tag: fastened to cover.

.6 Hinge: galvanized malleable iron.

.2 Swing check valves, NPS DN65-DN200 Class 250:

.1 Body and bolted cover: cast iron to ASTM A126 Class B with tapped and plugged opening on each side for hinge pin.

.2 Flanged ends: 2 mm raised face with serrated finish.

.3 Rating: 3500 kPa psi CWP.

.4 Disc: rotating for extended life.

.1 Up to DN80: bronze to ASTM B61.

.2 NPS DN100-200: Iron faced with ASTM B61 bronze.

.5 Seat rings: renewable bronze to ASTM B61, screwed into body.
.6 Hinge pin, bushings: renewable, bronze to ASTM B61.
.7 Hinge: galvanized malleable iron.
.8 Identification tag: fastened to cover.

2.6 SILENT CHECK VALVES

.1 Construction:
.1 Body: malleable or ductile iron with integral seat.
.2 Pressure rating: class 125, WP = 860 kPa.
.3 Connections: grooved ends or flanged ends.
.4 Disc: bronze or stainless steel renewable rotating disc.
.5 Seat: renewable, EPDM.
.6 Stainless steel spring, heavy duty.
.7 Grooved end check valves.

2.7 GROOVED END BUTTERFLY VALVES

.1 Butterfly valves: to MSS-SP-67. Application: Isolating coils or section of multiple component equipment (eg multi-section coils, multi-cell
.1 NPS 2 cooling towers and over: grooved ends.
.2 2068 kPa WOG and bath bi-directional and dead end service capable to fall rated pressure, ductile iron body with blow-out proof stainless steel stems and nickel coated ductile iron disc. Seat shall be "EPDM" and have a full 360 degree continuous contract with the seating surface.
.3 Valve operations: level, gear operator NPS 6 and over.

2.8 ACCEPTABLE MATERIAL

.1 Jenkins, Crane, Wath, Newman, Hatersley, Milwaukee, Conbraco, Kitz, Red Wine, M.A. Stewart, Nibco, Victaulic.
.2 Grooved end valves to be supplied by the same manufacturer as the grooved fittings.
.3 Grooved end valves to be installed in accordance with the manufacturer's written installation instructions. Grooved ends to be clean and free from indentations and projections. Gaskets to be verified as suitable for the intended service prior to installation. Gaskets to be molded and produced by the coupling manufacturer. Contractor to remove and replace any joints deemed improperly installed.

3 Execution

3.1 INSTALLATION

.1 Install rising stem valves in upright position with stem above horizontal.

3.2 COMMISSIONING

.1 As part of commissioning activities, develop schedule of valves and record thereon identifier, location, service, purchase order number and date and manufacturer.

END OF SECTION

1 General

1.1 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME).
- .1 ANSI/ASME B1.20.1-, Pipe Threads, General Purpose (Inch).
- .2 ANSI/ASME B16.1-, Cast Iron Pipe Flanges and Flanged Fittings.
- .3 ANSI/ASME B16.5-, Pipe Flanges and Flanged Fittings.
- .4 ANSI/ASME B16.11-, Forged Fittings, Socket-Welding and Threaded.
- .5 ANSI/ASME B16.25-, Buttwelding Ends.
- .6 ANSI/ASME B16.34-, Valves - Flanged, Threaded and Welding Ends.

.2 American National Standards Institute (ANSI)/American Petroleum Institute (API).
- .1 ANSI/API 609-, Lug- and Water-Type Butterfly Valves.

.3 American Society for Testing and Materials International, (ASTM).
- .1 ASTM A126-, Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
- .2 ASTM B62-, Specification for Composition Bronze or Ounce Metal Castings.
- .3 ASTM B209M-, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.4 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
- .1 MSS SP-67-, Butterfly Valves.

1.2 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets.
- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Submit data for valves specified this section.

.3 Closeout Submittals:
- .1 Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 QUALITY ASSURANCE

.1 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.4 DELIVERY STORAGE AND DISPOSAL

.1 Waste Management and Disposal:

.2 Separate and recycle waste materials in accordance with Section 01 74 00 - Cleaning & Waste Management.

.3 Collect and separate for disposal paper packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

1.5 MAINTENANCE

.1 Extra Materials:
- .1 Valves: one for every 10 valves of each size and type, minimum 1.Furnish following spare parts:
- .2 Gaskets for flanges: one for every 10 flanged joints.

2 Products

2.1 BUTTERFLY VALVES - RESILIENT SEAT - 1400 kPa

.1 Except to specialty valves, to be of single manufacturer.
.2 To be suitable for dead-end service.
.3 CRN registration number required for products.
.4 Sizes: Wafer or lug type.
.5 Pressure rating for tight shut-off at temperatures up to maximum for seat material.
  .1 DN50-DN300; 1400 kPa.
.6 Minimum seat temperature ratings to 135 degrees C.
.7 Application: on-off operation.
.8 Full lug body (threaded).
.9 Operators:
  .1 DN50-DN150; Handles capable of locking in any of ten (10) positions - 0 degrees to 90 degrees. Handle and release trigger - ductile iron. Return spring and hinge pin: carbon steel. Latch plate and mounting hardware: cadmium plated carbon steel. Standard coating: black laquer.
.10 Designed to comply with MSS SP-67 and API 609.
.11 Compatible with ANSI Class 125/Class 150 flanges.
.12 Construction:
  .1 Body ductile iron.
  .2 Disc: aluminum bronze.
  .3 Seat: EPDM.
  .4 Shaft: 416 stainless steel.
  .5 Taper pin: 316 SS.
  .6 Key: carbon steel or stainless.
  .7 O-Ring: Buna-N.
  .8 Bushings: Luberized bronze teflon.

2.2 MOUNTING FLANGES

.1 Class 125 cast iron to ANSI B16.1 or Class 150 steel to B16.5 pipe flanges.

2.3 ELECTRIC ACTUATORS

.1 Operation: designed to provide precise quarter turn electric operation.
  .1 Torque range: up to 1.130 N-m and speed ranges from 10 seconds to 30 seconds to move from fully open to fully closed.
  .2 Gear train within actuator to provide smooth continuous rotary power stroke for accurate automatic valve positioning. Factory-set, field adjustable cam-actuated travel limit switches to provide precise control of shaft rotation.
.2 Construction:
  .1 Castings: heavy duty industrial grade for rugged use.
  .2 Actuators: continuous duty with high efficiency single phase reversing capacitor motor with thermal overload protection.
  .3 Gears and pinions constructed from hardened steel.
  .4 Gear train to be permanently lubricated.
  .5 Mechanical brake to ensure that gear is locked in precise position.
.3 Electrical:
  .1 Standard voltage: 120 VAC. 60 Hz.
  .2 Control options: 4-20 Ma DC or 0-10 VDC.
  .3 CSA approved.

.4 Electrical rating: NEMA IV.

3 Execution

3.1 PREPARATION

.1 Valve and mating flange preparation.

.1 Inspect adjacent pipeline, remove rust, scale, welding slag, other foreign material.

.2 Ensure that valve seats and pipe flange faces are free of dirt or surface irregularities which may disrupt flange seating and cause external leakage.

.3 Install butterfly valves with disc in almost closed position.

.4 Inspect valve disc seating surfaces and waterway and eliminate dirt or foreign material.

3.2 INSTALLATION OF VALVES

.1 Install in accordance with manufacturer's instructions.

.2 Do not use gaskets between pipe flanges and valves unless instructed otherwise by valve manufacturer.

.3 Verify suitability of valve for application by inspection of identification tag.

.4 Mount actuator on to valve prior to installation.

.5 Handle valve with care so as to prevent damage to disc and seat faces.

.6 Valves in horizontal pipe lines should be installed with stem in horizontal position to minimize liner and seal wear.

.7 Ensure that valves are centered between bolts before bolts are tightened and then opened and closed to ensure unobstructed disc movement. If interference occurs due, for example to pipe wall thickness, taper bore adjacent piping to remove interference.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 03 30 00 - Cast in Place Concrete.
.2 Section 05 12 23 - Structural Steel for Buildings.
.3 Section 05 50 00 - Metal Fabrication.

1.2 REFERENCES

.1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
  .1 ANSI/ASME B31.1, Power Piping.
.2 American Society for Testing and Materials International (ASTM)
  .1 ASTM A125, Specification for Steel Springs, Helical, Heat-Treated.
  .2 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  .3 ASTM A563, Specification for Carbon and Alloy Steel Nuts.
.3 Factory Mutual (FM)
.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  .1 Material Safety Data Sheets (MSDS).
.5 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
  .1 MSS SP58, Pipe Hangers and Supports - Materials, Design and Manufacture.
  .2 ANSI/MSS SP69, Pipe Hangers and Supports - Selection and Application.
  .3 MSS SP89, Pipe Hangers and Supports - Fabrication and Installation Practices.
.6 Underwriter's Laboratories of Canada (ULC)

1.3 SYSTEM DESCRIPTION

.1 Design Requirements:
  .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
  .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.
  .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
  .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
  .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.
.2 Performance Requirements:
  .1 Design supports, platforms, cat walks, hangers, to withstand seismic events for locations as per the national building code.

1.4 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
.2 Shop drawings: submit drawings stamped and signed for approval by Owner's representative.
.3 Submit shop drawings and product data for following items:
  .1 Bases, hangers and supports.
  .2 Connections to equipment and structure.
  .3 Structural assemblies.
  .4 Quality Assurance Submittals: submit following in accordance with Section 01 33

00 - Submittal Procedures.

.1 Certification by manufacturer: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturers installation instruction.

.1 Consultant will make available one (1) copy of systems suppliers installation instructions.

.4 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

2 Products

2.1 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP58 and MSS SP59.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports: galvanized, painted with zinc-rich paint after manufacture.

.2 Use electro-plating galvanizing process or hot dipped galvanized process.

.3 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.

.2 Upper attachment structural: suspension from lower flange of I-Beam:

.1 Cold piping DN50 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.

.1 Rod: 9 mm UL listed, 13 mm FM approved.

.2 Cold piping DN65 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed FM approved where required to MSS-SP58 and MSS-SP69.

.3 Upper attachment structural: suspension from upper flange of I-Beam:

.1 Cold piping DN50 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed. FM approved where required to MSS SP69.

.2 Cold piping DN65 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed, FM approved where required.

.4 Upper attachment to concrete:

.1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.

.2 Concrete inserts: wedge shaped body with knockout protector plate, UL listed to FM approved where required to MSS SP69.

.5 Shop and field-fabricated assemblies:

.1 Trapeze hanger assemblies: MSS SP89.
.2 Steel brackets: MSS SP89.
.3 Sway braces for seismic restraint system: to MSS SP89.0

.6 Hanger rods: threaded rod material to MSS SP58:
.1 Ensure that hanger rods are subject to tensile loading only.
.2 Provide linkages where lateral or axial movement of pipework is anticipated.
.3 Do not use 22 mm or 28 mm rod.

.7 Pipe attachments: material to MSS SP58:
.1 Attachments for steel piping: carbon steel galvanized.
.2 Attachments for copper piping: copper plated black steel.
.3 Use insulation shields for hot pipework.
.4 Oversize pipe hangers and supports for insulated pipes.

.8 Adjustable clevis: material to MSS SP69 UL listed, (FM approved where required) clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
.1 Ensure "U" has hole in bottom for riveting to insulation shields.

.9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP69.

.10 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563.
.1 Finishes for steel pipework: galvanized.
.2 Finishes for copper, glass, brass or aluminum pipework: black with farmed portion plastic coated or epoxy coated.

.11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP69.

2.3 RISER CLAMPS

.1 Steel or cast iron pipe: galvanized carbon steel to MSS SP58, type 42, UL listed, FM approved where required.
.2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.
.3 Bolts: to ASTM A307.
.4 Nuts: to ASTM A563.

2.4 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping:
.1 64 kg/m3 density insulation plus insulation protection shield to: MSS SP69, galvanized sheet carbon steel. Length designed for maximum 3 m span.

.2 Insulated hot piping:
.1 Curved plate 300 mm long, with edges turned up, welded-in center plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP69.

2.5 CONSTANT SUPPORT SPRING HANGERS

.1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).
.2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.
.3 Provide upper and lower factory set travel stops.
.4 Provide load adjustment scale for field adjustments.
.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.
.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.6 VARIABLE SUPPORT SPRING HANGERS

.1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.

.2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.

.3 Variable spring hanger complete with factory calibrated travel stops. Provide certificate of calibration for each hanger.

.4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.7 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 12 23 - Structural Steel for Buildings. Submit calculations with shop drawings.

2.8 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

2.9 HOUSE-KEEPING PADS

.1 For base mounted equipment: Provide 100 mm high concrete housekeeping pads for base-mounted equipment; size pads 50 mm larger than equipment; chamfer pad edges.

.2 Concrete: to Section 03 30 00 - Cast-in-place Concrete.

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 datasheet.

3.2 INSTALLATION

.1 Install in accordance with:

.1 manufacturer's instructions and recommendations.

.2 Vibration Control Devices:

.1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.

.3 Clamps on riser piping:

.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

.2 Bolt-tightening torques to be to industry standards.

.3 Steel pipes: install below coupling or shear lugs welded to pipe.

.4 Cast iron pipes: install below joint.

.4 Clevis plates:

.1 Attach to concrete with four (4) minimum concrete inserts, one (1) at each corner.

.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

.6 Use approved constant support type hangers where:

.1 Vertical movement of pipework is 13 mm or more.

.2 Transfer of load to adjacent hangers or connected equipment is not permitted.

.7 Use variable support spring hangers where:

.1 Transfer of load to adjacent piping or to connected equipment is not critical.

.2 Variation in supporting effect does not exceed 25 % of total load.

3.3 HANGER SPACING

.1 Plumbing piping: to most stringent requirements of Canadian Plumbing Code.

.2 Fire protection: to applicable fire code.

.3 Gas and fuel oil piping: up to DN15: every 1.8 m.

.4 Copper piping: up to DN15: every 1.5 m.

.5 Hyronic, rigid and flexible roll grooved piped: in accordance with table below, but not less than one hanger at joints.

.6 Within 300 mm of each elbow.

.7

Max Pipe Size: DN	Max Spacing Steel	Max Spacing Copper
Up to DN32	2.1m	1.8m
DN40	2.7m	2.4m
DN50	3.0m	2.7m
DN65	3.6m	3.0m
DN80	3.6m	3.0m
DN90	3.9m	3.3m
DN100	4.2m	3.6m
DN125	4.8m	
DN150	5.1m	

Pipework greater than DN300: to MSS SP69

3.4 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members. Comprised of angle Iron or c-channel.

3.5 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:

.1 Hammer jaw firmly against underside of beam.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 03 30 33 - Cast in Place Concrete.

.2 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

1.2 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.2 National Fire Protection Association (NFPA)

.1 NFPA 13, Standard for the Installation of Sprinkler Systems.

.3 National Building Code of Canada (NBC)

1.3 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.1 Provide separate shop drawings for each isolated system complete with performance and product data.

.2 Shop drawings; submit drawings stamped and signed for approval by Consultant.

.3 Provide detailed drawings of seismic control measures for equipment and piping.

.3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.1 Consultant will make available 1 copy of systems supplier's installation instructions

.3 Manufacturer's Field Reports: manufacturer's field reports specified.

1.4 ADDITIONAL REQUIREMENTS

.1 The Contractor and the vibration isolation manufacturer or his regularly designated and factory authorized representative shall perform the following tasks in addition to the supply and installation of isolation equipment.

.1 Coordinate all resilient mounting systems with the exact equipment to be furnished in regard to physical size, isolator locations, weight, rotating speed, etc. Direct contact and cooperation between the vibration isolation device fabricator and the equipment manufacturer will be required.

.2 Obtain all necessary date in regard to piping systems which are to be resiliency supported so that proper isolators can be selected. Select piping system isolators for proper coordination with the physical arrangement of pipe lines and with the physical characteristics of the building.

.3 Submit shop drawings as required by other portions of this specification. These drawings shall include specification information as follows:

.1 Manufacturer's model number for each isolator, the machine or pipeline to which it is to be applied, and the number of isolators to be furnished

for each machine or pipeline.

.2 For steel spring mounts or hangers - free height, deflected height, solid height, isolator loading, and diameter of spring coil.

.3 For elastomer or glass fiber isolators - free height, deflected height, and isolator loading.

.4 Dimensional and weight data for concrete inertia bases, steel and rail bases, and details of isolator attachment.

.4 Provide on-the-job supervision as required during installation of resiliently mounted equipment and piping to assure that all vibration isolators are installed in strict accordance with normally accepted practices for critical environments.

.5 Replace at no extra cost to the Owner and isolators which do not produce the required deflection, are improperly loaded above or below their correct operating height, or which in any way do not produce the required isolation.

.6 Cooperate with all other Contractors engaged in this project so that the installation of vibration isolation devices will proceed in a manner that is in the best interests of the Owner.

.7 Notify the Architect of any project conditions which affect vibration isolation system installation or performance and which are found to be different from conditions indicated by the drawings or described by the specifications. Should vibration isolation system installation proceed without such notifications any remedial work required to achieve proper isolator performance shall be accomplished by the Contractor at no additional cost to the Owner.

.8 Be alert for possible "short-circuiting" of vibration isolation systems by piping supports, electrical connections, temperature control connections, drain lines, building construction, etc., and notify the involved contractor as to these problems or potential problems. Where such situations cannot be easily resolved, notify the Architect so that preventive or remedial action can take place on a timely basis. Any remedial measures required shall be undertaken by the contractor responsible at no additional cost to the Owner.

1.5 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance with Section 01 74 00 - Cleaning and Waste Management.

2 Products

2.1 GENERAL

.1 Size and shape of bases type and performance of vibration isolation as indicated.

2.2 ELASTOMERIC PADS

.1 Type EP1 - neoprene waffle or ribbed; 9mm minimum thick; 50 durometer; maximum

loading 350 kPa.

.2 Type EP2 - rubber waffle or ribbed; 9 mm minimum thick; 30 durometer natural rubber; maximum loading 415 kPa.

.3 Type EP3 - neoprene-steel-neoprene; 9mm minimum thick neoprene bonded to 1.71mm steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa.

.4 Type EP4 - rubber-steel-rubber; 9 mm minimum thick rubber bonded to 1.71 mm steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa.

2.3 ELASTOMERIC MOUNTS

.1 Type M1 - colour coded; neoprene in shear; maximum durometer of 60; threaded insert and two bolt-down holes; ribbed top and bottom surfaces.

2.4 SPRINGS

.1 Design stable springs: ratio of lateral to axial stiffness is equal to or greater than 1.2 times ratio of static deflection to working height. Select for 50% travel beyond rated load. Units complete with leveling devices.

.2 Ratio of height when loaded to diameter of spring between 0.8 to 1.0.

.3 Cadmium plate for outdoor installations, 100% relative humidity.

.4 Colour code springs.

2.5 HANGERS

.1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30 degrees arc without metal to metal contact.

.2 Type H1 - neoprene - in-shear, molded with rod isolation bushing which passes through hanger box.

.3 Type H2 - stable spring, elastomeric washer, cup with molded isolation bushing which passes through hanger box.

.4 Type H3 - stable spring, elastomeric element with precompression washer and nut with deflection indicator.

.5 Acceptable material: Korfund, Masdom, Vibron, Vibro Acoustics, Mason.

2.6 SEISMIC CONTROL MEASURES

.1 General:

.1 Following systems and/or equipment to remain operational during and after earthquakes:

.1 Air Distribution Boxes
.2 Air Separators
.3 Boilers
.4 Ductwork
.5 Piping (all types)
.6 Switch Gear
.7 Unit Heaters
.8 Water Heaters
.9 Fans All Types

.2 Seismic control systems to work in every direction.

.3 Fasteners and attachment points to resist same maximum load as seismic restraint.

.4 Drilled or power driven anchors and fasteners not permitted.

.5 No equipment, equipment supports or mounts to fail before failure of structure.

.6 Supports of cast iron or threaded pipe not permitted.

.7 Seismic control measures not to interfere with integrity of firestopping.

.2 Static equipment:

.1 Anchor equipment to equipment supports. Anchor equipment supports to structure.

.2 Suspended equipment:

.1 Use one or more of following methods depending upon site conditions:

.1 Install tight to structure.

.2 Cross brace in every direction.

.3 Brace back to structure.

.4 Cable restraint system.

.3 Seismic restraints:

.1 Cushioning action gentle and steady.

.2 Never reach metal-like stiffness.

.3 Vibration isolated equipment:

.1 Seismic control measures not to jeopardize noise and vibration isolation systems. Provide 6 to 9 mm clearance during normal operation of equipment and systems between seismic restraint and equipment.

.2 Incorporate seismic restraints into vibration isolation system to resist complete isolator unloading.

.3 As indicated.

.4 Piping systems:

.1 Fire protection systems: to NFPA 13.

.2 Piping systems: hangers longer than 300 mm; brace at each hanger.

.3 Compatible with requirements for anchoring and guiding of piping systems.

.5 Bracing methods:

.1 Approved by Consultant.

.2 Structural angles or channels.

.3 Cable restraint system incorporating grommets, shackles and other hardware to ensure alignment of restraints and to avoid bending of cables at connection points. Incorporate neoprene into cable connections to reduce shock loads.

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 datasheet.

3.2 INSTALLATION

.1 Seismic control measures to meet requirements of NBC (delete this where seismic control measures are not required on project).

.2 Install vibration isolation equipment in accordance with manufacturers instructions and adjust mountings to level equipment.

.3 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.

.4 Unless indicated otherwise, support piping connected to isolated equipment with spring mounts or spring hangers with 25 mm minimum static deflection as follows:

.1 Up to NPS4: first 3 points of support. NPS5 to NPS8: first 4 points of support. NPS10 and over.

.2 First point of support: static deflection of twice deflection of isolated equipment,

but not more than 50 mm.

.5 Where isolation is bolted to floor use vibration isolation rubber washers.

.6 Block and shim level bases so that ductwork and piping connections can be made to rigid system at operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Arrange with manufacturer's representative to review work of this Section and submit written reports to verify compliance with Contract Documents.

.1 Manufacturer's Field Services: consisting of product use recommendations and site visits for inspection of product installation in accordance with manufacturer's instructions.

.2 Submit reports to Consultant within 3 days of manufacturer representative's final review.

.2 Make adjustments and corrections in accordance with written report.

.2 Inspection and Certification:

.1 Experienced and competent sound and vibration testing professional engineer to take vibration measurement for HVAC systems after start up and TAB of systems to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.2 Take vibration measurements for equipment as indicated.

.3 Provide Consultant with notice 24 h in advance of commencement of tests.

.4 Establish adequacy of equipment isolation and acceptability of noise levels in occupied areas and where appropriate, remedial recommendations (including sound curves).

.5 Submit complete report of test results including sound curves.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Management.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 09 91 00 - Painting.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.
- .2 CAN/CGSB-24.3-92, Identification of Piping Systems.

.2 National Fire Protection Association (NFPA)
- .1 NFPA 13-2002, Standard for the Installation of Sprinkler Systems.
- .2 NFPA 14-2003, Standard for the Installation of Standpipe and Hose Systems.

1.3 SUBMITTALS

.1 Product Data:
- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data to include paint colour chips, other products specified in this section.
- .3 Samples:
  - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.4 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.2 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:
- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .2 Dispose of unused paint material at official hazardous material collections site approved by Owner's Representative.
- .3 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:
.1 Equipment: manufacturer's name, model, size, serial number, capacity.
.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:
.1 Hazardous: red letters, white background.
.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
.2 Construction:
.1 3 mm thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.
.3 Sizes:
.1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.
.4 Locations:
.1 Terminal cabinets, control panels: use #5.
.2 Equipment in Mechanical Rooms: use #9.

2.3 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.
.2 Where existing identification system does not cover for new work, use identification system specified this section.
.3 Before starting work, obtain written approval of identification system from Consultant.

2.4 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:
.1 Sprinklers: to NFPA 13.

2.5 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
.2 Pictograms:
.1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.
.3 Legend:
.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.
.4 Arrows showing direction of flow:
.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.

.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.

.3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 Other pipes: pressure sensitive plastic-coated cloth with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.

.7 Colours and Legends:

.1 Where not listed, obtain direction from Owner's Representative.

.2 Colours for legends, arrows: to following table:

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

.3 Background colour marking and legends for piping systems:

Contents	Background colour marking	Legend
City water	Green	CITY WATER
Treated water	Green	TREATED WATER
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
High temp HW Htg supply	Yellow	HTHW HTG. SUPPLY++
High temp HW Htg return	Yellow	HTHW HTG. RETURN++
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HWS recirculation	Green	DOM. HW CIRC
Dom. cold water supply	Green	DOM. CWS
Storm water	Green	STORM
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
No. ___ fuel oil suction	Yellow	#___ FUEL OIL
No. ___ fuel oil return	Yellow	# ___ FUEL OIL
Fire protection water	Red	FIRE PROT. WTR
Sprinklers	Red	SPRINKLERS

**Add design temperature

++Add design temperature and pressure

2.6 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stenciled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or coordinated with base colour to ensure strong contrast.

.3 Identify Systems: eg Supply AHU-1, Exhaust EF-1

2.7 VALVES, CONTROLLERS

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules

with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.8 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position, component ID name.

2.9 LANGUAGE

.1 Identification in English.

.2 Use one nameplate and label for each language.

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 datasheet.

3.2 TIMING

.1 Provide identification only after painting specified Section 09 91 23 - Interior Painting has been completed.

3.3 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and CSA registration plates as required by respective agency.

3.4 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:

.1 Do not paint, insulate or cover in any way.

3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access

points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.6 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Consultant. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

3.7 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Management.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 General

1.1 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB to Consultant within 90 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience. TAB Contractor shall have a minimum of five (5) years experience to AABC, NBC, NEBB or SMACNA

.3 TAB: performed in accordance with the requirements of Standard under which TAB Firm's qualifications are approved:

.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1.

.2 National Balancing Council (NBC) Certified Air Balancing Specifications and Certified Hydronic Balancing Specifications.

.3 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.

.4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing.

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.2 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads

.2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.3 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.4 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.5 PRE-TAB REVIEW

.1 Review contract documents before project construction is started confirm in writing to Consultant adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Consultant in writing proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.6 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.7 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by Consultant for verification of TAB reports.

1.8 START OF TAB

.1 Notify Consultant seven (7) days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.1 Installation of ceilings, doors, windows, other construction affecting TAB.

.2 Application of weatherstripping, sealing, and caulking.

.3 Pressure, leakage, other tests specified elsewhere Division 23.

.4 Provisions for TAB installed and operational.

.3 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:

.1 Proper thermal overload protection in place for electrical equipment.

.2 Air systems:

.1 Filters in place, clean.

.2 Duct systems clean.

.3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.

.4 Correct fan rotation.

.5 Fire, smoke, volume control dampers installed and open.

.6 Coil fins combed, clean.

.7 Access doors, installed, closed.

.8 Outlets installed, volume control dampers open.

.3 Liquid Systems:

.1 Flushed, filled, vented.

.2 Correct pump rotation.

.3 Strainers in place, baskets clean.

.4 Isolation and balancing valves installed and open.

.5 Calibrated balancing valve installed at factory settings.

.6 Chemical treatment systems complete, operational.

1.9 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1 Other HVAC Systems: plus 5%, minus 5%.

.2 Hydronic Systems: plus or minus 10%.

1.10 ACCURACY TOLERANCES

.1 Measured values accurate to within plus or minus 2 % of actual values.

1.11 INSTRUMENTS

.1 Prior to TAB, submit to Consultant list of instruments used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 3 months of TAB. Provide certificate of calibration to Consultant.

1.12 SUBMITTALS

.1 Submit, prior to commencement of TAB:

.1 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.13 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of Consultant, prior to submission of formal TAB report, sample of rough TAB sheets. Include:

.1 Details of instruments used.

.2 Details of TAB procedures employed.

.3 Calculations procedures.

.4 Summaries.

1.14 TAB REPORT

.1 Format in accordance with referenced standard.

.2 TAB report to show results in SI units and to include:

.1 Project record drawings.

.2 System schematics.

.3 Submit three (3) copies of TAB Report to Consultant for verification and approval, in English in D-ring binders, complete with index tabs.

1.15 VERIFICATION

.1 Reported results subject to verification by Consultant.

.2 Provide personnel and instrumentation to verify up to 30 % of reported results.

.3 Number and location of verified results as directed by Consultant.

.4 Pay costs to repeat TAB as required to satisfaction of Consultant.

1.16 SETTINGS

.1 After TAB is completed to satisfaction of Consultant, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.17 COMPLETION OF TAB

.1 TAB considered complete when final TAB Report received and approved by Consultant.

1.18 AIR SYSTEMS

.1 Standard: TAB to most stringent of this section.

.2 Do TAB of systems, equipment, components, controls specified in other Divisions.

.3 Qualifications: personnel performing to be qualified to Standards of AABC, NBC or NEBB.

.4 Quality assurance: perform TAB under direction of supervisor qualified to Standards of AABC, NBC, or NEBB.

.5 Measurements: to include as appropriate for systems, equipment, components, controls:
- .1 Air velocity
- .2 Static pressure
- .3 Flow rate
- .4 Pressure drop (or loss)
- .5 Temperatures (dry bulb, wet bulb, dewpoint)
- .6 Duct cross-sectional area
- .7 RPM
- .8 Electrical power
- .9 Voltage
- .10 Noise
- .11 Vibration
- .12 Amperage and volts for each stage of electric heating coils.

.6 Locations of equipment measurements: to include but not be limited to, following as appropriate:
- .1 Inlet and outlet of dampers
- .2 Filter
- .3 Coil
- .4 Humidifier
- .5 Fan
- .6 Other equipment causing changes in conditions.
- .7 Controllers.
- .8 Controlled device.

.7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.19 HYDRONIC SYSTEMS

.1 Definitions: for purposes of this section, to include low pressure hot water heating, chilled water, condenser water, glycol systems.

.2 Standard: TAB to be to most stringent of TAB standards of AABC, NBC or NEBB.

.3 Do TAB of systems, equipment, components, controls specified in other Divisions.

.4 Qualifications: personnel performing TAB to be qualified to standards of AABC, NBC or NEBB.

.5 Quality assurance: perform TAB under direction of supervisor qualified to standards of AABC, NBC or NEBB.

.6 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls:
- .1 Flow rate
- .2 Static pressure
- .3 Pressure drop (or loss)
- .4 Temperature
- .5 Specific gravity
- .6 Density
- .7 RPM
- .8 Electrical power
- .9 Voltage
- .10 Noise
- .11 Vibration

.7 Locations of equipment measurement: to include, but not limited to, following as appropriate:

.1 Inlet and outlet of heat exchangers (primary and secondary sides)
.2 Boiler
.3 Coil
.4 Pump
.5 PRV
.6 Control valve
.7 Other equipment causing changes in conditions
.8 At controllers
.9 Controlled device

.8 Locations of systems measurements to include, but not limited to, following as appropriate: supply and return of primary and secondary loops (main, main branch, branch, sub-branch) of all hydronic systems, inlet connection of make-up water.

1.20 DOMESTIC WATER SYSTEMS

.1 Meet requirements as specified for hydronic systems.

.2 Locations of equipment measurements: to include, but not limited to, following as appropriate: inlet and outlet heaters, tank, pump, circulator, at controllers, controlled device.

.3 Locations of systems measurements to include, but not limited to, following as appropriate: main, main branch, branch, sub-branch.

1.21 OTHER SYSTEMS

.1 Plumbing systems:
.1 Standard: National Plumbing Code.
.2 TAB procedures:
.1 Flush valves: adjust to suit project pressure conditions.
.2 Pressure booster systems: test for capacity and pressures under all conditions and at all times.
.3 Controlled flow roof drain systems: adjust weirs to suit actual roof conditions, slopes, areas drained.
.4 Pumped sanitary and storm water systems: test for proper operation at all possible flow rates.
.5 Pressure reducing station.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- .1 ANSI/ASHRAE/IESNA 90.1-, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials International, (ASTM)
- .1 ASTM B209M-, Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).
- .2 ASTM C335-, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
- .3 ASTM C411-, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
- .4 ASTM C449/C449M-, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
- .5 ASTM C547-, Specification for Mineral Fiber Pipe Insulation.
- .6 ASTM C553-, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- .7 ASTM C612-, Specification for Mineral Fiber Block and Board Thermal Insulation.
- .8 ASTM C795-, Specification for Thermal Insulation for Use with Austenitic Stainless Steel.
- .9 ASTM C921-, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.3 Canadian General Standards Board (CGSB)
- .1 CGSB 51-GP-52Ma-, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (R1999).

.5 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S102-, Surface Burning Characteristics of Building Materials and Assemblies.
- .2 CAN/ULC-S701-, Thermal Insulation Polyotrene, Boards and Pipe Covering.

1.3 DEFINITIONS

.1 For purposes of this section:
- .1 "CONCEALED" - means any work which is installed in suspended ceilings (accessible or non-accessible), attics and non-accessible chases and furred-in spaces.
- .2 "EXPOSED" - means any work which is not concealed in walls, shafts, or above accessible or non-accessible ceilings. Work behind doors, in closets, in cupboards, or under counters is considered exposed.
- .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.

.2 TIAC Codes:
- .1 CRD: Commercial Round Ductwork,
- .2 CRF: Commercial Rectangular Finish,
- .3 CEF: Commercial Rigid Insulation External Application.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

1.5 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix typewritten label beneath sample indicating service.

1.6 MANUFACTURERS' INSTRUCTIONS

.1 Submit manufacturer's installation instructions in accordance with Section 01 33 00 - Submittal Procedures.

.2 Installation instructions to include procedures used, and installation standards achieved.

1.7 QUALIFICATIONS

.1 Installer: specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project, qualified to TIAC standards.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Protect from weather and construction traffic.

.3 Protect against damage from any source.

.4 Store at temperatures and conditions recommended by manufacturer.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 00 - Cleaning & Waste Management.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Consultant.

.5 Divert unused adhesive material from landfill to official hazardous material collections site approved by Consultant.

.6 Do not dispose of unused adhesive materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, with factory applied vapour

retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).

.4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).

.1 Mineral fibre: to ASTM C553.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to ASTM C553.

2.3 JACKETS

.1 Canvas:

.1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.2 Lagging adhesive: Compatible with insulation.

.3 Aluminum:

.1 To ASTM B209 with moisture barrier as per attached Ductwork Insulation Schedule.

.2 Thickness: 0.40 mm sheet.

.3 Finish: Smooth.

.4 Jacket banding and mechanical seals: 12 mm wide, 0.5 mm thick stainless steel.

.1 Stainless steel:

.5 Type: 304.

.6 Thickness: 0.25 mm sheet.

.7 Finish: Smooth.

.8 Jacket banding and mechanical seals: 12 mm wide, 0.5 mm thick stainless steel.

.4 Self-adhesive weather barrier membranes shall be considered an alternate jacketing on all exterior ductwork, except high temperature ducts (i.e. grease exhaust ducts). Any exterior ductwork with this alternate shall be installed with 0% leakage.

.1 Acceptable material: Bakor Foilskin.

2.4 ACCESSORIES

.1 Vapour retarder lap adhesive:

.1 Water based, fire retardant type, compatible with insulation.

.2 Indoor Vapour Retarder Finish:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.

.4 ULC Listed Canvas Jacket:

.1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.5 Outdoor Vapour Retarder Mastic:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m².

.6 Tape: self-adhesive, aluminum, reinforced, 75 mm wide minimum.

.7 Contact adhesive: quick-setting

.8 Canvas adhesive: washable.

.9 Tie wire: 1.5 mm stainless steel.

.10 Banding: 12 mm wide, 0.5 mm thick stainless steel.

.11 Facing: 25 mm galvanized steel hexagonal wire mesh stitched on one face of insulation.

.12 Fasteners: 4 mm diameter pins with 35 mm diameter clips, length to suit thickness of insulation.

3 Execution

3.1 PRE-INSTALLATION REQUIREMENTS

.1 Pressure testing of ductwork systems complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

3.2 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturers instructions and as indicated.

.3 Use two layers with staggered joints when required nominal thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Hangers, supports to be outside vapour retarder jacket.

.5 Supports, Hangers in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.6 Fasteners: At 300 mm oc in horizontal and vertical directions, minimum two rows each side.

3.3 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thickness: Conform to following Table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and dual temperature supply air ducts (exposed)	C-1	yes	50
Round cold and dual temperature supply air ducts (concealed)	C-2	yes	50
Rectangular warm air ducts (exposed)	C-1	no	25
Round warm air ducts (exposed)	C-1	no	25
Rectangular cold and dual temperature supply air ducts (concealed)	C-2	yes	50
Round cold and dual temperature supply air ducts (exposed)	C-1	yes	50
Rectangular warm air ducts (concealed)	C-2	no	25
Round warm air ducts (concealed)	C-2	no	25
Outside air ducts to mixing plenum	C-1	yes	50
Mixing Plenums	C-1	yes	25

Exhaust duct between dampers and louvers	C-1	no	50
Rectangular ducts outside	C-1	special	50
Round ducts outside	C-1	special	50
Acoustically lined ducts	See Section 23 33 53 - Duct Liners		

.1 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:
.1 Use TIAC code C-1 insulation, scored to suit diameter of duct.

.2 Finishes: Conform to following table:

	TIAC Code	
	Rectangular	Round
Indoor, concealed	None	none
Indoor, exposed within mechanical room	CRF/1	CRD/2
Indoor, exposed elsewhere	CRF/2	CRD/3
Outdoor, exposed to precipitation	CRF/3	CRD/4
Outdoor, elsewhere	CRF/4	CRD/5

.3 For the purposes of this specification ducts shall be considered as follows:
.1 Exhaust ductwork (from diffuser to HVAC unit) - warm air duct, and may be uninsulated. (Does not include high-temperature duct from kitchens, or specialty exhaust).
.2 Return Air Ductwork (from diffuser to HVAC unit) - warm air duct, and may be uninsulated.
.3 Supply Air Ductwork (from HVAC unit to diffuser) - Dual temperature duct.
.4 Outdoor Air Ductwork (from louvre/intake to HVAC unit - Dual Temperature duct.
.5 Exhaust Air Ductwork (from HVAC unit to exhaust louvre) - Dual Temperature duct.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.2 Section 23 05 52 - Mechanical Identification.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE/IESNA 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials (ASTM International)

.1 ASTM B209M, Specification for Aluminum and Aluminum Alloy Sheet and Plate.

.2 ASTM C335, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C411, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449/C449M, Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C533, Specification for Calcium Silicate Block and Pipe Thermal Insulation.

.6 ASTM C547, Specification for Mineral Fiber Pipe Insulation.

.7 ASTM C553, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.8 ASTM C612, Specification for Mineral Fiber Block and Board Thermal Insulation.

.9 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.10 ASTM C921, Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma, Vapor Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.2 CGSB 51-GP-53M, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts.

.4 Thermal Insulation Association of Canada (TIAC)

.1 National Insulation Standards.

.5 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

.6 National Energy Code of Canada for Buildings (NECB).

1.3 PRODUCT DATA

.1 Submit Product Data in accordance with Section 01 33 00 - Submittal Procedures.

1.4 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix typewritten label beneath sample indicating service.

1.5 MANUFACTURER'S INSTRUCTIONS

.1 Submit manufacturer's installation instructions in accordance with 01 33 00 - Submittal

Procedures.

.2 Installation instructions to include procedures to be used, installation standards to be achieved.

1.6 QUALIFICATIONS

.1 Installer to be specialist in performing work of this section, and have at least three (3) years successful experience in this size and type of project, qualified to standards of TIAC.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.

.2 Protect from weather and construction traffic.

.3 Protect against damage from any source.

.4 Store at temperatures and conditions recommended by manufacturer.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 00 - Cleaning and Waste Management.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Consultant.

.5 Divert unused adhesive materials from landfill to official hazardous material collections site approved by Consultant.

.6 Do not dispose of unused adhesive materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre: includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code A-1: Rigid moulded mineral fibre without factory applied vapour retarder jacket.

.1 Mineral fibre: ASTM C547.

.2 Maximum "k" factor: ASTM C547.

.4 TIAC Code A-3: Rigid moulded mineral fibre with factory applied vapour retarder jacket.

.1 Mineral fibre: ASTM C547.

.2 Jacket: to CGSB 1-GP-52Ma.

.3 Maximum "k" factor: ASTM C547.

.5 TIAC Code C-1: Rigid mineral fibre board, unfaced.

.1 Mineral fibre: ASTM C612.

.2 Maximum "k" factor: ASTM C612.

.6 TIAC Code C-4: Rigid mineral fibre board faced with factory applied vapour retarder jacket.
- .1 Mineral fibre: ASTM C612.
- .2 Jacket: to CGSB51-GP-52Ma.
- .3 Maximum "k" factor: ASTM C612.

.7 TIAC Code C-2: Mineral fibre blanket unfaced or faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).
- .1 Mineral fibre: ASTM C553.
- .2 Jacket: to CGSB 51-GP-52Ma.
- .3 Maximum "k" factor: ASTM C553.

.8 TIAC Code A.6: Flexible unicellular tubular elastomer.
- .1 Insulation: with vapour retarder jacket.
- .2 Jacket: to CGSB 51-GP-52Ma.
- .3 Maximum "k" factor.
- .4 Certified by manufacturer free of potential stress corrosion cracking corrodants.

.9 TIAC Code A-2: Rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.
- .1 Insulation: ASTM C533.
- .2 Maximum "k" factor: ASTM C533.
- .3 Design to permit periodic removal and re-installation.

2.3 CEMENT

.1 Thermal insulating and finish
- .1 To: ASTM C449/C449M.
- .2 Hydraulic setting on mineral wool, to ASTM C449.

2.4 JACKETS

.1 Polyvinyl Chloride (PVC):
- .1 One-piece moulded type and sheet to CGSB 51-GP-53M with pre-formed shapes as required.
- .2 Colours: to match adjacent finish paint.
- .3 Minimum service temperatures: -20°C.
- .4 Maximum service temperature: 65°C.
- .5 Moisture vapour transmission: 0.02 perm.
- .6 Thickness: 0.56 mm.
- .7 Fastenings:
  - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
  - .2 Tacks.
  - .3 Pressure sensitive vinyl tape of matching colour.
- .8 Special requirements:
  - .1 Indoor: Flame spread rating 25, smoke developed 50.
  - .2 Outdoor: UV rated material at least 0.5 mm thick.
- .9 Covering adhesive: Compatible with insulation.

.2 ABS Plastic:
- .1 One-piece moulded type and sheet with pre-formed shapes as required.
- .2 Colours: to match adjacent finish paint.
- .3 Minimum service temperatures: -40°C.
- .4 Maximum service temperature: 82°C.
- .5 Moisture vapour transmission: 0.012 perm.

.6 Thickness: 0.75 mm.
.7 Fastenings:
.1 Solvent weld adhesive compatible with insulation to seal laps and joints
.2 Tacks.
.3 Pressure sensitive vinyl tape of matching colour.
.8 Locations:
.1 For outdoor use ONLY.

.3 Canvas:
.1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
.2 Lagging adhesive: Compatible with insulation.

.4 Aluminum:
.1 To ASTM B209.
.2 Thickness: 0.50 mm sheet.
.3 Finish: Smooth.
.4 Joining: Longitudinal and circumferential slip joints with 50 mm laps.
.5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
.6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

.5 Stainless steel:
.1 Type: 304 or 316.
.2 Thickness: 0.25 mm.
.3 Finish: Smooth.
.4 Joining: Longitudinal and circumferential slip joints with 50 mm laps.
.5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
.6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

2.5 REMOVABLE INSULATION COVERS

.1 General:
.1 All Covers shall be sewn, stapled or "hog-ringed" covers shall not be acceptable.
.2 Covers shall conform to the configuration of the items being insulated.
.3 Covers shall include openings for all protrusions such as pipes, packing glands on valves and expansion joints, hangers, supports, instrument lines, and other appurtenances.
.4 Covers shall be designed so that no force bending or folding of the cover is necessary for installation.
.5 Minimum 50 mm wide flaps at terminal ends are to be provided to overlap adjacent covers to ensure a good heat seal.
.6 Parting seems shall be at the installed low points (gravitational bottom) of the cover to allow drainage without the use of weep tubes or grommets.
.7 Valve bonnets are to be covered, but packing glands shall remain exposed.
.8 Valve covers are to be designed such that the bonnet section is sewn to the body section. For larger valves, the cover may be fabricated in two sections, each section containing one half of the valve body bonnet.
.9 Covers with a weight of 18.1 Kg or less are to be fabricated in one piece.
.10 Covers with a weight of more than 18.1 Kg are to be fabricated in more than one piece.

.2 Insulation Core:

.1 The insulation core shall be fabricated in one piece, wherever possible.

.2 To prevent insulation settlement, the insulation core shall be secured within the jacket through the weather barrier (outer jacketing), the insulation, and the liner (inner jacketing).

.3 Insulating cores with more than one piece shall have staggered joints to prevent hot spots and heat loss. The joint edges shall be butted together and extra securement provided at those edges.

.4 Insulation core shall be comprised of 50 mm thick fiberglass insulation of non-combustible wool with resilient inorganic glass fibers bonded with a thermosetting resin. Insulation density to be 38 Kg/m3. Insulation thermal conductivity to be 0.044W/m. deg C at a mean temperature of 100 deg C.

.3 Jacket:

.1 The jacket shall be fabricated in one piece, wherever possible.

.2 Gusset walls shall be required for covers with core insulation thickness in excess of 25 mm.

.3 All seams, except the final closing seam, shall be inside seams. The jackets are to be sewn inside out, then turned correct side out before inserting the insulation core. The final closing seam shall be sewn on the exterior of the jacket. Seams shall be sewn with Teflon coated fiberglass thread or Kevlar coated stainless steel thread.

.4 Machine stitching shall be used for all sewing. Sewing shall be 6-8 stitches per centimeter.

.5 Draw cords are to be placed along the outer edge of the flap and the outer edge of the flap then rolled back inside and double stitched.

.6 Draw cords are to be of sufficient length to allow 150 mm of cords to protrude from each side of the flap.

.7 The inner and outer jacket shall be comprised of a fiberglass fabric impregnated with silicone rubber. The silicone rubber shall be flame retardant and suitable for high temperature usage. Outer jacket density shall be 595 gms/m².

.4 Securement devices:

.1 The securement belts and D-ring belts shall be of the same material as the weather barrier (exterior jacket).

.2 The belts shall be placed 50 mm back from the parting seams and on 150 mm centers.

.3 Fire retardant Velcro shall be used to fasten the securement belt to the weather barrier after the belt passed through the Stainless Steel D-rings.

.5 Identification tags:

.1 Each cover shall be identified by a permanently attached stainless steel tag.

.2 An identification legend shall be mechanically embossed into the tag.

.3 The tags shall be located in the same areas on similar type covers.

.4 Should a cover require more than one piece for its construction, each piece to be identified and numbered (i.e. 1 or 3)

.5 Each tag shall include at least the following information, but may also include any pertinent information required by the end user.

.1 Type of item being covered.

.2 Location of item.

.3 Recording and tracking information.

.6 Warranty:

.1 Provide a 5-year product Warranty

.7 Acceptable material:

.1 Advanced Industrial Systems Inc., Thermo Help Canada Inc., Advanced

Thermal Corp., Island Thermal Innovations.

2.6 INSULATION SECUREMENTS

.1 Tape: Self-adhesive, aluminum, plain, 50 mm wide minimum.
.2 Contact adhesive: Quick setting.
.3 Canvas adhesive: Washable.
.4 Tie wire: 1.5 mm diameter stainless steel.
.5 Bands: Stainless steel, 19 mm wide, 0.5 mm thick.
.6 Facing: 25 mm galvanized steel hexagonal wire mesh on one face of insulation.
.7 Fasteners: 2 mm diameter pins with 35 mm diameter clips. Length of pin to suit thickness of insulation.

2.7 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.8 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.9 OUTDOOR VAPOUR RETARDER MASTIC

.1 Vinyl emulsion type acrylic, compatible with insulation.
.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m².

3 Execution

3.1 PRE- INSTALLATION REQUIREMENTS

.1 Pressure testing of equipment and adjacent piping systems complete, witnessed and certified.
.2 Surfaces clean, dry, free from foreign material.

3.2 INSTALLATION

.1 Install in accordance with TIAC National Standards
  .1 Hot equipment: To TIAC code 1503-H.
  .2 Cold equipment: to TIAC code 1503-C or 1503-CA.
.2 Elastomeric Insulation: to remain dry. Overlaps to manufacturer's instructions. Joints tight and sealed properly.
.3 Provide vapour retarder as recommended by manufacturer.
.4 Apply materials in accordance with insulation and equipment manufacturer's instructions and this specification.
.5 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
.6 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
  .1 Hangers, supports outside vapour retarder jacket.
.7 Supports, Hangers:
  .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.3 EQUIPMENT INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
.2 Hot Equipment:
  .1 TIAC code A-1 or C-1 mechanical fastenings or wire or bands and 13 cement reinforced with one layer of reinforcing mesh.
  .2 TIAC code A-2 with 25 mm air gap, mechanical fastenings or wire or bands and

13 mm cement reinforced with one layer of reinforcing mesh.

.3 TIAC code C-2 unfaced with wire and 13 mm cement precede by one layer of reinforcing mesh.

.4 Thicknesses:

.1 Domestic hot water storage tanks: 50mm.

.2 Air Separators: 50mm.

.3 Heat exchangers: 50mm (shell tube and plate exchangers)

.4 Steam condensate receivers: 50mm

.5 Dearator-feedwater heaters: 50mm

.6 Expansion tanks: 50mm

.7 Hot water buffer tanks: 50mm.

.3 Breechings, engine exhausts and mufflers:

.1 TIAC code A-2 with 25 mm air gap, mechanical fastenings and 13 mm cement reinforced with one layer of reinforcing mesh.

.4 Cold equipment:

.1 TIAC A-3 or C-4 with mechanical fastenings, wire or bands and 13 mm cement reinforced with one layer of reinforcing mesh.

.2 TIAC C-2 faced with vapour retardant jacket with wire or bands and 13mm cement preceded by one layer of reinforcing mesh.

.3 TIAC A-6 or C-4 with mechanical fastenings, wire, bands or adhesive.

.4 Thicknesses:

.1 Chillers (except factory insulated): A-3, A-6 or C-4, 50 mm.

.2 Expansion tanks: A-3, A-6 or C-4, 50mm

.3 Air Separators: A-3, A-6 or C-4, 50mm

.4 Heat exchangers (shell tube and plate): A-3, A-6 or C-4, 50mm.

.5 Chilled water buffer tanks: A-3, A-6 or C-4, 50 mm.

.5 Finishes:

.1 Equipment in mechanical rooms: TIAC code CEF/1 with aluminum jacket.

.2 Equipment elsewhere: TIAC code CEF/2 with 13 mm cement jacket.

3.4 REMOVABLE INSULATION COVERS

.1 Installation to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

.2 Removable insulation covers shall be provided for the following:

.1 Domestic hot water service pump assemblies.

.2 Hydronic heating system pump assemblies; - pumps, suction diffusers, triple duty valves.

.3 Hydronic heating valves NPS 2 1/2 and larger -gate, globe and butterfly.

.4 Hydronic flex connections, expansion joints.

.5 Balancing valves NPS 2 1/2 and above.

.6 Two-Way Control valves NPS 2 1/2 and larger.

.7 Three-Way Control valves NPS 2 1/2 and larger.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 22 11 18 - Domestic Water Piping Copper & PEX.
.2 Section 22 42 01 - Plumbing Specialties and Accessories.
.3 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
.4 Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.
.5 Section 23 11 13 - Facility Fuel-oil Piping.
.6 Section 23 21 13 - Hydronic Systems: Steel.
.7 Section 23 23 00 - Copper Tubing and Fittings Refrigerant.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
  .1 ASTM E202-04, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

1.3 CLEANING AND START-UP OF MECHANICAL PIPING SYSTEMS

.1 In accordance with Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

1.4 HYDRONIC SYSTEMS - PERFORMANCE VERIFICATION (PV)

.1 Perform hydronic systems performance verification after cleaning is completed and system is in full operation.
.2 When systems are operational, perform following tests:
  .1 Conduct full scale tests at maximum design flow rates, temperatures and pressures for continuous consecutive period of 48 hours to demonstrate compliance with design criteria.
  .2 Verify performance of hydronic system circulating pumps as specified in relevant technical sections, recording system pressures, temperatures, fluctuations by simulating maximum design conditions and varying.
    .1 Pump operation.
    .2 Boiler operation.
    .3 Pressure bypass open/closed.
    .4 Control pressure failure.
    .5 Maximum heating demand.
    .6 Boiler and/or chiller failure.
    .7 Outdoor reset. Re-check heat exchanger output supply temperature at 100% and 50% reset, maximum water temperature.

1.5 HYDRONIC SYSTEM CAPACITY TEST

.1 Perform hydronic system capacity tests after:
  .1 TAB has been completed
  .2 Verification of operating, limit, safety controls.
  .3 Verification of primary and secondary pump flow rates.
  .4 Verification of accuracy of temperature and pressure sensors and gauges.
.2 Calculate system capacity at test conditions.
.3 Using manufacturer's published data and calculated capacity at test conditions, extrapolate system capacity at design conditions.
.4 When capacity test is completed, return controls and equipment status to normal operating conditions.
.5 Submit sample of system water to approved testing agency to determine if chemical

treatment is correct. Include cost.

.6 Heating system capacity test:

.1 Perform capacity test when ambient temperature is within 10% of design conditions. Simulate design conditions by:

.1 Increasing OA flow rates through heating coils (in this case, monitor heating coil discharge temperatures to ensure that coils are not subjected to freezing conditions) or

.2 Reducing space temperature by turning of heating system for sufficient period of time before starting testing.

.2 Test procedures:

.1 Open fully heat exchanger, heating coil and radiation control valves.

.2 With boilers on full firing and hot water heating supply temperature stabilized, record flow rates and supply and return temperatures simultaneously.

.3 Conduct flue gas analysis test on boilers at full load and at low fire conditions.

1.6 POTABLE WATER SYSTEMS

.1 When cleaning is completed and system filled:

.1 Verify performance of equipment and systems as specified elsewhere in Division 23.

.2 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or recharge air chambers. Repeat for each outlet and flush valve.

.3 Confirm water quality consistent with supply standards, verifying that no residuals remain resulting from flushing and/or cleaning.

1.7 SANITARY AND STORM DRAINAGE SYSTEMS

.1 Buried systems: perform tests prior to back-filling. Perform hydraulic tests to verify grades and freedom from obstructions.

.2 Ensure that traps are fully and permanently primed.

.3 Ensure that fixtures are properly anchored, connected to system.

.4 Operate flush valves, tank and operate each fixture to verify drainage and no leakage.

.5 Cleanouts: refer to Section 22 42 01 - Plumbing Specialties And Accessories

.6 Roof drains:

.1 Refer to Section 22 42 01 - Plumbing Specialties And Accessories

.2 Remove caps as required.

1.8 REPORTS

.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Reports, supplemented as specified herein.

1.9 TRAINING

.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Training of O&M Personnel, supplemented as specified herein.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.2 Section 23 25 00 - HVAC Water Treatment Systems.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM E202, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Instructions: submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance with Section 01 74 00 - Cleaning and Waste Management.

2 Products

2.1 CLEANING SOLUTIONS

.1 Low-foaming detergent: at all temperatures.

.2 Designed for use on most metals including aluminum.

.3 No pH neutralization required.

.4 Phosphate free.

.5 Biodegradable.

.6 Nitrate Free.

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

datasheet.

3.2 CLEANING HYDRONIC SYSTEMS

.1 Timing: systems operational, hydrostatically tested and with safety devices functional, before cleaning is carried out.

.2 Cleaning Agency:

.1 Retain qualified water treatment specialist to perform system cleaning.

.3 Install instrumentation such as flow meters, orifice plates, pitot tubes, flow metering valves only after cleaning is certified as complete by water treatment specialist.

.4 Cleaning procedures:

.1 Provide detailed report outlining proposed cleaning procedures at least 4 weeks prior to proposed starting date. Report to include:

.1 Cleaning procedures, flow rates, elapsed time.

.2 Chemicals and concentrations used.

.3 Inhibitors and concentrations.

.4 Specific requirements for completion of work.

.5 Special precautions for protecting piping system materials and components.

.6 Complete analysis of water used to ensure water will not damage systems or equipment.

.5 Conditions at time of cleaning of systems:

.1 Systems: free from construction debris, dirt and other foreign material.

.2 Control valves: operational, fully open to ensure that terminal units can be cleaned properly.

.3 Strainers: clean prior to initial fill.

.4 Install temporary filters on pumps not equipped with permanent filters.

.5 Install pressure gauges on strainers to detect plugging.

.6 Report on Completion of Cleaning:

.1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.

.7 Hydronic Systems:

.1 Flush system thoroughly with water, back flush pump, strainers, blow down drain valves and risers to remove loose debris. Remove accumulated sludge in boilers.

.2 Add 2% solution of low foaming detergent to the system through a bypass feeder or another feeding device.

.3 Closed loop systems: circulate system cleaner at 820 degrees C for at least 36 hours. For chiller systems, circulate at least 48 hours at ambient temperature.

.4 During recirculation, back flush strainers, drain valves and risers at their lowest point once every 8 hours.

.5 Drain cleaning water completely.

.6 Fill and drain system several times. Circulate 30 minutes every time system is refilled.

.7 Blend system at secured points until water is clear and non foaming. Clean pump strainers.

.8 Draw a water sample from the system and send it to laboratory for analysis.

.9 If the laboratory report is unsatisfactory, repeat cleaning procedure.

3.3 START-UP OF HYDRONIC SYSTEMS

.1 After cleaning is completed and system is filled:

.1 Establish circulation and expansion tank level, set pressure controls.

.2 Ensure air is removed.
.3 Check pumps to be free from air, debris, possibility of cavitation when system is at design temperature.
.4 Dismantle system pumps used for cleaning, inspect, replace worn parts, install new gaskets and new set of seals.
.5 Clean out strainers repeatedly until system is clean.
.6 Commission water treatment systems as specified in Section 23 25 00 - HVAC Water Treatment Systems.
.7 Check water level in expansion tank with cold water with circulating pumps OFF and again with pumps ON.
.8 Repeat with water at design temperature.
.9 Check pressurization to ensure proper operation and to prevent water hammer, flashing, cavitation. Eliminate water hammer and other noises.
.10 Bring system up to design temperature and pressure slowly over a 48 hour period.
.11 Perform TAB as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
.12 Adjust pipe supports, hangers, springs as necessary.
.13 Monitor pipe movement, performance of expansion joints, loops, guides, anchors.
.14 If sliding type expansion joints bind or if bellows type expansion joints flex incorrectly, shut down system, re-align, repeat start-up procedures.
.15 Re-tighten bolts using torque wrench, to compensate for heat-caused relaxation. Repeat several times during commissioning.
.16 Check operation of drain valves.
.17 Adjust valve stem packings as systems settle down.
.18 Fully open balancing valves (except those that are factory-set).
.19 Check operation of over-temperature protection devices on circulating pumps.
.20 Adjust alignment of piping at pumps to ensure flexibility, adequacy of pipe movement, absence of noise or vibration transmission.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Management.
.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 General

1.1 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.2 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.1 Consultant will make available one (1) copy of systems supplier's installation instructions.

1.3 QUALITY ASSURANCE

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance with Section 01 74 00 - Cleaning and Waste Management.

2 Products

2.1 THERMOSTAT (LINE VOLTAGE, HEATING)

.1 Line voltage wall mounted electric heating thermostat with:

.1 Full load rating: 22 A at 120 V.

.2 Temperature setting range: 5 degrees C to 30 degrees C.

.3 Single pole.

.4 Thermometer range: 5 degrees C to 30 degrees C.

.5 Scale markings: Off-5-10-15-20-25 degrees C.

2.2 THERMOSTAT (LOW VOLTAGE)

.1 Low voltage wall thermostat:

.1 For use on 24 V circuit at 1.5 A capacity.

.2 With heat anticipator adjustable 0.1 to 1.2 A.
.3 Temperature setting range: 10 degrees C to 25 degrees C.
.4 Without sub-base.

2.3 THERMOSTAT (REMOTE BULB)

.1 Line voltage remote bulb type thermostat with:
.1 30 A rating on 120 V.
.2 3 m copper capillary tube.
.3 Moisture and dust-resistant enclosure.

2.4 THERMOSTAT GUARDS

.1 Thermostat guards: lockable, clear, plastic. Slots for air circulation to thermostat.

2.5 HIGH LIMIT TEMPERATURE ALARM

.1 High limit temperature alarm with:
.1 Rating 10 A at 120 V.
.2 Positive lock-out.
.3 Manual reset only after 14 degrees C drop-in temperature.
.4 Cutout setting: 50 degrees C.

2.6 FLOW SWITCH

.1 Flow switch for water or glycol, pipe size as indicated, CSA Enclosure 1, rated at 16 A at 120 V. Maximum liquid temperature: 121 degrees C. Maximum liquid gauge pressure of 1034 kPa ambient temperature range 0 degrees C to 82 degrees C. Ensure flow rate can activate flow switch at its minimum flow setting.

2.7 PRESSURE SWITCH

.1 Pressure switch for water, steam or air at range to suit application with auto reset, contacts open on rise. Maximum allowable gauge pressure of 1.2 MPa. Full load 16 A at 120 V, ULC rated.

2.8 ELECTRIC HEATING RELAYS

.1 Low voltage solid state electric heating relays, installed in ventilated enclosure, recess mounted, complete with power supply. Complete assembly to be CSA approved.
.2 Heating relays complete with integral heat sink, over voltage protection and status LED.
.3 Relay to have veiled conductor connections. No exposed terminals permitted.

2.9 TANK AQUASTAT

.1 Line Voltage heating thermostat with 30A contacts at 120V.
.2 Complete with remote sensing bulb in operable in the 10C to 100C range.
.3 Adjustable dial on faceplate.

2.10 MULTI-BOILER SYSTEM CONTROLLER

.1 Configurable application controller with 3.5" LCD alphanumeric display
.2 Dry contact enable outputs for boiler circulation pumps, boiler enable, boiler % load (for modulating boiler).
.3 Supplied with compatible sensors for required sensory inputs including (but not limited to):
.1 Facility hot water supply temperature.
.2 Boiler water supply temperature.
.3 Facility water return temperature.
.4 Outdoor air temperature.

.5 Boiler water supply header temperature.
.6 Domestic hot water current relay input (domestic hot water priority).
.7 Acceptable material: TEKMAR 284 Series, or approved equal.

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 datasheet.

3.2 INSTALLATION

.1 Install control devices.
.2 On outside wall, mount thermostats on bracket or insulated pad 25 mm from exterior wall.
.3 Install remote sensing device and capillary tube in metallic conduit. Conduit enclosing capillary tube must not touch heater or heating cable.

3.3 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Management.
.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

3.4 MULTI-BOILER SYSTEM CONTROLLER SETUP

.1 Unit to be configured to operate boilers using lead/lag functionality based on runhour rotation.
.2 Controller to start boilers and boiler pumps on a temperature setpoint, lag stage boiler & pump to be energized based on an adjustable time differential.
.3 Boiler heating setpoint to operate on a user-adjustable outdoor air temperature reset, with domestic hot water priority override.
.4 Controller to disable boiler system based on a user selectable warm-weather shutdown value.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 23 05 01 - Installation of Pipework.
.2 Section 23 05 22 - Valves - Bronze.
.3 Section 23 08 01 - Performance Verification of Mechanical Piping Systems.
.4 Section 23 08 02 - Cleaning and Start-Up of Mechanical Piping Systems.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)
  .1 ASME-B16.3-, Malleable-Iron Threaded Fittings.
  .2 ASME-B16.9-, Factory-Made Wrought Steel Buttwelding Fittings.
.2 American Society for Testing and Materials International (ASTM)
  .1 ASTM A47/A47M-, Standard Specification for Ferritic Malleable Iron Castings.
  .2 ASTM A53/A53M-, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
  .3 ASTM B61-, Standard Specification for Steam or Valve Bronze Castings.
  .4 ASTM B75M-, Standard Specification for Seamless Copper Tube.
.3 Canadian Standards Association (CSA International)
  .1 CSA-B139-, Installation Code for Oil Burning Equipment.
  .2 CSA-B140.0-, Oil Burning Equipment: General Requirements.
.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  .1 Material Safety Data Sheets (MSDS).
.5 Manufacturers Standardization Society of the Valve and Fitting Industry (MSS)
  .1 MSS-SP-80-, Bronze Gate, Globe, Angle and Check Valves.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
.2 Product Data:
  .1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.
    .1 Indicate on manufacturer's catalogue literature the following: valves.
.3 Submit WHMIS MSDS. Indicate VOC's for adhesive and solvents during application and curing.
.4 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
.5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.6 Instructions: submit manufacturer's installation instructions.
.7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Health and Safety:
  .1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:
  .1 Separate waste materials for reuse in accordance with Section 01 74 00 -

Cleaning and Waste Management.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).

.4 Separate for reuse and place in designated containers Steel waste in accordance with Waste Management Plan (WMP).

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with Provincial Regulations.

.7 Divert unused metal materials from landfill to metal recycling facility as approved by Consultant.

.8 Unused paint materials must be disposed of at official hazardous material collections site as approved by Consultant.

.9 Unused sealant materials must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

2 Products

2.1 STEEL PIPE COATING

.1 Bituminous (Bitumen) Asphalt Coating: in accordance with manufacturer's recommendations for exterior above ground or galvanized.

.2 Acceptable material: Benjamin Moore Corotech Cold Tar Epoxy V157, Sherwin William Tar Guard Cold Tar Epoxy B69B60 / B69 V60.

2.2 JOINTING MATERIAL

.1 Screwed fittings: teflon tape or pulverized lead paste.

.2 Soldered fittings: 95/5.

2.3 FITTINGS

.1 Steel:

.1 Malleable iron: screwed, banded, Class 150 to ASME-B16.3.

.2 Welding: butt-welding to ASME-B16.9.

.3 Unions: malleable iron, brass to iron, ground seat, screwed, to ASTM A47/A47M.

.4 Nipples: Schedule 40, to ASTM A53/A53M.

.5 Flexible Connections: 1A braided kink-proof flexible connection with woven jacket and oil proof synthetic tube and cover and neoprene liner, shall be used. Supporting wire shall be run the full length of hose. Hose to pipe connectors are to be of the removable metal compression type. Temperature range shall be -40C to 121C.

.2 Copper:

.1 Piping: soldered type.

.2 Connections to equipment: compression.

2.4 GATE VALVES

.1 DN50 and under, screwed bonnet:

.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, solid wedge disc as specified under Section 23 05 22 - Valves - Bronze.

2.5 GLOBE VALVES

.1 DN50 and under, screwed:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, screwed over bonnet, renewable bronze disc as specified under Section 23 05 22 - Valves - Bronze.

.2 Lock shield handles: as indicated.

2.6 BALL VALVES

.1 DN50 and under:

.1 Bronze body, screwed ends, TFE seal, hard chrome ball, 4 MPa, WOG as specified under Section 23 05 22 - Valves - Bronze.

2.7 SWING CHECK VALVES

.1 DN50 and under, screwed:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc suitable for oil service, screw in cap, regrindable seat as specified under Section 23 05 22 - Valves - Bronze.

2.8 LUBRICATED PLUG COCKS

.1 DN50 and under, screwed:

.1 To ASTM B61, Class 150, 1 MPa, bronze body.

2.9 OIL FILTER

.1 Duplex type replaceable cartridge type as recommended by oil burner manufacturer.

.2 Furnish spare filter cartridge.

2.10 FUSIBLE VALVE

.1 Gate or globe type, gate type preferred, with spring and replaceable fusible element at 740 degrees C, also manually operable.

2.11 DE-AERATOR

.1 One-pipe inlet NPT connections, supply outlet, recirculated inlet, dome and float-top de-aeration chamber.

.2 Acceptable Material: SPX Tigerloop, Granby Optifuel

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 datasheet.

3.2 PIPING

.1 Install piping in accordance with Section 23 05 01 - Installation of Pipework, supplemented as specified.

.2 Install oil piping system in accordance with CSA-B139 and CSA-B140.0.

.3 Slope piping down in direction of storage tank unless otherwise indicated.

.4 Suction and return piping inside building:

.1 Steel with screwed fittings in trench below floor or pan on floor, protected by 6mm checkered aluminum plate cover in traffic areas.

.2 Install filter and gate valve and fusible valve at burners.

.3 Where suction line enters building, install union, gate valve, anti-syphon device, fusible valve and cap (for priming purposes).

3.3 VALVES

.1 Install valves with stems upright or horizontal unless approved otherwise by Consultant.

.2 Install ball valves at branch take-offs, to isolate pieces of equipment and as indicated.
.3 Install globe valves for balancing and in by-pass around control valves.
.4 Install swing check valves on discharge of pumps and as indicated.

3.4 OIL FILTERS

.1 Install at pumps and at burners / engines.
.2 At time of acceptance, replace filter cartridge with new.

3.5 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:
  .1 Test system in accordance with CSA-B139 and CSA-B140.0 and authorities having jurisdiction.
  .2 Isolate tanks from piping pressure tests.
  .3 Maintain test pressure during backfilling.
.2 Manufacturer's Field Services:
  .1 Have manufacturer of products, supplied under this Section, review work involved in the handling, installation / application, protection and cleaning of its products and submit written reports, in acceptable format to verify compliance of work with Contract.
  .2 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 Schedule site visits to review work, at stages listed:
    .1 After delivery and storage of products, and when preparatory Work or other Work, on which the work of this Section depends is complete, but before installation begins.
    .2 Twice during process of work at 25% and 60% complete.
    .3 Upon completion of the work, after cleaning is carried out.
  .4 Obtain reports within three (3) working days of review and submit immediately to the Owner's Representative.

3.6 CLEANING

.1 In accordance with Section 23 08 02 - Cleaning and Start-Up of Mechanical Piping Systems, supplemented as specified herein.
.2 Flush after pressure test with number 2 fuel oil for a minimum of two hours. Clean strainers and filters.
.3 Dispose of fuel oil used for flushing out in accordance with requirements of authority having jurisdiction.
.4 Check vents from regulators, control valves are terminated in approved location and are protected against blockage and damage.
.5 Check entire installation is approved by authority having jurisdiction.
.6 Perform cleaning operations in accordance with manufacturer's recommendations.
.7 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 07 92 00 - Joint Sealants.

.2 Section 23 05 54 - Mechanical Identification.

.3 Section 23 07 14 - Thermal Insulation for Equipment.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM B209M, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.

.2 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C533, Calcium Silicate Block and Pipe Thermal Insulation.

.6 ASTM C547, Mineral Fiber Pipe Insulation.

.7 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.8 ASTM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.9 ASTM D184, Standard Specification for Rigid Poly (Vinyl Chloride) (PUC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.2 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.5 Manufacturer's Trade Associations

.1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.

.6 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.3 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings.

.4 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

.7 National Energy Code of Canada for Buildings (NECB).

1.3 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - will mean "not concealed" as specified.

.2 TIAC ss:
.1 CRF: Code Rectangular Finish.
.2 CPF: Code Piping Finish.

1.4 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
.3 Shop Drawings:
.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
.4 Samples:
.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix label beneath sample indicating service.
.5 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.2 Instructions: submit manufacturer's installation instructions to Owner's Representative.

1.5 QUALITY ASSURANCE

.1 Qualifications:
.1 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.
.2 Health and Safety:
.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
.3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
.2 Storage and Protection:
.1 Protect from weather, construction traffic.
.2 Protect against damage.
.3 Store at temperatures and conditions required by manufacturer.
.3 Waste Management and Disposal:
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance with Section 01 74 00 - Cleaning and Waste

Management.

.2 Place excess or unused insulation and insulation accessory materials in designated containers.

.3 Divert unused metal materials from landfill to metal recycling facility approved by Consultant.

.4 Dispose of unused adhesive material at official hazardous material collections site approved by Consultant.

2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102.

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.

.1 Mineral fibre: to CAN/ULC-S702.

.2 Maximum "k" factor: to CAN/ULC-S702.

.4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.

.1 Mineral fibre: to CAN/ULC-S702.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702.

.5 TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).

.1 Mineral fibre: to CAN/ULC-S702.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702.

.6 TIAC Code A-6: flexible unicellular tubular elastomer.

.1 Insulation: with vapour retarder jacket.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: 0.039 w/m - °C

.4 Certified by manufacturer: free of potential stress corrosion cracking corrodants.

.7 TIAC Code A-2: rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.

.1 Insulation: to ASTM C533.

.2 Maximum "k" factor: to 0.75 w/m °C @ 500°c.

.3 Design to permit periodic removal and re-installation.

2.3 INSULATION SECUREMENT

.1 Tape: self-adhesive, aluminum, plain, 50 mm wide minimum.

.2 Contact adhesive: quick setting.

.3 Canvas adhesive: washable.

.4 Tie wire: 1.5 mm diameter stainless steel.

.5 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

2.4 CEMENT

.1 Thermal insulating and finishing cement:
  .1 Hydraulic setting or air drying on mineral wool, to ASTM C449/C449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.6 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 JACKETS

.1 Polyvinyl Chloride (PVC):
  .1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.
  .2 Colours: to match adjacent finish paint.
  .3 Minimum service temperatures: -20°C.
  .4 Maximum service temperature: 65°C.
  .5 Moisture vapour transmission: 0.02 perm.
  .6 Thickness: 0.55 mm.
  .7 Fastenings:
    .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
    .2 Tacks.
    .3 Pressure sensitive vinyl tape of matching colour.
  .8 Special requirements:
    .1 Indoor: flame spread rating 25, smoke developed rating 50.
    .2 Outdoor: UV rated material at least 0.5 mm thick.
.2 Canvas:
  .1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
  .2 Lagging adhesive: compatible with insulation.

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 datasheet.

3.2 PRE-INSTALLATION REQUIREMENT

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
.2 Surfaces clean, dry, free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards.
.2 Apply materials in accordance with manufacturers instructions and this specification.
.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
  .1 Install hangers, supports outside vapour retarder jacket.
.5 Supports, Hangers:

.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 See Section 23 07 14 - Thermal Insulation for Equipment.

3.5 INSTALLATION OF ELASTOMERIC INSULATION

.1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.6 PIPING INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 TIAC Code: A-1.

.1 Securements: SS wire at 300 mm on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code 1501-H.

.3 TIAC Code: A-3.

.1 Securements: SS wire at 300 mm on centre.

.2 Seals: VR lap seal adhesive, VR lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.4 TIAC Code: A-6.

.1 Insulation securements: as per manufacturer's recommendation.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-CA.

.5 TIAC Code: C-2 vapour retarder jacket.

.1 Insulation securements: 18 ga SS wire, or 12mm x 0.5mm SS bands at 300mm o.c.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.6 TIAC Code: A-2.

.1 Insulation securements: 18 ga SS wire, or 12mm x 0.5mm SS bands at 300mm o.c.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-H.

.7 Thickness of insulation as listed in following table.

.1 Run-outs to individual units and equipment not exceeding 4000 mm long.

.2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp °C	TIAC	Pipe sizes (NPS) and insulation thickness (mm)					
		Code	Run out	To 1	1 ¼ to 2	2 ½ to 4	5 to 6	8 & over
Hot Water Heating	60-94	A-1	25	38	38	38	38	38
Hot Water Heating	Up to 59	A-1	25	25	25	25	38	38
Domestic HWS		A-1	25	25	25	38	38	38
Domestic CWS with vapour retarder		C-2	25	25	25	25	25	25
RWL and RWP		C-2	25	25	25	25	25	25

.8 Finishes:

.1 Exposed indoors: PVC jacket.

.2 Exposed in mechanical rooms: PVC jacket.

.3 Concealed, indoors: canvas on valves, fittings. No further finish.

.4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.

.5 Finish attachments: SS screws, at 150 mm on centre. Seals: wing or closed.

.6 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.7 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Management.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 23 21 16 - Hydronic Systems: Steel.

1.2 REFERENCES

.1 American Society for Testing and Materials, (ASTM).
- .1 ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
- .2 ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

.2 American National Standards Institute (ANSI)/American Water Works Association (AWWA)
- .1 ANSI/AWWA C901 AWWA Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inch (13 mm) Through 3 inch (76 mm), for Water Service.
- .2 ANSI/AWWA C906 AWWA Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 inch (100 mm) Through 63 inch (1575 mm), for Water Distribution.

.3 American Standards Institute (ANSI)/National Sanitation Foundation (NSF): ANSI/NSF 61 Drinking Water System Components - Health Effects.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: Submit manufacturer's product submittal data and installation instructions.

.3 Shop Drawings: Provide installation drawings indicating: piping layout, size dimension by installation segment, vault locations, support fixtures and schedules with all details required for installation of the system.

.4 Samples: Submit selection and verification samples of piping.

.5 Quality Assurance/Control Submittals:
- .1 Test Reports: Upon request, submit test reports from recognized testing laboratories.
- .2 Submit the following documentation:
  - .1 Manufacturer's certificate stating that products comply with specified requirements.
  - .2 Manufacturer's flow schedule for the distribution system.
  - .3 Documentation that the installer is trained to install the manufacturer's products.
  - .4 PEX manufacturer will ensure pressure drops for critical paths do not exceed specified pump head. Any costs to upsize piping as required will be the responsibility of this trade.

.6 Closeout Submittals: Submit the following documents:
- .1 Warranty documents specified herein.
- .2 Operation and maintenance data.
- .3 Manufacturer's field reports specified herein.
- .4 Final as-built piping layout drawing.

1.4 QUALITY ASSURANCE

.1 Installer Qualifications: Use an installer with demonstrated experience on projects of similar size and complexity and possessing documentation proving familiarization training by the tubing manufacturer.
- .1 Regulatory Requirements and Approvals: Ensure the piping distribution system complies with all applicable codes and regulations.

.2 Certifications: Provide letters of certification indicating: Installer uses skilled workers holding a trade qualification license or equivalent, or apprentices under the supervision of a licensed trades person.

.3 Pre-installation Meetings:

.1 Verify project requirements, excavation conditions, system performance requirements, manufacturer's installation instructions and warranty requirements.

.2 Review project construction timeline to ensure compliance or discuss modifications as required.

.3 Interface with other trade representatives to verify areas of responsibility.

.4 Establish the frequency and construction phase the project engineer intends for site visits and inspections by the tubing manufacturer's representative.

1.5 DELIVERY STORAGE AND DISPOSAL

.1 Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

.2 Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.3 Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

.1 Store potable pre-insulated piping coils under cover to prevent dirt or foreign material from entering the service tubing.

.2 Do not expose the service pipe to direct sunlight for more than 30 days. If construction delays are encountered, cover piping that is exposed to direct sunlight.

1.6 WARRANTY

.1 Manufacturer's Warranty for Hydronic Piping: Manufacturer's standard 25 year warranty for PEX piping and ASTM F 1960 fittings.

.2 Manufacturer's Warranty for Pre-Insulated Pipe Distribution Systems: Submit, for owner's acceptance, manufacturer's standard 5-year warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights owner may have under contract documents.

.1 Warranty covers the repair or replacement of any piping or fittings proven defective

.2 Warranty may transfer to subsequent owners.

.3 The most recent limited warranty published by the manufacturer takes precedence at the time of installation.

2 Products

2.1 HYDRONIC PIPING AND FITTINGS (PEX)

.1 Performance Requirements: PEX piping and fittings shall meet the following pressure and temperature ratings:

.1 200 degrees F (93 degrees C) at 80 psi (551 kPa).

.2 180 degrees F (82 degrees C) at 100 psi (689 kPa).

.3 73.4 degrees F (23 degrees C) at 160 psi (1,102 kPa).

.2 Plastic Pipe and Fittings:

.1 PEX (Engle-method Crosslinked Polyethylene) Piping: to ASTM 876 with oxygen-diffusion barrier that meets DIN 4726.

.2 PEX Fittings, Elbows and Tees (DN15 through DN80): ASTM F1960 cold-expansion fitting manufactured from the following material types:
- .1 UNS No. C69300 Lead-free (LF) Brass.
- .2 20 percent glass-filled polysulfone as specified in ASTM D6394.
- .3 Unreinforced polysulfone (group 01, class 1, grade 2) as specified in ASTM D6394.
- .4 Polyphenylsulfone (group 03, class 1, grade 2) as specified in ASTM D6394.
- .5 Blend of polyphenylsulfone (55-80%) and unreinforced polysulfone (rem.) as specified in ASTM D6394.
- .6 Reinforcing cold-expansion rings shall be manufactured from the same source as PEX piping manufacturer and marked "F1960".

.3 PEX Fittings (DN25 through DN100): SDR9 compression type fitting consisting of a double O-ring insert with a compression sleeve tightened around the pipe and insert.

.3 PEX Fittings (DN100):
- .1 Manufacturer: Provide fittings from the same manufacturer of the piping.
- .2 Threaded Brass to PEX Transition: One-piece brass fitting with male or female threaded adapter and F1960 cold-expansion end, with PEX reinforcing cold-expansion ring. Typically used for PEX sizes DN80 and below.
- .3 Brass Sweat to PEX Transition: One-piece brass fitting with sweat adapter and F1960 cold-expansion end, with PEX reinforcing cold-expansion ring. Typically used for PEX sizes DN80.
- .4 Dezincification-resistant (DZR) Brass to PEX Transition: Male NPT thread and PEX compression fitting. Editor: Typically used for PEX sizes DN5 through DN1020.

.4 Plastic-to-Metal Transition Unions:
- .1 Manufacturer: Provide unions from the same manufacturer of the piping.
- .2 Threaded Brass to PEX Union: One-piece brass fitting with male or female threaded adapter and F1960 cold-expansion end, with PEX reinforcing cold-expansion ring. Typically used for PEX sizes 3 inch and below.
- .3 Brass Sweat to PEX Union: One-piece brass fitting with sweat adapter and F1960 cold-expansion end, with PEX reinforcing cold-expansion ring. Typically used for PEX sizes DN80 and below.

.5 Piping Applications:
- .1 Hot-water heating piping, aboveground (DN80 and below) shall be the following: PEX piping, with F1960 cold-expansion fittings.
- .2 Hot-water heating piping, aboveground (DN90 through DN100) shall be the following: PEX piping, with compression fittings.
- .3 Chilled-water piping, aboveground (DN80and below) shall be the following:
  - .1 PEX piping, with F1960 cold-expansion fittings.
- .4 Chilled-water piping, aboveground (DN90 through DN100) shall be the following: PEX piping, with compression fittings.

2.2 ASTM PRE-INSULATED THERMAL TWIN DISTRIBUTION SYSTEM

.1 Design Requirements: The PEX service tubing is manufactured and tested in accordance with ASTM F876, ASTM F877, ASTM F1960, CSA B137.5 and NSF-rfh. The PEX service tubing has hydrostatic ratings in accordance with the temperatures and pressures listed in the ASTM standard. The hydrostatic ratings are:
- .1 200 degrees F (93 degrees C) at 80 PSI (551 kPa).
- .2 180 degrees F (82 degrees C) at 100 PSI (689 kPa).
- .3 73.4 degrees F (23 degrees C) at 160 psi (1102 kPa).

.2 Performance Requirements: Provide a pre-insulated distribution system that is manufactured, fabricated and installed to comply with regulatory agencies and authorities with jurisdiction, and that maintains performance criteria stated by the tubing manufacturer without defects, damage or failure.

.1 Show compliance with ASTM F876 regarding Crosslinked Polyethylene (PEX) Tubing.

.2 Show compliance with ASTM F877 regarding Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems.

.3 Show compliance with DIN 4726 regarding Oxygen Diffusion

.4 Show compliance with ASTM F1960 regarding Cold Expansion Fittings with PEX Reinforcing Rings for Use with Crosslinked Polyethylene (PEX) Tubing.

.5 Show compliance with CSA B137.5 regarding Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.

.3 Service Tubing:

.1 Material: Crosslinked polyethylene (PEX) manufactured to PEX or Engel-method standard

.2 Material Standard: Manufactured in accordance with ASTM F876 and F877.

.3 Pressure Ratings: Hydrostatic design and pressure ratings are in accordance with the ASTM standard. Operating limits are as follows:

.1 -58 degrees F to 203 degrees F at 80 psi (-50 degrees C to 95 degrees C at 551 kPA).

.4 The PEX service twin tubing in the Ecoflex Thermal Twin pipe have an oxygen diffusion barrier that does not exceed an oxygen diffusion rate of 0.10 grams per cubic meter per day at 104 degrees F (40 degrees C) water temperature in accordance with German DIN 4726.

.5 Accordance with ASTM F876, as indicated. Note: Numbers in brackets are the metric equivalent pipe size.

.1 DN25.

.2 DN30.

.3 DN40.

.4 DN50.

.5 DN65.

.4 End Seals:

.1 The piping manufacturer will supply all EPDM rubber end caps with water-stop seal.

.2 EPDM rubber end caps are to be installed on each end prior to connecting the service pipes and insulating the field joints.

.3 The EPDM end caps will seal onto the tubing and outer jacket forming a watertight seal.

.5 Cold Expansion Fittings for PEX Service Tubing:

.1 For system compatibility use fittings offered by the tubing manufacturer.

.2 Fittings must comply with the performance requirements of ASTM F877.

.3 Fittings are to be manufactured in accordance with ASTM F1960.

.4 The fitting assembly consists of a barbed adapter and an applicable-sized PEX ring.

.5 All buried fittings will be installed, insulated, and sealed in accordance with the instructions of the piping manufacturer.

.6 Compression Fittings for PEX Service Tubing:

.1 For system compatibility, use fittings offered by the tubing manufacturer.

.2 Fittings are to be manufactured from dezincification-resistant brass and lead-free brass.

.3 The fitting assembly must comply with performance requirements of ASTM F877.

.4 Fittings will consist of a compression fitting with a coupling sleeve, a fitting body insert with o-ring(s) and a bolt and nut.

.5 All buried fittings will be installed, insulated, and sealed in accordance with the piping manufacturer's instructions.

.6 Male NPT thread for each compression fitting is shown below.

.1 1 inch PEX compression fitting has 1-inch male NPT thread.

.2 1-1/4 inch PEX compression fitting has 1-1/4 inch male NPT thread.

.3 1-1/2 inch PEX compression fitting has 1-1/2 inch male NPT thread.

.4 2 inch PEX compression fitting has 2 inch male NPT thread.

.5 2-1/2 inch PEX compression fitting has 2 inch male NPT thread.

.7 All transition fittings connecting to the compression fittings will be manufactured of dezincification-resistant brass.

.7 Pipe and Fitting Identification: The pipe shall be marked in accordance with the standards to which it is manufactured.

.1 Color identification by the use of stripes on pipe to identify pipe service shall be optional. If used, stripes or colored exterior pipe product shall be blue for potable water, green for wastewater/sewage, or purple for reclaimed water.

.2 Tracing wire shall be placed parallel and 18 inches above, but separate from, the pipe and shall be 10 AWG.

.3 Marking tape shall be approved by the engineer and placed between 12 and 18 inches above the crown of the pipe.

.8 Accessories: Use accessories associated with the installation of the piping system as recommended by or available from the manufacturer.

.9 Insulation Kits: Insulation kits will be manufactured of ABS shells or HDPE sleeves, will feature equal thickness of closed-cell PEX insulation as the pipe, and sealed watertight.

3 Execution

3.1 EXAMINATION

.1 Site Verification of Conditions: Verify that site conditions are acceptable for installation of the hydronic piping distribution system. Do not proceed with installation until unacceptable conditions are corrected.

3.2 INSTALLATION

.1 Install hydronic piping according to approved shop drawings or coordination drawings.

.2 Comply with manufacturer's product data, including product technical bulletins, installation instructions and design drawings, including the following.

.3 PEX Piping:

.1 PEX Piping Hanger Spacing: Install hangers for PEX piping with the following maximum spacing:

.1 1 inch and below: Maximum span, 32 inches.

.2 1-1/2 inch and above: Maximum span, 48 inches.

.2 PEX Piping Hanger Spacing with PEX Support Channel: Install hangers for PEX piping with horizontal support channel in accordance with local jurisdiction and manufacturer's recommendations, with the following maximum spacing:

.1 Maximum span, 8 feet.

.3 PEX Riser Supports: Install CTS riser clamps at the base of each floor and at the top of every other floor. Install mid-story guides between each floor.

.4 Pipe Joint Connections: Install per manufacturer's recommendations. Use manufacturer-recommended cold-expansion tool for F1960 connections.

3.3 CLEANING

.1 Remove temporary coverings and protection of adjacent work areas.

.2 Repair or replace damaged installed products.

.3 Clean the installed products in accordance with manufacturer's instructions prior to Owner's acceptance.

.4 Remove construction debris from project site and legally dispose of debris.

3.4 DEMONSTRATION

.1 Demonstrate operation of the piping distribution system to Owner's personnel.

3.5 PROTECTION

.1 Protect installed work from damage caused by subsequent construction activity on the site.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 23 05 01 - Installation of Pipework.

.2 Section 23 08 01 - Performance Verification of Mechanical Piping Systems.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME).

.1 ASME, Boiler and Pressure Vessel Code.

.2 American Society for Testing and Materials, (ASTM).

.1 ASTM A47/A47M, Specification for Ferritic Malleable Iron Castings.

.2 ASTM A278M, Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650 degrees F (345 degrees C).

.3 ASTM A516/A516M, Specification for Pressure Vessel Plates, Carbon Steel, for Moderate - and Lower - Temperature Service.

.4 ASTM A536, Specification for Ductile Iron Castings.

.5 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.

.3 Canadian Standards Association (CSA International).

.1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets.

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate on product data expansion tanks, air vents, separators, valves and strainers.

.3 Closeout Submittals:

.1 Submit maintenance data in accordance with Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.5 DELIVERY STORAGE AND DISPOSAL

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse in accordance with Section 01 74 00 - Cleaning and Waste Management.

.2 Collect and separate for disposal paper packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

2 Products

2.1 CANADIAN REGISTRATION NUMBER (CRN)

.1 Required on all products as per Provincial Regulations and CSA B51.

2.2 DIAPHRAGM TYPE EXPANSION TANK

.1 Horizontal or vertical as indicated, steel pressurized diaphragm type expansion tank.

.2 Capacity: as indicated.

.3 Size and acceptance volume: as indicated.
.4 Diaphragm sealed in elastomer or EPDM (always use EPDM for glycol systems) suitable for 115 degrees C operating temperature.
.5 Working pressure: 860 kPa with ASME stamp and certification, where required.
.6 Air precharged to 84 kPa (initial fill pressure of system) or as indicated.
.7 Saddles for horizontal installation, base mount for vertical installation.
.8 Supports: provide supports with hold down bolts and installation templates.
.9 On tanks larger than 44 Gallons provide replaceable bladder/diaphragm.
.10 Acceptable Material: Amtrol, Bell & Gossett, Taco, Armstrong

2.3 AUTOMATIC AIR VENT

.1 Standard float vent: brass body and NPS 1/8 connection and rated at 1000 kPa working pressure.
.2 Industrial float vent: ASTM A48 Class 30, cast iron body and NPS 1/2 connection and rated at 860 kPa working pressure.
.3 Float: solid material suitable for 115 degrees C working temperature.

2.4 AIR SEPARATOR - BOILER MOUNTED

.1 Complete with dip tube.
.2 Working pressure: 860 kPa.

2.5 AIR SEPARATOR - EXPANSION TANK FITTING

.1 Complete with adjustable vent tube and built-in manual vent valve.
.2 Working pressure: 860 kPa.

2.6 AIR SEPARATOR - AIR SCOOP

.1 Working pressure: 860 kPa.
.2 Provide in-line air separator for line sizes 75mm (3") and smaller only, to match pipe sizes as indicated.
.3 Provide automatic air vent and vent isolation valve.
.4 Acceptable material: Taco "Air Scoop", Amtrol "Air Purger".

2.7 COMBINATION SEPARATORS/STRAINERS

.1 Steel, tested and stamped in accordance with ANSI/ASME BPVC where required, for 860 kPa operating pressure, with integral strainer with 5 mm perforations, tangential inlet and outlet connections, and internal stainless steel air collector tube.
    .1 For line sizes 100mm (4") and larger provide air and dirt separator.
    .2 Acceptable material: Taco AC series, Amtrol AS-L series, Caleffi Discal Dirt, Bell and Gossett.
    .3 Provide automatic air vent and vent isolation valve.

2.8 COMBINATION LOW PRESSURE RELIEF AND REDUCING VALVE

.1 Adjustable pressure setting: 206 kPa relief, 55 to 172 kPa reducing.
.2 Low inlet pressure check valve.
.3 Removable strainer.

2.9 PIPE LINE STRAINER

.1 NPS 1/2 to 2: bronze body to ASTM B62, solder or screwed end connections, Y pattern.
.2 NPS 2 1/2 to 12: cast steel body to ASTM A278M, Class 30, connections.
.3 NPS 2 to 12: T type with ductile iron body to ASTM A536 or malleable iron body to ASTM A47M, grooved ends.
.4 Blowdown connection: NPS 1.

.5 Screen: stainless steel with 1.19 mm perforations.
.6 Working pressure: 860 kPa.
.7 Acceptable material: Watts 7775, Hoffman, Wilkins, Victaulic, Armstrong.

2.10 SUCTION DIFFUSER

.1 Body: cast iron with flanged or grooved ductile iron connections. 2.1 mPa.
.2 Strainer: with built-in, disposable 1.19 mm mesh, low pressure drop screen and NPS 1 connection.
.3 Permanent magnet particle trap.
.4 Full length straightening vanes.
.5 Pressure gauge tappings.
.6 Adjustable support leg.
.7 Acceptable Material: Bell and Gossett, Victaulic, Taco, Armstrong.

2.11 TRIPLE DUTY VALVE

.1 Centre-guided non-slam drip tight check valve.
.2 Positive shut off valve.
.3 Calibrated system balancing valve.
.4 Straight pattern as indicated.
.5 Flanged or grooved end connections.
.6 Soft seat design for positive sealing.
.7 Construction:
  .1 Body: cast iron with bronze seat.
  .2 Disc: bronze with EPDM seat insert.
  .3 Stem: stainless steel.
  .4 Spring: stainless steel.
  .5 Packing: Teflon - graphite (asbestos free).
  .6 Gasket: asbestos free.
  .7 Readout Valve: brass with EPT insert, check valve and gasket.
  .8 Maximum operating temperature 121 C.
  .9 Maximum hourly pressure: 1.2 mPa.
  .10 Valve design shall permit repacking under full system pressure.
  .11 Provide complete with brass readout valves, integral check feature, to facilitate taking differential pressure readings across the orifice for accurate system balance.
  .12 Provide CU rating at 10% increments. Manufacturer shall supply the CU rating for readout of flow determination and system pressure drop.
  .13 Capacity: see schedule on drawings for performance criteria and model selection.
  .14 Acceptable Material: Bell and Gossett, Victaulic, Taco, Armstrong.

2.12 COMBINATION AIR, DIRT, HYDRAULIC AND MAGNETIC PARTICLE SEPERATOR

.1 Flanged inline air separation vessel compliant with Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code.
.2 Maximum Allowable Working Pressure 1000 kPa.
.3 Complete with ASME U stamp.
.4 ANSI B16.5 Class 150 RF flanged, 150MM connections.
.5 25MM full port quarter turn ball valve.
.6 Maximum working temperature: 132°C.
.7 CRN registered.

3 Execution

3.1 GENERAL

.1 Install as indicated and to manufacturer's recommendations.

.2 Run drain lines and blow off connections to terminate above nearest drain.

.3 Maintain proper clearance to permit service and maintenance.

.4 Should deviations beyond allowable clearances arise, request and follow Consultant's directive.

.5 Check shop drawings for conformance of all tappings for ancillaries and for equipment operating weights.

3.2 STRAINERS

.1 Install in horizontal or down flow lines.

.2 Ensure clearance for removal of basket.

.3 Install ahead of each pump.

.4 Install ahead of each automatic control valve larger than NPS 1 and as indicated.

3.3 AIR VENTS

.1 Install at high points of systems in piping mains. The Contractor shall provide automatic air eliminators in order to avoid air pockets in the system. Air vents are to be installed at an accessible place with the aid of necessary piping in order to facilitate maintenance.

.2 Install gate valve on automatic air vent inlet. Run discharge to nearest drain or service sink.

3.4 EXPANSION TANKS

.1 Adjust expansion tank pressure to suit design criteria.

.2 Install lockshield type valve at inlet to tank.

3.5 PRESSURE SAFETY RELIEF VALVES

.1 Run discharge pipe to terminate above nearest drain.

3.6 SUCTION DIFFUSERS

.1 Install on inlet to pumps having suction size greater than 50.

3.7 PERFORMANCE VERIFICATION

.1 In accordance with Section 23 08 01 - Performance Verification of Mechanical Piping Systems, supplemented as specified herein.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 23 05 00 - Common Work Results for HVAC.
.2 Section 23 05 17 - Pipe Welding.
.3 Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.
.4 Section 23 05 01 - Installation of Pipework.
.5 Section 23 05 22 - Valves - Bronze.
.6 Section 23 05 23 - Valves - Cast Iron.
.7 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
.8 Section 23 08 01 - Performance Verification of Mechanical Piping Systems.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME).
  .1 ASME B16.1-, Cast Iron Pipe Flanges and Flanged Fittings.
  .2 ASME B16.3-, Malleable Iron Threaded Fittings.
  .3 ASME B16.5-, Pipe Flanges and Flanged Fittings.
  .4 ASME B16.9-, Factory-Made Wrought Buttwelding Fittings.
  .5 ASME B18.2.1-, Square and Hex Bolts and Screws (Inch Series).
  .6 ASME B18.2.2-, Square and Hex Nuts (Inch Series).
.2 American Society for Testing and Materials International, (ASTM).
  .1 ASTM A47/A47M-, Standard Specification for Ferritic Malleable Iron Castings.
  .2 ASTM A53/A53M-, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
  .3 ASTM A536-, Standard Specification for Ductile Iron Castings.
  .4 ASTM B61-, Standard Specification for Steam or Valve Bronze Castings.
  .5 ASTM B62-, Standard Specification for Composition Bronze or Ounce Metal Castings.
  .6 ASTM E202-, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.
.3 American Water Works Association (AWWA).
  .1 AWWA C111-, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
.4 Canadian Standards Association (CSA International).
  .1 CSA B242-, Groove and Shoulder Type Mechanical Pipe Couplings.
  .2 CAN/CSA W48-, Filler Metals and Allied Materials for Metal Arc Welding (Developed in cooperation with the Canadian Welding Bureau).
.5 Manufacturer's Standardization of the Valve and Fittings Industry (MSS).
  .1 MSS-SP-67-, Butterfly Valves.
  .2 MSS-SP-70-, Cast Iron Gate Valves, Flanged and Threaded Ends.
  .3
  .4 MSS-SP-71-, Cast Iron Swing Check Valves Flanged and Threaded Ends.
  .5 MSS-SP-80-, Bronze Gate, Globe, Angle and Check Valves.
  .6 MSS-SP-85-, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.
.6 Province of Prince Edward Island Boiler and Pressure Vessel Act and Regulations.

1.3 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
  .1 Product Data: for each type of the following:
    .1 Pipe materials.
    .2 Unions and flanges, including gaskets, nuts and bolts.

.3 Welding Fittings.
.4 Groove and joint couplings and fittings.
.5 Sleeves and packing.
.6 Pressure seal fittings.
.7 Valves: include flow and pressure drop curves based on manufacturers testing for calibrated-orifice balancing valves and automatic flow control valves.
.8 Air control devices.
.9 Chemical treatment.
.10 Hydronic specialties: submit schedule listing type, make, model and model number, size and service for all hydronic specialties.

.2 Closeout Submittals.
.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals and include following:
.1 Special servicing requirements.

.3 Groove joint couplings and fittings to be indicated on product submittals and to be specifically identified with the applicable style or series designation.

.4 Grooved products manufacturer to supply on site tools and products for installation training.

.5 All groove products to be of one manufacturer.

.6 Groove products to have current CRN numbers.

1.4 QUALITY ASSURANCE

.1 Health and Safety.
.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal.
.1 Separate waste materials for reuse in accordance with Section 01 74 00 - Cleaning and Waste Management.
.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
.3 Collect and separate for disposal paper packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
.4 Fold up metal banding, flatten and place in designated area for recycling.

1.6 MAINTENANCE

.1 Extra Materials.
.1 Provide following spare parts:
.1 Valves: One for every 10 valves, minimum one of each size & type.
.2 Gaskets for flanges: one for every ten flanges.

2 Products

2.1 PIPE

.1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:
.1 Up to NPS 2: Schedule 40.
.2 NPS 2-1/2 and 10: Schedule 10.
.3 NPS 12 and over, 10 mm wall thickness.

2.2 PIPE JOINTS

.1 NPS2 and under: screwed fittings with PTFE tape or lead-free pipe dope.
.2 NPS2-1/2 and over: welding fittings and flanges to CAN/CSA W48.
.3 Roll grooved: standard coupling to CSA B242.
.4 Flexible couplings to CSA B242 to be used where noted on drawings and on elbows utilized on expansion joints.
.5 Flanges: plain ASME B16.1 or raised face, slip-on or weld neck to ASME B16.5.
.6 Orifice flanges: slip-on raised face, 2100 kPa.
.7 Flange gaskets: to AWWA C111.
.8 Pipe thread: taper.
.9 Bolts and nuts: to ASME B18.2.1 and ASME B18.2.2.
.10 Roll grooved coupling gaskets: type EPDM - 40% to 120 deg C for continuous operation using hot water, glycol water, chilled water or condenser water.

2.3 FITTINGS

.1 Screwed fittings: malleable iron, to ASME B16.3, Class 150.
.2 Pipe flanges and flanged fittings:
  .1 Cast iron: to ASME B16.1, Class 125.
  .2 Steel: to ASME B16.5.
.3 Butt-welding fittings: steel, to ASME B16.9.
.4 Unions: malleable iron, to ASTM A47/A47M and ASME B16.3.
.5 Fittings for roll grooved piping: malleable iron to ASTM A47/A47M, ductile iron to ASTM A536.

2.4 VALVES

.1 Connections:
  .1 NPS2 and smaller: screwed ends.
  .2 NPS 21/2 and larger: grooved ends.
.2 Ball valves:
  .1 NPS 2 and under: as specified in Section 23 05 22 - Valves - Bronze.
.3 Gate valves: to MSS-SP-70:
  .1 NPS 2 and under:
    .1 Mechanical Rooms : Class 125, rising stem, split wedge disc, as specified Section 23 05 22 - Valves - Bronze.
    .2 Elsewhere: Class 125, non-rising stem, solid wedge disc, as specified Section 23 05 22 - Valves - Bronze.
  .2 NPS 21/2 and over:
    .1 Mechanical Rooms: stem, split wedge disc, lead free trim, as specified Section 23 05 23 - Valves - Cast Iron: Gate, Globe, Check.
    .2 Elsewhere: rising stem, solid wedge disc, lead free trim, as specified Section 23 05 23 - Valves - Cast Iron: Gate, Globe, Check.
.4 Butterfly valves: to MSS-SP-67:
  .1 NPS 21/2 and over: Lug type: as specified Section 23 05 26 - Butterfly Valves.
.5 Globe valves: to MSS-SP-80:
  .1 NPS2 and under:
    .1 Mechanical Rooms: with PTFE disc, as specified Section 23 05 22 - Valves - Bronze.
    .2 Elsewhere: Globe, with composition disc, as specified Section 23 05 22 - Valves - Bronze.
  .2 NPS21/2 and over:

.1 With composition disc, lead free trim, as specified Section 23 05 23 - Valves - Cast Iron: Gate, Globe, Check.

.6 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, as specified Section 23 05 22 - Valves - Bronze.

.7 Bypass valves on globe valves NPS 8 and larger: NPS 3/4, Globe, with PTFE disc as specified Section 23 05 22 - Valves - Bronze.

.8 Swing check valves: to MSS-SP-71.

.1 NPS2 and under:

.1 Class 125, swing, with composition disc, as specified Section 23 05 22 - Valves - Bronze.

.2 NPS21/2 and over:

.1 Grooved ends: as specified Section 23 05 23 - Valves - Cast Iron: Gate, Globe, Check.

.9 Silent check valves:

.1 NPS2 and under:

.1 As specified Section 23 05 22 - Valves - Bronze.

.2 NPS21/2 and over:

.1 Grooved ends: as specified Section 23 05 23 - Valves - Cast Iron: Gate, Globe, Check.

.10 Glycol:

.1 Ethylene glycol with inhibitors for corrosion control.

.2 Percentage volume as indicated.

.11 Combination balancing and shutoff valves NPS 2 and smaller.

.1 Body: brass, stainless steel, bronze or a metal ball or y-pattern.

.2 Seat: PTFE or a metal

.3 End connection: threaded or socket.

.4 Pressure gauge connections: integral seals for portable differential pressure meter.

.5 Handle style: digital hand wheel, with memory stop to retain set position.

.6 CWP rating: minimum 125 PSIG.

.7 Maximum operating temperature: 250 deg F.

.8 Acceptable material: Tour and Anderson, Xylem, Armstrong.

.12 Combination balancing and shut off valves NPS 2 1/2 and larger.

.1 Body: ductile icon or steel body, ball, plug or globe pattern with calibrated orifice or ventur:

.2 Stem Seals: EPPM 0-rings.

.3 Disc: Elassor carbon filled PTFE

.4 Seat: PTFE

.5 End connections: flanged or grooved.

.6 Pressure gauge connections: integral seal for portable differential meter.

.7 Handle style: digital hand wheel with memory stop to retain set position.

.8 CWP rating: minimum 125 PSIG.

.9 Maximum operating temperature: 250 deg F.

.10 Acceptable material: Xylem, Tour and Anderson, Armstrong.

3 Execution

3.1 PIPING INSTALLATION

.1 Install pipework in accordance with Section 23 05 01 - Installation of Pipe Work.

.1 Install shutoff duty valves at each branch connection to supply mains and at

supply connection to each piece of equipment.

.2 Install balancing valves at each branch connection to return main and return pipe of each heating or cooling terminal.

3.2 CIRCUIT BALANCING VALVES

.1 Install flow measuring stations and flow balancing valves as indicated.

.2 Remove handwheel after installation and when TAB is complete.

.3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

3.3 CLEANING, FLUSHING AND START-UP

.1 In accordance with Section 23 08 02 - Cleaning and Start-Up of Mechanical Piping Systems.

3.4 TESTING

.1 Test system in accordance with Section 23 05 00 - Common Work Results - Mechanical. Minimum 1.5 times working pressure on 1000 KPa.

.2 For glycol systems, retest with propylene glycol to ASTM E202, inhibited, for use in building system after cleaning. Repair leaking joints, fittings or valves.

3.5 BALANCING

.1 Balance water systems to within plus or minus 5 % of design output.

.2 Refer to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC for applicable procedures.

3.6 PERFORMANCE VERIFICATION

.1 In accordance with Section 23 08 01 - Performance Verification of Mechanical Piping Systems.

.2 Provide copies of test reports for commissioning manuals.

END OF SECTION

1 General

1.1 REFERENCES

.1 American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE).
  .1 Standard 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings.
.2 Electrical Equipment Manufacturers Advisory Council (EEMAC).
.3 Canadian Standards Association (CSA International).
  .1 CAN/CSA-B214, Installation Code for Hydronic Heating Systems.
.4 National Electrical Manufacturers Association (NEMA).
  .1 NEMA MG 1, Motors and Generators.

1.2 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
.3 Submit manufacturer's detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories and controllers.
.4 Submit product data of pump curves for review showing point of operation. Including rated capacities, NPSHR, efficiency lined and BHP lines.
.5 Indicate piping, valves and fittings shipped loose by packaged equipment supplier, showing their final location in field assembly.
.6 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse in accordance Section 01 74 00 - Cleaning and Waste Management.
.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
.3 Collect and separate for disposal paper packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
.4 Separate for reuse and place in designated containers Steel waste in accordance with Waste Management Plan.
.5 Fold up metal banding, flatten and place in designated area for recycling.

1.5 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
.2 Furnish following spare parts:
  .1 Mechanical seal for each pump.
  .2 Packing for each pump.
  .3 Set of gaskets for each pump.

2 Products

2.1 EQUIPMENT

.1 Do component selection and sizing to: CAN/CSA-B214.

2.2 IN-LINE CIRCULATORS

.1 Volute: cast iron radially split, with screwed or flanged design suction and discharge connections.
.2 Impeller: cast bronze, cast iron or stainless steel to suit application.
.3 Shaft: stainless steel with bronze sleeve bearing, integral thrust collar.
.4 Seal assembly: mechanical for service to 135 degrees C.
.5 Coupling: flexible self-aligning.
.6 Motor: as per Section 23 05 13 - Common Motor Requirements for HVAC Equipment and as per manufacturer's recommendations. Speed and power as indicated.
.7 Capacity: as indicated.
.8 Design pressure: 1200 kPa.
.9 Acceptable Material: Bell & Gossett, Taco, Armstrong, Grundfos, Wilo.

2.3 IN-LINE WET ROTOR CIRCULATORS

.1 Pump body: Cast iron
.2 Impellor: Polypropylene (glass filled)
.3 Shaft: Stainless steel
.4 Bearings: Graphite
.5 Gasket material: EPDM
.6 Maximum fluid temperature: 110ºC
.7 Maximum working pressure: 1000 kPa
.8 Capacity: as indicated.
.9 Connections: union or flanged
.10 Acceptable Material: Bell & Gossett, Taco, Armstrong, Grundfos, Wilo.

2.4 VARIABLE SPEED PUMPS

.1 Terminal Boxes:
  .1 The circulating pumps shall have a high quality composite terminal box with NPT electrical connections and a secure, gasketed cover, Class 2 protection level. Included on the face of the terminal box cover is the adjustment buttons, front readable graphical pump display, field adjustable for horizontal or vertical positioning of the terminal box.
  .2 The display shall indicate:
  .3 Operation status.
  .4 Control mode.
  .5 Differential pressure or speed / setpoint.
  .6 Fault and warning signals.
.2 Electrical Connections:
  .1 Circulating pump shall have a coded terminal strip indicating common / neutral / ground within the terminal box for field connections for single phase 208 volt, 60Hz power.
.3 Electrical General:
  .1 All low voltage interface (IF) wiring shall be of 18 gauge of larger, UL/CSA approved, 220°F maximum (167°F minimum) temperature.
  .2 All 208 low volt main power wiring shall be of 14 gauge of larger, UL/CSA approved, 230°F maximum (167°F minimum) temperature.
  .3 Voltage variances shall be less than +/- 10% from rated voltage with pump underload conditions. Maximum amperage not to be exceeded as indicated on the pump nameplate. electrical power to the pump is confirmed when the face of

the graphic display is lit.

.4 Control, Operation and Diagnostics:

.1 Circulating pumps shall include electronic variable speed control to operate at constant / variable differential pressure control without external sensors. Automatic night setback control available as standard using "self taught, FUZZI" technology.

.2 Pumps to include motors with special sensorless control electronics and single phase electronic converters.

.3 Integrated overload motor protection shall protect the pump against over / under voltage, over temperature of motor and / or electronics, over current, locked rotor and dry run (no load condition).

.4 Fault contact "FC" terminals shall be included in the terminal box and are to be potentially free, normally closed contacts that open on the event of a failure.

.5 Interface (IF) modules will be includes where specified, installed in the terminal box. The modules will allow BMS communication via LONworks, 0-10 volt DC control of speed or head setpoint, external minimum speed , external off, dual pump communication and pump operation status.

3 Execution

3.1 INSTALLATION

.1 Do Work in accordance with CAN/CSA-B214.

.2 In line circulators: install as indicated by flow arrows. Support at inlet and outlet flanges or unions. Install with bearing lubrication points accessible.

.3 Base mounted type: supply templates for anchor bolt placement. Furnish anchor bolts with sleeves. Place level, shim unit and grout. Align coupling in accordance with manufacturer's recommended tolerance. Check oil level and lubricate.

.4 Ensure that pump body does not support piping or equipment. Provide stanchions or hangers for this purpose. Refer to manufacturer's installation instructions for details.

.5 Pipe drain tapping to floor drain.

.6 Install volute venting pet cock in accessible location.

.7 Check rotation prior to start-up.

.8 Install pressure gauge ball valves.

3.2 START-UP

.1 General

.1 In accordance with Section 01 91 13 - General Commissioning Requirements; supplemented as specified herein.

.2 In accordance with manufacturer's recommendations.

.2 Procedures:

.1 Before starting pump, check that cooling water system over-temperature and other protective devices are installed and operative.

.2 After starting pump, check for proper, safe operation.

.3 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.

.4 Check base for free-floating, no obstructions under base.

.5 Run-in pumps for 12 continuous hours.

.6 Verify operation of over-temperature and other protective devices under low- and no-flow condition.

.7 Eliminate air from scroll casing.

.8 Adjust water flow rate through water-cooled bearings.

.9 Adjust flow rate from pump shaft stuffing boxes to manufacturer's recommendation.
.10 Adjust alignment of piping and conduit to ensure true flexibility at all times.
.11 Eliminate cavitation, flashing and air entrainment.
.12 Adjust pump shaft seals, stuffing boxes, glands.
.13 Measure pressure drop across strainer when clean and with flow rates as finally set.
.14 Replace seals if pump used to degrease system or if pump used for temporary heat.
.15 Verify lubricating oil levels.
.16 Verify pipe system has been flushed , cleaned and filled.
.17 Prime pump and verify correct rotation.
.18 Verify correctly sized motor overload devices are installed.
.19 Ensure strainer is free of debris prior to testing and balancing of the hydronic system.
.20 After 30 days of operation, perform a final cleaning of the strainers.

3.3 PERFORMANCE VERIFICATION (PV)

.1 General
.1 In accordance with Section 01 91 13 - General Commissioning Requirements, supplemented as specified herein.
.2 In accordance with manufacturer's recommendations
.2 Exclusions:
.1 This paragraph does not apply to small in-line circulators.
.3 Assumptions: these PV procedures assume that:
.1 Manufacturer's performance curves are accurate.
.2 Valves on pump suction and discharge provide tight shut-off.
.4 Net Positive Suction Head (NPSH):
.1 Application: measure NPSH for pumps which operate on open systems and with water at elevated temperatures.
.2 Measure using procedures prescribed in the Standard.
.3 Where procedures do not exist, discontinue PV, report to Consultant and await instructions.
.5 Multiple Pump Installations - Series and Parallel:
.1 Repeat PV procedures specified above for pump performance and pump BHP for combinations of pump operations.
.6 Mark points of design and actual performance at design conditions as finally set upon completion of TAB.
.7 Commissioning Reports: In accordance with Section 01 91 13 - General Commissioning Requirements, supplemented as specified herein. Reports to include:
.1 Record of point(s) of actual performance at maximum and minimum conditions and for single and parallel operation as finally set at completion of commissioning on pump curves.
.2 Report forms as specified Section 01 91 13 - General Commissioning Requirements: Report Forms and Schematics.
.3 Pump performance curves (family of curves).

3.4 FIELD QUALITY CONTROL

.1 Commissioning:
.1 Manufacturer to:
.1 Certify installation.

.2 Start up and commission installation per tests recommended by manufacturer under actual or simulated operating conditions, and provide full compliance with design and specified requirements. Tests to be performed simultaneously with the system of which each item is an integral part.

.3 Demonstrate operation and maintenance.

.2 Provide Consultant at least 24 hours notice prior to inspections, tests and demonstrations. Submit written report of inspections and test results.

END OF SECTION

1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation of low-pressure metallic ductwork, joints and accessories.

1.2 RELATED SECTIONS

.1 Section 07 84 00 - Firestopping.

.2 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

1.3 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.2 American Society for Testing and Materials International, (ASTM).

.1 ASTM A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

.2 ASTM A635/A635M, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.

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

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.4 National Fire Protection Association (NFPA).

.1 NFPA 90A, Standard for the installation of Air-Conditioning and Ventilation Systems.

.2 NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.3 NFPA 96, Standard for ventilation control and fire protection of commercial cooling operations.

.5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition and Addendum No. 1.

.2 SMACNA HVAC Air Duct Leakage Test Manual, 1st Edition.

.3 IAQ Guideline for Occupied Buildings Under Construction, 1st Edition.

1.4 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets for the following:

.1 Sealants.

.2 Tape.

.3 Proprietary Joints.

1.5 QUALITY ASSURANCE

.1 Certification of Ratings:

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35

29 - Health, Safety and Emergency Response Procedures.

.3 Indoor Air Quality (IAQ) Management Plan.

.1 Develop and implement an Indoor Air Quality (IAQ) Management Plan for construction and preoccupancy phases of building.

.2 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings under Construction.

.4 Installers to be certified journey person level in sheet metal works.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse in accordance with Section 01 74 00 - Cleaning and Waste Management.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and place in designated containers Steel waste in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with Provincial regulations.

.7 Fold up metal banding, flatten and place in designated area for recycling.

2 Products

2.1 SEAL CLASSIFICATION

.1 Classification as follows:

MAX Pressure Pa	SMACNA Seal Class
1000	A
750	B
500	C
250	C
125	C

.2 Seal classification:

.1 Class A: longitudinal seams, transverse joints, duct wall penetrations, and connections made air tight with sealant and tape.

.2 Class B: Longitudinal seam transverse joints, and connections made air tight with sealant, type or combination thereof.

.3 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

2.2 SEALANT

.1 Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.

2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.4 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows.

.1 Rectangular: centreline radius: 1.5 times width of duct.

.2 Round: smooth radius or five piece. Centreline radius: 1.5 times diameter.

.3 Mitred elbows, rectangular:

.1 To 400 mm: with single thickness turning vanes.

.2 Over 400 mm: with double thickness turning vanes.

.4 Branches:

.1 Rectangular main and branch: with radius on branch 1.5 times width of duct or 45 degree entry on branch.

.2 Round main and branch: enter main duct at 45 degrees with conical connection.

.3 Provide volume control damper in branch duct near connection to main duct.

.4 Main duct branches: with splitter damper.

.5 Transitions:

.1 Diverging: 20 degrees maximum included angle.

.2 Converging: 30 degrees maximum included angle.

.6 Offsets:

.1 Full radiused elbows.

.7 Obstruction deflectors: maintain full cross-sectional area.

.1 Maximum included angles: as for transitions.

2.6 FIRE STOPPING

.1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 - Firestopping.

.2 Fire stopping material and installation must not distort duct.

2.7 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Joints: to SMACNA or proprietary manufactured duct joint. Proprietary manufactured flanged duct joint to be considered to be a class A seal.

2.8 HANGERS AND SUPPORTS

.1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

.1 Maximum size duct supported by strap hanger: 500.

.2 Hanger configuration: to ASHRAE.

.3 Hangers: black steel angle with black steel rods to ASHRAE:

Duct Size(mm)	Angle Size(mm)	Rod Size(mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2410 and over	50 x 50 x 6	10

.4 Upper hanger attachments:

.1 For concrete: manufactured concrete inserts.
.2 For steel joist: manufactured joist clamp.
.3 For steel beams: manufactured beam clamps.
.4 Acceptable material: Myatt, Grinnel, Hunt.

3 Execution

3.1 GENERAL

.1 Do work in accordance with, NFPA 90A & 90B, ASHRAE and SMACNA.
.2 Do not break continuity of insulation vapour barrier with hangers or rods.
  .1 Insulate strap hangers 100 mm beyond insulated duct.
.3 Support risers in accordance with SMACNA.
.4 Install breakaway joints in ductwork on sides of fire separation.
.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
.6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.
.2 Angle hangers: complete with locking nuts and washers.
.3 Hanger spacing: in accordance with SMACNA

Duct Size (mm)	Spacing (mm)
to 1500	3000
1501 and over	2500

3.3 WATERTIGHT DUCT

.1 Provide watertight duct for:
  .1 Dishwasher exhaust.
  .2 Fresh air intake.
  .3 Minimum 3000 mm from duct mounted humidifier in all directions.
  .4 As indicated.
.2 Form bottom of horizontal duct without longitudinal seams.
  .1 Solder joints of bottom and side sheets.
  .2 Seal other joints with duct sealer.
.3 Slope horizontal branch ductwork down towards fume hoods served.
  .1 Slope header ducts down toward risers.
.4 Fit base of riser with 150 mm deep drain sump and 32 mm drain connected, with deep seal trap and valve and discharging to open funnel drain.

3.4 SEALING AND TAPING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

3.5 LEAKAGE TESTS AND COMMISSIONING

.1 Refer to Section 23 05 94 - Pressure testing of ducted air systems.
.2 In accordance with SMACNA HVAC Duct Leakage Test Manual.
.3 Do leakage test in sections.
.4 Make trial leakage tests as instructed to demonstrate workmanship.
.5 Install no additional ductwork until trial test has been passed.

.6 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degree elbows.

.7 Complete test before insulation or concealment.

END OF SECTION

1 General

1.1 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI/AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.2 ANSI/NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 International Organization of Standardization (ISO)

.1 ISO 3741, Acoustics-Determination of Sound Power Levels of Noise Sources Using Sound Pressure - Precision Methods for Reverberation Rooms.

.4 Underwriter's Laboratories (UL)

.1 UL 181, Factory-Made Air Ducts and Air Connectors.

1.2 SYSTEM DESCRIPTION

.1 Performance Requirements:

.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from certified ADC (Air Diffusion Council) testing agency signifying adherence to codes and standards.

1.3 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's published product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Test data: to ANSI/AMCA 210.

.1 Submit published test data on DIN (Direct Internal Noise), in accordance with ISO 3741 made by independent testing agency for 0, 2.5 and 6 m/s branch velocity or inlet velocity.

.2 Sound power level with minimum inlet pressure of 0.25 kPa in accordance with ISO 3741 for 2nd through 7th octave band, also made by independent testing agency.

.3 Pressure loss through silencer shall not exceed 60% of inlet velocity pressure maximum.

.2 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate the following:

.1 Capacity.

.2 Pressure drop.

.3 Noise rating.

.4 Leakage.

.5 Dimensions.

.3 Quality Assurance Submittals:

.1 Certificates: submit certificates signed by manufacturer certifying that materials

comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.4 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance Section 01 74 00 - Cleaning and Waste Management.

1.6 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Furnish list of individual manufacturer's recommended spare parts for equipment include:

.1 Bearings and seals.

.2 Addresses of suppliers.

.3 List of specialized tools necessary for adjusting, repairing or replacing.

2 Products

2.1 MANUFACTURED UNITS

.1 Terminal units of the same type to be product of one manufacturer.

2.2 VARIABLE VOLUME BOXES

.1 Pressure independent reset to air flow between zero and maximum air volume.

.2 Sizes, capacities, differential pressures and sound ratings: as indicated.

.3 Differential pressure not to exceed 25 Pa at inlet air velocity of 10 m/s.

.4 Sound ratings of assembly not to exceed 35 NC at 750 Pa. Use sound attenuation if necessary to achieve rating.

.5 Complete with:

.1 Sound attenuator: as indicated or as product of manufacturer.

.6 Casing: constructed of 0.75 mm thick galvanized steel, internally lined with 25 mm, 0.7 kg density fibrous glass, to UL 181 and ANSI/NFPA 90A. Mount control components inside protective metal shroud.

.7 Damper: galvanized steel with peripheral gasket and self lubricating bearings. Air leakage past closed damper not to exceed 2% of nominal rating at 750 Pa inlet static pressure, in accordance with Air Diffusion Council test procedure.

.8 VAV boxes to be supplied without controller, to be provided by others (future).

.9 Acceptable Material: E.H. Price, Titus, Nailor, Carrier.

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 datasheet.

3.2 INSTALLATION

.1 Install in accordance with manufacturers recommendations.

.2 Support independently of ductwork.

.3 Install with at least 1000 mm of flexible inlet ducting and minimum of four duct diameters of straight inlet duct, same size as inlet.

.4 Locate controls, dampers and access panels for easy access.

3.3 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Management.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 General

1.1 SYSTEM DESCRIPTION

.1 Performance Requirements:

.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

1.2 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate following:

.1 Capacity.

.2 Throw and terminal velocity.

.3 Noise criteria.

.4 Pressure drop.

.5 Neck velocity.

1.3 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Include:

.1 Keys for volume control adjustment.

.2 Keys for air flow pattern adjustment.

2 Products

2.1 GENERAL

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.

.2 Frames:

.1 Full perimeter gaskets.

.2 Plaster frames where set into plaster or gypsum board.

.3 Concealed fasteners.

.3 Concealed manual volume control damper operators.

.4 Colour: standard.

.5 Acceptable Material: E.H. Price, Titus, Nailor, Tuttle & Bailey.

2.2 MANUFACTURED UNITS

.1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

2.3 SUPPLY GRILLES AND REGISTERS

.1 General: See Schedule on Drawings.

2.4 RETURN AND EXHAUST GRILLES AND REGISTERS

.1 General: See Schedule on Drawings.

2.5 DIFFUSERS

.1 General: Schedule on Drawings.

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 datasheet.

3.2 INSTALLATION

.1 Install in accordance with manufacturers instructions.

.2 Install with flat head screws in countersunk holes where fastenings are visible.

.3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.

.4 Provide concealed safety chain on each grille, register and diffuser in gymnasium and similar game rooms and elsewhere as indicated.

END OF SECTION

1 General

1.1 REFERENCES

.1 Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

.2 Underwriters' Laboratories of Canada (ULC)

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.2 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) 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.

.2 Indicate following:

.1 Methods of sealing sections.

.2 Methods of expansion.

.3 Details of thimbles.

.4 Bases/Foundations.

.5 Supports.

.6 Guy details.

.7 Rain caps.

.8 Installation procedures.

.3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Closeout Submittals

.1 Submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 QUALITY ASSURANCE

.1 Regulatory Requirements: work to be performed in compliance with Provincial regulations.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

.3 Certificates:

.1 Catalogued or published ratings: obtained from tests carried out by independent testing agency or manufacturer signifying adherence to codes and standards.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance with Section 01 74 00 - Cleaning and Waste Management.

2 Products

2.1 FUELS: PRESSURE CHIMNEY AND BREECHING

.1 ULC labelled, 760 ºC rated.

.2 Sectional, prefabricated, double wall with air space, mineral wool insulation with mated fittings and couplings.

- .1 Liner: 20 gauge thick, type 316 stainless steel, up to 900mm diameter; 1.2mm up to 1200mm.
- .2 Shell: 34 gauge thick, type 316 stainless steel, up to 600mm diameter; 0.9mm up to 1200mm.
- .3 Outer seals between sections: to suit application.
- .4 Inner seals between sections: to suit application.
- .5 Guy section and tensions where required.
- .6 Storm collar and flashing for non-combustible roofs.
- .7 Ventilated roof thimble and roof support assembly for combustible roofs.
- .8 Stack cap.
- .9 Lateral tee 45º, drain tee cap.
- .10 Installation thickness: 25mm minimum.

2.2 ACCESSORIES

.1 Cleanouts: bolted, gasketted type, full size of breeching, as indicated.

.2 Barometric dampers: single acting, 70% of full size of breeching area.

.3 Hangers and supports: in accordance with recommendations of Sheet Metal and Air Conditioning Contractors National Association Inc. (SMACNA).

.4 Rain cap.

.5 Expansion sleeves with heat resistant caulking, held in place as indicated.

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 datasheet.

3.2 INSTALLATION - GENERAL

.1 Follow manufacturer's and SMACNA installation recommendations for shop fabricated components.

.2 Suspend breeching at 1.5 m centres and at each joint.

.3 Support chimneys at bottom, roof and intermediate levels as indicated.

.4 Install thimbles where penetrating roof, floor, ceiling and where breeching enters masonry chimney. Pack annular space with heat resistant caulking.

.5 Install flashings on chimneys penetrating roofs, as indicated.

.6 Install rain caps and cleanouts, as indicated.

3.3 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Management.

.2 Upon completion and verification of performance of installation, remove surplus

materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 General

1.1 REFERENCES

.1 American Boiler Manufacturer's Association (ABMA)

.2 American National Standards Institute (ANSI)

.1 ANSI Z21.13/CSA 4.9, Gas-Fired Low-Pressure Steam and Hot Water Boilers.

.3 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME)

.1 ANSI/ASME Boiler and Pressure Vessel Code, Section IV.

.4 Canadian Gas Association (CGA)

.1 CAN1-3.1, Industrial and Commercial Gas-Fired Package Boilers.

.2 CAN/CSA-B149.1, Natural Gas and Propane Installation Code.

.5 Canadian Standards Association (CSA International)

.1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.

.2 CSA B139, Installation Code for Oil Burning Equipment.

.3 CSA B140.7, Oil Burning Equipment: Steam and Hot-Water Boilers.

.6 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)

.7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.8 Province of Prince Edward Island Boiler, Pressure Vessel Act and Regulations.

1.2 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) 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.

.2 Indicate the following:

.1 General arrangement showing terminal points, instrumentation test connections.

.2 Clearances for operation, maintenance, servicing, tube cleaning, tube replacement.

.3 Foundations with loadings, anchor bolt arrangements.

.4 Piping hook-ups.

.5 Equipment electrical drawings.

.6 Burners and controls.

.7 All miscellaneous equipment.

.8 Flame safety control system.

.9 Breeching and stack configuration.

.10 Stack emission continuous monitoring system to measure C0, 0, N0x, S0, stack temperature and smoke density of flue gases.

.3 Engineering data to include:

.1 Boiler efficiency at 25%, 50%, 75%, 100% of design capacity.

.2 Radiant heat loss at 100% design capacity.

.3 Quality assurance submittals: submit following in accordance with Section 01 33 00 -

Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.4 Closeout Submittals:

.1 Submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 QUALITY ASSURANCE

.1 Regulatory Requirements: work to be performed in compliance with applicable Provincial regulations.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance with Section 01 74 00 - Cleaning and Waste Management.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

1.5 MAINTENANCE

.1 Extra materials:

.1 Special tools for burners, manholes, handholes and Operation and Maintenance.

.2 Spare parts for 1 year of operation.

.3 Spare gaskets.

.4 Spare gauge glass inserts.

.5 Probes and sealants for electronic indication.

.6 Spare burner tips.

.7 Spare burner gun.

.8 Safety valve test gauge.

2 Products

2.1 GENERAL

.1 Packaged boiler:

.1 Complete with burner and necessary accessories and controls.

.2 Laboratory tested at rated capacity to, and bearing seal or nameplate certifying compliance with, CSA B140.7.

.3 Ready for attachment to piping, electrical power, controls, flue gases exhaust.

.4 Designed and constructed to ANSI/ASME Boiler and Pressure vessel Code.

.5 CRN (Canadian Registration Number), to CSA B51.

.6 Boiler/burner package to bear ULC label.

.2 Performance:

.1 In accordance with American Boiler Manufacturers Association (ABMA), testing procedures.

.2 Hot water: Maximum operating pressure as indicate: 30 PSIG
.3 Firing rate: #2 oil; as indicated.
.4 Boiler efficiency: 86.4% Thermal efficiency minimum.
.5 Flue gas temperature leaving boiler:
.1 Not to exceed 260 degrees C.
.2 Above dew point conditions at minimum firing rate.

.3 Electrical:
.1 Power: 120 V, 1 phase, 208V / 3phase / 60Hz. Division 26 shall provide single 208V power source to boiler. Remainder of 120V wiring shall be performed by a licensed. Coordinate with Division 26.
.2 Electrical components: CSA approved.

.4 Thermal insulation:
.1 4" thick mineral fibre. Seal insulation at handholes, manholes, mudholes, piping connections with insulating cement or asphaltic paint. Finish with heat resisting paint.

.5 Jackets: heavy gauge metal, finished with heat resisting paint.

.6 Mounting:
.1 Structural steel base, lifting lugs.

.7 Anchor bolts and templates:
.1 Supply for installation by other Divisions.

.8 Start-up, instruction, on-site performance tests: 3 days per boiler.

.9 Trial usage:
.1 Consultant may use boilers for test purposes prior to acceptance and commencement of warranty period.
.2 Supply labour, materials and instruments required for tests.

.10 Temporary use by contractor:
.1 Contractor may use boilers only after written approval from Consultant.
.2 Monitor and record performance continuously. Keep log of maintenance activities carried out.
.3 Refurbish to as-new condition before final inspection and acceptance.

2.2 CAST IRON BOILER

.1 Sectional forced draft firing, waterwall design, complete with site assembled sections, front plate and removable panels.

.2 Design of sections to provide balanced water circulation and flue gas travel. Make sections gas-tight and water-tight through use of high temperature rope, nipples, pull-up bolts.

.3 Flue passages: readily accessible without use of special tools.

.4 Provide supply and return headers, elbows to manufacturers recommendations and to suit installation.

.5 Include mudholes, inspection and cleanout handholes.

.6 Cast Iron material to be a high-silicon blend resistant to thermal shock and cracking, to be able to withstand up to 80F temperature differential between supply and return, and sustained operation at return temperatures of 110F.

.7 Acceptable Material: Viessmann Vitorond, De-Dietrich GT Series

2.3 AUXILIARIES

.1 Provide auxiliaries for each boiler and to meet ANSI/ASME requirements.

.2 Hot water boilers:
.1 Relief valves: ANSI/ASME rated, set at 30 PSI.
.2 Pressure gauge: 90 mm diameter complete with shut-off cock.

.3 Thermometer: 115 mm diameter range 10 to 150 degrees C to Section 23 05 21 - Thermometers and Pressure Gauges - Piping Systems.
.4 UL listed and certified.
.5 Low water cut-off: burner shall be de-energized in the event water level falls below cut-off.
.6 Isolating gate or butterfly valves: on supply and return connections.
.7 Drain valve.
.8 Stack thermometer: range 65 to 400 degrees C.
.9 Outdoor controller: to reset operating temperature controller.
.10 One 1 set of cleaning tools.
.11 Auxiliary high temperature cut-out with manual reset.
.12 Disconnect switch outside boiler room.
.13 Triple aquastat relay with quick response probe.

.3 Pot type chemical feeder.

2.4 OIL BURNERS

.1 General:

.1 Pressure-mechanical atomizing forced draft with:

.1 Built-in blower to supply combustion air, complete with motor, silencer and damper.
.2 Single stage oil pump driven by blower motor and complete with integral relief valve.
.3 Oil filter.
.4 Pressure gauge.
.5 High voltage ignition transformer.
.6 Flame observation port.
.7 Easy access to nozzles and electrodes.
.8 Oil and air metering controls for maximum burner efficiency throughout operating range.
.9 Outdoor air direct-duct connection for combustion air.

.2 Controls:

.1 Electronic combustion control relay with scanner for combustion control and flame supervision.
.2 Control to shut off fuel within 5 seconds upon flame failure or upon signal of safety interlock and to ensure, when restarted, in sequence, ignition and resumption of supervision of burner operation.
.3 Immersion controllers:

.1 Operating: to start and stop burner, and operating between adjustable setpoints.
.2 High-low: to shift burner operation to high or low fire.
.3 Modulating: to modulate burner output, where applicable.
.4 High limit: manual reset, as indicated.
.5 Controller range: 30 to 121 degrees.

.4 Visual and audible alarms: to indicate burner shutdown due to flame failure, low water level, high pressure, low air pressure, low fuel pressure, low fuel temperature.
.5 Selector switch: to permit manual and automatic firing at any rate between low and high fire.
.6 Pilot lights: to indicate:

.1 Normal burner operation.

.2 All stages of burner operation.

.7 Burner to start up in low fire position where applicable.

.8 Boiler operation to include:

.1 Pre-purge.

.2 Pilot ignition and supervision.

.3 Burner operation.

.4 Post purge upon burner shutdown.

2.5 EMISSION CONTROL

.1 Rate of discharge of air contaminants from boiler not to exceed:

.1 For nitrogen oxides expressed as nitrogen dioxide:

.1 43 ng/J of heat input when fired with oil specified as type 1 or 2, according to CGSB classification.

.2 22 ng/J of heat input when fired with gaseous fuel.

.2 For sulphur dioxide:

.1 25 ng/J of heat input when fired with oil specified as type 1 or 2, according to CGSB classification.

.3 For carbon monoxide, 125 ng/J of heat input.

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 datasheet.

3.2 INSTALLATION

.1 Install in accordance with ANSI/ASME Boiler and Pressure Vessels Code Section IV, regulations of Province of PEI, except where specified otherwise, and manufacturers recommendations.

.2 Make required piping connections to inlets and outlets recommended by boiler manufacturer.

.3 Maintain clearances as indicated or if not indicated, as recommended by manufacturer for operation, servicing and maintenance without disruption of operation of any other equipment/system.

.4 Mount unit level.

.5 Pipe hot water relief valves full size to nearest drain.

.6 Oil fired installations - in accordance with CSA-B139.

.7 All boilers to be approved by the local authorities having jurisdiction. Obtain all required inspections and approvals prior to start-up and commissioning. Provide copies of affidavits, approval letters, etc. to the Consultant for record purposes.

.8 Pipe low water cut-out to drain.

.9 Low water cut off device to be installed in such a manner that it can be tested under operational conditions.

3.3 MOUNTINGS AND ACCESSORIES

.1 Safety valves and relief valves:

.1 Run separate discharge from each valve.

.2 Terminate discharge pipe as indicated.

.3 Run drain pipe from each valve outlet and drip pan elbow to above nearest drain.

3.4 FIELD QUALITY CONTROL

.1 Commissioning:

.1 Manufacturer to:

.1 Certify installation.

.2 Start up and commission installation.

.3 Carry out on-site performance verification tests.

.4 Demonstrate operation and maintenance.

.2 Provide Consultant at least 24 hours notice prior to inspections, tests, and demonstrations. Submit written report of inspections and test results.

.3 Commission in accordance with Section 01 91 13 - General Commissioning (cx) Requirements.

.4 Final commissioning to occur between November and March when ambient temperature is 10ºC or lower.

3.5 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Management.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 General

1.1 RELATED SCTIONS

.1 Section 23 33 00 - Air Duct Accessories.
.2 Section 23 33 15 - Dampers Operating.
.3 Section 23 72 16 - Air Handling Unit - Backup.
.4 Section 23 72 11 - Air Handling Unit - Packaged.

1.2 REFERENCES

.1 American Bearing Manufacturer's Association (ABMA)
  .1 ANSI/ABMA 9 Load Ratings and Fatigue Life for Ball Bearings.
  .2 ANSI/ABMA 11 Load Ratings and Fatigue Life for Roller Bearings.
.2 Air Movement and Control Association (AMCA)
  .1 AMCA 210, Laboratory Method of Testing Fans for Aerodynamic Performance Rating (ASHRAE).
  .2 AMCA 300 Reverberant Room Method for Second Testing of Fans.
.3 American National Standards Institute / Air-Conditioning. Heating and Refrigeration Institute (ANSI/ASHRI).
  .1 ANSI/AHRI 430, Central Station Air Handling Units.
  .2 ANSI/AHRI 1060, Performance Rating of Air-to-Air Heat Exchangers Energy Recovery Ventilation Equipment.
.4 American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE).
  .1 ASHRAE 68, Laboratory Method of Testing to Determine the Sound Power in a Duct.
  .2 ASHRAE 84, Method of Testing Air-to-Air Exchangers.
.5 American Society for Testing and Materials (ASTM).
  .1 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
.6 Canadian General Standards Board (CGSB).
  .1 CAN/CGSB 1.181, Ready-Mixed Organic Zinc-Rich Coating.
.7 Canadian Standards Association (CSA)
  .1 CSA B52 Mechanical Refrigeration Code.
.8 National Electrical Manufacturer's Association (NEMA)
  .1 NEMA MG1 Motors and Generators
  .2 NEMA ICS 7-1 Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive System.
.9 Provincial Boiler, Pressure Vessel and Compressed Gas Regulations.
.10 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA).

1.3 SUBMITTALS

.1 Product Data:
  .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
    .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) 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.

.1 Shop drawings: submit drawings stamped and signed by Contractor as reviewed.
.2 Indicate following: fan, fan curves showing points of operation, motor drive, bearings fillers, mixing box, dampers, VAV, coil, include performance data.

.3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.2 Instructions: submit manufacturer's installation instructions.

.4 Closeout Submittals:
.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

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

1.4 QUALITY ASSURANCE

.1 Health and Safety:
.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Health, Safety and Emergency Response Procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

.2 Waste Management and Disposal:
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance with Section 01 74 00 - Cleaning and Waste Management.

1.6 MAINTENANCE

.1 Extra Materials:
.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
.2 Furnish list of individual manufacturer's recommended spare parts for equipment include:
.1 Bearings and seals.
.2 Addresses of suppliers.
.3 List of specialized tools necessary for adjusting, repairing or replacing.

2 Products

2.1 GENERAL

.1 Factory assembled or field erected total energy recovery wheel arranged as indicated.

.2 Unit construction to Section 23 72 10 - Air handling units - built-up or 23 71 11 - Air Handling Units - Packaged.

.3 Performance:
.1 Capacity: As indicated.

.2 Efficiency: As indicated.

.4 Acceptable Material: Aldes, Engineered Air, Fantech, Nuaire, Renewaire, Venmar, Vanee.

2.2 ENTHALPY HEAT TYPE AIR TO AIR FIXED PLATE HEAT EXCHANGER

.1 Casing: 70.8 mm thick, galvanized steel 0.8 mm thick stainless steel, with removable side panels.

.2 Motor: direct drive or belt drive ODP.

.3 Media: water vapor transport durable polymer membrane that is highly permeable to humidity, freeze tolerant and water washable.

.4 Cross contamination not permitted.

.5 Performance characteristics: as indicated.

2.3 AIR TO AIR FIXED PLATE EXCHANGER

.1 Casing: 0.8 mm thick galvanized steel.

.2 Heat transfer surfaces: corrugated aluminum or poly propylene edge sealed and bonded to casing.

.3 Cross contamination: not permitted.

.4 Condensate drain: NPS 2.

.5 Removable access panels.

.6 Performance characteristics: as indicated.

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 datasheet.

3.2 INSTALLATION

.1 Install in accordance with manufacturers recommendations.

.2 Support independently of adjacent ductwork with flexible connections.

.3 Install access doors in accordance with Section 23 33 00 - Air Duct Accessories for access to coils, dampers, and motors.

3.3 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Management.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

3.4 FIELD QUALITY CONTROL

.1 Commissioning:

.1 Manufacturer to:

.1 Certify installation.

.2 Start up and commission installation.

.3 Carry out on-site performance verification tests.

.4 Demonstrate operation and maintenance.

.2 Provide Consultant at least 24 hours notice prior to inspections, tests and demonstrations. Submit written report of inspections and test results.

END OF SECTION

1 General

1.1 REFERENCES

.1 Health Canada / Workplace Hazardous Material Information System (WHMIS).

.2 Hydronic Institute of Boiler and Radiator Manufacturers (IBR).

.3 Air-conditioning, Heating and Refrigeration Institute (AHRI).

1.2 SUBMITTALS

.1 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate:

.1 Equipment, capacity, piping, and connections.

.2 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, sizes and location of mounting bolt holes.

.3 Special enclosures.

.2 Closeout Submittals:

.1 Submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance with Section 01 74 00 - Cleaning and Waste Management.

2 Products

2.1 DAMPERS

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

2.2 CAPACITY

.1 As indicated.

2.3 BASEBOARD RADIATION

.1 Heating elements: tubing mechanically expanded into flanged collars of evenly spaced aluminum fins and cast from headers, steel side plates and supports.

.2 Enclosure: minimum 1.0 mm thick steel prefinished with 1.0 mm thick back and top of one piece construction. Front panel removable. Run wall to wall unless otherwise indicated. Provide panel corners. Assemble with stainless steel no.10 oval head sheet metal screws. Finish factory applied baked on enamel.

.3 Element brackets: 1.2 mm thick galvanized steel to support front panel and element cradle. Space brackets 900 mm centres maximum.

.4 Provide for noiseless expansion of components.

.5 Acceptable Material: JAGA, Runtal.

2.4 FINNED TUBE RADIATION

.1 Heating elements: seamless copper tubing, 1.2 mm minimum wall thickness, mechanically expanded into flanged collars of evenly spaced fins.

.2 Element hangers: ball bearings cradle type providing unrestricted longitudinal movement on enclosure brackets. Space brackets 900 mm centres maximum.

.3 Standard enclosures: 2.0 mm thick steel complete with components for wall-to-wall or complete with die formed end caps having no knock-outs, with inside corners, outside corners, as indicated. Provide full length channel and sealer strip at top of wall edge. Height as indicated. Joints and filler pieces flush with cabinet. Support rigidly top and bottom, on wall mounted brackets. Joints and filler pieces clear of grilles located to provide easy access to valves and vents. Finish cabinet with factory applied baked primer coat.

.4 Special enclosures: as indicated.

.5 Dimensions for enclosures: measure site conditions. Do not scale from drawing.

.6 Provide for noiseless expansion of components.

.7 Acceptable Material: JAGA, Runtal.

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 datasheet.

3.2 INSTALLATION

.1 Install in accordance with manufacturer's instructions.

.2 Install in accordance with piping layout and approved shop drawings.

.3 Provide for pipe movement during normal operation.

.4 Maintain sufficient clearance to permit performance of service maintenance.

.5 Check final location with Consultant if different from that indicated prior to installation. Should deviations beyond allowable clearances arise, request and follow Consultant's directive.

.6 Valves:

.1 Install valves with stems upright or horizontal unless approved otherwise.

.2 Install isolating gate valves on inlet and lockshield globe balancing valves on outlet of each unit.

.7 Venting:

.1 Install screwdriver vent on cabinet convector, terminating flush with surface of cabinet.

.2 Install automatic air vent on continuous finned tube radiation.

.8 Clean finned tubes and comb straight.

.9 Install flexible expansion compensators as indicated.

3.3 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning and Waste Management.

END OF SECTION

1 General

1.1 REFERENCES

.1 Air Movement and Controls Association (AMCA)

.1 AMCA 210: Laboratory methods of testing fans for aerodynamics performance rating.

.2 National Electrical Manufacturer's Association (NEMA).

.1 NEMA MG-1 Motors and Generators.

.3 Canadian Standards Association (CSA).

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit product data sheets for unit heaters. Include the following:

.1 Product characteristics.

.2 Performance criteria.

.3 Mounting methods.

.4 Physical size.

.5 kW rating, voltage, phase.

.6 Cabinet material thicknesses.

.7 Limitations.

.8 Colour and finish.

.3 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate:

.1 Equipment, capacity and piping connections.

.2 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, sizes and location of mounting bolt holes.

1.4 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for unit heaters for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 00 - Cleaning and Waste Management, and with Waste Reduction Workplan.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

2 Products

2.1 CABINET UNIT HEATERS

.1 Acceptable material:

.1 Modine, Rosemex, Eng Air, Beacon Morris, JAGA.

.2 Cabinet: type surface, semi-recessed or recessed as indicated, 1.6 mm thick steel with rounded exposed corners and edges, removable panels, glass fibre insulation and integral air outlet and inlet.

.3 Finish with factory applied primer coat.
.4 Special cabinets or front panels: as indicated.
.5 Coils: aluminum fins mechanically bonded to copper tubes. Hydrostatically tested to 1 MPa.
.6 Electric coils: nickel-chrome resistance coils embedded in refractory material and enclosed in steel sheathing with low or high watt density extended fins.
.1 Two stage heating with magnetic contactors, high temperature limit switch, and fan override switch.
.2 Control heating elements in conjunction with fan by common control switch.
.7 Fans: centrifugal double width wheels, statically and dynamically balanced, direct driven, sleeve bearings, resilient mounted.
.8 Motor: multi-speed, tapped wound permanent split capacitor type with sleeve bearings, built-in thermal overload protection and resilient rubber isolation mounting.
.9 Filters: removable 25 mm thick fibrous glass throwaway type or permanent washable.
.10 Capacity: as indicated.
.11 Control:
.1 3 speed on-off switch with integral overloads in cabinet.
.2 Control thermostat: integral electric, line voltage, electronic, Energy Star Certified, rating to suit cabinet unit heater, locking cover, set point locking device, concealed adjustment, plastic cover and guard, thermometer in cover. See Section 23 09 33 - Electric and Electronic controls system for HVAC or Section 25 30 02 EMCS: Field Control Devices and Indicated.

2.2 HORIZONTAL UNIT HEATERS

.1 Acceptable material:
.1 Modine, Rosemex, Eng Air, Beacon Morris, JAGA.
.2 Casing: 1.6 mm thick cold rolled steel, gloss enamel finish, with threaded connections for hanger rods.
.3 Coils: seamless copper tubing, silver brazed to steel headers with evenly spaced aluminum fins mechanically bonded to tubing. Hydrostatically test to 1 MPa.
.4 Fan: direct drive propeller type, factory balanced, with anti-corrosive finish and fan guard.
.5 Motor: speed as indicated continuous duty, built-in overload protection, and resilient motor supports.
.6 Air outlet: two-way adjustable louvres.
.7 Capacity: as indicated
.8 Control room thermostat: electric, line voltage, electronic, Energy Star Certified, locking cover, set point locking device, concealed adjustment, plastic cover and guard, thermometer in cover.

3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's instructions.
.2 Provide double swing pipe joints as indicated.
.3 Check final location with Consultant if different from that indicated prior to installation.
.1 Should deviations beyond allowable clearances arise, request and follow Consultant's directive.
.4 Hot water units: for each unit, install gate valve on inlet and lockshield globe balancing valve on outlet of each unit. Install drain valve at low point.
.1 Install manual or automatic air vent at high point.

.5 Steam units: for each unit, install gate valve on inlet, steam trap assembly as indicated on outlet.
.6 Clean finned tubes and comb straight.
.7 Provide supplementary suspension steel as required.
.8 Install thermostats in locations indicated.
.9 Before acceptance, set discharge patterns and fan speeds to suit requirements.

END OF SECTION

1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.1-18, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

.2 CAN/CSA-22.3 No. 1, Overhead Systems.

.3 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.4 CSA Z462-12, Workplace Electrical Safety.

.2 Institute of Electrical and Electronics Engineers (IEEE) / National Electrical Safety Code Product Line (NESC).

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standard Terms, 7th Edition.

1.2 DEFINITIONS

.1 Electrical terms used in electrical specifications and on electrical drawings are those defined by IEEE SP1122.

1.3 CARE, OPERATION AND START-UP

.1 Instruct Consultant and operating personnel in the operation, care and maintenance of systems, system equipment and components.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start up, proper adjustment, operating, maintenance, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment or component failure.

.5 Other items of instruction as recommended by manufacturer of the system or equipment.

.3 Print operating instructions in laminated plastic adjacent to equipment or systems interface.

.4 Arrange and pay for manufacturer's factory service technician to supervise start-up, installation, check, adjust, balance and calibrate components and instruct operating personnel.

.5 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.4 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235-83(R2000).

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.5 SITE VISIT

.1 Prior to tender submission visit the site and become familiar with the job and all conditions which may affect the overall cost. Ignorance of existing conditions will not be considered as basis for extra claims. Refer to Division 01 - General Requirements for additional information.

1.6 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Division 01 - General Requirements.
  .1 Submit shop drawings for all electrical equipment unless otherwise indicated.
  .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure coordinated installation.
  .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
  .4 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.
  .5 If changes are required, resubmit corrected shop drawings.
.2 Manufacturer's Field Reports: submit to Consultant within 7 days of review, verifying compliance of work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.
.3 Provide single line electrical diagrams in glazed frames or laminated sheets as follows:
  .1 Electrical distribution system: locate in main electrical room.
.4 Submit WHMIS MSDS information in accordance with Division 01 - General Requirements.
.5 Upon completion of work submit As-Built Drawings, Maintenance Manuals, and Submittals in accordance with Division 01 - General Requirements.

1.7 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Division 01 - General Requirements.
.2 All electrical work is to be carried out by qualified, licensed electricians or apprentices for the province of Prince Edward Island and the electrical contractor must have a valid contractor license issued by the province of Prince Edward Island.
  .1 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
.3 The Consultant reserves the right to approve the quality of material and workmanship, and to call for any tests which they deem necessary to establish the integrity of the installation during the progress of the work and a complete test of each system at the completion of the work. The cost of such tests are not to be considered as extras.
.4 Health and Safety: in accordance with Division 01 - General Requirements.
  .1 Protect exposed live equipment during construction for personnel safety.
  .2 Shield and mark all live parts “LIVE 120 VOLTS”, or with appropriate voltage in English.
  .3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of an electrician.
.5 Quality Control: in accordance with Division 01 - General Requirements.
  .1 Provide CSA certified equipment and material. Where CSA certified equipment and material is not available, submit such equipment and material to the authority having jurisdiction for approval before delivery to site.
  .2 Submit test results of installed electrical systems and instrumentation.
  .3 Upon completion of work, submit load balance report as described in PART 3 - LOAD BALANCE.
  .4 Submit certificate of acceptance from authority having jurisdiction upon completion of work to Consultant.

1.8 PERMITS, FEES AND INSPECTION

.1 Submit to Electrical Inspection Division and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of

work.

.2 Pay all associated fees.

.3 Notify Consultant of changes required by Electrical Inspection Division prior to making changes.

.4 Submit Certificates of Acceptance from Electrical Inspection Division or authorities having jurisdiction on completion of work to Consultant.

1.9 CO-ORDINATION

.1 Co-ordinate all work with work of other divisions to avoid conflict and notify Consultant if any changes are required.

.2 Locate electrical systems, equipment, and materials to provide minimum interference and maximum usable space.

.3 Contractor to locate all existing underground services before commencing work and be responsible for any damages caused by failure to coordinate with and preserve underground services.

.4 Where interference occurs, the Consultant must approve relocation of equipment and materials regardless of installation order.

.5 Notwithstanding the review of shop drawings, the Electrical Contractor may be required to relocate electrical equipment which interferes with the equipment of other trades, due to lack of co-ordination of the Electrical Contractor with other trades. The cost of this relocation will be the responsibility of the Electrical Contractor and the Consultant will determine the extent of relocation required.

.6 Leave space clear, and install equipment to accommodate future materials and/or equipment as indicated or specified, or to accommodate equipment and/or materials supplied by other Contractors.

.7 Verify that the spaces in which the equipment is to be installed is sufficient and install all equipment to maintain head room and clearances, to conserve space, comply with codes, and to ensure adequate space for future servicing.

.8 The Drawings for the Electrical work are diagrammatic performance Drawings only and are intended to convey the scope of work and indicate the general arrangement, locations, and size of equipment fixtures and outlets. The Drawings do not show Architectural, Mechanical or Structural details.

.9 Do not scale or measure Drawings, but obtain information regarding accurate dimensions, from the dimensions shown on the Architectural Drawings or by site measurements. Follow the Electrical Drawings for laying out the work.

1.10 CUTTING AND PATCHING

.1 Electrical Contractor to inform all other divisions in time, of required electrical openings and/or penetrations. Where this requirement is not met, the cost of all cutting and associated work to provide openings and/or penetrations will be the responsibility of the Electrical Contractor. Obtain written approval of Structural Engineer before drilling through any beams or floors. Keep hole sizes to a minimum and be responsible to repair damage caused by lack of coordination.

1.11 DELIVERY, STORAGE AND HANDLING

.1 Provide Consultant with material delivery schedule within two weeks after award of Contract.

.2 Arrange for delivery access and unloading and/or storage areas with General Contractor.

1.12 INSPECTION OF WORK

.1 Periodic visits to the site during construction phase will take place to ascertain reasonable conformity to plans and specifications. The Contractor will be responsible for the execution of their work in conformity with the construction documents, the Contract,

and the requirements of the inspection authority.

1.13 SCHEDULING OF WORK

.1 Work is to be scheduled in phases as described in Division 01 - General Requirements.

.2 Become familiar with the phasing requirements for the work and comply with these conditions.

.3 No additional monies will be paid for Contractor's requirement to comply with work phasing conditions.

.4 Note that the Owner intends to carry on business as usual and work activities must be coordinated to maintain electrical services in occupied areas. Provide any required temporary work.

.5 Work activities which disrupt occupants of the building, such as excessive noise caused by drilling of walls, floors or ceilings must be approved and scheduled in writing by the Project Manager at least 48 hours in advance.

.6 All power shutdowns which affect building occupants or building operation must have prior approval of Owner and must be scheduled in writing at least 48 hours in advance with the Project Manager.

.7 Overtime work, and work outside normal work hours deemed necessary to meet the schedule are the responsibility of the Contractor and must meet the requirements of the PEI Employment Standards Act. All costs resulting from such overtime work must be included in the Contractor's total tender price.

1.14 FIRE RATING OF PENETRATIONS

.1 Provide fire stopping and smoke seal materials at openings around cabling conduits passing through floors, ceilings and fire rated walls, as required to maintain fire rating equal to the fire rated assembly.

.2 Use ULC or approved equal fire barrier products installed in accordance with manufacturers instructions at each penetration.

.3 Acceptable material for fire barrier products to be 3M #CP25 fire barrier caulk, #303 putty, #FS 195 wrap and #CS195 sheet.

1.15 NOISE CONTROL

.1 Cables or conduits penetrating through or entering into acoustical wall types must be appropriately sleeved and sealed to mitigate the transmission of structure and air borne sound. Reference the attached acoustic isolating details at the end of this section for more information.

.2 Where a penetration through a wall or floor requires both a fire and acoustic seal, both requirements shall be satisfied. A fire seal does not negate the need for an acoustic seal. Alterations to acoustic details dictated by fire code interpretations shall be reviewed by the Acoustical Consultant prior to installation.

.3 Acoustic sealant to be a non-hardening airtight caulking material in accordance with CAN/CGSB-19.21-M87.

.1 Acceptable material: Tremco or CGC Acoustic Sealant.

.2 If a fire and acoustic seal is required at the penetration use TREMstop Acrylic Firestopping Sealant. Submit shop drawings for fire and acoustic sealants in accordance with Division 01 - General Requirements.

.4 Electrical back boxes installed on one side of an acoustic wall must not come in contact with the other side of the wall, directly opposite. If the gap between back box and the opposite wall is less than 1/2" it will need to be filled with loosely packed glass fibre insulation.

2 Products

2.1 PRIOR APPROVAL OF PRODUCTS

.1 The use of any product not listed by name in the specification must be approved by Consultant prior to tender submission.

.2 By using pre-approved product substitutions the Contractor accepts the responsibility and associated costs for all required modifications to circuitry, devices and wiring. The Contractor is to submit shop drawings with deviation from the original design highlighted to the Consultant for review and approval prior to rough-in.

2.2 MATERIALS AND EQUIPMENT

.1 Provide materials and equipment in accordance with Division 01 - General Requirements.

.2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Division prior to delivery and submit such approval as described in Part 1 - Submittals.

2.3 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint indoor electrical equipment enclosures light grey to EEMAC 2Y-1.

2.4 WARNING SIGNS

.1 As specified and to meet requirements of Electrical Inspection Department.

.2 Porcelain enamel or acrylic decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

.1 All junction and pull boxes are to be marked with an indelible ink marker to designate the circuit number of enclosed wiring, the designated panel name and electrical characteristics. Where boxes are painted in exposed areas, information is to be written on inside of box cover.

.2 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: Lamicoid 3 mm thick plastic engraving sheet, black white face, black white core, mechanically attached with self tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES:

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 line	6 mm high letters

.3 Labels:

.1 Embossed plastic labels with 6 mm high letters unless specified otherwise.

.4 Wording on nameplates and labels to be approved by Consultant prior to manufacture.

.5 Allow for average of twenty-five (25) letters per nameplate and label.

.6 Identification to be English.

.7 Nameplates for pull boxes and junction boxes to indicate system name and voltage

characteristics.

.8 Nameplates for disconnects, starters and contactors to indicate equipment being controlled, wire, voltage, phase, number of power source and branch circuit breaker number.

.9 Nameplates for pull boxes to indicate system name, overcurrent protection device rating, voltage, phase, and number of wire, and power source.

.10 Lamicoid nameplates installed on combination starters, magnetic starters, manual starters and all various system controls, control panels, contactors, disconnect switches, and large junction and pull boxes shall contain the following information:

.1 Designated name of equipment.

.2 Designated name of power source.

.3 Voltage, number of phases and wires.

.4 Branch circuit breaker number(s) where possible.

.5 The following is an example:

PUMP P-4
208V-3PH, FED FROM G-19, 21, 23

.11 Install an additional nameplate on all, or any piece of electrical equipment, or apparatus, i.e. Main Switchboard and fusible switches, etc., that may contain overcurrent devices, i.e. circuit breakers and/or fuses, that have been designed for, and incorporate an interrupting capacity sized "larger" than 10 KAIC.

Example:

Minimum interrupting capacity of breakers installed in this panel is to be not less than 22 KAIC	Minimum interrupting capacity of fuses installed in this switch are to be not less than 100 KAIC

2.7 WIRING IDENTIFICATION

.1 Identify wiring with indelible pre-printed self-adhesive vinyl tape, indicating panel and circuit number. Wiring to be identified at both ends and at junction, pull boxes and splices.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour code: to CSA C22.1-18, Canadian Electrical Code.

2.8 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.1 Colour coding of electrical boxes and their associated covers located in finished areas to be applied to the inside cover and box.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

.1 Colours indicated below are for reference only. If an existing colour coding scheme exists within the building, then the existing colour coding scheme is to be utilized.

SYSTEM	PRIME COLOR	AUXILIARY COLOR
208/120V (normal)	Yellow	-------
Telephone	White	-------
Data	Blue	-------
Fire Alarm	Red	-------
Emergency Voice	Red	Blue
Low Voltage Lighting	Black	-------
WAP	Yellow	-------
Public Address	Blue	-------

3 Execution

3.1 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.2 LOCATION OF EQUIPMENT

.1 Change location of equipment at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

.4 Prior to rough-in, coordinate locations of conduit runs with other trades.

3.4 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify with Consultant before proceeding with installation.

.3 Install electrical equipment at the following heights:

- .1 Local switches: 1200 mm.
- .2 Wall receptacles:
  - .1 General: 450 mm.
  - .2 Above top of continuous baseboard heater: 200 mm.
  - .3 152mm above counter or 230mm above counter with backsplash.
  - .4 In mechanical rooms: 1400 mm.
- .3 Panelboards: 1600 mm or as required by Code.
- .4 Telephone and data outlets: 450 mm.
  - .1 Above top of continuous baseboard heater: 200 mm.
  - .2 152mm above counter or 230mm above counter with backsplash.
- .5 Fire alarm manual stations: 1100 mm.
- .6 Fire alarm end-of-line resistors: 1800 mm.
- .7 Public address speakers: as indicated on the Drawings.
- .8 Call-in switch: 1200mm
- .9 Carehawk Central Controller:
- .10 Wall mounted exit signs: 2400 mm.

.11 Emergency lighting heads: 2400 mm.

.12 Luminaires: as indicated in the Luminaire Schedule.

.4 Masonry outlet boxes are to be installed at the bottom of concrete blocks to the approximate height indicated.

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.6 FIELD QUALITY CONTROL

.1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program will be permitted, under the direct supervision of a qualified licensed electrician.

.1 Permitted activities are to be determined based on the level of training attained and the demonstration of ability to perform specific duties.

.2 The work of this division to be carried out by a contractor who holds a valid Code 1 Electrical Contractor License as issued by the Province.

.3 Load Balance:

.1 Measure phase current to panelboard with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Submit, at completion of work, report listing phase and neutral currents on panelboards, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

.4 Conduct and pay for following tests in accordance with Division 01 - General Requirements.

.1 Distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Lighting and its control.

.4 Exit sign and emergency lighting.

.5 Motors, heaters and associated control equipment including sequenced operations of systems where applicable.

.6 Systems: fire alarm system, communications and public address system.

.7 Ground system continuity and resistance test.

.5 Furnish manufacturer’s certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer’s instructions.

.6 Insulation resistance testing for:

.1 Megger and record circuits, incoming service feeders and wiring to distribution panels up to 350 V with a 500 V instrument.

.2 Megger and record 350 – 600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Megger and record 350 – 15000 V circuits, feeders and equipment with a 5000 V instrument.

.4 Check resistance to ground before energizing and record value.

.7 Provide instruments, meters, equipment and personnel required to conduct tests during and conclusion of project.

3.7 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent

rusting.

.3 Clean luminaire lenses, housings, louvers, etc. upon completion of construction.

END OF SECTION

1 General

1.1 DESCRIPTION OF WORK

.1 Work of this Section consists of the complete removal of all obsolete or abandoned electrical equipment including, but not limited to:

.1 Existing obsolete 600A, 120/208V, three phase, four wire switchboard and associated incoming cabling and branch circuit feeders to associated distribution and branch circuit panelboards.

.2 Existing obsolete lighting, conduit and wire, and raceway.

.3 Existing obsolete power, communication and public address system aconduit and wire/cabling.

.2 All removal or alteration work of electrical construction to be done in accordance with the safety standards outlined in the Canadian Electrical Code.

1.2 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Division 01 - General Requirements.

1.4 SITE SURVEY

.1 Prior to Tender submission, visit the site and survey and quantify the extent of the removals/alterations required for this contract and include for all costs in the total tendered price. Any existing conditions information indicated on the drawings is for general guidance only.

.2 In conjunction with site visit, review all drawings and include all costs due to existing conditions in total tendered price.

1.5 PROTECTION

.1 The Contractor is to provide and coordinate the protection of existing structures and systems which may be damaged by work activities and is to be responsible for any damages to existing structures or systems as a result of lack of coordination and/or protection.

1.6 SALVAGE MATERIAL

.1 Existing equipment and devices designated for reuse are to be removed, stored, cleaned and re-installed as indicated on the drawings.

.2 Identify any damaged equipment or materials intended for reuse prior to demolition and point out deficiencies to the Consultant at that time.

2 Products

2.1 NOT APPLICABLE

.1 Not Applicable.

3 Execution

3.1 GENERAL REMOVALS

.1 Where indicated remove all obsolete or abandoned equipment or electrical services including wire and conduit back to the source.

.2 Coordinate work of this Section with other trades.

.3 Schedule all removal work with the Owner. Do not disrupt building operations except as permitted by the Schedule.

.4 Any existing conduit, wiring, boxes or equipment that is to remain in service is to be properly supported as required by the Canadian Electrical Code. Any additional hangers, straps or fasteners required are to be supplied under this contract.

.5 Make alterations to existing electrical services as required and make good all circuits affected by the renovations.

.6 Any existing electrical circuits and/or equipment that are interrupted during construction to accommodate alterations but are to remain in service are to be reconnected and circuits made good.

.7 Any relocating of existing equipment and any rerouting of existing wire and conduit to coordinate with new work to be included in total tendered price.

3.2 IDENTIFICATION OF EXISTING CIRCUITS AND EQUIPMENT

.1 All circuits in existing panelboards serving renovated areas are to be traced out to identify any devices not labeled on existing directories and to confirm all circuits indicated on directories are accurate. Provide new, updated, typewritten circuit directories in all panelboards modified by the renovations.

.2 Provide identification indicating circuit and panel number at all new and existing wiring devices in renovated area.

.3 Provide equipment nameplates and labels for all new and existing equipment in renovated area.

.4 Equipment identification, wiring identification and conduit and cable identification is to be in accordance with Section 26 05 00 - Common Work Results - Electrical.

3.3 CUTTING

.1 Cutting required for removals and alterations to be to the approval of the Consultant and performed with appropriate power tools.

3.4 CLEANING

.1 Reused existing equipment to be cleaned in accordance with Division 01 - General Requirements.

END OF SECTION

1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-C22.2 No.18-98 (R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.

.2 CSA C22.2 No.65-93 (R2008), Wire Connectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

2 Products

2.1 MATERIALS

.1 Crimp style wire connectors, nylon insulated, with current carrying parts of copper alloy for conductors #16 AWG and smaller.

.2 Fork tongue or ring style connectors, nylon insulated crimp style. Terminals for connecting conductors #16 AWG and smaller to screw down terminals.

.3 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required. Use twist-on connectors for #14 AWG to #8 AWG conductors.

.4 Fixture type twist-on splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors #10 AWG or less.

.5 Compression type connectors for connecting #6 AWG conductors and larger, unless indicated otherwise.

.6 Bushing stud connectors: to EEMAC 1Y-2 to consist of:

.1 Connector body and stud clamp for stranded round copper or aluminum conductors.

.2 Clamp for stranded round copper or aluminum conductors.

.3 Stud clamp bolts for copper or aluminum conductors.

.4 Bolts for copper bar.

.5 Sized for conductors and bars as indicated.

.7 Clamps or connectors for armoured cable, aluminum sheathed cable, Teck cable, and flexible conduit as required to: CAN/CSA-C22.2 No.18.

3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation is to meet secureness tests in accordance with CSA C22.2 No.65.

.2 Install fixture type connectors and tighten. Replace insulating cap.

.3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

.4 Where ACM conductors are used, apply zinc joint compound on aluminum conductors prior to installation of connectors or termination.

.5 Install crimp style connectors with snap-on nylon caps on splices and joints on branch circuits.

.2 All connections are to be made electrically and mechanically secure. Size and type of connector to be in accordance with manufacturers recommendations for each wire size

and combination of wires.

3.2 RESTRICTIONS

.1 Circuit splices are NOT permitted in equipment enclosures or electrical panelboards.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.
.2 Section 26 05 20 - Wire and Box Connectors (0-1000V).
.3 Section 26 05 29 - Hangers and Supports for Electrical Systems.
.4 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
.5 Section 26 05 43.01 - Installation of Cables in Trenches and in Ducts.
.6 Section 26 24 01 - Service Entrance.
.7 Section 26 50 00 - Lighting.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)
  .1 CSA C22.2 No. 03-96, Test Methods for Electrical Wires and Cables.
  .2 CAN/CSA C22.2 No. 131, Type TECK 90 Cable.

2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for #8 AWG and larger, solid for #10 AWG and smaller.
.2 Minimum size to be #12 AWG for lighting and power, #14 AWG for controls, #16 AWG for low voltage and lighting relay/controls.
.3 Conductors to be sized as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE and RWU90 XLPE as indicated. Provide RWU90 XLPE rated cable for underground wiring related to new service entrance feeders. RWU90 XLPE not required under interior floor slabs.
.4 Single conductor metal sheathed cables are not permitted.
.5 Conductor sizes on drawings are based on copper conductors.
.6 Aluminum Composite Material (ACM) conductors will be permitted as an acceptable alternative to copper conductors for service, and panelboard feeders equal or greater than 60 A. ACM conductors are not to be terminated with copper bodied connectors, and all ACM conductor ends are to be treated with an oxide retardant coating prior to termination. The use of ACM conductors must be approved by the Consultant prior to tender submission. Exact size of ACM conductors as an alternate to copper conductors are to be verified by the Consultant prior to rough-in.

2.2 TECK CABLE

.1 Cable: to CAN/CSA C22.2 No. 131.
.2 Conductors:
  .1 Grounding conductor: copper.
  .2 Circuit conductors: copper and ACM alloy, size as indicated.
.3 Insulation:
  .1 Chemically cross-linked polyethylene (XLPE), rated RW90, 600 V.
.4 Inner jacket: polyvinyl chloride material.
.5 Armour: interlocking aluminum.
.6 Overall covering: thermoplastic polyvinyl chloride material.
.7 Fastenings:
  .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
  .2 Channel type supports for two or more cables at 1500 mm centers.

.3 Threaded rods: 6 mm dia. to support suspended channels.

.8 Connectors:

.1 Watertight spin-on style connectors or type approved for TECK cable.

.1 Acceptable material:

.1 Thomas & Betts - Star Teck.

2.3 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90.

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Connectors: standard as required, complete with double split rings in accordance with Section 26 05 20 - Wire and Box Connectors (0 - 1000 V).

2.4 CONTROL CABLES

.1 Type LVT: 2 soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket.

.2 Low energy 300 V control cable: stranded annealed copper conductors sized as indicated, with PVC insulation type TW -40°C polyethylene insulation with shielding of tape coated with paramagnetic material wire braid over each conductor and overall covering of PVC jacket.

2.5 ACM CONDUCTORS

.1 Annealed, compacted aluminum alloy conductor material (ACM), single or multi-conductor, 600 V insulation.

.2 Type: AC90, ACWU90 and TECK90.

.3 Armour: interlocked aluminum strip.

.4 Conductivity: 61% IACS to that of copper.

.5 Outer jacket: ACWU90 PVC jacket, FT4 rated suitable for direct buried

.6 Restrictions: On service or panelboard feeders only, which are equal or greater than 60 A, and pending approval by Consultant prior to tender submission.

3 Execution

3.1 WIRING METHODS

.1 All work to be concealed in finished areas where possible, wire in painted conduit where exposed in finished areas.

.2 All work in or through fire rated or acoustic structures to be in accordance with Section 26 05 00 - Common Work Results - Electrical.

.3 Panelboard feeders: building wire in conduit.

.4 Branch circuit work:

.1 Concealed work in wall partitions: building wire in conduit or armoured cable.

.2 Horizontal work above accessible ceilings: building wire in conduit or armoured cable.

.3 Surface work in unfinished areas: building wire in conduit.

.4 Armoured cable may be used where permitted by the Canadian Electrical Code for drops to new equipment in existing gypsum board walls and ceilings.

.5 Drops to light fixtures to be building wire in flexible conduit or armoured cable, maximum length 1.5 m.

.6 Branch circuit wiring to be sized for a maximum voltage drop of 3%.

.1 15A branch circuits to be wired with:

.1 #12 AWG up to 80'

.2 #10 AWG up to 125'
.3 #8 AWG up to 200'

.2 20A branch circuits to be wired with:
.1 #12 AWG up to 60'
.2 #10 AWG up to 95'
.3 #8 AWG up to 150'

.3 30A branch circuits to be wired with:
.1 #10 AWG up to 60'
.2 #8 AWG up to 100'
.3 #6 AWG up to 160'

3.2 GENERAL CABLE INSTALLATION

.1 Install cable in trenches in accordance with Section 33 71 73.02 - Underground Electrical Service.

.2 Support cables in accordance with Section 26 05 29 - Hangers and Supports for Electrical Systems.

.3 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors (0-1000 V).

.4 Cable Colour Coding: to Section 26 05 00 - Common Work Results - Electrical.

.5 Conductor length for parallel feeders to be identical.

.6 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.7 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.8 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 In trenches and underground ducts in accordance with Section 26 05 43.01 - Installation of Cables in Trenches and Ducts.

.3 In surface and lighting fixture raceways in accordance with Section 26 50 00 - Lighting.

.4 Underground service conductors in accordance with Section 26 24 01 - Service Entrance.

3.4 INSTALLATION OF TECK CABLE

.1 Install Teck cables where indicated.

.1 Group cables wherever possible on channels.

.2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors (0 - 1000 V).

3.5 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

.2 Use permitted only for work in movable partitions and vertical power supply drops to lighting fixtures.

.3 Install anti-shorts as required.

.4 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors (0 - 1000 V).

3.6 INSTALLATION OF CONTROL CABLES

.1 Controls wiring for mechanical systems to be completed by the Controls Contractor. All other controls wiring to be completed by the Electrical Contractor.

.2 Install control cables in conduit as indicated.

.3 Ground control cable shield.

.4 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors (0 - 1000 V).

3.7 INSTALLATION OF ACM CONDUCTORS

.1 Install ACM cables as per CSA 22.1-18 and manufacturers installation requirements.

.2 Do not terminate ACM conductors with a copper bodied connector.

.3 Apply oxide coating on base cables as per CSA 22.1-18 requirements.

3.8 RESTRICTIONS

.1 Splices in wire and cable #6 AWG and larger are not permitted.

.2 Flexible conduit or armoured cable drops to luminaires are to be installed from junction box to luminaires, loops between luminaires is not permitted.

.3 Wiring and cabling, both concealed and exposed, is to be installed parallel and/or perpendicular to building lines in a clean, organized and professional fashion. Where possible, wiring and cabling is to follow a common pathway.

3.9 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Perform tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

.1 ANSI/IEEE 837-1989 (R1996), Qualifying Permanent Connections Used in Substation Grounding.

2 Products

2.1 EQUIPMENT

.1 Rod electrodes: copper clad steel 19 mm dia by 3 m long.

.2 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

.3 Insulated grounding conductors: green, type RW90, copper, size as indicated.

.4 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.5 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

.1 Grounding and bonding bushings.

.2 Protective type clamps.

.3 Bolted type conductor connectors, as required by local authority having jurisdiction.

.4 Bonding jumpers, straps.

.5 Pressure wire connectors.

3 Execution

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, and accessories.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to electrodes, using copper welding by mechanical bolt type.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install a bonding wire in all conduits. Where EMT is used, run insulated copper bond wire in conduit.

.8 Install internal bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw.

.9 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.10 Connect building structural steel and metal siding to ground by welding copper to steel.

.11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.12 Bond single conductor, metallic armoured cables to cabinet at supply end and load end.

.13 Ground secondary service pedestals.

.14 Connect conductive floor tile to ground. Make connections from tile system to ground in accordance with tile manufacturers instructions.

3.2 ELECTRODES

.1 Install water meter shunt.

.2 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.

.3 Install rod, plate electrodes and make grounding connections.

.4 Bond separate, multiple electrodes together.

.5 Use size 1/0 AWG copper conductors for connections to electrodes as required by Section 10 of the Canadian Electrical Code.

.6 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.3 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of secondary 208 V system.

3.4 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, duct systems, frames of motors, starters & distribution panels.

3.5 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall of electrical room.

.2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size as required by Section 10 of the Canadian Electrical Code.

3.6 COMMUNICATION SYSTEMS

.1 Install grounding connections for sound, fire alarm, intercommunication systems as follows:

.1 Communications: make grounding system in accordance with service provider's requirements and as indicated.

.2 Sound and fire alarm systems as indicated and in accordance with the manufacturers grounding instructions.

3.7 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No. 18.4-04 (R2009), Hardware for the support of Conduit, Tubing, and Cable (Bi-National Standard with UL 2239).

2 Products

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted suspended or set in poured concrete walls and ceilings as required.

2.2 SPECIFIC PURPOSE SUPPORTS

.1 Specific purpose heat treated, spring steel fasteners to support boxes, conduit and cable from main structure, channels, and metal studs.

3 Execution

3.1 INSTALLATION

.1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors or nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with bar type box hangers. Ensure that box hangers are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.

.1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.

.2 Two-hole steel straps for conduits and cables larger than 50 mm.

.3 Beam clamps to secure conduit to exposed steel work.

.4 Strap AC90 at box location and at every 900 mm.

.7 Suspended support systems.

.1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.

.2 Support two (2) or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

.12 Electrical boxes concealed in hollow gypsum board walls to be supported by specific

purpose brackets or clips designed for stud wall construction.

.13 Boxes installed in steel stud walls to be mounted on screw gun brackets installed between studs.

3.2 RESTRICTIONS

.1 Do not use wire lashing, wood blocking, nylon or plastic strap ('Ty-Wraps') to support or secure raceways or cables.

.2 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Consultant.

.3 Do not install cable, raceway, or boxes directly to underside of roof deck, maintain a minimum separation of 40mm as required by Code.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.1-18, Canadian Electrical Code, Part 1, 24th Edition.

2 Products

2.1 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

.3 Covers with turned edges for surface-mounted pull and junction boxes.

.4 Acceptable material:

.1 Appleton GRUE Series boxes c/w sealing cover where required.

3 Execution

3.1 JUNCTION AND PULL BOXES INSTALLATION

.1 Install pull boxes in inconspicuous, but accessible locations.

.2 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.2 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Install size 2 identification labels indicating system name voltage and phase or box designation as indicated.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results – Electrical.

.2 Section 26 05 29 – Hangers and Supports for Electrical Systems.

.3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No. 18-98 (R2003), Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware, a National Standard of Canada.

.2 CSA 22.1-18, Canadian Electrical Code, Part 1, 24th Edition.

2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA 22.1-18.

.2 102 mm square or larger outlet boxes as required.

.3 Gang boxes where wiring devices are grouped.

.4 Stainless steel blank cover plates for boxes without wiring devices.

.5 Combination boxes with steel barriers where outlets for more than one system or voltage are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.1 Screw-on, turned edge covers for surface mounted boxes.

.3 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster walls.

.4 102 mm square or octagonal outlet boxes for luminaires.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

.1 Electro-galvanized steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 CONDUIT BOXES

.1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

2.6 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

.5 Double split rings for AC90 terminations.

3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush within finished walls using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit and armoured cable connections. Reducing washers are not allowed.

.5 Vacuum clean interior of outlet boxes before installation of wiring devices.

.6 Identify systems for outlet boxes in accordance with Section 26 05 00 - Common Work Results - Electrical.

.7 Outlet boxes and conduit boxes to be flush mounted in new construction. Outlet and conduit boxes in existing construction to be flush mounted except in existing masonry filled block walls.

.8 Install vapour barrier boxes around all device boxes installed in acoustical wall types and structures. Fill void between device box and vapour barrier with isolating expansion foam where indicated.

.9 Install vapour barrier boxes around all galvanized steel device boxes recess mounted in exterior walls and structures.

END OF SECTION

1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

- .1 CSA C22.2 No. 45, Rigid Metal Conduit.
- .2 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .3 CSA C22.2 No. 83-M1985 (R2003), Electrical Metallic Tubing.
- .4 CSA C22.2 No. 211.2 (R2011), Rigid PVC (Unplasticized) Conduit.
- .5 CSA C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing (NMPT), a National Standard of Canada.
- .6 CSA C22.2 No. 18.3-12, Conduit, Tubing, and Cable Fittings (Tri-National Standard with ANCE NMX-J-017 & UL 514B).
- .7 CSA 22.1-18, Canadian Electrical Code, Part 1, 24th Edition.

1.2 SUBMITTALS

.1 Provide shop drawings and product data in accordance with Division 01 - General Requirements.

1.3 LOCATION OF CONDUITS

.1 Drawings do not show all conduits. Those shown are in diagrammatic form only.

2 Products

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.

.2 Two (2), 4" epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside, where mounted to exterior facade of building.

.3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with steel set-screw couplings and connectors.

- .1 Exposed conduit in finished areas to be painted to match adjacent finished surfaces where indicated.

.4 Rigid PVC conduit: to CSA C22.2 No. 211.2.

.5 Flexible metal conduit: to CSA C22.2 No. 56, aluminum flexible metal.

.6 FRE conduit: to CSA C22.2.

.7 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits spaced every 1.5 m on center.

.4 Threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: To CAN/CSA C22.2 No. 18.3, manufactured for use with conduit specified. Coating: same as conduit.

.2 Factory "ells" where 90° bends are required for 25 mm and larger conduits, unless indicated otherwise.

.3 Ensure conduit bends other than factory “ells” are made with an approved bender. Making offsets and other bends by cutting and rejoining 90 degree bends is not

permitted.

.4 Connectors and couplings for EMT. Steel set-screw type, size as required.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Watertight expansion fittings with integral bonding jumper suitable for 100mm linear expansion to suit installation and 19 mm deflection in all directions.

.2 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

.1 Polypropylene.

2.6 SEALANT

.1 Low VOC mastic compound.

.1 Acceptable material:

.1 DS-321.

.2 Flex Grip.

.3 Kingco 11-600.

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 INSTALLATION

.1 Install all conduit, conduit fittings and accessories in accordance with the latest edition of the Canadian Electrical Code in a manner that does not alter, change or violate any part of the installed system components or the certification of the components.

.2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.3 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.4 Surface mount conduits except in finished areas or as indicated.

.5 Use rigid hot dipped galvanized steel threaded conduit for exposed work below 2.4 m above finished floor.

.6 Use epoxy coated conduit underground in corrosive areas and where exposed to exterior elements. (ie:pole and surface mounted service entrance conduits)

.7 Use electrical metallic tubing (EMT) except in cast concrete and above 2.4 m not subject to mechanical injury, as well as concealed work in masonry construction.

.8 Use rigid PVC conduit underground and buried in or under concrete slab on grade.

.9 Use FRE conduit for encasement in concrete duct bank for service entrance feeders.

.10 Use flexible metal conduit for connection to motors in dry areas, connection to recessed luminaires without a prewired outlet box, and for connection to surface or recessed luminaires work in movable metal partitions.

.11 Use AC-90 for vertical power supply drops to luminaires.

.12 Minimum conduit size for lighting and power circuits: 21 mm. 16 mm conduit is acceptable for switch leg drops and control circuits only.

.13 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.14 Mechanically bend steel conduit over 21 mm dia.

.15 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.16 Install fish cord in empty conduits.
.17 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
.18 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.
.2 Run conduits in flanged portion of structural steel.
.3 Group conduits wherever possible on suspended channels.
.4 Do not pass conduits through structural members except as indicated.
.5 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.
.2 Do not install horizontal runs in masonry walls.
.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.
.2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

3.6 CLEANING

.1 On completion and verification of performance of installation, remove surplus materials, excess materials rubbish, tools and equipment.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

.2 Section 31 23 00 - Excavation and Fill.

1.2 REFERENCES

.1 Canadian Standards Association, (CSA)

.2 Insulated Cable Engineers Association, Inc. (ICEA)

2 Products

2.1 CABLE PROTECTION

.1 38 x 140 mm planks pressure treated with copper napthenate or 5% pentachlorophenol solution, water repellent preservative.

2.2 MARKER TAPE

.1 Metal detectable polyethylene marker tape: 75 mm wide for direct burial.

.2 Marker tape to be red in colour with the words "CAUTION ELECTRIC LINE BURIED BELOW" in large black letters.

2.3 SEALANT

.1 Low VOC mastic compound.

.1 Acceptable material:

.1 DS-321.

.2 Flex Grip.

.3 Kingco 11-600.

3 Execution

3.1 CABLE INSTALLATION IN DUCTS

.1 Install cables as indicated in ducts.

.1 Do not pull spliced cables inside ducts.

.2 Install multiple cables in duct simultaneously.

.3 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.4 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.

.5 Pull mandrel through and clean each section of conduit prior to installation.

.6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.7 After installation of cables, seal duct ends with duct sealing compound.

3.2 MARKER TAPE

.1 Install marker tape 300 mm below grade as indicated, continuous over full length of cables and ducts.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Perform tests using qualified personnel. Provide necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.

.5 Pre-acceptance tests for incoming service feeders and wiring to distribution panels.

.1 After installing cable but before splicing and terminating, perform insulation resistance test with megger on each phase conductor.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Acceptance Tests

.1 Ensure that terminations and accessory equipment are disconnected.

.2 Ground shields, ground wires, metallic armour and conductors not under test.

.3 High Potential (Hipot) Testing.

.1 Conduct hipot testing at 100 % of original factory test voltage in accordance with manufacturer's recommendations.

.4 Leakage Current Testing. [DESIGN NOTE: OPTIONAL]

.1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.

.2 Hold maximum voltage for specified time period by manufacturer.

.3 Record leakage current at each step.

.7 Provide Owner's Representative with list of test results showing location at which each test was made, circuit tested and result of each test. Include results in Commissioning Manual.

.8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No.184.1, Solid-State Dimming Controls (Bi-national standard with UL 1472).

1.3 SUBMITTALS

.1 Provide shop drawings and product data in accordance with Division 01 - General Requirements.

.1 Submit product data sheets for lighting dimming control equipment. Include product characteristics, performance criteria, physical size, limitations and finish.

.2 Manufacturer’s Instructions: Provide to indicate special handling criteria, installation sequence and cleaning procedures.

2 Products

2.1 0 - 10 VDC CONTROL DIMMERS

.1 Operating voltage dimming: Control 0 - 10 VDC, 120V, 8A rated line voltage switch.

.2 ON/OFF rocker style or push button switch.

.3 Manual pre-set slide control for adjustment from maximum intensity to off, and minimum threshold adjustment to eliminate lamp flicker.

.4 Finish: White gloss.

.5 Five-year warranty.

.6 Complete with matching faceplate for single or ganged wall boxes.

.7 Suitable for installation in a one gang wall box.

.1 Provide physical partition when ganged with one or more line voltage devices.

.8 Acceptable material:

.1 Sensor Switch #SPODMRD-WH

.2 Lutron #DVSTV-WH.

.3 Wattstopper #RH4FBL3L3PW

.4 Leviton.

3 Execution

3.1 INSTALLATION

.1 Install dimmers and remote control stations in accordance with manufacturer's instructions.

.2 Connect luminaire circuits to dimmer power sections and power packs in accordance with the manufacturers wiring instructions.

.3 Install remote monitoring station.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Demonstrate that dimming systems are installed as indicated.

.3 Demonstrate that dimming systems operate as intended and that there are no problems in starting luminaires, nor in keeping them lit and flicker-free at any setting of dimming

intensity control.

.4 Demonstrate that no audio, radio or TV interference is carried by system.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

.2 Section 26 50 00 - Lighting.

1.2 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Division 01 - General Requirements.

1.3 SYSTEM DESCRIPTION

.1 Occupancy sensors to turn lighting on when entering a controlled area and off after the area is vacated.

.2 Products sourced from a single manufacturer.

2 Products

2.1 TECHNOLOGY

.1 Passive infrared (PIR) sensing systems are passive and react only to energy sources. They detect the difference between heat emitted by the human body and the background space.

.2 Ultrasonic sensors (US) detect volumetric motion using the Doppler Principle to sense movement.

.3 Dual technology (DT) sensors use both PIR and US technologies.

2.2 PASSIVE INFRARED AUTOMATIC WALL SWITCH

.1 Advanced PIR technology wall switch to provide automatic control of lighting.

.2 Programmable for either Manual-ON or Automatic-ON.

.3 Digital time delay of 15 seconds to 30 minutes.

.4 LED to indicate occupancy detection.

.5 Adjustable unit sensitivity.

.6 No minimum load requirement.

.7 Compatible with all load types.

.8 Five-year warranty.

.9 Load: up to 800 W @ 120 V.

.10 Minimum coverage: 180 deg. - 290 sq.ft.

.11 Finish: White.

.12 Acceptable material:

.1 Lutron #4-MS-OPS6M2-DV

.2 Cooper Greengate #OSW-P-0801-120-W.

.3 Wattstopper #PW-100.

.4 Sensor Switch #WSX-WH.

2.3 POWER PACK WITH RELAY

.1 Power pack to provide 24 VDC operating voltage to occupancy sensors and control lighting loads with auxiliary relay.

.2 Auto-On or Manual-On selectable operating mode.

.3 Power: 120 VAC input, 24 VDC output.

.4 Relay load ratings: 20 A load (1 HP).

.5 Plenum rated.

.6 Five year warranty.

.7 Acceptable material:

.1 Lutron #PP120-H.

.2 Wattstopper #BZ-150.

.3 Cooper Greengate #SPD20-MV-NO.

3 Execution

3.1 INSTALLATION

.1 Obtain complete installation instructions from manufacturer prior to rough-in.

.2 Review sensor locations on site prior to rough-in and install in location within room that provides maximum sensor coverage but confines coverage to the room. Motion outside the room is not to activate lighting within the room.

.3 Locate occupancy sensors on vibration-free surfaces at least 1.8 m away from air vents.

.4 Wire sensors into circuits as indicated to control luminaires in the indicated areas of coverage.

.5 Program sensors and timers with time delay off set to 15 minutes.

.6 Occupancy sensors are to be individually adjusted in accordance with the manufacturer's recommendations for the specific room in which they are installed, taking into account room shape, size and usage.

.7 Test for acceptable operation.

.8 Demonstrate operation to the satisfaction of the Consultant.

3.2 COMMISSIONING

.1 The system must be completely commissioned prior to interim inspection to verify optimum operation.

.2 Sensors must be added or relocated and patterns adjusted as required to eliminate nuisance turning on/off of luminaires.

END OF SECTION

1 General

1.1 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE).

.1 ANSI / IEEE C62.41 IEEE Guide on the surge environment in low voltage AC power circuits.

.2 Canadian Underwriters Laboratories (ULC)

.1 UL 1449. 4th Edition.

.3 Canadian Standard Association.

.1 CSA 22.2 No. 269.2-13 - Surge protection devices (Type 2) permanently connected.

1.2 RELATED WORK

.1 Not Applicable.

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Division 01 - General Requirements.

.1 Written functional description of transient voltage surge suppressor (TVSS) components, configuration and performance.

.2 Means of connection of the TVSS to the electrical distribution system, including all wiring diagrams showing field and factory connections and associated wire circuit breakers/fuse sizes.

.3 CSA 22.2 No.269-13 information including the following, but not limited to:

.1 Short circuit current rating (SCCR).

.2 Voltage protection rating for all modes.

.3 Maximum continuous operating voltage rating (MCOV)

.4 I-nominal rating.

1.4 WARRANTY

.1 Ten (10) year warranty on unit from date of substantial completion.

2 Products

2.1 SURGE PROTECTION DEVICES

.1 Surge protection device for operation on a 120/208 V, 3 phase, 4 wire system to provide surge protection in accordance with and listed by C62.41 and CSA C22.2 No 269-13.

.2 A nameplate showing the electrical ratings, including UL1449 Surge Suppression ratings and the UL and CSA monograms is to be permanently affixed to the unit.

.3 200 kA SCCR minimum, and equal or greater to short circuit current available at the system being protected..

.4 TVSS device shall meet NEMA 3R requirements, when stand alone.

.5 TVSS devices shall be MOV based, and surge current should equally distributed to all MOV components.

.6 TVSS to be complete with a surge counter, push to test diagnostics switch, per phase and status LED's and Form 'C' alarm output contact rate at 1A and 120V for remote annunciator of TVSS status.

.7 SPD shall be CSA C22.2 No. 269.2-13 or cUL labelled with 20kA I-nominal (I-n).

.8 SPD shall provide surge current diversion paths for all modes of protection; L-N, L-G, N-G, and L-L in SPLIT PHASE and WYE systems, and L-L, L-G in High Resistive Ground

and DELTA Systems.

.9 Minimum Single Impulse Surge Current Capability (single pulse rated) per phase shall be:

.1 Single Impulse Surge Current Capacity is to be 300kA.

.10 CSA C22.2 No. 269.2-13 or UL/cUL 1449 4th Edition Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

VOLTAGE	L-N	L-G	N-G	L-L
208Y/120V	700V	700V	700V	1200V

.11 CSA C22.2 No. 269.2-13 or UL/cUL 1449 Listed Maximum Continuous Operating Voltage (MCOV) for L-N, L-G, and N-G modes of protection (verifiable at www.csagroup.org or www.UL.com):

System Voltage	Allowable System Voltage Fluctuation (%)	MCOV
208Y/120V	25%	150V

.12 Type 2 only SPD shall be complimentary CSA C22.2 No. 8-13 or UL/cUL 1283 listed for EMI/RFI filtering with minimum attenuation of -50dB at 100kHz. Install devices at service entrance on teh load side of the main disconnect, with ground lead bonded to service entrance ground.

3 Execution

3.1 INSTALLATION

.1 Stand alone unit.

.2 Contractor to allow for a 30 A, three pole breaker in distribution panel. Wire to unit in accordance with manufacturers wiring instructions.

.3 SPD shall be installed per manufacturer's installations instructions with lead lengths as short (less than 24") and straight as possible. Gently twist conductors together.

.4 Installer may reasonably rearrange breaker locations to ensure short and straightest possible leads to SPDs.

.5 Before energizing, installer shall verify service and separately derived system Neutral to Ground bonding jumpers are present per CEC C22.1-18, 24th Edition, Rule 10-204, 10-212, and 10-642(4).

END OF SECTION

1 General

1.1 SECTION INCLUDES

.1 Materials and installation for standard breaker type panelboards.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

.2 Section 26 28 16.02 - Moulded Case Circuit Breakers.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No.29, Panelboards and enclosed Panelboards.

1.4 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Division 01 - General Requirements.

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity, interrupting capacity, incoming feeder location, and enclosure dimensions.

2 Products

2.1 PANELBOARDS

.1 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.

.2 250V panelboards: bus and breakers rated for 18,000 A (symmetrical) minimum interrupting capacity respectively or as indicated on electrical drawings.

.1 Where new circuit breakers are installed in existing panelboards, the minimum interrupting capacity of the new circuit breakers is to match the minimum interrupting capacity of the existing panelboard and associated circuit breakers.

.3 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.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Two keys for each panelboard and key panelboards alike.

.6 Tin plated aluminum bus with neutral of same ampere rating as mains. Panelboards are to be supplied fully bussed.

.7 Mains: suitable for bolt-on breakers.

.8 Trim and door finish: baked grey enamel with concealed front bolts and hinges.

.9 Minimum tub width of 500 mm.

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.

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

.3 Main breaker: separately mounted on top of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for 10% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to Departmental Representative.

.5 Lock-on devices are to be installed and branch circuit breakers are to be painted red for fire alarm, emergency, stairway, exit light and night light circuits as indicated.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.4 MANUFACTURERS

.1 Acceptable material:

.1 Schneider.

.2 Siemens.

.3 Cutler-Hammer.

3 Execution

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 00 - Rough Carpentry. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height specified in Section 26 05 00 – Common Work Results - Electrical or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

.6 Balance phase loading and complete testing in accordance with Section 26 05 00 - Common Work Results - Electrical.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

- .1 CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices.
- .2 CSA-C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
- .3 CSA-C22.2 No.55, Special Use Switches.
- .4 CSA-C22.2 No.111, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Division 01 - General Requirements.

2 Products

2.1 SWITCHES

.1 15 A, 120 V, single pole, double pole, three-way, four-way switches as indicated to: CSA-C22.2 No.55 and CSA-C22.2 No.111.

.2 Manually-operated general purpose AC switches with following features:

- .1 Terminal holes approved for # 10 AWG conductor.
- .2 Silver alloy contacts.
- .3 Suitable for side wiring.
- .4 White toggle.
- .5 Commercial specification grade.

.3 Toggle operated fully rated for LED drivers/lamps and up to 80% of rated capacity of motor loads.

.4 Switches of one manufacturer throughout project.

.5 Acceptable material:

- .1 Hubbel HBL 1201 W,
- .2 Leviton 1201-2W,
- .3 Pass and Seymour.

2.2 RECEPTACLES

.1 Duplex receptacles, tamper resistant, CSA type as indicated, U ground, to: CSA-C22.2 No.42 with following features:

- .1 White thermoplastic moulded housing.
- .2 Suitable for # 10 AWG conductor for side wiring.
- .3 Four side wiring screws.
- .4 Triple wipe contacts and rivetted grounding contacts.
- .5 Commercial specification grade.
- .6 Acceptable material:
  - .1 Standard Duplex, CSA type 5-15 R:
    - .1 Cooper
    - .2 Hubbell #CR15WHITR

.3 Leviton
.4 Pass & Seymour

.2 Standard Duplex, CSA 5-20R:
.1 Hubbell #CR20-WHITR.
.2 Cooper
.3 Leviton
.4 Pass & Seymour

.2 Tamper Resistant Duplex ground fault circuit interrupter (GFCI) receptacles to have the following features:
.1 White thermoplastic housing.
.2 Suitable for side wiring.
.3 0.025s trip-time and 10,000 A maximum interrupting capacity.
.4 Integral test button and indicator light.
.5 Acceptable material:
.1 Decora Duplex CSA 5-15R:
.1 Cooper #VGF15-W.
.2 Hubbell #GF15WLA.
.3 Leviton #N7599-WH.
.4 Pass & Seymour #1595W.

.3 Receptacles of one manufacturer throughout project.

2.3 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 cover plates as indicated, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.
.5 Sheet metal cover plates with turned-in corners for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
.6 All wiring device cover plates to be labeled using clear, self adhesive vinyl strips with black type lettering identifying panel and circuit number for each device. White vinyl strips will not be permitted.

3 Execution

3.1 INSTALLATION

.1 Switches:
.1 Install single throw switches with handle in "UP" position when switch closed.
.2 Install switches in gang type outlet box when more than one switch is required in one location.
.3 Mount switches at height in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Receptacles:
.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
.2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results - Electrical.
.3 Do not use back entrances for connecting wiring devices to circuits. Wrap conductors around screw terminals and tighten. Tighten all unused screw terminals.

.3 Cover plates:

.1 Protect 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 outlet boxes back-to-back in wall; allow 150 mm horizontal clearance between boxes.

3.2 TESTING

.1 All receptacles to be tested for voltage drop and results recorded where branch circuit voltage drop exceeds 3% from brand circuit panelboard to the point of utilization, in accordance with the Canadian Electrical Code, branch circuit wiring will have to be modified to meet the 3% requirement unless otherwise approved by the Authority Having Jurisdiction.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.2No.248.12, Low Voltage Fuses Part 12: Class R (Bi-National Standard with, UL 248-12 (1st Edition).

1.3 SUBMITTALS

.1 Submit fuse performance data characteristics for each fuse type and size above 600 A. Performance data to include: average melting time-current characteristics.

1.4 DELIVERY AND STORAGE

.1 Ship fuses in original containers.

.2 Do not ship fuses installed in switchboard.

.3 Store fuses in original containers in storage cabinet moisture free location.

1.5 MAINTENANCE MATERIALS

.1 Provide maintenance materials in accordance with Division 01 - General Requirements.

.2 Three spare fuses of each type and size installed above 600 A.

2 Products

2.1 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 for entire project.

2.2 FUSE TYPES

.1 Class J fuses (formerly HRCI- J).

.1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.

.2 Type J2, fast acting.

.2 Class R -R fuses (formerly HRCI- R). For UL Class RK1 fuses, peak let-through current and its' peak let-through values not to exceed limits of UL 198E-1982, table 10.2.

.1 Type R1, (UL Class RK1), time delay, capable of carrying 500% of its rated current for 10 s minimum, to meet UL Class RK1 maximum let-through limits.

3 Execution

3.1 INSTALLATION

.1 Install fuses in mounting devices immediately before energizing circuit. Ensure correct fuses fitted to physically matched mounting devices.

.1 Install Class R rejection clips for HRCI-R fuses.

.2 Ensure correct fuses fitted to assigned electrical circuit.

.3 Where UL Class RK1 fuses are specified, install warning label "Use only UL Class RK1 fuses for replacement" on equipment.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

.1 American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE)

.1 ANSI/IEEE C37.13, Low Voltage AC Power Circuit Breakers Used in Enclosures.

.2 Canadian Standards Association (CSA)

.1 CSA C22.2 No. 5, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Division 01 - General Requirements.

.1 Include time-current phase protection co-ordination characteristic curves for breakers with ampacity 100 A and over or breakers with interrupting capacity of 22,000 A (symmetrical) and over at system voltage.

2 Products

2.1 MOULDED BREAKERS GENERAL

.1 Moulded-case circuit breakers, to CSA C22.2 No. 5.

.2 Bolt-on moulded-case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 deg. C ambient.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection. 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.

.5 Circuit breakers with interchangeable trips on units over 225 A as indicated.

.6 Breakers are to be by the same manufacturer as the panelboard in which they are being installed.

.7 Circuit breakers to match panelboard interrupting capacity with minimum 10 kA at 208 V.

.8 Breakers must be new, complete with original factory warranty and supplied from an authorized manufacturer's distributor.

2.2 OPTIONAL FEATURES

.1 Install lock-on devices as indicated in Panel Schedule.

.2 Padlocking provision on main breaker of panelboard.

3 Execution

3.1 INSTALLATION

.1 Install breakers as indicated.

.2 Connect main secondary service to line terminals of breaker.

.3 Connect load terminals of breaker to new feeders, through existing underground

conduits. New panelboard to be lined up with five (5) existing underground conduits stubbed up into panelboard. .

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance Section 26 05 00 – Common Work Results - Electrical

.2 Check factory made connections for mechanical security and electrical continuity.

.3 Check trip unit settings and to ensure proper working operation and protection of components.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA C22.2 No. 4-89 (R2000), Enclosed Switches.

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Division 01 - General Requirements.

2 Products

2.1 DISCONNECT SWITCHES

.1 Fusible and non-fusible, horsepower rated disconnect switch in CSA Enclosure type 1, to CAN/CSA C22.2 No. 4, size as indicated.

.1 Provide service rated disconnect switch complete with neutral bus and sprinkler proof enclosure for main service.

.2 Provision for padlocking in on-off switch position by three locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated, to Section 26 28 13.01 - Fuses - Low Voltage.

.5 Fuseholders: suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

2.2 MANUFACTURERS

.1 Acceptable material:

.1 Schneider.

.2 Siemens.

.3 Cutler-Hammer.

.4 Eaton.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

3 Execution

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses as indicated.

.2 In finished areas mount disconnect switches on top of flush mounted junction box with conduit nipple on its coverplate into the back of the switch.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

1.2 REFERENCES

.1 International Electrotechnical Commission (IEC)

.1 IEC 947-4-1-1990, Part 4: Contactors and motor-starters.

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Division 01 - General Requirements.

.2 Product data to indicate:

.1 Mounting method and dimensions.

.2 Starter size and type.

.3 Layout of identified internal and front panel components.

.4 Enclosure types.

.5 Wiring diagram for each type of starter.

.6 Interconnection diagrams.

2 Products

2.1 MATERIALS

.1 Starters: to IEC 947-4 with AC4 utilization category.

2.2 MANUAL MOTOR SWITCHES

.1 Manual switch, 1, 2 or 3 poles as required. Mounted in CSA 1 Enclosure with quick-make, quick-break toggle switch.

.2 Rated for 30 A at 250 V AC.

.3 Shielded toggle with provision to be padlocked in ON or OFF positions.

.4 Acceptable material:

.1 Cutler-Hammer #B230AG/B330AG.

.2 Square D Class #2510, Type K.

.3 Hubbell No. #7832/7810-UD.

.4 Siemens Class 12.

2.3 FULL VOLTAGE MAGNETIC STARTERS

.1 Magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:

.1 Contactor solenoid operated, rapid action type, IEC AC4 rated, contactor size as follows:

.1 23 A for 0-10 hp.

.2 Bimetal motor overload protective device providing three phase protection and electronic trip overloads for 5 HP motors or larger, with following features:

.1 Selectable overload settings.

.2 Phase loss protection.

.3 Phase unbalance protection.

.4 Class II ground fault protection.

.5 Selectable trip class.

.6 Selectable Automatic/Manual reset. Set to Manual.

.7 Manual reset pushbutton outside of enclosure.
.8 IEC rated to match starter.
.9 Acceptable material:
.1 Cutler-Hammer #C440.
.2 Siemens #3RB21.
.3 Schneider Tesys Solid State Series.
.4 Allen-Bradley Bulletin #193-EGF/193-CBCT.

.3 Power and control terminals.
.4 Wiring and schematic diagram inside starter enclosure in visible location.
.5 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.2 Combination type starters to include fusible disconnect with operating lever on outside of enclosure and provision for:
.1 Locking in "OFF" position with up to 3 padlocks.
.2 Independent locking of enclosure door.
.3 Provision for preventing switching to "ON" position while enclosure door open.

.3 Accessories:
.1 Pushbuttons/Hand-off-Auto Selector switches: heavy duty, oil tight, labelled as indicated.
.2 Indicating lights: heavy duty LED type and color as indicated.
.3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

.4 Acceptable material:
.1 Cutler-Hammer #XT Series.
.2 Schneider #LE1 Series.
.3 Siemens #V4AB Series.
.4 Allen-Bradley Bulletin #112.

2.4 CONTROL TRANSFORMER

.1 Single phase, dry type, control transformer with primary voltage as indicated and 24 V secondary, complete with secondary fuse, installed in with starter as indicated.
.2 Size control transformer for control circuit load plus 20% spare capacity.

2.5 ENCLOSURE

.1 Enclosure: CSA type 1 unless indicated otherwise.

2.6 FINISHES

.1 Apply finishes to enclosure in accordance with Section 26 05 00 - Common Work Results - Electrical.

2.7 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.
.2 Manual starter and switch designation label, white plate, black letters, size 1, engraved as indicated.
.3 Magnetic starter designation label, white plate, black letters, size 1 engraved as indicated.

2.8 EXTRA MATERIALS

.1 Provide listed spare parts for each different size and type of starter if applicable for the particular starter.
.1 One (1) contact; auxiliary.

.2 Two (2) fuses.

3 Execution

3.1 INSTALLATION

.1 Prior to installation verify motor sizes with division supplying motor to ensure starter and overload relay match equipment being supplied.

.2 Install starters, connect power and control as indicated.

.3 Ensure correct fuses and overload devices elements installed. Adjust overload relay settings to match motor nameplate.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical and manufacturer's instructions.

.2 Operate switches, contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

END OF SECTION

1 General

1.1 REFERENCES

.1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE).

.1 ANSI/IEEE C62.41, Surge Voltages in Low-Voltage AC Power Circuits.

.2 Illuminating Engineering Society of North America (IESNA).

.1 LM-79, Photometric Measurements of Solid State Lighting Products.

.2 LM-80, Measuring Lumen Maintenance of LED Light Sources.

.3 TM-21, Projecting Long Term Lumen Maintenance of LED Light Sources.

.3 United States of America, Federal Communications Commission (FCC).

.1 FCC (CFR47) EM and RF Interference Suppression.

1.2 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

1.3 SUBMITTALS

.1 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Owner’s Representative.

.2 Photometric data to include: VCP Table and spacing criterion and luminaire coefficient of utilization (CU) tables and/or electronic IES files.

.3 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.4 Quality assurance submittals: provide the following in accordance with Section 01 45 00 - Quality Control.

.1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation, wiring, operation and cleaning procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Division 01 - General Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Disposal and recycling of fluorescent lamps and ballasts as per local regulations, and in accordance with Section 26 05 03 - Electrical Removals and Alterations.

1.5 ACCEPTABLE MATERIAL

.1 Luminaires described in the Luminaire Schedule identify the minimum standard of quality and performance criteria which is acceptable for product. Named fixtures are acceptable with modifications and accessories as indicated.

.2 Fixtures from other manufacturers may be acceptable provided:

.1 Appearance and lighting performance are similar.

.2 Quality is equal or better.

.3 Luminaire performance is equal or better.

.4 The fixture is provided with modifications and accessories to provide a complete product in keeping with the intent of the project.

.5 Approval in writing is obtained from the Consultant to the Contractor five (5) days prior to tender closing date.

2 Products

2.1 LED DRIVERS

.1 Power supply units including drivers:
- .1 Minimum efficiency of 85%.
- .2 Operate between -40°C and +50°C.
- .3 120 V (±10%) input voltage; UL Class 1 or 2 output.
- .4 Dimmable where indicated in Luminaire Schedule
- .5 Power factor greater than or equal to 0.90; total harmonic distortion less than or equal to 20%.
- .6 Located with luminaire housing or remote as indicated.
- .7 Minimum five (5) year warranty.

2.2 LED LUMINAIRES

.1 Proposed equal fixtures not listed in the Luminaire Schedule must meet or exceed the overall performance requirements of the specific space without requiring changes to designed branch circuiting due to higher power consumption.

.2 Luminaire efficacy to be a minimum of 90 lumens/watt, unless noted otherwise in the Luminaire Schedule.

.3 Color rendering index to be a minimum of 80 for indoor lighting.

.4 Color temperature as indicated in the Luminaire Schedule.

.5 Luminaire shall be tested using IESNA LM-79-08, in situ temperature measurement test (ISTMT) and IESNA LM-80-08 in an EPA recognized laboratory.

.6 A minimum of L70 = 50,000 hours or L90 = 36,000 hours as calculated using IESNA TM-21-11 standard.

.7 Luminaire distribution to be as indicated on the Luminaire Schedule.

.8 Minimum five (5) year warranty on complete LED system including LED modules and driver.

2.3 FINISHES

.1 Light fixture finish as indicated in Luminaire Schedule. Finish to meet ULC listings and CSA certifications related to intended installation.

2.4 LUMINAIRES

.1 As indicated in Luminaire Schedule on drawings. Provide 10% spare lamps of Type A1.

3 Execution

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.
- .1 Provide adequate support to suit ceiling system.

3.2 WIRING

.1 Connect luminaires to lighting circuits.
- .1 Install flexible conduit for vertical power supply drop to luminaires as indicated. Horizontal wiring using flexible conduit is not permitted.

3.3 LUMINAIRE SUPPORTS

.1 For suspended ceiling installations support luminaires from ceiling grid in accordance with local inspection requirements.

3.4 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical

3.6 CLEANING

.1 Luminaire lenses, housings, louvers, etc., are to be cleaned upon completion of construction in accordance with Division 01 - General Requirements.

END OF SECTION

1 General

1.1 SECTION INCLUDES

.1 Materials and installation for emergency lighting systems.

1.2 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results – Electrical.

.2 Section 26 05 21 - Wires and Cables (0-1000 V).

.3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No.141, Unit Equipment for Emergency Lighting.

1.4 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Division 01 - General Requirements. Product data to indicate system components, mounting method, source of power and special attachments.

1.5 WARRANTY

.1 For batteries, the ten years warranty period is extended to 120 months, with no-charge replacement during the first 5 years and pro-rate charge on the second 5 years from the date of Substantial Completion.

2 Products

2.1 EMERGENCY LIGHTING

.1 Emergency lighting equipment: to CSA C22.2 No.141.

.2 Supply voltage: 120 V, AC.

.3 Output voltage: 12 V DC.

.4 Operating time: 30 minutes to NBCC 2015.

.5 Battery: sealed, maintenance free.

.6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V for plus or minus 10% input variations.

.7 Solid state transfer circuit.

.8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.

.9 Signal lights: solid state, for 'AC Power ON'.

.10 Lamp heads: integral on unit and remote, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: 4W MR16 LED.

.11 Cabinet: suitable for direct mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.12 Finish: standard.

.13 Auxiliary equipment:

.1 Test switch.

.2 Time delay relay.

.3 Battery disconnect device.

.4 AC input and DC output terminal blocks inside cabinet.

.5 RFI suppressors.

2.2 MANUFACTURER

.1 Acceptable material - Emergency Lighting Battery Pack:
  .1 Aimlite #EBST122MDWHTAT.
  .2 Ready-Lite #LDX12-36-AD-2-LD7.
  .3 Lumacell #RG12S362LD7AT.
  .4 Stanpro #SLA-1236-2S4WLR-WHAT.

.2 Acceptable material - Remote Heads:
  .1 Aimlite #RMMD1[2]-6-24-4WLRWHT
  .2 Lumacell #MGM1[2]LD7
  .3 Ready-Lite #RM1[2]LD7
  .4 Stanpro #S1[2]-6-24-4WLRWH

2.3 WIRING OF REMOTE HEADS

.1 Conduit: type EMT, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Conductors: RW90 type in accordance with Section 26 05 21 - Wires and Cables (0-1000 V) sized as indicated in accordance with manufacturer's recommendations.

3 Execution

3.1 INSTALLATION

.1 Install unit equipment and remote mounted fixtures.

.2 Direct heads.

.3 Connect exit lights to unit equipment.

.4 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)
  .1 CSA C22.2 No.141, Unit Equipment for Emergency Lighting.
  .2 CSA C860, Performance of Internally-Lighted Exit Signs.

.2 National Fire Protection Association (NFPA)
  .1 NFPA 101, Life Safety Code.

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Division 01 - General Requirements:
  .1 Product data to include performance criteria, physical size, finish and limitations.

.2 Manufacturer’s Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures and disposal.

2 Products

2.1 EXIT SIGNS

.1 Exit signs: to CSA C22.2 No.141 and CSA C860.

.2 120 VAC normal power.

.3 Housing: Steelc/w white powder coat finish.

.4 Face: Edge lit acrylic with pictorial white running man on green face with chevrons as indicated on drawings.

.5 Lamps: multiple - LED - 120 V input, 4 W.

.6 10 years unconditional Parts and Labour Warranty.

.7 Double or single face, universal wall or ceiling mounted as indicated on the drawings.

.8 Acceptable material:
  .1 Lumacell #LS Series.
  .2 Ready-Lite #RS Series.
  .3 Aim-Lite #RPST Series.
  .4 Stanpro #RMS Series.

3 Execution

3.1 INSTALLATION

.1 Install exit lights to manufacturer's recommendations, listing requirements, code and local regulatory requirements.

.2 Connect fixtures to exit light circuits using RW90 wire in EMT conduit.

.3 Connect emergency lamp sockets to emergency circuits.

.4 Ensure that exit light circuit breaker is locked in on position.

.5 Provide tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

3.2 CLEANING

.1 Clean Exit signs upon completion of construction in accordance with Division 01 - General Requirements.

.2 On completion and verification of performance of installation, remove surplus materials,

excess materials, rubbish, tools and equipment.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results – Electrical.

.2 Section 26 05 28 – Grounding – Secondary.

1.2 REFERENCES

.1 American National Standards Institute.

.1 ANSI J-STD-607-D, Joint Standard - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

.2 Telecommunications Industries Association (TIA)/Electronic Industries Alliance (EIA).

.1 TIA/EIA-606-C, Administration Standard for the Commercial Telecommunications Infrastructure.

1.3 SYSTEM DESCRIPTION

.1 Telecommunications grounding and bonding system consists of, but not limited to bonding conductors.

.2 Provides ground reference for telecommunications systems within building and bonding to it of telecommunications rooms.

.3 Metallic pathways, cable shields, conductors, and hardware within telecommunications spaces are bonded to telecommunications grounding and bonding system.

2 Products

2.1 BONDING CONDUCTOR FOR TELECOMMUNICATIONS (BCT)

.1 Copper stranded conductor, green insulated marked to: ANSI J-STD-607-A.

2.2 WARNING LABELS

.1 Non-metallic warning labels adjacent to all bonding conductor terminations in English to: ANSI J-STD-607-D.

.2 Identify labels with wording "If this connector is loose or must be removed, please call the building telecommunications manager".

3 Execution

3.1 BONDING CONDUCTORS GENERAL

.1 Ensure all data/ telephone system conduits are properly grounded. For conduit drops at workstation locations and for sleeves, install ground bushings and a #14 AWG green insulated bonding conductor to closest grounded raceway or junction box. Use #6 AWG green insulated bonding conductor for connections in Telecommunications Room.

3.2 BONDING FOR TELECOMMUNICATIONS

.1 Bond metallic raceways in telecommunications rooms to TMGB using #6 AWG green insulated copper conductor.

.2 For cables within telecommunications rooms having shield or metallic member, bond shield or metallic member to TMGB using #6 AWG green insulated copper conductor.

.3 Bond equipment rack and cabinets located in telecommunications rooms to TMGB using #6 AWG green insulated copper conductor.

3.3 LABELLING

.1 Apply warning labels to telecommunications bonding and grounding conductors.

.2 Apply additional administrative labels to: TIA/EIA-606.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.
.2 Section 26 05 31 - Junction and Pull Boxes.
.3 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
.4 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
.5 Section 27 05 26 - Grounding and Bonding for Communications Systems.

1.2 REFERENCES

.1 American National Standards Institute:
  .1 ANSI/TIA-569-E, Telecommunications Pathways and Spaces.
  .2 ANSI/TIA-606C, Administration Standard for Commercial Telecommunications Infrastructure.

1.3 SYSTEM DESCRIPTION

.1 Telecommunications pathway system consists of, but not limited to outlet boxes, conduits, pull boxes, fish wires and J-hooks.

1.4 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Division 01 - General Requirements.

2 Products

2.1 MATERIAL

.1 Conduits: type, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
.2 Outlet boxes: 4" sq. with single device cover and fittings: in accordance with Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings.
.3 J-hook support clips: Caddy “CableCat Clip”.
  .1 Acceptable material:
    .1 Caddy "Cable CAT Clip".
    .2 Cooper B-Line.
.4 Velcro cable ties:
  .1 Acceptable material:
    .1 Panduit #HLS-15RO.

3 Execution

3.1 INSTALLATION

.1 Install raceway system, including outlet boxes, conduit, miscellaneous and positioning material to constitute complete system.
.2 Install conduit from data/telephone outlet box locations to accessible corridor ceiling space. Use 21mm EMT Conduit to communication outlet with two (2) or less drops and 27mm EMT conduit to communications outlet with three (3) or more drops. Use 100mm x 100mm x 25mm device boxes with single gang plaster rings at outlet box locations.
  .1 Where communications cables are run above inaccessible ceiling spaces, use appropriately sized zone conduit between accessible locations and group cables neatly together when routed to outlets. Indicate routing on as-built drawings.
.3 Ensure all data/ telephone system conduits are properly grounded. Where required,

install ground bushings and a #14 AWG bare bonding conductor to closest grounded raceway or junction box, or #6 AWG, where indicated.

.4 Communications conduits in telecommunications rooms are to be bonded to ground in accordance with Section 27 05 26 - Grounding and Bonding for Communications Systems.

.5 Dress cabling using Velcro cable ties. The use of nylon or plastic ties is not permitted.

.6 Cable management in accessible ceiling spaces.

.1 Existing ITSS J-hook supports to be used as required to support loose cable bundles at 1000 mm maximum spacing to point of entry into conduit system.

.2 Provide support for individual cables using velcro ties at 1000 mm maximum spacing to point of entry into conduit system.

.7 All zone conduit are to be identified and labelled at both ends and at pull boxes to TIA-606 and TIA-569. Tags are to identify start and finish of conduit runs.

.8 Pullboxes for communications cabling are to be installed at a reasonable height in an exposed location, such that access for installation of cables is not prohibited. Pullboxes are to not be installed above gypsum or inaccessible ceiling types unless immediately above a suitably sized access hatch. Provide indicator vinyl decals on ceiling T-bar rail identifying location of pullbox above.

.9 Cable fill capacities of conduit, cable tray and raceways is to be maximum 40%.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results – Electrical.

.2 Section 27 05 26 – Grounding and Bonding for Communications Systems.

.3 Section 27 05 28 – Pathways for Communications Systems.

1.2 REFERENCES

.1 Canadian Standards Association

.1 CSA-C22.2 No. 214-02, Communications Cables (Bi-National standard with UL 444).

.2 Telecommunications Industry Association (TIA)

.1 ANSI/TIA-568.0-E Generic Telecommunications Cabling for Customer Premises.

.2 ANSI/TIA-568.1-E Commercial Building Telecommunications Cabling Standard.

.3 ANSI/TIA-568.2-D Balanced Twisted-Pair Telecommunications Cabling and Components Standards.

.4 ANSI/TIA-569-E, Telecommunications Pathways and Spaces.

.5 ANSI/TIA-606-C, Administration Standard for Commercial Telecommunications Infrastructure.

.6 ANSI/TIA-607-D, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises.

.7 ANSI/TIA-1152-A, Requirements for Field Test Instruments and Measurements for Balanced Twisted Pair Cabling.

.8 Government of Canada Workplace Fit-up - Special Technical Standards Guidelines (Section A4), Telecommunications (Cable Networks) Pathways and Spaces - Planning and Implementation.

.3 BICSI - Building Industry Consulting Service International:

.1 Telecommunications Distribution Methods Manual 13th Edition.

.2 ANSI/NECA/BICSI-568-2006, Standard for Installing Commercial Building Telecommunications Cabling.

1.3 SYSTEM DESCRIPTION

.1 Structured telecommunications wiring system consist of unshielded-twisted-pair cables, terminations, connectors and related equipment installed inside building for occupant's telecommunications systems. Services for the fire alarm system to be connected directly to the telephone service entrance.

.2 All structured cabling system is to be supplied, installed and tested in accordance with the Government of Prince Edward Island Structured Cabling standards (dated February 26, 2016), found in the appendices of these Specifications.

1.4 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Division 01 - General Requirements.

.2 As-built Records and Drawings:

.1 Provide and place one hard copy of as-built records in telecommunications room.

1.5 QUALITY ASSURANCE

.1 All cabling, termination hardware and connecting cords to be sourced from a certifying manufacturer to assure quality control.

.2 The system is to have an end-to-end 20-year warranty against defects in materials and labour. Certified system vendor to repair or replace any failed component, including

labour at no cost to the Owner. Provide system test results, certificates and warranty in Maintenance Manuals.

.3 Contractor shall be a licensed to install telecommunications systems in the locale where work will be performed.

1.6 DELIVERY, STORAGE AND PROTECTION

.1 Materials and equipment furnished shall be delivered in new condition and be of current production lots.

.2 Contractor shall ensure that material deliveries to work site shall be coordinated with construction manager responsible for materials distribution to all trades. Handle in accordance with Manufacturer's recommendations and instructions to avoid damaging equipment, installed devices and finish.

.3 Contractor shall coordinate for the removal of all rubbish and packing materials produced by the Contractor's activities during the project.

.4 Contractor shall ensure materials are stored according to Manufacturer's recommendations. In addition, materials must be stored in a location protected from vandalism and weather.

2 Products

2.1 HORIZONTAL DATA/TELEPHONE CABLES

.1 100 OHM, 4 pair, 24 AWG U/UTP Balanced Twisted Pair Cable - CMP/FT6.

.1 Cable shall comply with ANSI/TIA-568.2-D, ISO/IEC 11801, EN50173 Category 6, IEC 61156-5 standards and be RoHS Compliant.

.2 Cable shall be 4pr 24 awg U/UTP construction and available in CMP/FT6 fire rating.

.3 Plenum (CMP/FT6) cables shall be cULus listed to UL 444 - CAN/CSA C22.2 No. 214.

.4 Cable shall have an operating temperature range of -20°C to 75°C.

.5 Cable shall be available in 305 m reel in a box putups.

.6 Cable shall be compliant with Manufacturer's performance warranty criteria.

.7 Jacket printed at intervals not exceeding 300 mm indicating cable code, AWG, UL and CSA designations and quarter and year of manufacture.

.1 Jacket colour to be blue for data, white for telephone, purple for CCTV and yellow for WAP and blue for public address.

.8 Acceptable material (CAT 6):

.1 Leviton eXtreme #UTP6P-M*S *-color;

.2 Belden GigaFlex 2413;

.3 Panduit PUP6004;

.4 Systimax 1071E.

2.2 DATA/TELEPHONE OUTLETS

.1 Category 6 Data and Telephone Outlets

.1 The modular connectors shall be independently tested and verified by a Nationally Recognized Testing Laboratory to meet or exceed the Category 6 component performance requirements of ANSI/TIA-568.2-D.

.2 The connectors shall also be in compliance with US National Electrical Codes; compliant with ANSI/TIA-1096-A (formerly FCC Part 68); UL listed; and independently verified.

.1 IEEE 802.3at (Type 1) Power over Ethernet (PoE) applications up to 15.4 watts.

.2 IEEE 802.3bt (Type 4) Power over Ethernet (PoE+) applications up to 90

watts.

.3 Cisco Universal Power Over Ethernet (UPOE) applications up to 60 watts.

.4 Power over HDBaseTTM (POH) applications up to 95 watts.

.3 The connector module shall utilize an engineered method to prevent PoE arcing damage from occurring at the critical contact-mating zone between the plug and connector module tines.

.4 The modular connector shall be individual snap-in style.

.5 Termination of all connectors shall be 110-type insulation displacement connectors (IDC).

.6 Rear termination field shall include pointed pair separation towers to promote easier installation.

.7 The connector module shall be designed for use at the work area, communications room and/or equipment room without modification.

.8 Connector wiring is universal and will accommodate installation color codes for T568A and T568B wiring schemes and incorporate Dual-layer T568B/T568A wiring labels.

.9 The termination field shall be 180° configuration such that the punch field is in the back, allowing for easy access rear terminations.

.10 The modular connector shall fit all other installed telecommunications wallplates, outlets and field-configurable patch panels and patch blocks.

.11 The connector module shall have an insulation displacement connection featuring insulation slicing of 22 to 24 AWG plastic-insulated solid copper conductors forming a gas-tight connection.

.12 All plastics used in construction of the connector bodies shall be fire-retardant with a UL flammability rating of 94V-0.

.13 Connectors shall be available in 13 different colors.

.1 Modular outlet color: blue for data, white for telephone, purple for CCTV and yellow for WAP and blue for public address.

.14 4-port white interface plate. Provide blanking fillers for unused ports. Interface plate to accept two (2) Category 6 modular outlets. Where required, provide interface plates that support additional modular outlets.

.15 Acceptable material:

.1 Belden PS6 & PS5e modules c/w 4 port faceplate.

.2 Leviton Extreme 61110-RW6 & 5G110-RW6 module c/w 4 port 42080-4WS faceplate.

.3 Panuit CJ688TP & CJSE88T modules c/w 4 port CFPE faceplate.

.4 Systimax MGS400 & MPS100E Series c/w 4 port M-Series modular faceplate.

2.3 CABLE SUPPORTS

.1 Conduit in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

.2 J-hook and velcro ties in accordance with Section 27 05 28 – Pathways for Communications Systems.

2.4 UTP CROSS-CONNECT PATCH CORDS

.1 3' long, colour to match horizontal cabling jacket colour, with factory-installed male plug at one end to mate with RJ-45 jack and with factory-installed male plug at other end to mate with RJ-45 jack Category 6, 4 pairs to: TIA/EIA-568.2-D

.2 Patch cords shall be UTP construction, stranded 24 AWG conductors, and an 8-position modular plug on each end.

.3 Patch Cords shall feature a narrow profile snagless strain relief boot.
.4 Patch cords shall meet UL 444 CM rating.
.5 The cords shall be available in 3', 5', 7', 10', 15', and 20' lengths.
.6 Acceptable material:
.1 Belden GigaFlex PS6+ / PS5e.
.2 Leviton eXtreme slimline patch cords #6D460-03*/5D460-03* *-color.
.3 Systimax GS8E XL Cat.6 / Cat. 5e.
.4 Panduit TX6 UTPSP / TX5e UTPSP.
.7 Provide 1 patch cord for each data drop and each telephone drop.

2.5 UTP WORK AREA CORDS

.1 7' long, colour to match horizontal cabling jacket colour, with factory installed male plugs on both ends to mate with RJ45 jack, Category 6 for data and Category 5e for telephone, 4 pairs: to TIA/EIA-568.2-D.
.2 Provide one patch cord for each data outlet and each telephone outlet.
.3 Specifications to meet UTP cross-connect patch cords above.

2.6 PATCH PANELS

.1 Category 6 for public address modular patch panels, installed in public address wall mounted cabinet, complete with mounting hardware.
.2 48 port patch panels as indicated with T568A-ISDN wiring assignment. Patch panels to be supplied fully populated with modular outlets.
.3 Mounts inside public address wall mounted cabinet.
.4 Front and rear port identification complete with labels.
.5 Connectors:
.1 Punch down UTP connector, modular, insulation displacement connection type.
.2 Quiet front, with fully recessed clips.
.3 Built-in wire pair splitters.
.6 Acceptable material:
.1 Belden 48 port FLEX Patch Panel.
.2 Leviton 48 port Quickport patch panel.
.3 Panduit 48 port CPP series patch panel.
.4 Systimax 48 port Patchmax Patch Panel.

2.7 IDENTIFICATION

.1 Each modular jack to be identified with an alpha/numeric label.
.2 Each horizontal cable to have identification markers installed on both ends. Identification markers to be self adhesive vinyl, white background with printed black indelible block lettering.
.3 Each patch panel or termination block to have corresponding labelling. Patch panels are to be labelled A, B, C, etc. with A being located near the top of the rack. The ports on each patch panel are to be labelled 1 to 48.
.4 Labelling to indicate rack number, patch panel letter and outlet number (i.e. 1A48 is rack 1, patch panel A, outlet 48).

3 Execution

3.1 INSTALLATION OF HORIZONTAL DATA AND TELEPHONE CABLES

.1 Cable shall be installed in accordance with ANSI/NECA/BICSI-568-2006 Standard manufacturer's recommendations and best industry practices.
.2 A plastic or nylon pull cord with a minimum test rating of 90 Kg (200 lb.) shall be co-

installed with all cable installed in any conduit.

.3 Cable raceways shall not be filled greater than the ANSI/TIA-569-E maximum fill for the particular raceway type.

.4 Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.

.5 The cable's minimum bend radius and maximum pulling tension shall not be exceeded. Refer to manufacturer's requirements.

.6 Existing ITSS J-hooks are to be used to support cable bundles. New J hooks shall be properly sized to accommodate the immediate need and future growth of the cable pathway. J Hooks shall be designed to control bend radius requirements of the cable categories being installed. J hooks shall be installed at intervals of 1.2 -1.5 m (4 - 5 feet) apart to effectively support and distribute the cable's weight and be randomly spaced. Randomly spacing cable supports is considered a best practice for all cable systems to reduce harmonics.

.7 Cable supports shall utilize independent wires, support rods and associated hardware for suspension. At no point shall cable(s) rest on acoustic ceiling grids, T-bars, ceiling support wires, acoustical panels or other components of the suspended ceiling.

.8 The bundle size recommendations of ANSI/TIA TSB-184-A shall be followed as it pertains to current or future support for POE applications.

.9 The cable system and support hardware shall be installed so that it does not obscure, fire alarm conduit, boxes, or other control devices.

.10 Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Contractor prior to final acceptance at no cost to the Owner.

.11 Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA-568.0-E document, manufacturer's recommendations and best industry practices.

.12 Leave a minimum of 12" of slack for twisted pair cables at the work area outlet. Cables shall be coiled in the in-wall box, surface-mount box or modular furniture raceway if adequate space is present to house the cable coil without exceeding the manufacturers bend radius. In hollow-wall installations where box-eliminators are used, excess wire can be stored in the wall. Excess slack shall be loosely coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.

.13 When cables are being installed, slack (service loops) shall be provided at both ends to accommodate future changes in the structured cabling system. Slack should be included in all length calculations to ensure that the permanent link does not exceed 90 m (295 ft). The amount of cable slack required will depend on the size and layout of the connecting hardware.

.1 The recommended amount of cable slack shall be:

.1 30cm at work area outlet.

.14 Cables shall be neatly dressed at their respective termination device. Each terminating device shall be fed by an individual cable group separated and dressed back to the point of cable entrance into the rack or frame.

.15 Cables shall not be painted.

.16 Each cable shall be clearly labeled on the cable jacket behind the termination device at a location that can be viewed without removing the bundle support ties. Cables labeled where the label is obscured from view shall not be acceptable.

.17 Comply with TIA-569-D recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.

3.2 INSTALLATION OF VOICE AND DATA MODULAR JACKS

.1 8-position, 8-contact (8P8C) modular jacks shall be installed in accordance with manufacturer's recommendations and installation guides, and best industry practices.
.2 Pair untwist at the termination shall not exceed 13 mm (0.5 inch).
.3 Data jacks, unless otherwise noted in Drawings shall be located in the bottom position(s) of each faceplate. Data jacks in horizontally oriented faceplates shall occupy the right-most position(s).
.4 Termination wire map shall be 568A unless otherwise stated in drawings.
.5 Data jacks shall be plenum rated when installed above ceilings.

3.3 INSTALLATION OF PATCH PANELS

.1 Cables shall be dressed and terminated in accordance with the recommendations made in ANSI/TIA-568.0-E and/or ANSI/TIA-568.1-D, ANSI/NECA/BICSI-568-2006 and manufacturer's recommendations and best industry practice.
.2 Cables shall be properly supported in the wall mounted cabinet and supported at the rear of the patch panel to retain terminations.
.3 Pair untwist at the termination shall not exceed 12mm for Cat 6 cabling.
.4 Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
.5 Termination wire map shall be 568A unless otherwise stated in drawings.

3.4 PATCH CORD INSTALLATION

.1 Patch cords shall be installed at Janitor 110B, LAN Room 210B end and at workstation end with cords of appropriate length such that cables are routed through proper cable management ducts and patch ways in a consistent manner. Cords should be routed so as not to block panel labels where possible.
.2 Patch cords shall be installed with the proper color to match the adopted color scheme for the organization.
.3 Patch cords shall be labeled at both ends according to the adopted labeling scheme for the organization. Labeling scheme shall adhere to ANSI/TIA-606-C labeling standard.
.4 Patching schedules and or records shall be updated by the Structured Cabling Plant Administrator after patching has been completed.
.5 Patch cords that are no longer in use shall be removed from the patching frame and properly stored. Patch cords to be harvested for reuse shall have unique ID labeling removed and be retested prior to being made available for re-use.
.6 Plenum rated patch cords shall be used in all above ceiling.

3.5 IMPLEMENT CROSS-CONNECTIONS

.1 Implement cross-connections using jumper wires as specified.

3.6 FIELD QUALITY CONTROL

.1 Contractor to provide map of the data and telephone outlet numbering and cable pathway on 11" x 17" (or larger) copy of the building floor plan for each associated rack. Submit marked up floor plans in accordance with Division 01 - General Requirements.
.2 Test 100 percent of all new and modified communications cable runs for defects in installation and verify cabling system performance under installed conditions in accordance with ANSI/TIA-568.0-D standards.
.3 Defects in cabling system installation, including but not limited to cables, connectors, patch panels, and connector blocks shall be repaired or replaced to ensure 100 percent useable conductors in all cables installed.
.4 Performance Certification Testing of Twisted-Pair Cables: (NOTE: Permanent Link Test results are recommended and are the expected norm).
    .1 Test 100 percent of all new and modified communications cable runs for defects in installation and verify cabling system performance under installed conditions in

accordance with ANSI/TIA-568.0-D standards.

.2 Test horizontal cabling using approved certification tester for Category 6 performance in accordance with ANSI/TIA-568.0-D. Level IIIe tester for Cat 6.

.3 Basic Tests Required:

.1 Wire map.

.2 Length (feet).

.3 Insertion loss (dB), formerly attenuation.

.4 NEXT (Near end crosstalk) (dB).

.5 Return loss (dB).

.6 ELFEXT (dB).

.7 Propagation delay (ns).

.8 Delay skew (ns).

.9 PSNEXT (Power sum near-end crosstalk loss) (dB).

.10 PSELFEXT (Power sum equal level far-end crosstalk loss) (dB).

.4 Test Category 6/Class E by auto test to 250 MHz.

.5 Provide test results in approved certification testers original software format on CD, with the following minimum information per cable:

.1 Circuit ID.

.2 Information from specified basic tests required.

.3 Test Result: "Pass" or "Fail".

.4 Date and time of test.

.5 Project and time of test.

.6 NVP.

.7 Software version.

.6 Submit fully functional version of tester software for use by the Owner in reviewing test results.

.7 Report in writing to the Owner immediately, along with copy of test results, failed test results that cannot be remedied through re-termination (as in the case of reversed or split pairs).

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

1.2 SUMMARY

.1 Section Includes:

- .1 Materials and installation for fire alarm systems.
- .2 Manual alarm stations.
- .3 Automatic alarm initiating devices.
- .4 End-of-line devices.
- .5 System operation.
- .6 Verification.
- .7 Control panels.
- .8 Fire alarm signal transmitting unit.
- .9 Fault isolators.
- .10 Addressable interface modules.

.2 General Requirements

- .1 This specification details the supply, installation commissioning and verification of a new single-stage, hybrid addressable and conventional fire alarm initiation and notification system for the Montague Consolidated School in Montague, PEI.
- .2 The manufacturer is required to identify any areas of the specification where they do not completely comply.
- .3 The fire alarm system must include all the necessary electronic hardware, software, and memory for a completely operable system in accordance with these specifications and associated drawings, to perform the functions described herein.
- .4 Device and equipment locations are approximate only and must be field verified prior to tendering and the tender price adjusted to cover actual conditions.
- .5 Install all new wire and conduits for new addressable fire alarm initiation devices in accordance with the drawings and specifications. The actual device, equipment, and wiring layout will be the manufacturer's responsibility and detailed wiring and installation drawings must be provided.

1.3 REFERENCES

.1 Government of Canada

- .1 NBC-2015 National Building Code of Canada.
- .2 NFC-2012 National Fire Code of Canada.

.2 Underwriter's Laboratories of Canada (ULC)

- .1 CAN/ULC-S524-06, Standard for the Installation of Fire Alarm Systems.
- .2 CAN/ULC-S527-11, Control Units.
- .3 CAN/ULC-S528-05, Manual Pull Stations for Fire Alarm Systems.
- .4 CAN/ULC-S529-09, Smoke Detectors for Fire Alarm Systems.
- .5 CAN/ULC-S536-04, Inspection and Testing of Fire Alarm Systems.
- .6 CAN/ULC-S537-04, Verification of Fire Alarm Systems.
- .7 ULC-S548-08, Alarm Initiating and Supervisory Devices for Water Type Extinguishing Systems.
- .8 CAN/ULC-S559-04; Equipment for Fire Signal Receiving Centres and Systems.
- .9 CAN/ULC-S561-13, Installation and Services for Fire Signal Receiving Centres and Systems.

.3 National Fire Protection Agency (NFPA)
- .1 NFPA 72-2010, National Fire Alarm Code.
- .2 NFPA 90A-2012, Installation of Air Conditioning and Ventilating Systems.
- .3 NFPA 101-2006, Life Safety Code.

.4 International Standard Organization (ISO)
- .1 ISO 8201, Acoustics - Audible Emergency Evacuation Signal.

1.4 SHOP DRAWINGS

.1 Shop Drawings:
- .1 Submit shop drawings and product data for all fire alarm equipment and devices in accordance with Division 01 - General Requirements.
  - .1 All fire alarm equipment and devices.
- .2 Include:
  - .1 Layout of equipment.
  - .2 Zoning.
  - .3 Complete wiring diagram, including schematics of modules.
- .3 Quality assurance submittals: submit following in accordance with Division 01 - General Requirements.
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Instructions: submit manufacturer's installation instructions.
  - .3 Manufacturer's Field Reports: manufacturer's field reports specified.
- .4 Closeout Submittals:
  - .1 System wiring diagrams:
  - .2 Submit complete wiring diagrams of system showing points of connection and terminals used for electrical connections in the system.
  - .3 Show modules, relays, switches and lamps in control panel.
  - .4 Power Calculations:
    - .1 Submit design calculations for new work specified to substantiate that battery capacity exceeds supervisory and alarm power requirements.
    - .2 Show comparison of detector power requirements per zone versus control panel smoke detector power output per zone in both standby and alarm modes for zones affected by the renovations.
    - .3 Show comparison of notification appliance circuit alarm power requirements with rated circuit power output for notification circuits affected by the renovations.

1.5 QUALITY ASSURANCE

.1 Qualifications:
- .1 Installer: company or person specializing in fire alarm system installations with five (5) years documented experience approved by manufacturer.
- .2 Provide services of representative or technician from manufacturer of system, experienced in installation and operation of type of system being provided, to supervise installation, adjustment, preliminary testing, and final testing of system and to provide instruction to project personnel.
- .3 System:
  - .1 In accordance with applicable Codes, Standards and the Authority Having Jurisdiction.

.4 Maintenance Service:

.1 Provide one (1) year's free maintenance based upon 24 hour emergency service with two inspections by manufacturer during warranty period. Inspection tests to conform to CAN/ULC-S536 and CAN/ULC-S561. Submit inspection report to Engineer.

2 Products

2.1 MATERIALS

.1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.

.2 Control Panel: to CAN/ULC-S527.

.3 Manual pull stations: to CAN/ULC-S528.

.4 Smoke detectors: to CAN/ULC-S529.

.5 Signal transmitting unit: to CAN/ULC-S599.

2.2 DESCRIPTION OF WORK

.1 This specification details the supply, installation commissioning and verification of a new single-stage, hybrid addressable and conventional fire alarm initiation and notification system for Montague Consolidated School in Montague, PEI.

.2 Modifications and additions to the existing conventional fire alarm initiation system at the Montague Consolidated School and new fire alarm initiation systems for the new lower and upper core of the Montague Consolidated School.

.3 Installation, commissioning and verification of new hybrid fire alarm control panel, new and modified devices and wiring.

.4 Existing fire alarm protection functions including receiving alarm signals, initiating general alarms, supervising the system continuously, actuating zone annunciators, and initiating trouble signals are to be reused.

.5 Installation to proceed on the basis that the building is fully occupied and retrofit of the existing fire alarm system will be implemented in a manner to minimize disruption of day-to-day operations and personnel within the building.

.6 During the retrofit, fire protection must be maintained throughout all areas of the building, and is to conform to the following standard: NFPA 101: 9.6.1.7 - Fire Alarm System Shutdown which states: "Where a required fire alarm system is out of service for more than 4 hours in a 24-hour period, the authority having jurisdiction is to be notified and the building must be evacuated or an approved fire watch must be provided for all parties left unprotected by the shutdown until the fire alarm system has been returned to service." As the building cannot be evacuated the Contractor must provide an approved fire watch when necessary and the fire watch must be provided using security cleared and qualified personnel. The Contractor is to carry the full cost for fire watch in the tender price.

.7 As required, install temporary covers on existing spot type fire alarm detectors to prevent false alarms during supervised work.

2.3 SYSTEM OPERATION

.1 Actuation of any alarm initiating device to:

.1 Indicate type of alarm and location at control panel and remote annunciators.

.2 Cause audible signaling devices to sound throughout the building and at the control panel.

.3 Cause visual signals to flash continuously throughout the building.

.4 Transmit signal to fire receiving centre via central station and signal transmitting unit.

.5 Cause air conditioning and ventilation fans to shut down or to function to provide

required control of smoke movement.

.6 Release fire / smoke control door hold-open devices.

.2 Actuation of second stage alarm to:

.1 Cause audible and visual signaling devices to activate throughout the building that the alarm initiated.

.3 If the first stage alarm is not acknowledged in two minutes, system to automatically go into second stage.

.4 Acknowledging alarm: indicated at control panel.

.5 Possible to silence signals by "alarm silence" switch at control unit after 60 second period of operation.

.6 Subsequent alarm, received after previous alarm has been silenced, to re-activate signals.

.7 Actuation of supervisory devices to:

.1 Indicate type of supervisory device and location at control panel and where applicable, at remote annunciator.

.2 Cause audible signal at control panel to sound.

.3 Activate common supervisory sequence.

.8 Resetting alarm or supervisory device not to return system indications/functions back to normal until control panel has been reset.

.9 Trouble on system to:

.1 Indicate device and circuit in trouble at control panel.

.2 Activate "system trouble" indication, buzzer and common trouble sequence. Acknowledging trouble condition to silence audible indication, whereas visual indication to remain until trouble is cleared and system is back to normal.

.10 Trouble on system: suppressed during course of alarm.

.11 Trouble condition of any circuit in system not to initiate alarm conditions.

2.4 CONTROL PANEL

.1 Hybrid Central Control Unit:

.1 Suitable for Class A or B wiring of both conventional and addressable initiation loops, data communication link style: to CAN/ULC-S524 with Class A or B wiring.

.2 Features specified are minimum requirements for microprocessor-based system with digital data control and transmission.

.3 Minimum capacity of 50 addressable input/initiation and 50 addressable output/ control points on two (2) integral Class A initiation circuit. Points may be divided between multiple communication channels in distributed system, each channel operating independently of the other. Faults on one communication channel not to affect operation of other channel.

.4 System to provide a minimum of two (2) Class B or Class A integral conventional notification appliance circuits with a combined output capacity of 2.5 A at 24 VDC.

.5 System to provide for priority reporting levels, with fire alarm points assigned highest priority, supervisory and monitoring lower priority and third priority for troubles. Possible to assign control priorities to control points in system to guarantee operation or allow emergency override as required.

.6 Provide a display interface with 80 character liquid crystal display. Use LCD technology and backlighting for high contrast visual clarity. In the normal mode, display the time, the total number of active points and the total number of disable points. In the alarm mode, display the current time, total number of messages waiting, type of event on display, location, message and event address.

.7 Provide visual indicators for the following common control functions: AC power, alarm, supervisory, monitor, trouble, disable, ground fault, CPU fail test and both

cellular/IP and telephone line active. Provide common control keys and visual indicators for: reset, alarm silence, trouble silence, drill and one custom programmable key/indicator. Provide four pairs of display control keys for selection of event display by type (alarm, supervisory, monitor and trouble) and forward/backward scrolling through event listings. Allow the first event of the highest priority to capture the LCD for display so that arriving fire fighters can view the first alarm event "hands free". Provide system function keys, status reports, enable, disable, activate, restore, program and test. System to be complete with a QWERTY keypad.

.8 Integral power supply, battery charger and standby batteries.

.9 Basic life safety software retained in non-volatile Erasable Programmable Read Only Memory (EPROM). Random Access Memory (RAM) chips in panel to facilitate password protected field editing of simple software functions (e.g. zone labels, priorities) and changing of system operation software.

.10 Circuitry to continuously monitor communications and data processing cycles of microprocessor. Upon failure, audible and visual trouble indication to activate.

.11 A digital alarm communicator transmitter module to transmit alarm, supervisory and trouble signals to a central monitoring station conforming to NFPA 72. The communicator shall support communications with the fire alarm signal transmitting unit as well as a 20 PPS 4/2 telephone line configured for dual tone multi-frequency or pulse modes.

.12 RS-232-C I/O port: parallel ASCII with adjustable baud rates to allow interface of any commercially available printer, terminal or computer.

.13 Equipped with software routines to provide Event-Initiated-Programs; change in status of one or more monitor points, may be programmed to operate any or all of system's control points.

.14 Software and hardware to maintain time of day, day of week, day of month, month and year.

.15 Software to operate variable sensitivity addressable and conventional smoke detectors and annunciate their status and sensitivity settings at control panel.

.2 Enclosure: surface mounted CSA Type 1 enclosure. Provide a locking hinged door with viewing window, flush lock and two keys.

2.5 SIGNAL TRANSMITTING UNIT

.1 Capable of communicating alarm, trouble, and supervisory signals to the fire alarm receiving centre through a minimum of two non-interdependent communication channels in accordance with CAN/ULC-S561.

.2 Enclosure to be surface mounted CSA Type 1 enclosure. Provide with a locking hinged door, flush lock and two keys, and cabinet tamper switch.

.3 Unit to be c/w integral power supply, hardwired transformer, and two listed standby 12 VDC, 7Ah batteries.

.4 Passive communication to signal receiving centre through supervised GSM transmitter located within the transmitting unit enclosure and a 20 PPS 4/2 telephone line configured for dual tone multi-frequency or pulse modes.

.5 Signal transmitting unit to be certified and compatible for use with the main fire alarm control panel.

.6 Circuitry to continuously monitor communications and data processing cycles of system, c/w a 24h test transmission of fire signals across both non-interdependent communication channels.

.7 Acceptable material:

.1 DSC Fire Kit # DSC-KIT32-412HC.

2.6 POWER SUPPLIES

.1 120 V, 60 Hz as primary source of power for system.
.2 Voltage regulated, current limited distributed system power.
.3 Primary power failure, power loss or supply voltage drop will activate common trouble sequence.
.4 Interface with battery charger and battery to provide uninterruptible transfer of power to standby source during primary power failure or loss.
.5 During normal operating conditions fault in battery charging circuit, short or open in battery leads to activate common trouble sequence and standby power trouble indicator.
.6 Standby batteries: sealed, maintenance free.
.7 Continuous supervision of wiring for external initiating and alarm circuits to be maintained during power failure.

2.7 SYSTEM TESTING BYPASS MODULE

.1 Provide a control display module with 4 auxiliary switches/LED's which can be programmed to bypass annunciation circuits, municipal connection and remote relay functions as required for system maintenance/testing.

2.8 INITIATING / INPUT CIRCUITS

.1 Receiving circuits for alarm initiating devices such as manual pull stations and smoke detectors to be, wired in a Class A configuration to control panel.
.2 Alarm receiving circuits: compatible with smoke detectors and open contact devices.
.3 Actuation of alarm initiating device: cause system to operate as specified in "System Operation".
.4 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".

2.9 ALARM OUTPUT CIRCUITS

.1 Alarm output circuits: connected to output or notification devices, wired in Class A, configuration to the control panel.
  .1 Signal circuit operation to follow system programming, capable of sounding signals either continuously, at 20spm or using a temporal pattern as described by International Standard ISO 8201, Acoustics - Audible Emergency Evacuation Signal and continuously flashing visual signals. Each signal circuit rated at 6 A, 24 VDC, fuse protected from overloading/overcurrent.
  .2 Manual alarm silence, automatic alarm silence and alarm silence inhibit to be provided by system's common control.

2.10 WIRING

.1 Wire type and number of conductors as recommended by fire alarm equipment manufacturer.
.2 To initiating circuits: Power limited fire alarm armoured cable or in conduit, twisted or untwisted, shielded or unshielded, copper conductors #18 AWG minimum, 300 V, FT4 rated to: CSA C22.2 No. 208-03, FAS 105°C.
.3 To signal circuits: 14 AWG, RW90 minimum and in accordance with manufacturer's requirements for voltage drop.
.4 To control circuits: 14 AWG, RW90 minimum and in accordance with manufacturer's requirements.

2.11 MANUAL ALARM STATIONS

.1 Addressable manual pull station: pull lever, surface semi-flush, wall mounted type, double action, two stage, English signage, and electronics to communicate station's status to addressable module. Station address to be set on station in field.

2.12 AUTOMATIC ALARM INITIATING DEVICES

.1 Addressable variable-sensitivity fire detectors:

- .1 Combination Photoelectric and fixed heat type.
- .2 Electronics to communicate detector's status to addressable module.
- .3 Detector address to be set on detector base in field.
- .4 Sensitivity settings: Five (5) settings, determined and operated by control panel. No shifting in detector sensitivity due to atmospheric conditions (dust, dirt) within certain parameters.
- .5 Ability to annunciate levels of detector contamination automatically with trouble condition at control panel.
- .6 Where detectors are concealed supply and install a remote mounted LED indicator at a visible location.

2.13 ADDRESSABLE INTERFACE MODULES

.1 Interface modules: facilitate connection of non-addressable devices (e.g. flow switch) to control panel; provided in different types for connection to monitoring devices (e.g. flow/ tamper switch) and control functions (e.g. fan shutdown, door release); communicate with control panel over (minimum number of wires) or (specified by manufacturer) or (addressable devices loop).

2.14 FAULT ISOLATORS

.1 Provide line fault isolators in detector bases or separately mounted. The isolator relay is controlled by the detector or the loop controller.

.2 The isolator operates as follows:

- .1 A short on the line causes all isolators to open within 23 msec.
- .2 At 10 msec intervals, beginning nearest the loop controller, the isolators close to provide the next isolator down the line with power.
- .3 When the isolator next to the short closes, it reopens within 10 msec.

2.15 REMOTE POWER SUPPLY

.1 120 V, 60 Hz, 3.2 A primary, to 24 VDC across four (4) Class A or B output circuits rated at 3 A maximum for any one circuit, and 6 A total.

.2 Form-C normally closed trouble relay with fully supervised power supply, battery, and notification circuits and two fully isolated control circuits.

.3 Capable of synchronization of notification appliances.

.4 Self contained unit with lockable cabinet, powder coat finish, integral battery charger, and 7.0 AH lead acid batteries.

2.16 END OF LINE DEVICES

.1 End-of-line devices to control supervisory current in alarm circuits and signaling circuits, sized to ensure correct supervisory current for each circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

2.17 MANUFACTURER

.1 Acceptable material:

- .1 Edwards - to match existing.

3 Execution

3.1 INSTALLATION

.1 Install systems in accordance with CAN/ULC-S524.

.2 For signal, alarm and ancillary devices, wire in EMT conduit with wire counts to be approved by fire alarm equipment manufacturer prior to installation. Install alarm and signal circuits in separate conduits. Surface mounted devices to be installed on matching outlet boxes recommended by manufacturer.

.3 Install control panel at 60" AFF to center and connect to AC power supply.

.4 Install addressable loops.

.5 Surface mounted fire alarm conduit or boxes located in finished areas to be painted to match the associated surface color. Coordinate exact color(s) on-site.

.6 Locate and install manual alarm stations as indicated and connect to initiation circuit loops.

.7 Locate and install new addressable detectors as indicated and connect to new addressable initiation circuit loops. Do not mount detectors in direct airflow from supply or exhaust air outlets. Maintain at least 18" radius clear space on ceiling, below and around detectors in accordance with CAN/ULC-554.

.8 Provide for fan shut down, door release, etc. using relays and intelligent interface modules.

.9 Confirm with manufacturer if supplied interface modules require separate DC power and if so, install DC power to interface module from control panel in accordance with manufacturers wiring instructions.

.10 Install end-of-line devices as required.

.11 Coordinate with the Owner and manufacturer for the naming of all loop device locations. Provide a list to the Owner indicating all proposed naming prior to programming. Make changes as directed by Owner at no extra charge. Arrange with the manufacturer to have location names listed on charts with loop numbers and device addresses. During installation of devices, peel the serial number label from the device and stick to the location message chart beside the location name.

.12 Include system configuration and programming to meet the needs of the new and existing building designs as required. Include programming of detection devices, relays, signal devices and custom configuration.

.13 Connect fire alarm system to remote monitoring station. On behalf of the Owner, make all arrangements for 24-hour remote monitoring at location of Owner's choice and verify that alarm signals are received. Include for one (1) year of monitoring service in total tender price.

3.2 FIELD QUALITY CONTROL

.1 Site Tests:

- .1 Conduct tests to Section 26 05 00 - Common Work Results - Electrical and CAN/ULC-S537 for system modifications.
- .2 Test each device and alarm circuit to ensure manual stations, smoke detectors transmit alarm to control panel and actuate general, first stage alarm and ancillary devices.
- .3 Verify fan control or shutdown.
- .4 Where applicable check annunciator panels to ensure zones are shown correctly.
- .5 Simulate grounds and breaks on alarm and signaling circuits to ensure proper operation of trouble signals.
- .6 Addressable circuits system:
  - .1 Test each conductor.
  - .2 Check to ensure zones are shown correctly.
  - .3 Simulate grounds and breaks on alarm and signaling circuits to ensure proper operation of trouble signals.
  - .4 Verify trouble and alarm signals are received at the remote supervised

location via both non-interdependent communication channels in accordance with CAN/ULC-S561.

.2 Manufacturers Field Service:

.1 Obtain written report from manufacturer verifying compliance of work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports in accordance with this Section and the Contract Documents.

.2 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 Schedule site visits to review work in accordance with this Section and the Contract Documents.

.3 Certificates and Reports:

.1 Provide:

.1 A copy of the inspecting technician's report showing location of each device and certifying the test results of each device.

.2 A certificate of verification confirming that the inspection has been completed in accordance with CAN/ULC-S537 and CAN/ULC-S561, and showing the conditions upon which such inspection and certification have been rendered.

.3 Final test and acceptance of the system shall be witnessed by representatives of three parties: the Owner, the Contractor and the manufacturer.

3.3 TRAINING

.1 Arrange and pay for on-site lectures and demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

3.4 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

.2 Section 31 23 00 - Excavation and Fill.

1.2 REFERENCES

.1 Canadian Standards Association (CSA).

.1 CSA C22.2 No. 211.1, Rigid Types EBI and DB2/ES2 PVC Conduit.

2 Products

2.1 PVC DUCTS AND FITTINGS

.1 Rigid PVC duct: to CSA C22.2 No. 211.1, type rigid PVC for direct burial with minimum wall thickness at any point of 1/10". Nominal length: 10' plus or minus 0.5". Type DB2 (thinwall) PVC conduits unacceptable.

.2 Rigid PVC split ducts as required.

.3 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make complete installation.

.4 Rigid PVC 90° and 45° bends as required.

.5 Rigid PVC 5° angle couplings as required.

.6 Expansion joints as required.

.7 Preformed, interlocking intermediate duct spacers for duct size as indicated

.8 Use epoxy coated galvanized steel conduit for sections extending above finished grade.

2.2 SOLVENT WELD COMPOUND

.1 Solvent cement for PVC duct joints.

2.3 CABLE PULLING EQUIPMENT

.1 Use 1/4" stranded nylon pull rope tensile strength 5 kN.

2.4 MARKERS

.1 6" wide, polyethylene marker tape in all trenches. Use red colored tape. Install at depth as per drawings.

3 Execution

3.1 INSTALLATION

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

.2 Clean inside of ducts before laying.

.3 Ensure full, even support every 1.5 m and smooth transitions throughout duct length.

.4 Slope ducts with 1 to 400 minimum slope.

.5 During and after construction, cap ends of ducts to prevent entrance of foreign materials.

.6 Pull through each duct wooden mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter. Pull stiff bristle brush through each duct immediately before pulling-in cables.

.7 In each duct install pull rope continuous throughout each duct run with 3 m spare rope at each end.

.8 Install continuous strip of marker tape above duct before backfilling.

.9 Notify Departmental Representative upon completion of direct buried ducts and obtain

acceptance prior to backfill.

END OF SECTION

1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.
.2 Section 26 05 28 - Grounding - Secondary.
.3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
.4 Section 26 05 43.01 - Installation of Cables in Ducts.
.5 Section 26 24 01 - Service Entrance.
.6 Section 33 65 76 - Direct Buried Underground Cable Ducts.

2 Products

2.1 MATERIALS

.1 Underground ducts: to Section 33 65 76 - Direct Buried Underground Cable Ducts, rigid PVC type, size as indicated.
.2 Conductors: copper, type RWU-90, to Section 26 05 21 - Wires and Cables (0 -1000V), size and number of conductors as indicated.
.3 Backfill: clean and free from debris.

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 INSTALLATION

.1 Coordinate incoming service with Utility on site.
.2 Install cables in ducts in accordance with Section 26 05 43.01 - Installation of Cables in Ducts.
.3 Allow adequate conductor length for connection to service. Size and quantity of secondary voltage cables to be supplied and installed by Division 26 - Electrical. Connection of secondary voltage cables to utility transformers to be completed by the Utility.
.4 Meter cabinet and socket to Utility requirements. Connect PT & CT around service cables and coordinate location of remote meter with Utility on site.
.5 Connect conductors to service equipment and arrange for energization with Utility. Connection to Utility equipment to be completed by Utility.
.6 Allow adequate conductor length for connection to service equipment.
.7 Make grounding connections in accordance with Section 26 05 28 - Grounding - Secondary.
.8 Seal ducts and conduits at building entrance location after installation of cables.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
.2 Perform additional tests as required by authority having jurisdiction.
.3 Submit written test results for review and approval.

END OF SECTION

APPENDIX 'A'
Hazardous Assessment Report

ALL-TECH
ENVIRONMENTAL SERVICES LIMITED

HAZARDOUS MATERIALS ASSESSMENT
Montague Consolidated School
622 Princess Dr, Montague, PE

Prepared For:

PEI Department of Transportation, Infrastructure and Energy
11 Kent St,
Charlottetown, PE

January 27, 2021

ALL-TECH Project No.: PE282

ALL-TECH Environmental Services Limited, 70 Nicholas, Unit 4, Charlottetown, PE, C1E 3J5
Phone: (902) 569-0172 Web: http://www.toalltech.com

Bedford, NS Sydney, NS St. John, NB Moncton, NB Charlottetown, PE St John's, NL Cornerbrook, NL Gander, NL

EXECUTIVE SUMMARY

ALL-TECH Environmental Services Limited was retained by Prince Edward Island's Department of Transportation, Infrastructure and Energy (DTIE) to conduct a hazardous material assessment for Montague Consolidated School located at 622 Princess Drive in Montague, Prince Edward Island.

This report has been prepared to document the identities, usages and locations of any designated substances and hazardous materials identified within the building.

The purpose of the Hazardous Materials Survey was to identify hazardous materials which may require safe handling procedures and disposal requirements in accordance with their applicable regulations prior to an upcoming major renovation project.

The on-site assessment was conducted in December 2020. During the assessment hazardous materials including asbestos and lead (paint) were sampled.

Other suspect materials including but not limited to mercury, mould (active growth), Polychlorinated Biphenyls (PCBs), Silica and other potential hazardous materials were visually assessed and reported if identified.

Based on the findings from the Hazardous Materials Assessment, the following conclusions and recommendations are presented.

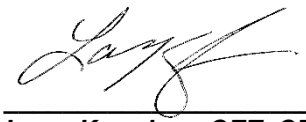
Hazardous Materials identified through sampling and identification were:

- Asbestos Containing Hardboard ceiling (MC-01)
- Asbestos Containing Mechanical Insulation (MC-03; MC-04; MC-08; MC-09; MC-10; MC-11)
- Asbestos Containing Gasket material (MC-05)
- Asbestos Containing Parging (MC-02; MC-16; MC-21; MC-22; MC-28; MC-29; MC-31)
- Asbestos Containing Vinyl sheet flooring (MC-25)
- Lead Paint (LM-01; LM-10)
- Crystalline Silica
- Mercury containing lamps (minor)
-

A summary of the Hazardous Materials identified within the building is provided below in Table A based on our assessment. A summary of estimated quantities of asbestos containing materials is provided in Appendix V.

TABLE A Summary of Hazardous Materials Montague Consolidated Scholl - Montague, Prince Edward Island			
Hazardous Materials	***Description / Comments***	***Safe Handling Requirements***	***Disposal Requirements***
ASBESTOS	Asbestos Containing Hardboard ceiling (MC-01 – Rm 120)	Licensed contractor to obtain work permit prior to handling from PEI Dept. of WCB/OSH Division and all other pertinent sections of the *Occupational Health and Safety Act* R.S.P.E.I.	Regulatory approval from PEIELJ Disposal at approved facility such as EPWMF in Wellington, PEI
	Asbestos Containing Gasket material (MC-05 – Room 120)		
	Asbestos Containing Mechanical Insulation (MC-03; MC-04; MC-08; MC-09; MC-10; MC-11 – Room 120)		
	Asbestos Containing Parging (MC-02 – Room 120; MC-16 – Room 121; MC-21 – Room 110; MC-22 – Room 105; MC-28 – Room 103, MC-29 – Room 202; MC-31 – Library)		
	Asbestos Containing Vinyl sheet floor covering (MC-25 – Room 129)		
LEAD	LM-01 Green Paint Boiler Room 120	TDG – manifest Trained personnel in the safe handling of lead coated surfaces and all other pertinent sections of the *Occupational Health and Safety Act* R.S.P.E.I	Regulatory approval from PEIELJ Additional analysis required for TCLP for disposal purposes, if required.
	LM-10 Beige Paint on Concrete Upper Level Corridor		
CRYSTALLINE SILICA	Numerous areas through building interior and exterior with concrete / brick structures including walls, floors, exterior finish.	Trained personnel in the safe handling of crystalline silica surfaces for cutting, grinding and demolition activities and all other pertinent sections of the *Occupational Health and Safety Act* R.S.P.E.I.	C&D disposal
MERCURY	Mercury containing bulbs and lamps	Safe handling procedures	Recycle

This summary should not be used alone. The report must be read in its entirety.



Larry Koughan, CET, CRSP
Project Principal
ALL-TECH Environmental Services Limited

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SITE / CLIENT INFORMATION

Project No:	PE282
Assessment Date:	**December 2020**
Client Name:	**DTIE**
Address:	Montague Consolidated School 622 Princess Drive Montague, PE

1. INTRODUCTION

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The on-site assessment was conducted in December 2020. During the assessment hazardous materials including asbestos and lead (paint) were sampled.

Other suspect materials including but not limited to mercury, mould (active growth), Polychlorinated Biphenyls (PCBs), Silica and other potential hazardous materials were visually assessed and reported if identified.

1.1 SURVEY OBJECTIVES

The scope of the survey was to conduct a semi-destructive assessment to identify any designated substances and hazardous materials within the subject building. ALL-TECH inspected both interior and exterior spaces of the subject building to determine whether designated substances and hazardous materials were present. Representative sampling for suspect asbestos and lead paint materials was conducted as required based on industry standards and the consultant's experience.

2. REGULATIONS & GUIDELINES

A summary table (Table 1) is provided for the applicable regulations, policies, codes, and / or guidelines of hazardous materials assessed for the purpose of this report. This information was used as reference to assess suspect hazardous materials and make recommendations based on the findings.

TABLE 1
SUMMARY OF REGULATORY FRAMEWORK

ASBESTOS	▪ *Occupational Health and Safety Act* R.S.P.E.I. 1988, Cap. O-1.01 General Regulations – Part 49 (Including any amendments to May 2006) ▪ *Environmental Protection Act Chapter E-9 Waste Management Regulations*, Prince Edward Island ▪ Federal Treasury Board of Canada Secretariat Hazardous Substances Directive –II, Section 2.9 ▪ Transportation of Dangerous Goods Act (TDGA)
LEAD	▪ Hazardous Products Act ▪ Prince Edward Island Department of Environment, Labor and Justice (PEIELJ) ▪ Transportation of Dangerous Goods Act (TDGA) ▪ US Environmental Protection Agency (EPA)
MERCURY	▪ Hazardous Products Act ▪ Canadian Council of Ministers of the Environment (CCME)
MOULD	• *Occupational Health and Safety Act* R.S.P.E.I. 1988, Cap. O-1.01 General Regulations – Part 11 Ventilation (Including any amendments to May 2006)
OZONE DEPLETING SUBSTANCES	▪ *Canadian Environmental Protection Act, Federal Halocarbon Regulation (SOR/99-255) Ozone Depleting Substance Regulations, 2003* under the *Environmental Protection Act* (O.C. 2003-222). ▪ Prince Edward Island *Environmental Protection Act E-9 Ozone Layer Protection Regulations*
PCB's	▪ Environmental Contaminants Act, Chlorophenyl Regulations ▪ Environment Canada – "Identification of Lamp Ballasts Containing PCB's", report EPS 2/CC/2 (revised) August, 1991
OTHER HAZARDOUS MATERIALS	• Hazardous Products Act

2.1 ASBESTOS

Asbestos materials can be found in one of two forms: friable asbestos or a non-friable type. Friable asbestos material refers to material that when dry, can be crumbled, pulverized, or reduced to a powder by hand pressure. This type of asbestos material is hazardous due to its potential to become airborne, if damaged or disturbed.

Friable asbestos building products used that have been used in the past are sprayed acoustic and fire protection insulation which were installed on mechanical room ceilings, building structures, ceiling finishes, etc., and mechanical insulation on piping, tanks, boilers, vessels, etc. Some non-friable building products are vinyl acoustic floor tiles, gaskets, transite panels, piping, and shingles.

Non-friable materials if handled improperly during removal or renovations, such as cutting transite panels with an electrical tool, can cause high fiber releases.

Asbestos is classified as a hazardous material under the TDGA and must adhere to specific requirements for transfer including but not limited to waste transfer manifests and proper placards. All asbestos waste must be disposed of at an approved municipal solid waste disposal site. Recent changes from the Prince Edward Island's Department of Environment's Environmental Protection Act, Waste Resource Management Regulations have defined asbestos as "special waste" as asbestos containing materials containing greater than 1% by weight for the purpose of disposal.

All work should be carried out by personnel trained and licensed with the provincial department of the Workers Compensation Board / Occupational Health and Safety Division for asbestos abatement.

2.2 LEAD

Lead in paints is regulated under the Canadian Environmental Protection Act (CEPA) as published in Canada Gazette Part II. The lead content limit has been set to 600 mg/kg (0.06 percent by weight) for surface coating materials.

Any disturbance or removal of lead-based materials which may generate lead dust shall have to conform to the federal and provincial Occupational Health and Safety Act and Regulations. All work should be carried out by personnel trained in the safe handling of lead-based paint coatings and shall be trained in the use of respirators and be properly fit tested.

PEIELJ has established guidelines that restrict hazardous materials from municipal landfills and Construction and Demolition (C&D) waste disposal sites which potentially may migrate / leach into groundwater and cause adverse environmental impacts. Lead coated surfaces may leach from their base materials into soil and subsequent groundwater. PEIELJ has established guidelines that materials containing 1000 mg/kg or 0.1% lead by weight shall be classified as lead-based paints. If materials are found to be above this guideline and require removal and disposal, then the materials must undergo leachate testing to assess to concentration which could potentially leach into the ground soil and groundwater. Presently provincial requirements for lead leachate testing shall not exceed 5 mg/L.

Materials with leachable lead concentrations above provincial guidelines must be manifested as dangerous goods during transport under the federal TDGA. Hazardous materials that are being disposed of out of province must comply with Interprovincial Movement of Hazardous Waste Regulations under the Canadian Environmental Protection Act (CEPA).

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found to be above this guideline and require removal and disposal, then the materials must undergo leachate testing to assess to concentration which could potentially leach into the ground soil and groundwater. Presently provincial requirements for lead leachate testing shall not exceed 5 mg/L. Disposal criteria for lead containing paints are based on total and leachable concentrations are as follows:

- Materials with total lead concentrations below the applicable Total guidelines can be disposed of at any C&D disposal site.
- Materials with *total lead concentrations above* the applicable Total guidelines and *leachable lead concentrations below* the applicable Leachate guidelines must be disposed of at an approved municipal solid waste landfill that has a composite liner and leachate collection system (i.e. East Prince Waste Management Facility in Wellington, PEI). A waste generator permit must first be approved and obtained by PEIELJ.
- Materials with total and leachable lead concentrations above provincial guidelines must be transported to an approved hazardous waste disposal site.

Materials with leachable lead concentrations above provincial guidelines must be manifested as dangerous goods during transport under the federal TDGA. Hazardous materials that are being disposed of out of province must comply with Interprovincial Movement of Hazardous Waste Regulations under the Canadian Environmental Protection Act (CEPA).

2.3 MERCURY

Standard for Mercury Containing Lamps and a Canada- Wide Standard for Mercury Emissions. The goal of the standards is to reduce the release of mercury into the environment.

The province of Prince Edward Island Workers Compensation Board / Occupational Health & Safety Services follows the American Conference of Governmental Industrial Hygienists (ACGIH) levels when dealing with airborne mercury levels: TLV = 0.01 mg/m^3. These limits represent conditions under which it is believed that nearly all workers can be repeatedly exposed day after day without adverse health effects.

Regulations classify mercury as a hazardous waste and proper handling and disposal is required.

2.4 MOULD

There are no specific regulations in P.E.I. addressing mould contamination. However, according to Health Canada and the Canadian Construction Association (CCA) guidelines on assessment and remediation of fungi in indoor environments, building materials supporting mould growth should be remediated *as rapidly as possible* in order to ensure a healthy environment. Remediation of mould growth is based on an approximation of the extent of visible mould growth including the estimated extent of any hidden mould growth.

2.5 OZONE DEPLETING SUBSTANCES

In 1994, the federal government filed the Ozone-Depleting Substances (ODS) Regulation to amend controls on production and consumption of chlorofluorocarbons (CFC's), halons, carbon tetrachloride and methyl chloroform. CFC's have been used in refrigeration, air conditioners, heat pumps, cooling systems and fire extinguishing systems for many years. Regulations set forth are intended to prevent CFC gases from escaping into the environment. CFC's are primarily used as a cooling and heating agent inside mechanical units.

2.6 POLYCHLORINATED BIPHENYLS (PCB's)

In 1976, the Canadian Environment Contaminants Act passed regulations which prohibited the use of PCB's in transformer equipment. Under the same Act, the Chlorophenyl Regulations No. 1, states that PCBs cannot be used as a constituent of electrical capacitors, electrical transformers and associated electrical equipment manufactured in or imported into Canada after July 1, 1980.
There is currently no regulatory requirement to remove in-use PCB's from service. However, should suspect PCB containing light ballasts be removed from service, they should be treated as PCB waste or if confirmed to contain PCB oil in excess of 0.5 kg.

2.7 CRYSTALLINE SILICA

No specific provincial disposal requirements have been established for silica. Worker protection must be adhered to when generating airborne silica dust through cutting or grinding processes.
Indoor air pollutants in commercial buildings and non-industrial workplaces at the present time in Prince Edward Island are regulated under Part 11 *Ventilation*, section 11.3. Regulations are adopted from the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV's). The ACGIH has established Threshold Limit Value/Time-Weighted Averages (TLV-TWA's) for a large number of airborne contaminants. TLV-TWA's are contaminant concentrations considered acceptable for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse health effects. Currently in the province of Prince Edward Island, ACGIH TLV-TWA's have been adopted under the Occupational Health and Safety Act.
Should TLV's be exceeded, employers are required to ensure suitable ventilation is provided to reduce contamination in the workplace.
Some contaminants have Short-Term Exposure Limits (STEL) which is a 15 minute exposure that should not be exceeded at any time during a workday.
Also, some chemicals have Ceiling (C) limits which should not be exceeded for any part of the working exposure.

3. METHODOLOGY

The scope of work for the survey was to visually identify controlled hazardous materials for the safe handling and disposal of hazardous materials prior to renovations within the building. Where visual

identification of asbestos containing materials and lead based paints were suspected but unable to be determined, samples were collected and sent to an approved laboratory for analysis.

There was limited destructive testing of structural members (i.e. walls, flooring, and roof membranes) during the assessment. Where accessible, areas above ceiling cavities and behind walls were visually assessed to identify potentially concealed hazardous materials.

3.1 ASBESTOS

Using standard bulk sampling methodologies, representative suspect asbestos containing materials were sampled from ceiling & wall finishes, floor coverings, located throughout the building. Samples were placed in sealed plastic bags, labelled and a chain of custody form completed to be forwarded to IATL Laboratory via courier for analysis.

The asbestos assessment involved a visual investigation of suspect materials for the presence of asbestos containing materials. If these materials were suspected to contain asbestos, a bulk sample was collected of the representative material to be analysed with Polarized Light Microscopy.

It should be noted that asbestos containing materials may be present behind unrevealed areas. During demolition of these materials, precautions should be taken such as the use of personal protective equipment in the event of exposing concealed asbestos materials. If suspect materials are revealed, have them tested immediately.

3.2 LEAD

During the assessment, suspect mercury and lead-based paints were sampled from surfaces as determined by the consultant. Where practical, all layers of paint were removed and placed in sealed plastic bags, labelled and a chain of custody form completed to be forwarded to IATL Laboratory via courier for analysis.

3.3 POLYCHLORINATED BIPHENYLS

During the assessment, suspect PCB containing light ballasts were examined for PCB identification or by recording serial numbers for reference. Ballasts were inspected and manufacturers name, date and serial numbers were recorded when visible. The manufacturers identification numbers were then compared to Environment Canada's "Identification of Lamp Ballasts Containing PCB's", Report EPS 2/CC/2 9revised), August 1991.

It should be noted that the assessment did not include the sampling / testing or analysis of the suspect PCB containing materials.

3.4 OTHER HAZARDOUS MATERIAL

During the assessment, other hazardous materials including, but not limited to, crystalline silica, mercury, mould, ozone depleting substances, etc. were visually assessed for the presence within suspect areas or materials. No sampling was carried out for any other noted hazardous materials.

4. ASSESSMENT FINDINGS

Asbestos materials can be found in one of two forms: friable asbestos or a non-friable type. Asbestos containing materials can be properly managed and left in place depending on their location, condition, and friability. Non-friable materials receive less attention than friable materials due to the fact that the asbestos fibres in the non-friable material are bound or held tightly together, reducing the chance of fibres becoming airborne. This makes the non-friable products safer and easier to manage.

4.1 ASBESTOS CONTAINING MATERIALS (ACM)

During the survey, the consultants collected individual bulk material samples of suspect materials within the structure. A total of thirty-five (35) bulk material samples were collected within the buildings during the survey. Some of these samples such as tile floor coverings with adhesives were separated and a total of forty-three (43) samples were analyzed. Of the 43 samples analyzed, seventeen (17) were found to be asbestos containing.

Results of the asbestos assessment sampling and findings are summarized below in table 2. Laboratory analysis certificate are presented in Appendix I and site photos are itemized in Appendix III for reference. Estimated quantities for ACM's assessed in accessible areas are outlined in Appendix V.

Other materials such as pipe and duct insulations visually identified as fibreglass insulation were noted and not sampled.

TABLE 2
SUMMARY OF ASBESTOS CONTAINING MATERIALS

Sample No.	Material Design/Location	Asbestos Content (%)
MC-01	Hard board Ceiling / Room 120	15% Chrysotile
MC-02	Parging on Elbow / Room 120	30% Chrysotile
MC-03	Cold Water Storage Tank / Room 120	10% Chrysotile PC 2 Amosite
MC-04	Hot Water Storage Tank / Room 120	10% Chrysotile
MC-05	Gasket on Boiler Port Hole / Room 120	40% Chrysotile
MC-07	Parging on Tee / Room 120	30% Chrysotile
MC-08	8" Boiler Feed Parging / Room 120	30% Chrysotile
MC-09	Boiler insulation around gauge / Room 120	15% Chrysotile
MC-10	Boiler breaching / Room 120	30% Chrysotile

MC-11	**Insulation on boiler port hole / Room 120**	**15% Chrysotile**
MC-16	**Pipe Parging on 8" Vertical pipe / Room 121**	**20% Chrysotile**
MC-21	**Elbow Parging / Outside Room 110**	**25% Chrysotile**
MC-22	**Pipe Parging / Outside Room 105**	**30% Chrysotile**
MC-25	**Brown Sheet Floor / Outside Room 129**	**15% Chrysotile**
MC-28	**Parging on Straight Run / Outside Room 103**	**50% Chrysotile**
MC-29	**Pipe Parging Elbow / Outside Room 202**	**50% Chrysotile**
MC-31	**Parging on Roof Drain / Upper Level Library**	**10% Chrysotile**

4.2 LEAD-BASED PAINTS

Based on the age of the buildings, lead based paints were sampled. A total of ten (10) painted surface coatings were sampled within the buildings and sent to the laboratory for analysis for lead in paint.

Based on the assessment findings, two of the paints sampled exceeded CEPA guidelines of 0.06% by weight for safe handling and for Provincial Regulations set by PEIELJ for disposal purposes.

A summary of results for lead based paints is presented below in table 3.

Laboratory analysis certificate is presented in Appendix II and site photos are itemized in Appendix III for reference.

TABLE 3
SUMMARY OF LEAD BASED PAINT RESULTS

Sample No.	Paint description / Location	Total Lead results (% by weight)
LM-01	**Green Paint / Boiler Room 120**	**0.69**
LM-10	**Beige Paint on Concrete / Upper Level Corridor**	**0.31**

4.3 MERCURY

Some types of lamps, such as household light bulbs, straight (or linear) fluorescent lamps contain small quantities of mercury.

During the assessment, straight (or linear) fluorescent lamps were observed in some areas of the buildings. Although they are safe to use, when a lamp breaks, the mercury can be released and contaminate the environment. It is important to safely handle and recycle these lamps.

Mercury filled thermostats were not observed during the assessment.

4.4 MOULD AFFECTED AREAS

No visible mould was encountered during the assessment. Minor water staining on ceiling tiles was observed but no significant issues were noted or reported. Most walls throughout the school are concrete construction, so no destructive testing is or shall be required and extensive mould in walls is not anticipated.

4.5 OZONE DEPLETING SUBSTANCES (ODS)

Materials/equipment suspected to contain ozone depleting substances were not visually identified during time of assessment.

4.6 POLYCHLORINATED BIPHENYLS (PCB's)

Some older model lamp ballasts were observed within the buildings. The Advance and Triad ballasts observed had Non-PCB markings on the labels (see Appendix III P45, P46, P47).

Through referencing and markings on lamp ballasts, it was determined that the ballasts observed on site are non PCB containing.

4.7 CHRYSTALLINE SILICA

Renovations, demolition, or building maintenance involving work with concrete and masonry products is a ubiquitous activity. Research has identified demolition of concrete or masonry structures as one of the construction activities with potentially high exposures to respirable crystalline silica[1]. There is consistency among various professionals that total elimination or substitution of silica from the construction process may not be a feasible option. The use of wet methods, local exhaust ventilation and high efficiency particulate air (HEPA) filtration systems attached to work tools or equipment, worker's isolation from dust generating sources by tenting off or use of other physical barriers, respiratory protection, practice of basic hygiene, work practices, and worker training may significantly reduce silica dust in many construction activities. However, these controls when used separately or incompletely may fail to reduce exposure to less than established occupational exposure limits[2].

A visual assessment of materials that are suspected to contain crystalline silica during the survey was completed. No samples were collected. The main wall structures observed within the building are exterior brick and mortars as well as concrete floors and concrete block walls.

4.8 OTHER HAZARDOUS MATERIALS

No other potentially hazardous materials were not observed during the assessment.

5. SUMMARY OF HAZARDOUS MATERIALS

Based on the findings from the Hazardous Materials Assessment, the following conclusions and recommendations are presented.

Hazardous Materials identified through sampling and identification were:

- Asbestos Containing Hardboard ceiling (MC-01)
- Asbestos Containing Mechanical Insulation (MC-03; MC-04; MC-08; MC-09; MC-10; MC-11)
- Asbestos Containing Gasket material (MC-05)
- Asbestos Containing Parging (MC-02; MC-16; MC-21; MC-22; MC-28; MC-29; MC-31)
- Asbestos Containing Vinyl floor covering (MC-25)
- Lead Paint (LM-01; LM-10)
- Crystalline Silica
- Mercury containing lamps (minor)

A summary of the Hazardous Materials identified within the building is provided below in Table 4 based on our assessment. A summary of estimated quantities of asbestos containing materials is provided in Appendix V.

It should be noted that the removal/handling procedures will vary depending upon a number of factors including removal techniques, tools used during removal, quantities, etc. Therefore, detailed specifications and a scope of work should be developed for the handling, removal, and disposal of the hazardous materials.

TABLE 4
Summary of Hazardous Materials
Montague Consolidated Scholl - Montague, Prince Edward Island

Hazardous Materials	*Description / Comments*	*Safe Handling Requirements*	*Disposal Requirements*
ASBESTOS	Asbestos Containing Hardboard ceiling (MC-01 – Rm 120)	Licensed contractor to obtain work permit prior	Regulatory approval from
	Asbestos Containing Gasket material (MC-05 – Room 120)		

	Asbestos Containing Mechanical Insulation (MC-03; MC-04; MC-08; MC-09; MC-10; MC-11 – Room 120)	to handling from PEI Dept. of WCB/OSH Division and all other pertinent sections of the *Occupational Health and Safety Act* R.S.P.E.I.	PEIELJ Disposal at approved facility such as EPWMF in Wellington, PEI
	Asbestos Containing Parging (MC-02 – Room 120; MC-16 – Room 121; MC-21 – Room 110; MC-22 – Room 105; MC-28 – Room 103, MC-29 – Room 202; MC-31 – Library)		
	Asbestos Containing Vinyl sheet floor covering (MC-25 – Room 129)		
LEAD	LM-01 Green Paint Boiler Room 120	TDG – manifest Trained personnel in the safe handling of lead coated surfaces and all other pertinent sections of the *Occupational Health and Safety Act* R.S.P.E.I	Regulatory approval from PEIELJ Additional analysis required for TCLP for disposal purposes, if required.
	LM-10 Beige Paint on Concrete Upper Level Corridor		
CRYSTALLINE SILICA	Numerous areas through building interior and exterior with concrete / brick structures including walls, floors, exterior finish.	Trained personnel in the safe handling of crystalline silica surfaces for cutting, grinding and demolition activities and all other pertinent sections of the *Occupational Health and Safety Act* R.S.P.E.I.	C&D disposal
MERCURY	Mercury containing bulbs and lamps	Safe handling procedures	Recycle

6. DISCLAIMER

The recommendations detailed in this report were carried out in a manner consistent with the level of care and skill normally exercised by reasonable members of the environmental and industrial hygiene consulting profession currently practicing under similar conditions in the area.
In preparing this report, ALL-TECH Environmental Services Limited relied on information supplied by others, including independent laboratories and testing services. Except as expressly set out in this report, we have not made any independent verification of such information.

The recommendations in this report have been made in the context of existing industry accepted guidelines which were in place at the date of this report.

We trust this information is beneficial for assisting you in better understanding the process that has been carried out as well as the benefits and limitations of air sample results.

Should you have any questions or concerns pertaining to this report, please contact the undersigned directly.

Larry G. Koughan, CET, CRSP
Senior Project Consultant

ALL-TECH
ENVIRONMENTAL SERVICES LIMITED

CANADIAN SOCIETY OF SAFETY ENGINEERING
MEMBER

APPENDIX I

Laboratory Certificate of Analysis – Asbestos PLM Samples

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Environmental Services Limited
20 Duke St.,Suite 109
Bedford NS B4A 2Z5

Client: ALL131

Report Date: 1/10/2021
Report No.: 625904 - PLM
Project: Montague Consolidated
Project No.: PE282

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7121945
Client No.: MC-01
Analyst Observation: Grey Cement Product
Client Description: Hard Board Ceiling
Location: Room 120
Facility:

Percent Asbestos:
15 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
85

Lab No.: 7121946
Client No.: MC-02
Analyst Observation: Grey Insulation
Client Description: Parging on Elbow
Location: Room 120
Facility:

Percent Asbestos:
30 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
10 Fibrous Glass

Percent Non-Fibrous Material:
60

Lab No.: 7121947
Client No.: MC-03
Analyst Observation: White Insulation
Client Description: Cold Water Storage Tank
Location: Room 120
Facility:

Percent Asbestos:
10 *Chrysotile*
PC 2 *Amosite*

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
88

Sample received wet

Lab No.: 7121948
Client No.: MC-04
Analyst Observation: Tan Insulation
Client Description: Hot Water Storage Tank
Location: Room 120
Facility:

Percent Asbestos:
10 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
30 Mineral Wool

Percent Non-Fibrous Material:
60

Sample received wet

Lab No.: 7121949
Client No.: MC-05
Analyst Observation: Black/Tan Gasket
Client Description: Gasket on Boiler Port Hole
Location: Room 120
Facility:

Percent Asbestos:
40 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
60

Lab No.: 7121950
Client No.: MC-06
Analyst Observation: Yellow Insulation
Client Description: Boiler 1589 Insulation
Location: Room 120
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
98 Fibrous Glass

Percent Non-Fibrous Material:
2

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 1/6/2021
Date Analyzed: 01/09/2021
Signature: Natalia Morais Soares
Analyst: Natalia Morais Soares

Approved By:
Frank E. Ehrenfeld, III
Laboratory Director

iATL INTERNATIONAL
ASBESTOS TESTING LABORATORIES

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Client: ALL131

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Project No.: PE282

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7121951
Client No.: MC-07

Analyst Observation: Grey Insulation
Client Description: Parging on Tee

Location: Room 120
Facility:

Percent Asbestos:
30 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
70

Lab No.: 7121952
Client No.: MC-08

Analyst Observation: Grey Insulation
Client Description: 8" Boiler Feed Parging

Location: Room 120
Facility:

Percent Asbestos:
30 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
70

Lab No.: 7121953
Client No.: MC-09

Analyst Observation: Tan Insulation
Client Description: Boiler Insulation Around Gauge

Location: Room 120
Facility:

Percent Asbestos:
15 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
85

Sample received wet

Lab No.: 7121954
Client No.: MC-10

Analyst Observation: White Insulation
Client Description: Boiler Breaching

Location: Room 120
Facility:

Percent Asbestos:
30 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
70

Lab No.: 7121955
Client No.: MC-11

Analyst Observation: Tan Insulation
Client Description: Insulation on Boiler Pot Hole

Location: Room 120
Facility:

Percent Asbestos:
15 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
85

Sample received wet

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 1/6/2021
Date Analyzed: 01/09/2021
Signature: Natalia Morais Soares
Analyst: Natalia Morais Soares

Approved By:

Frank E. Ehrenfeld, III
Laboratory Director

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CERTIFICATE OF ANALYSIS

Client: ALL-TECH Environmental Services Limited
20 Duke St.,Suite 109
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Client: ALL131

Report Date: 1/10/2021
Report No.: 625904 - PLM
Project: Montague Consolidated
Project No.: PE282

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7121956
Client No.: MC-12
Analyst Observation: Grey Insulation
Client Description: Ceiling Tile 12"x12"
Location: Corridor O/S Room 121
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
95 Mineral Wool

Percent Non-Fibrous Material:
5

Lab No.: 7121957
Client No.: MC-13
Analyst Observation: Tan Debris
Client Description: Debris on Ceiling Tile
Location: O/S Room 122
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 7121958
Client No.: MC-14
Analyst Observation: Grey Debris
Client Description: Debris on Ceiling Tile
Location: Corridor O/S Room 122
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
80 Cellulose

Percent Non-Fibrous Material:
20

Lab No.: 7121959
Client No.: MC-15
Analyst Observation: White Joint Compound
Client Description: Drywall/Joint Compound
Location: Room 121
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 7121960
Client No.: MC-16
Analyst Observation: Grey Pipe Material
Client Description: Pipe Parging on 8" Vertical Pipe
Location: Room 121
Facility:

Percent Asbestos:
20 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
60 Mineral Wool

Percent Non-Fibrous Material:
20

Lab No.: 7121961
Client No.: MC-17
Analyst Observation: White Floor Tile
Client Description: 12"x12" Off-White Floor Tile
Location: Corridor Room 125
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 1/6/2021
Date Analyzed: 01/10/2021
Signature: Natalia Morais Soares
Analyst: Natalia Morais Soares

Approved By:
Frank E. Ehrenfeld, III
Laboratory Director

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Report Date: 1/10/2021
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Project: Montague Consolidated
Project No.: PE282

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7121961(L2)
Client No.: MC-17
Analyst Observation: Yellow Mastic
Client Description: 12"x12" Off-White Floor Tile
Location: Corridor Room 125
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 7121962
Client No.: MC-18
Analyst Observation: Tan Ceiling Tile
Client Description: Ceiling Tile 12'x12" Fissure
Location: O/S Room 115
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
50 Cellulose
40 Mineral Wool

Percent Non-Fibrous Material:
10

Lab No.: 7121963
Client No.: MC-19
Analyst Observation: Tan Floor Tile
Client Description: 12x12 Vinyl Floor Tile Beige
Location: Room 112
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 7121963(L2)
Client No.: MC-19
Analyst Observation: Black Mastic
Client Description: 12x12 Vinyl Floor Tile Beige
Location: Room 112
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 7121964
Client No.: MC-20
Analyst Observation: Yellow Floor Tile
Client Description: 12x12 Gold Vinyl Floor Tile
Location: Room 110 B
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 7121964(L2)
Client No.: MC-20
Analyst Observation: Black Mastic
Client Description: 12x12 Gold Vinyl Floor Tile
Location: Room 110 B
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 1/6/2021
Date Analyzed: 01/10/2021
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Report Date: 1/10/2021
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Project: Montague Consolidated
Project No.: PE282

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7121965
Client No.: MC-21

Analyst Observation: Grey Insulation
Client Description: Elbow Parging

Location: Corridor O/S 110
Facility:

Percent Asbestos:
25 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
75

Lab No.: 7121966
Client No.: MC-22

Analyst Observation: Grey Insulation
Client Description: Pipe Parging

Location: Corridor O/S Room 105
Facility:

Percent Asbestos:
30 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
70

Lab No.: 7121967
Client No.: MC-23

Analyst Observation: Tan Floor Tile
Client Description: 12"x12" Vinyl Floor Tile

Location: Room 117 B
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 7121967(L2)
Client No.: MC-23

Analyst Observation: Black Mastic
Client Description: 12"x12" Vinyl Floor Tile

Location: Room 117 B
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 7121968
Client No.: MC-24

Analyst Observation: Blue Floor Tile
Client Description: 12"x12" Vinyl Floor Tile

Location: Room 131
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 7121969
Client No.: MC-25

Analyst Observation: Brown Vinyl Sheet Flooring
Client Description: Brown Sheet Floor

Location: Outside Room 129
Facility:

Percent Asbestos:
15 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
85

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 1/6/2021
Date Analyzed: 01/10/2021
Signature: Natalia Morais Soares
Analyst: Natalia Morais Soares

Approved By:

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CERTIFICATE OF ANALYSIS

Client: ALL-TECH Environmental Services Limited
20 Duke St.,Suite 109
Bedford NS B4A 2Z5

Client: ALL131

Report Date: 1/10/2021
Report No.: 625904 - PLM
Project: Montague Consolidated
Project No.: PE282

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7121970
Client No.: MC-26
Analyst Observation: Tan Insulation
Client Description: 2x4 Ceiling Tile
Location: Room 129
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
30 Cellulose
60 Mineral Wool

Percent Non-Fibrous Material:
10

Sample received wet

Lab No.: 7121971
Client No.: MC-27
Analyst Observation: Tan Floor Tile
Client Description: 12"x12" Off-White Vinyl Floor Tile
Location: Room 101
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 7121971(L2)
Client No.: MC-27
Analyst Observation: Black Mastic
Client Description: 12"x12" Off-White Vinyl Floor Tile
Location: Room 101
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 7121972
Client No.: MC-28
Analyst Observation: Grey Insulation
Client Description: Parging on Straight Run
Location: Corridor O/S Room 103
Facility:

Percent Asbestos:
50 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
50

Lab No.: 7121973
Client No.: MC-29
Analyst Observation: Grey Insulation
Client Description: Pipe Elbow Parging
Location: Corridor O/S Room 202
Facility:

Percent Asbestos:
50 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
50

Lab No.: 7121974
Client No.: MC-30
Analyst Observation: Tan Ceiling Tile
Client Description: 2'x4' Ceiling Tile Fissure
Location: Upper Level Library
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
50 Cellulose
40 Mineral Wool

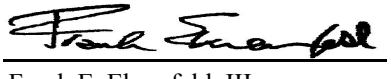
Percent Non-Fibrous Material:
10

Sample received wet

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 1/6/2021
Date Analyzed: 01/10/2021
Signature: Natalia Morais Soares
Analyst: Natalia Morais Soares

Approved By:



Frank E. Ehrenfeld, III
Laboratory Director

iATL INTERNATIONAL
ASBESTOS TESTING LABORATORIES

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Environmental Services Limited
20 Duke St.,Suite 109
Bedford NS B4A 2Z5

Client: ALL131

Report Date: 1/10/2021
Report No.: 625904 - PLM
Project: Montague Consolidated
Project No.: PE282

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7121975
Client No.: MC-31

Analyst Observation: Grey Insulation
Client Description: Parging on Roof Drain

Location: Upper Level Library
Facility:

Percent Asbestos:
10 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
60 Mineral Wool

Percent Non-Fibrous Material:
30

Lab No.: 7121976
Client No.: MC-32

Analyst Observation: Tan Floor Tile
Client Description: Beige Floor Tile

Location: 2nd Level
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 7121976(L2)
Client No.: MC-32

Analyst Observation: Black Mastic
Client Description: Beige Floor Tile

Location: 2nd Level
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 7121977
Client No.: MC-33

Analyst Observation: Yellow Insulation
Client Description: Duct Insulation

Location: Gym
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
98 Fibrous Glass

Percent Non-Fibrous Material:
2

Lab No.: 7121977(L2)
Client No.: MC-33

Analyst Observation: Black Mastic
Client Description: Duct Insulation

Location: Gym
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 7121978
Client No.: MC-34

Analyst Observation: Tan Floor Tile
Client Description: 12"x12" VAT - Olive

Location: Room 220
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 1/6/2021
Date Analyzed: 01/10/2021
Signature: Natalia Morais Soares
Analyst: Natalia Morais Soares

Approved By:

Frank E. Ehrenfeld, III
Laboratory Director

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CERTIFICATE OF ANALYSIS

Client: ALL-TECH Environmental Services Limited
20 Duke St.,Suite 109
Bedford NS B4A 2Z5

Client: ALL131

Report Date: 1/10/2021
Report No.: 625904 - PLM
Project: Montague Consolidated
Project No.: PE282

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 7121978(L2)
Client No.: MC-34
Analyst Observation: Black Mastic
Client Description: 12"x12" VAT - Olive
Location: Room 220
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 7121979
Client No.: MC-35
Analyst Observation: Beige Floor Tile
Client Description: 12"x12" Vinyl Floor Tile - Beige
Location: Room 230
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 1/6/2021
Date Analyzed: 01/10/2021
Signature: Natalia Morais Soares
Analyst: Natalia Morais Soares

Approved By:
Frank E. Ehrenfeld, III
Laboratory Director

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Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	1/10/2021
	20 Duke St.,Suite 109	Report No.:	625904 - PLM
	Bedford NS B4A 2Z5	Project:	Montague Consolidated
		Project No.:	PE282
Client:	ALL131		

Appendix to Analytical Report

Customer Contact:
Method: 40 CFR Appendix E to Subpart E of Part 763, interim method for the Determination of Asbestos in Bulk Insulation Samples, and USEPA 600, R93-116 as needed.

This appendix seeks to promote greater understanding of any observations, exceptions, special instructions, or circumstances that the laboratory needs to communicate to the client concerning the above samples. The information below is used to help promote your ability to make the most informed decisions for you and your customers. Please note the following points of contact for any questions you may have.

iATL Customer Service: customerservice@iatl.com
iATL Office Manager: wchampion@iatl.com
iATL Account Representative: Semih Kocahasan
Sample Login Notes: See Batch Sheet Attached
Sample Matrix: Bulk Building Materials
Exceptions Noted: See Following Pages

General Terms, Warrants, Limits, Qualifiers:

General information about iATL capabilities and client/laboratory relationships and responsibilities are spelled out in iATL policies that are listed at www.iATL.com and ir our Quality Assurance Manual per ISO 17025 standard requirements. The information therein is a representation of iATL definitions and policies for turnaround times, sample submittal, collection media, blank definitions, quantification issues and limit of detection, analytical methods and procedures, sub-contracting policies, results reporting options, fees, terms, and discounts, confidentiality, sample archival and disposal, and data interpretation.

iATL warrants the test results to be of a precision normal for the type and methodology employed for each sample submitted. iATL disclaims any other warrants, expressed or implied, including warranty of fitness for a particular purpose and warranty of merchantability. iATL accepts no legal responsibility for the purpose for which the client uses test results. Any analytical work performed must be governed by our Standard Terms and Conditions. Prices, methods and detection limits may be changed without notification. Please contact your Customer Service Representative for the most current information.

This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA LAP LLC, or any agency of local, state or province governments nor of any agency of the U.S. government.

This report shall not be reproduced except in full, without written approval of the laboratory.

Information Pertinent to this Report:

Analysis by US EPA 600 93-116: Determination of Asbestos in Bulk Building Materials by Polarized Light Microscopy (PLM).

Certifications:

- NIST-NVLAP No. 101165-0
- NYSDOH-ELAP No. 11021
- AIHA-LAP, LLC No. 100188

Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. PC Trace represents a <0.25% amount. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analytical Methodology Alternatives: Your initial request for analysis may not have accounted for recent advances in regulatory requirements or advances in technology that are routinely used in similar situations for other qualified projects. You may have the option to explore additional analysis for further information. Below are a few options, listed as the matrix followed by the appropriate methodology. Also included are links to more information on our website.

Bulk Building Materials that are Non-Friable Organically Bound (NOB) by Gravimetric Reduction techniques employing PLM and TEM: ELAP 198.6 (PLM-NOB), ELAP 198.4 (TEM-NOB)

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Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	1/10/2021
	20 Duke St.,Suite 109	Report No.:	625904 - PLM
	Bedford NS B4A 2Z5	Project:	Montague Consolidated
		Project No.:	PE282
Client:	ALL131		

Loose Fill Vermiculite Insulation, Attic Insulation, Zonolite (copyright), etc.: US EPA 600 R-4/004 (multi-tiered analytical process)
Sprayed On Insulation/Fireproofing with Vermiculite (SOF-V): ELAP 198.8 (PLM-SOF-V)

Soil, sludge, sediment, aggregate, and like materials analyzed for asbestos or other elongated mineral particles (ex. erionite, etc.): ASTM D7521, CARB 435, and other options available

Asbestos in Surface Dust according to one of ASTM's Methods (very dependent on sampling collection technique – by TEM): ASTM D 5755, D5756, or D6480

Various other asbestos matrices (air, water, etc.) and analytical methods are available.

Disclaimers / Qualifiers:

There may be some samples in this project that have a "NOTE:" associated with a sample result. We use added disclaimers or qualifiers to inform the client about something that requires further explanation. Here is a list with highlighted disclaimers that may be pertinent to this project. For a full explanation of these and other disclaimers, please inquire at **customerservice@iatl.com**.

1) Note: No mastic provided for analysis.
2) Note: Insufficient mastic provided for analysis.
3) Note: Insufficient material provided for analysis.
4) Note: Insufficient sample provided for QC reanalysis.
5) Note: Different material than indicated on Sample Log / Description.
6) Note: Sample not submitted.
7) Note: Attached to asbestos containing material.
8) Note: Received wet.
9) Note: Possible surface contamination.
10) Note: Not building material. 1% threshold may not apply.
11) Note: Recommend TEM-NOB analysis as per EPA recommendations.
12) Note: Asbestos detected but not quantifiable.
13) Note: Multiple identical samples submitted, only one analyzed.
14) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.080%.
15) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.125%.
16) Note: This sample contains >10% vermiculite mineral. See Appendix for Recommendations for Vermiculite Analysis.

Recommendations for Vermiculite Analysis:

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gange, homogeneous exfoliated books of mica, or mixed mineral composites).Please contact your client representative for pricing and turnaround time options available.

iATL recommends initial testing using the EPA 600/R-93/116 method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of vermiculite for possible asbestos.

Results from this testing may be inconclusive. EPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004).

For New York State customers, NYSDOH requires disclaimers and qualifiers for various vermiculite containing samples that direct analysis via ELAP198.6 and ELAP198.8 for samples that contain >10% vermiculite mineral where ELAP198.6 may be used to evaluate the asbestos content of the material. However, any test result using ELAP198.6 will be reported with the following disclaimer: “ELAP198.6 method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing >10% vermiculite.”

Further information on this method and other vermiculite and asbestos issues can be found at the following: Agency for Toxic Substances and Disease Registry (ATSDR) www.atsdr.cdc.gov, United States Geological Survey (USGS) www.minerals.usgs.gov/minerals/, US EPA www.epa.gov/asbestos. The USEPA also has an informative brochure "Current Best Practices for Vermiculite Attic Insulation" EPA 747F03001 May 2003, that may assist the health and remediation professional. NYS customers please follow current NYSDOH ELAP requirements per policy on subject of surfacing and vermiculite, May 6, 2016, Testing Requirements for Surfacing Material Containing Vermiculite (https://www.wadsworth.org/sites/default/files/WebDoc/I198_8_02_2.pdf)

The following is a summary of the analytical process outlines in the EPA 600/R-04/004 Method:

1)**Analytical Step/Method:** Initial Screening by PLM, EPA 600R-93/116
Requirements/Comments: Minimum of 0.1 g of sample. ~0.25% for most samples.

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CERTIFICATE OF ANALYSIS

Client: ALL-TECH Environmental Services Limited
20 Duke St.,Suite 109
Bedford NS B4A 2Z5

Client: ALL131

Report Date: 1/10/2021
Report No.: 625904 - PLM
Project: Montague Consolidated
Project No.: PE282

2)**Analytical Step/Method:** Wet Separation by PLM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.

3)**Analytical Step/Method:** Wet Separation by PLM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Floats" only.

4)**Analytical Step/Method:** Wet Separation by TEM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.

5)**Analytical Step/Method:** Wet Separation by TEM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Suspension" only.
*With advance notice and confirmation by the laboratory.
**Approximately 1 Liter of sample in double-bagged container (~9x6 inch bag of sample).

APPENDIX II

Laboratory Certificate of Analysis – Lead Paint Samples

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ASBESTOS TESTING LABORATORIES

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Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Environmental Services Limited
20 Duke St.,Suite 109
Bedford NS B4A 2Z5

Client: ALL131

Report Date: 1/13/2021
Report No.: 625901 - Lead Paint
Project: Montague Consolidated
Project No.: PE282

LEAD PAINT SAMPLE ANALYSIS SUMMARY

Lab No.: 7121916 **Description:** Green Paint **Result (% by Weight):** 0.69
Client No.: LM-01 **Location:** Boiler RM 120 **Result (ppm):** 6900
Comments: ***

Lab No.: 7121917 **Description:** Off-White Paint **Result (% by Weight):** 0.040
Client No.: LM-02 **Location:** RM 115 **Result (ppm):** 400
Comments:

Lab No.: 7121918 **Description:** Beige Wall Paint **Result (% by Weight):** <0.0082
Client No.: LM-03 **Location:** Gym **Result (ppm):** <82
Comments:

Lab No.: 7121919 **Description:** Yellow Door Trim Paint **Result (% by Weight):** 0.017
Client No.: LM-04 **Location:** RM 215 **Result (ppm):** 170
Comments: *

Lab No.: 7121920 **Description:** Beige Wall Paint **Result (% by Weight):** <Void
Client No.: LM-05 **Location:** RM 214 **Result (ppm):** <Void
Comments: **

Lab No.: 7121921 **Description:** Blue Paint On Beam **Result (% by Weight):** <0.020
Client No.: LM-06 **Location:** Second Level **Result (ppm):** <200
Comments: *

Lab No.: 7121922 **Description:** Yellow Paint On Stairs **Result (% by Weight):** <0.0088
Client No.: LM-07 **Location:** **Result (ppm):** <88
Comments:

Lab No.: 7121923 **Description:** White Paint On Railing **Result (% by Weight):** <0.0087
Client No.: LM-08 **Location:** **Result (ppm):** <87
Comments:

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 1/6/2021
Date Analyzed: 01/13/2021
Signature: Chad Shaffer
Analyst: Chad Shaffer

Approved By: Frank E. Ehrenfeld, III
Laboratory Director

Dated : 1/13/2021 4:11:33

iATL INTERNATIONAL
ASBESTOS TESTING LABORATORIES

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Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Environmental Services Limited
20 Duke St.,Suite 109
Bedford NS B4A 2Z5

Client: ALL131

Report Date: 1/13/2021
Report No.: 625901 - Lead Paint
Project: Montague Consolidated
Project No.: PE282

LEAD PAINT SAMPLE ANALYSIS SUMMARY

Lab No.: 7121924 **Description:** Light Green Paint On Trim **Result (% by Weight):** 0.0092
Client No.: LM-09 **Location:** **Result (ppm):** 92
Comments:

Lab No.: 7121925 **Description:** Beige Paint On Concrete **Result (% by Weight):** 0.31
Client No.: LM-010 **Location:** **Result (ppm):** 3100
Comments:

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 1/6/2021
Date Analyzed: 01/13/2021
Signature: Chad Shaffer
Analyst: Chad Shaffer

Approved By: Frank E. Ehrenfeld, III
Laboratory Director

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	1/13/2021
	20 Duke St.,Suite 109	Report No.:	625901 - Lead Paint
	Bedford NS B4A 2Z5	Project:	Montague Consolidated
		Project No.:	PE282
Client:	ALL131		

Appendix to Analytical Report:

Customer Contact:
Method: ASTM D3335-85a, US EPA SW846 3050B:7000B

This appendix seeks to promote greater understanding of any observations, exceptions, special instructions, or circumstances that the laboratory needs to communicate to the client concerning the above samples. The information below is used to help promote your ability to make the most informed decisions for you and your customers. Please note the following points of contact for any questions you may have.

iATL Customer Service: customerservice@iatl.com
iATL Office Manager:wchampion@iatl.com
iATL Account Representative: Semih Kocahasan
Sample Login Notes: See Batch Sheet Attached
Sample Matrix: Paint
Exceptions Noted: See Following Pages

General Terms, Warrants, Limits, Qualifiers:

General information about iATL capabilities and client/laboratory relationships and responsibilities are spelled out in iATL policies that are listed at www.iATL.com and ir our Quality Assurance Manual per ISO 17025 standard requirements. The information therein is a representation of iATL definitions and policies for turnaround times, sample submittal, collection media, blank definitions, quantification issues and limit of detection, analytical methods and procedures, sub-contracting policies, results reporting options, fees, terms, and discounts, confidentiality, sample archival and disposal, and data interpretation.

iATL warrants the test results to be of a precision normal for the type and methodology employed for each sample submitted. iATL disclaims any other warrants, expressed or implied, including warranty of fitness for a particular purpose and warranty of merchantability. iATL accepts no legal responsibility for the purpose for which the client uses test results. Any analytical work performed must be governed by our Standard Terms and Conditions. Prices, methods and detection limits may be changed without notification. Please contact your Customer Service Representative for the most current information.

This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA LAP LLC, or any agency of local, state or province governments nor of any agency of the U.S. government.

Information Pertinent to this Report:

Analysis by ASTM D3335-85a by AAS

Certification:
- National Lead Laboratory Program (NLLAP): AIHA-LAP, LLC No. 100188
- NYSDOH-ELAP No. 11021

This report meets the standards set forth in the EPA's National Lead Laboratory Accreditation Program (NLLAP) through the Laboratory Quality System Requirements (LQSR) Revision 3.0 November 5, 2007. All Environmental Lead Proficiency Analytical Testing (ELPAT) is through the AIHA-PAT established program.

Regulatory limit is 0.5% lead by weight (EPA/HUD guidelines). Recommend multiple sampling for all samples less than regulatory limit for confirmation.
All results are based on the samples as received at the lab. iATL assumes that appropriate sampling methods have been used and that the data upon which these results are based have been accurately supplied by the client.
Method Detection Limit (MDL) per EPA Method 40CFR Part 136 Apendix B.
Reporting Limit (RL) based upon Lowest Standard Determined (LSD) in accordance with AIHA-ELLAP policies.
LSD=0.2 ppm MDL=0.005% by weight. RL= 0.010% by weight (based upon 100 mg sampled).

Disclaimers / Qualifiers:

There may be some samples in this project that have a "NOTE:" associated with a sample result. We use added disclaimers or qualifiers to inform the client about something that requires further explanation. Here is a complete list with highlighted disclaimers pertinent to this project. For a full explanation of these and other disclaimers, please inquire at **customerservice@iatl.com.**

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Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	1/13/2021
	20 Duke St.,Suite 109	Report No.:	625901 - Lead Paint
	Bedford NS B4A 2Z5	Project:	Montague Consolidated
		Project No.:	PE282
Client:	ALL131		

* Insufficient sample provided to perform QC reanalysis (<200 mg)
** Not enough sample provided to analyze (<50 mg)
*** Matrix / substrate interference possible.

< less than sign, signifies none-detected below the empirical value based upon sub-sampled mass. This is often below the Reporting Limit (see above).

APPENDIX III

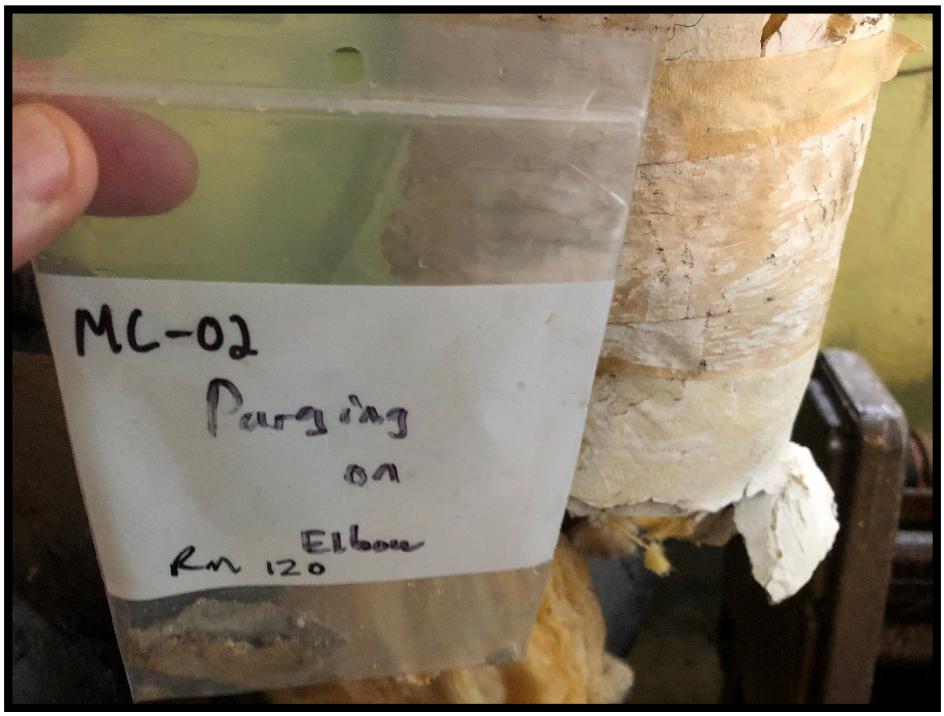
Site Photographs

Montague Consolidated School

Hazmat Assessment Photo Log

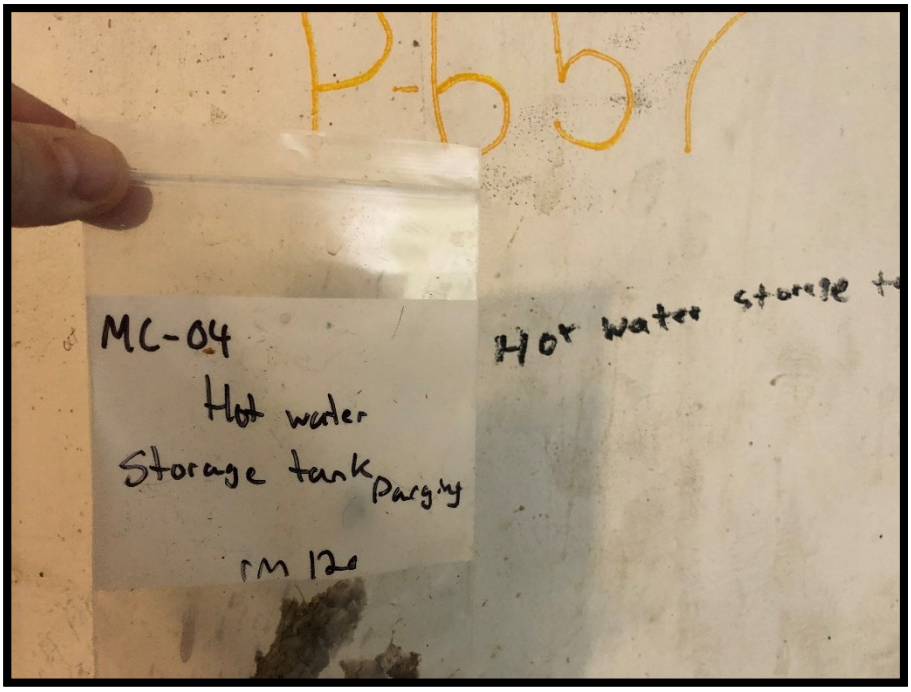
Site Building Exterior

P1	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-01	Furnace Room 120	Hard Board Ceiling	15% Chrysotile

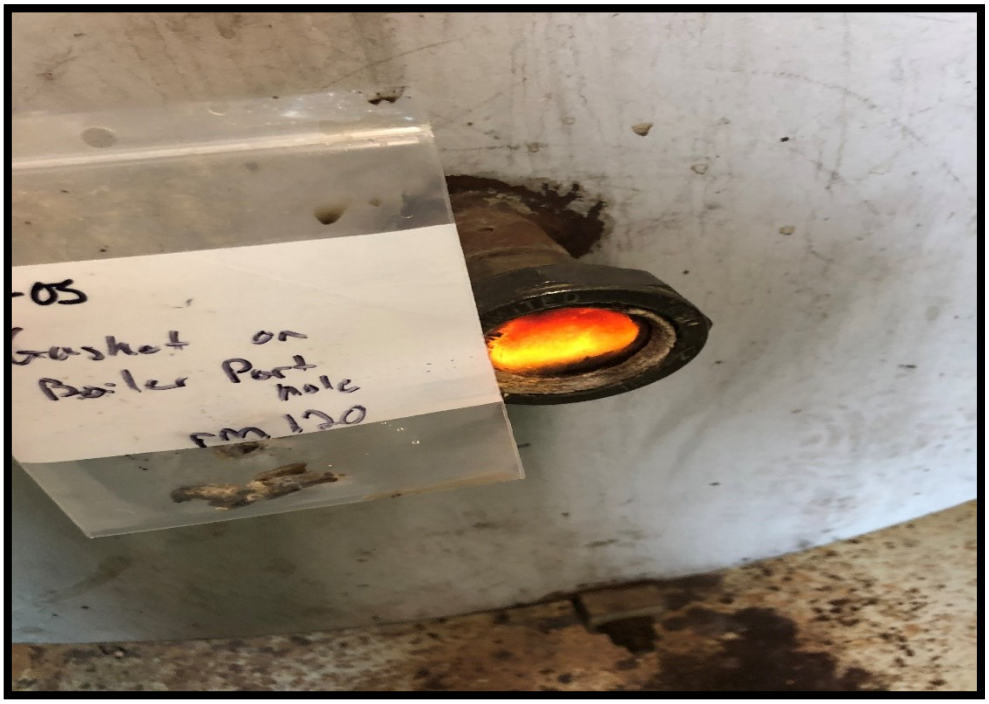


P2	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-02	Furnace Room 120	Parging on Elbow	30% Chrysotile

P3	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-03	Furnace Room 120	Cold Water Storage Tank	10% Chrysotile 2% Amosite



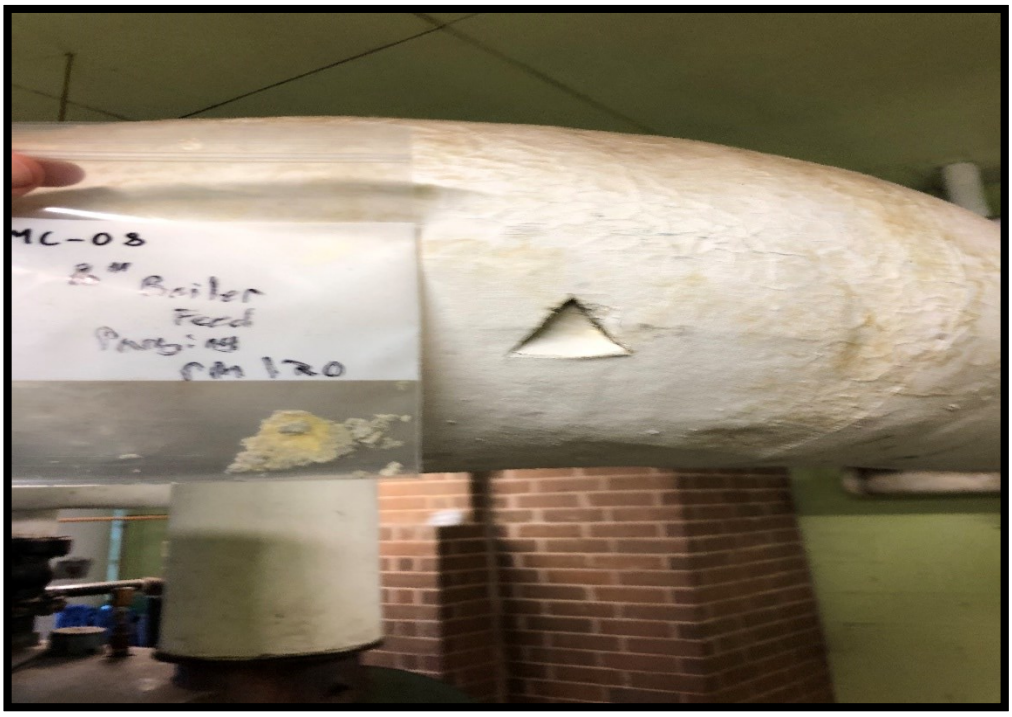
P4	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-04	Furnace Room 120	Hot Water Storage Tank	10% Chrysotile



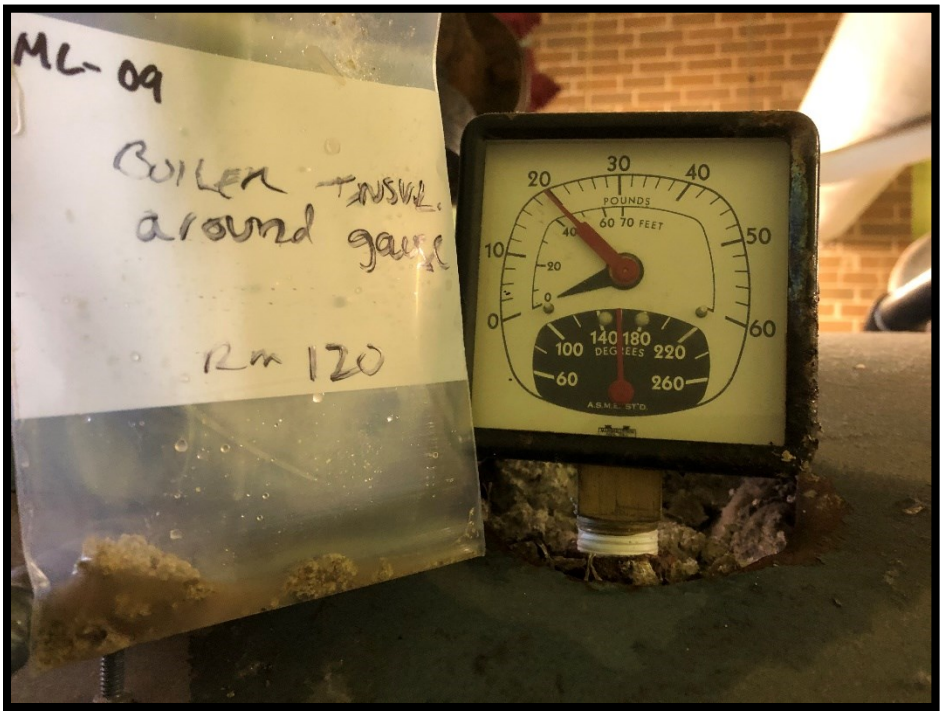
P5	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-05	Furnace Room 120	Gasket on Boiler Port Hole	40% Chrysotile

P6	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-06	Furnace Room 120	Boiler 1589 Insulation	None Detected

P7	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-07	Furnace Room 120	Parging on T-fitting	30% Chrysotile



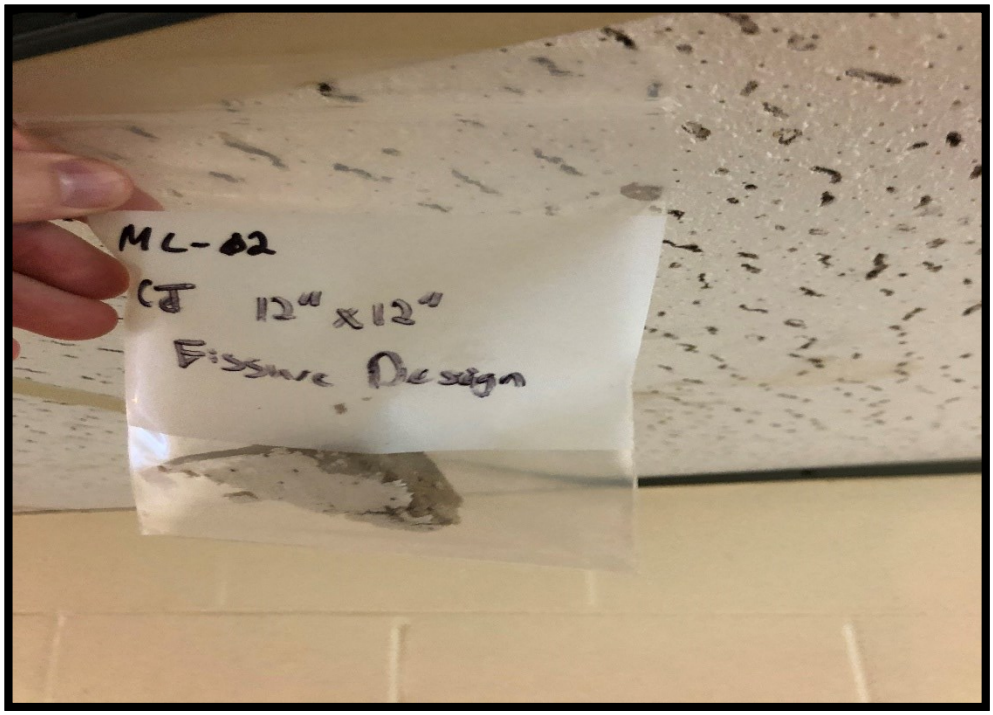
P8	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-08	Furnace Room 120	8” Boiler Feed Parging	30% Chrysotile



P9	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-09	Furnace Room 120	Boiler Insulation around gauge	15% Chrysotile

P10	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-10	Furnace Room 120	Boiler Breaching	30% Chrysotile

P11	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-11	Furnace Room 120	Insulation on Boiler port hole	30% Chrysotile

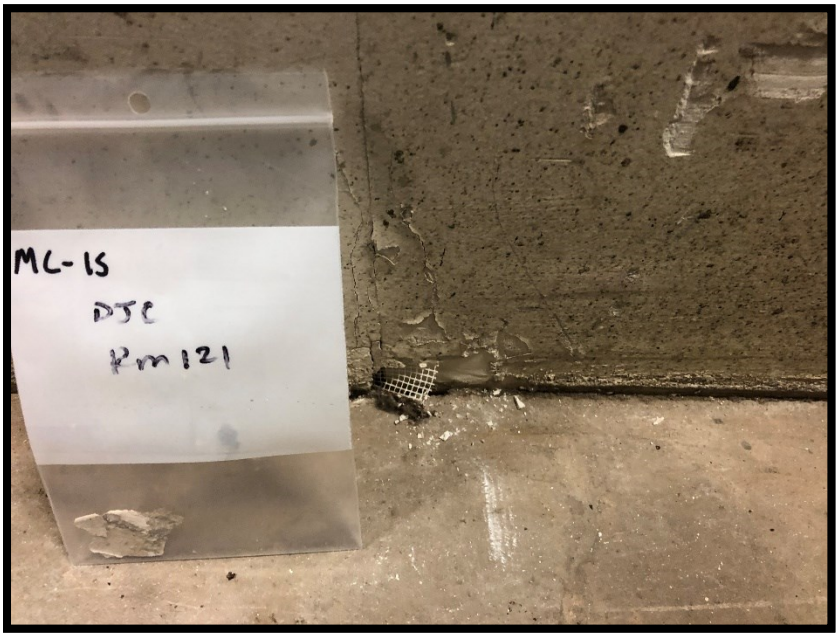


P12	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-12	Corridor outside Room 121	12” x 12” Ceiling Tile 9fissure design)	None Detected

N/A

P13	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-13	Corridor Outside Room 122	Tan Debris on Ceiling Tile	None Detected

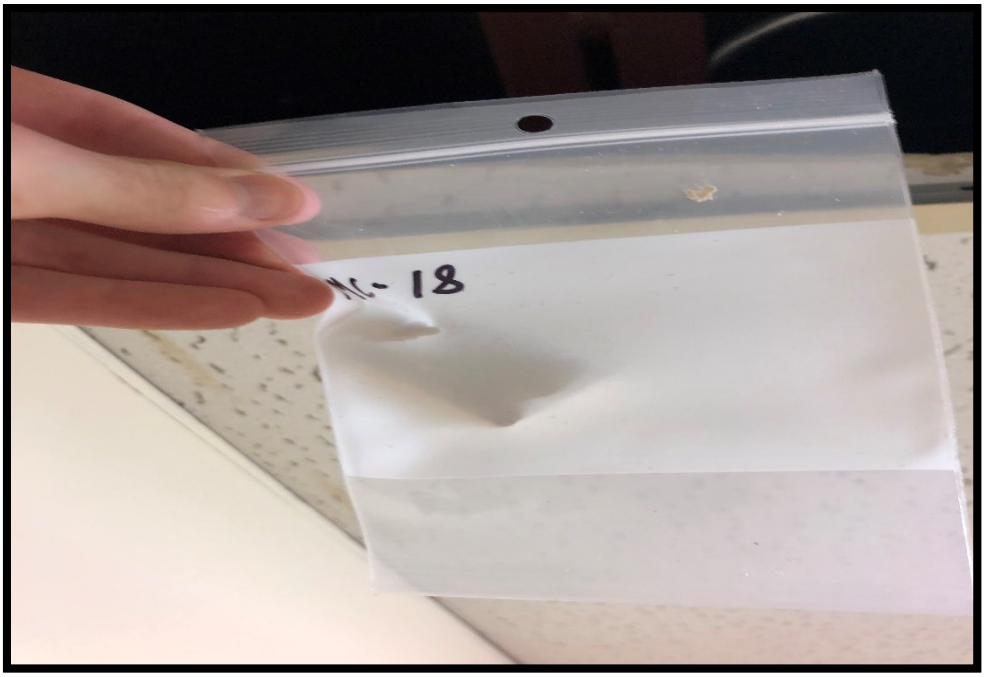
P14	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-14	Corridor Outside Room 122	Grey Debris on Ceiling Tile	None Detected



P15	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-15	Room 121	Drywall Joint Compound	None Detected

P16	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-16	Room 121	Pipe Parging on 8" Vertical pipe	20% Chrysotile

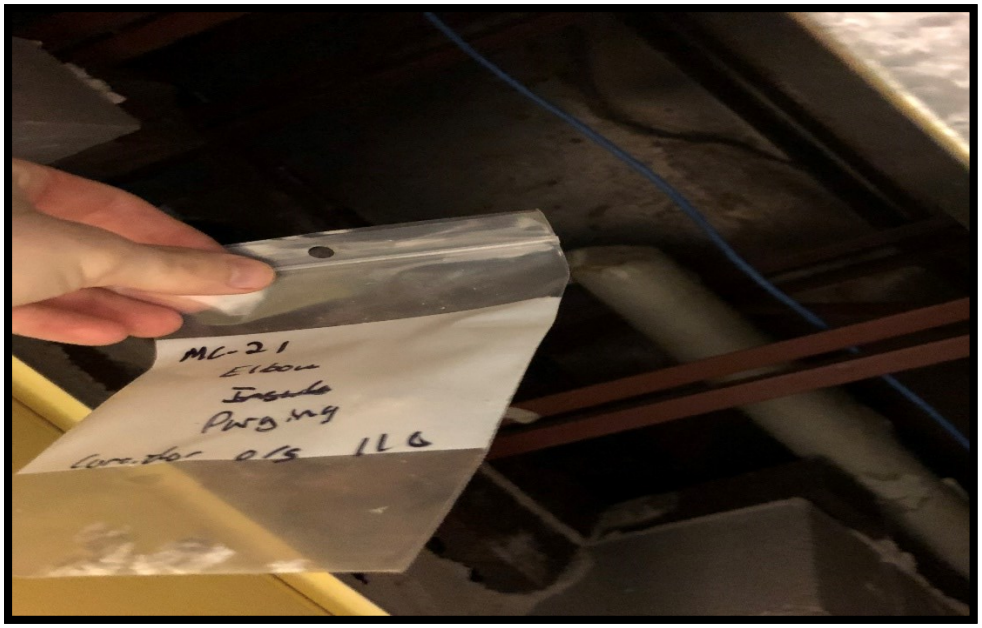
P17	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-17	Corridor Outside Room 125	a) 12" x 12" Off-White Floor Tile b) Yellow Mastic	a) None Detected b) None Detected



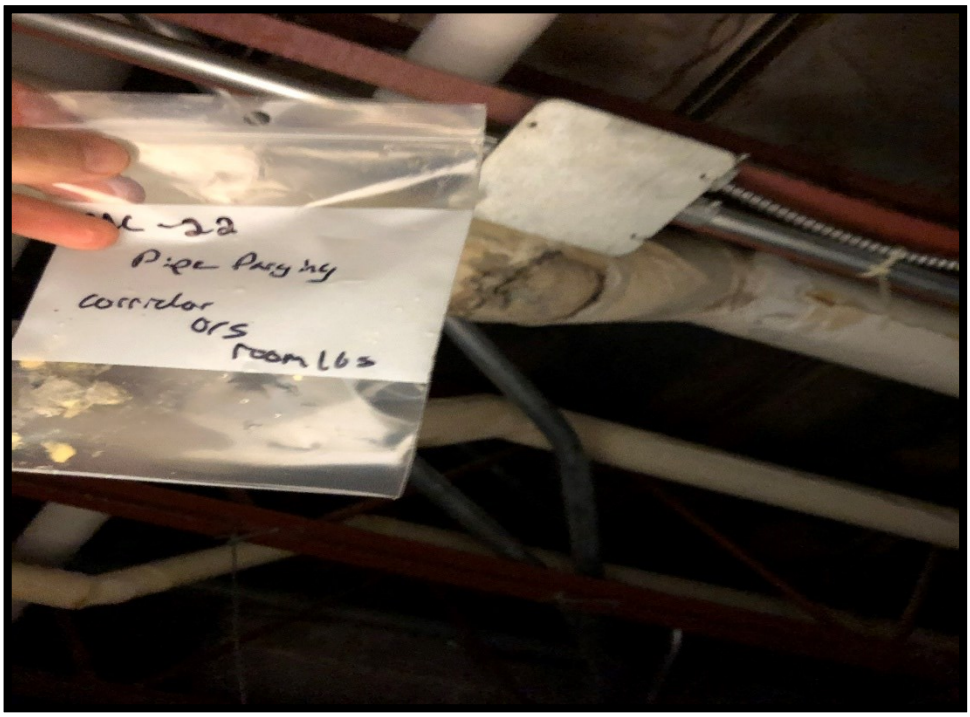
P18	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-18	Corridor Outside Room 115	Ceiling Tile Fissure Design	None Detected

P19	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-19	Room 112	a) 12” x 12” Beige Vinyl Floor Tile b) Black Mastic	a) None Detected b) None Detected

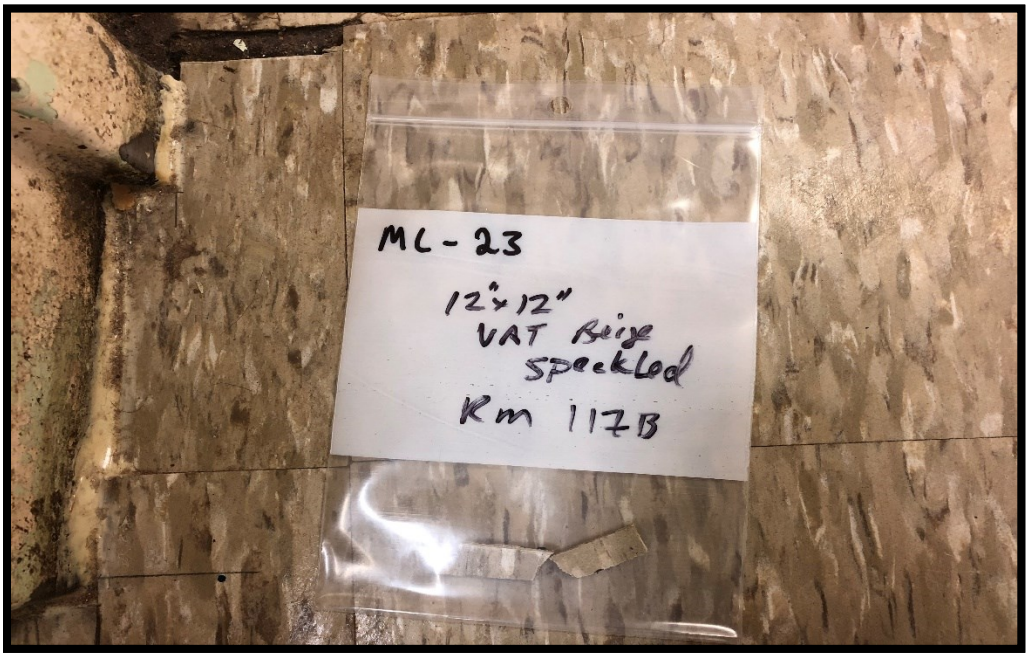
P20	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-20	Room 110B	a) 12” x 12” Gold Vinyl Floor Tile b) Black Mastic	a) None Detected b) None Detected



P21	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-21	Corridor Outside Room 110	Pipe Parging cement	25% Chrysotile



P22	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-22	Corridor Outside Room 105	Pipe Parging cement	30% Chrysotile



P23	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-23	Room 117B	a) Tan Vinyl Floor Tile b) Black Mastic	a) None Detected b) None Detected

P24	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-24	Room 131	Blue Floor Tile	None Detected

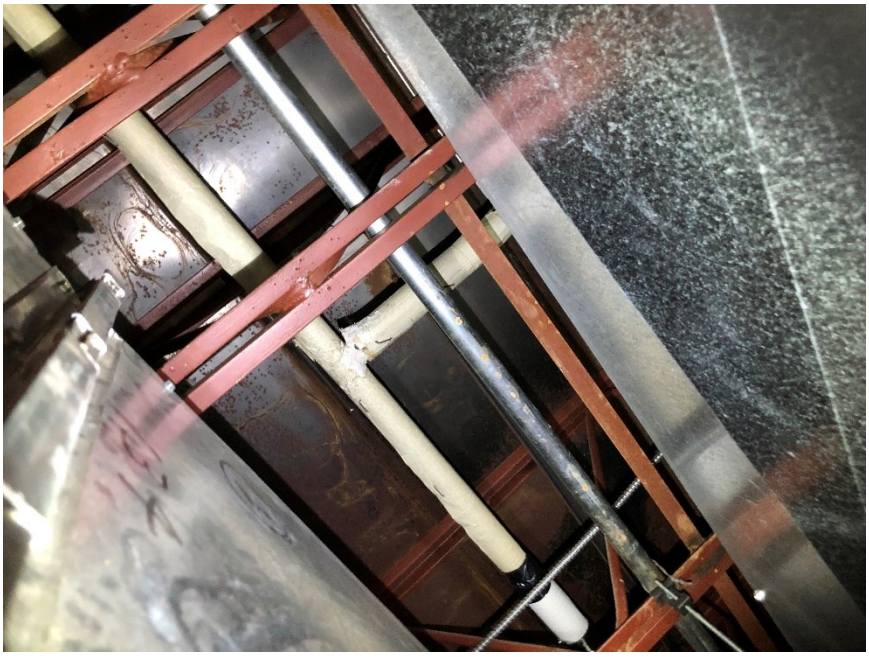
P25	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-25	Exit outside Room 129	Brown vinyl sheet flooring	15% Chrysotile

N/A

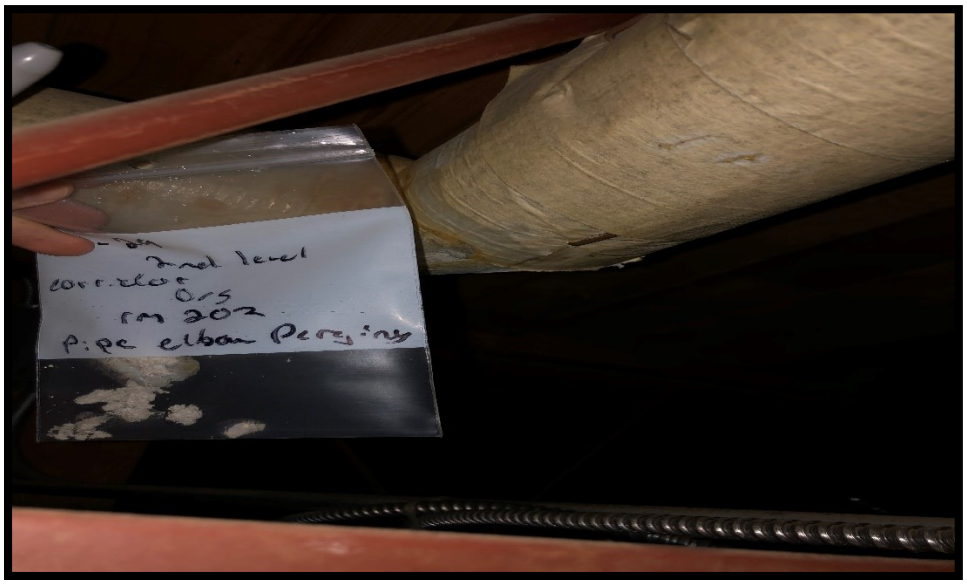
P26	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-26	Room 129	2' x 4' Ceiling Tile	None Detected

N/A

	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
P27	MC-27	Room 101	a) Tan Vinyl Floor Tile b) Black Mastic	a) None Detected b) None Detected



	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
P28	MC-28	Corridor Outside Room 103	Parging on Straight Run	50% Chrysotile

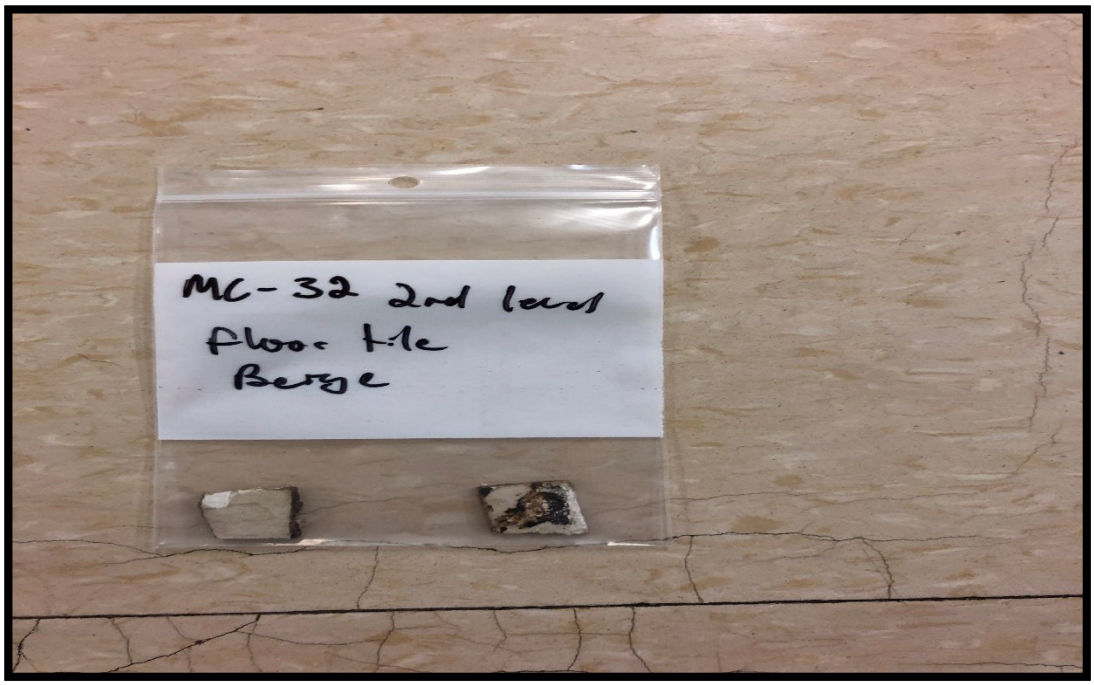


P29	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-29	Cubicles Room 204	Pipe Parging cement	50% Chrysotile

N/A

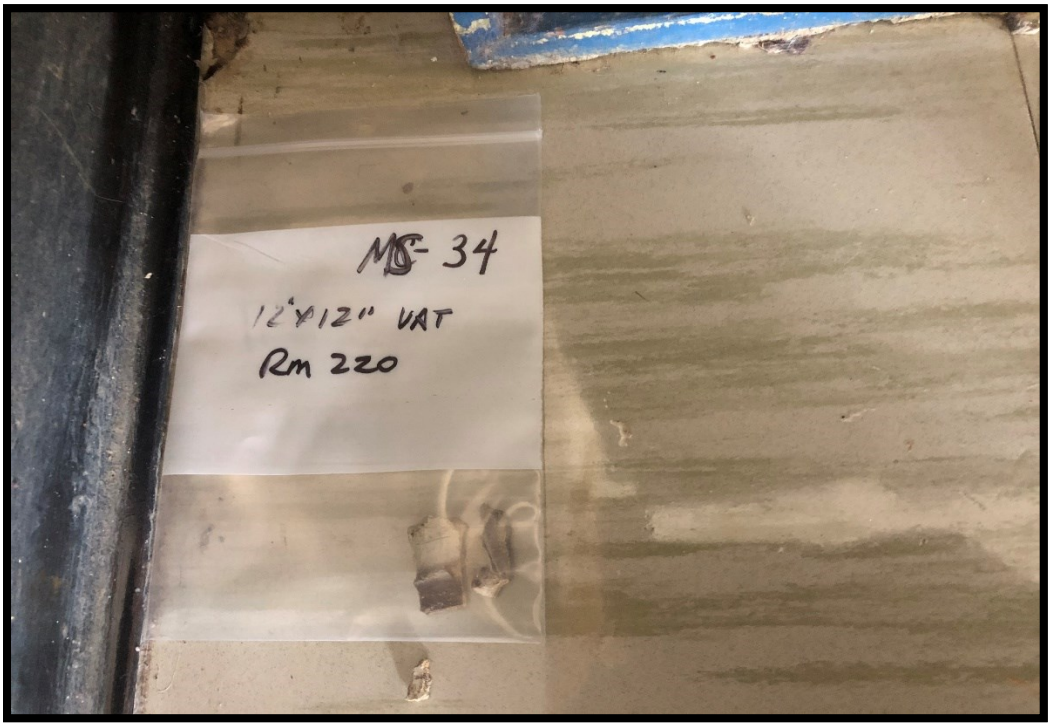
P30	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-30	Upper Level Library	2' x 4' Ceiling Tile Fissure Design	None Detected

P31	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-31	Upper-Level Library	Parging on Roof Drain	10% Chrysotile



P32	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-32	2nd Level	a) Beige Floor Tile b) Black Mastic	a) None Detected b) None Detected

P33	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-33	Gym	a) Duct Insulation b) Black Mastic	None Detected



P34	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-34	Room 220	a) Vinyl Floor Tile Olive b) Black Mastic	a) None Detected b) None Detected

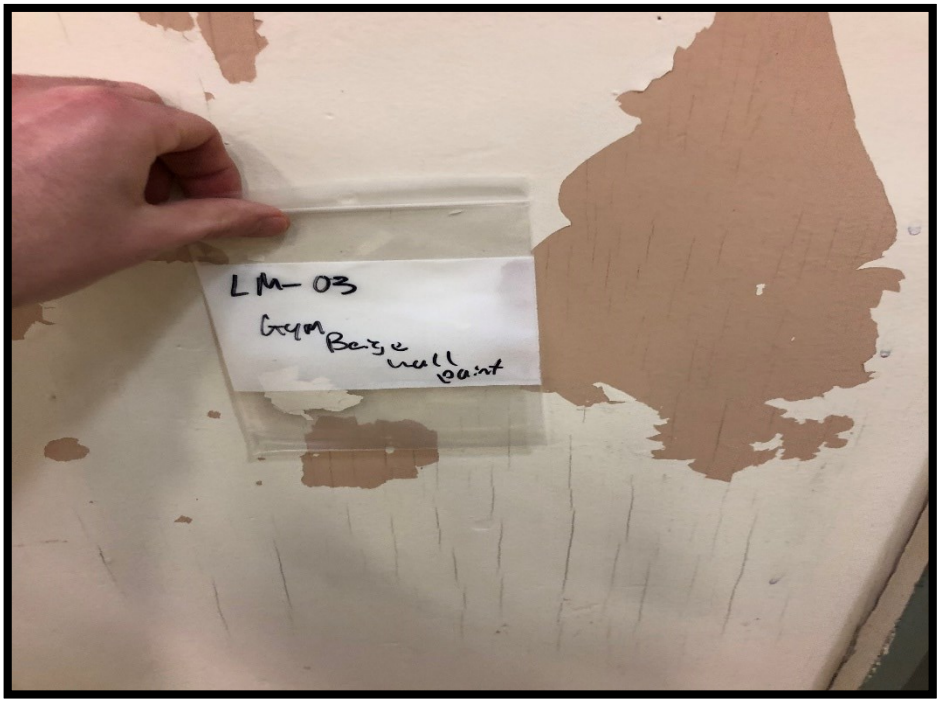
P35	SAMPLE I.D	LOCATION	DESCRIPTION	ASBESTOS CONTENT
	MC-35	Room 230	Beige Vinyl Floor Tile	None Detected

N/A

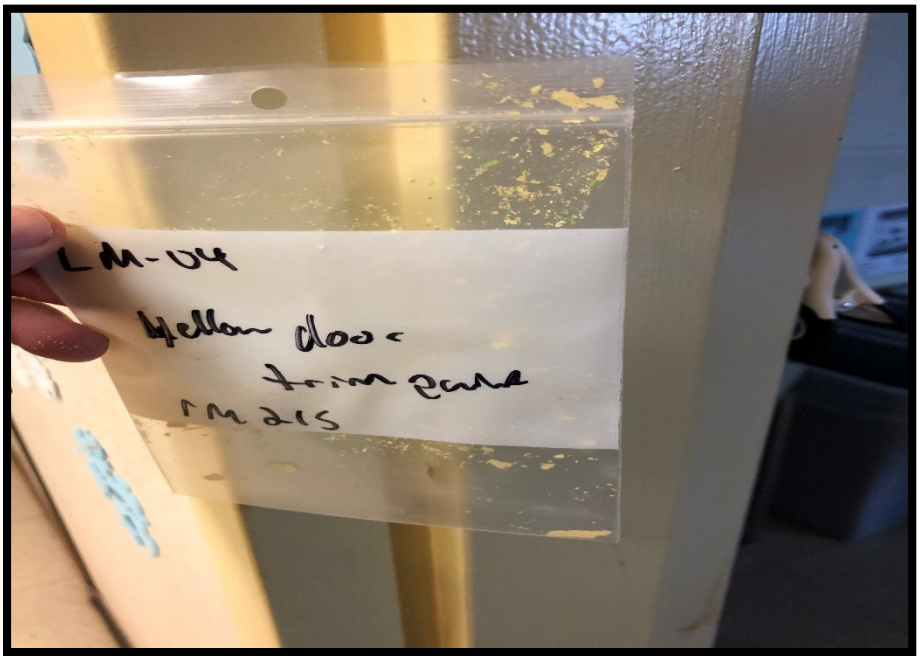
P36	SAMPLE I.D	LOCATION	DESCRIPTION	Total Lead results (% by weight))
	LM-01	Furnace Room 120	Green Paint on concrete wall	0.69

N/A

P37	SAMPLE I.D	LOCATION	DESCRIPTION	Total Lead results (% by weight)
	LM-02	Classroom 115	Off-White Wall Paint	0.040



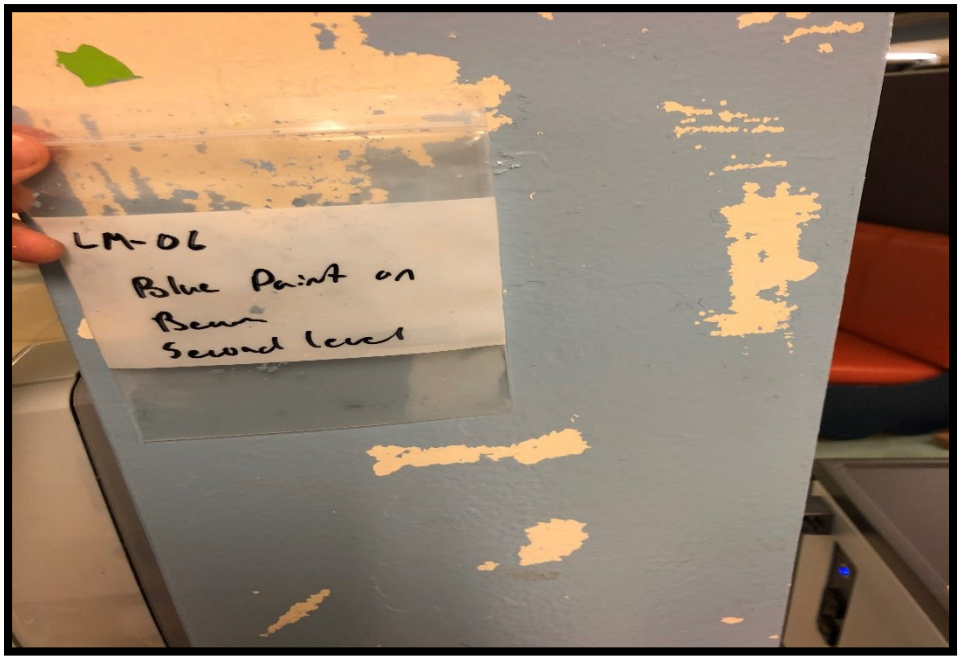
P38	SAMPLE I.D	LOCATION	DESCRIPTION	Total Lead results (% by weight)
	LM-03	Gymnasium	Beige Wall Paint	<0.0082



P39	SAMPLE I.D	LOCATION	DESCRIPTION	Total Lead results (% by weight)
	LM-04	Classroom 215	Yellow Door Trim Paint	0.017

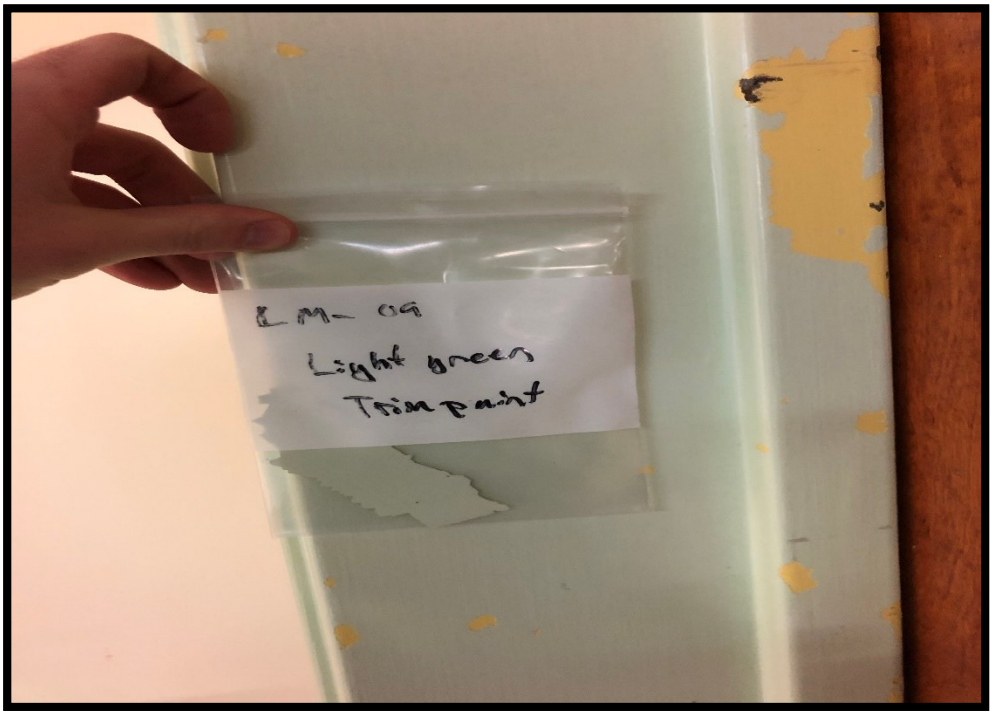
N/A

P40	SAMPLE I.D	LOCATION	DESCRIPTION	Total Lead results (% by weight))
	LM-05	Classroom 214	Beige Wall Paint	<Void



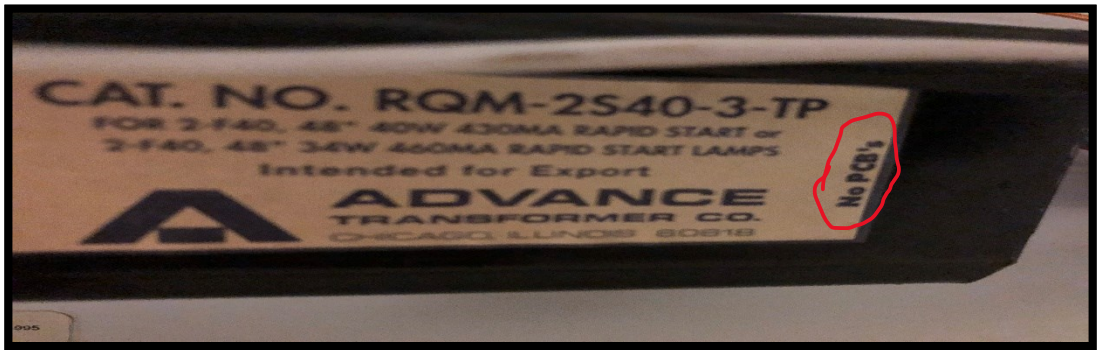
P41	SAMPLE I.D	LOCATION	DESCRIPTION	Total Lead results (% by weight)
	LM-06	Upper Level Library area	Blue Paint on Beam	<0.020

P42	SAMPLE I.D	LOCATION	DESCRIPTION	Total Lead results (% by weight)
	LM-07	Main Entry	Yellow Paint on Stairs	<0.0088

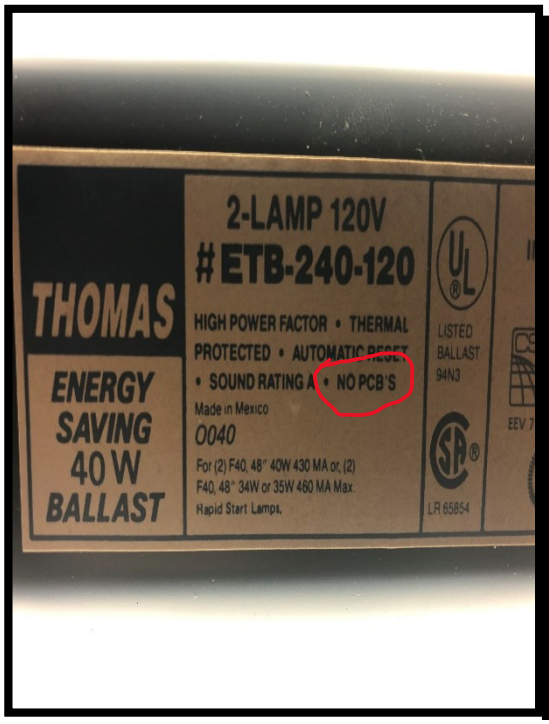


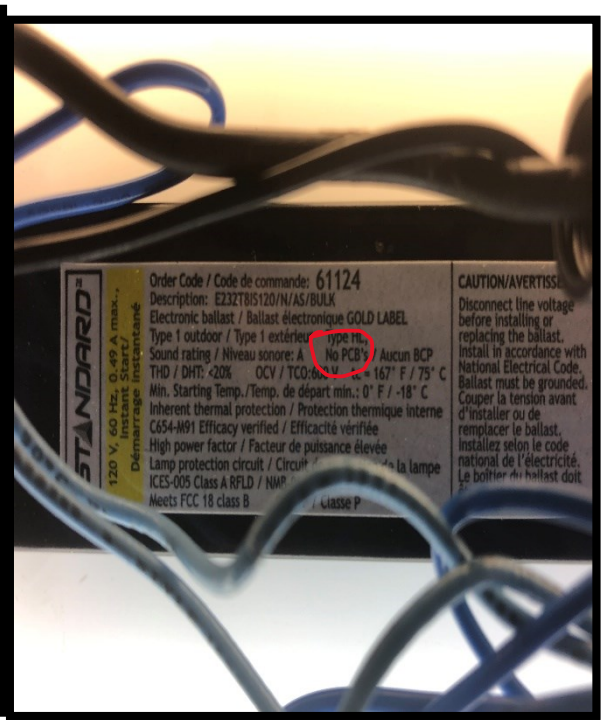
P43	SAMPLE I.D	LOCATION	DESCRIPTION	Total Lead results (% by weight)
	LM-09	Doorway	Light Green Paint on Trim	0.0092

P44	SAMPLE I.D	LOCATION	DESCRIPTION	Total Lead results (% by weight)
	LM-10	Second Level	Beige Paint on Concrete	0.31

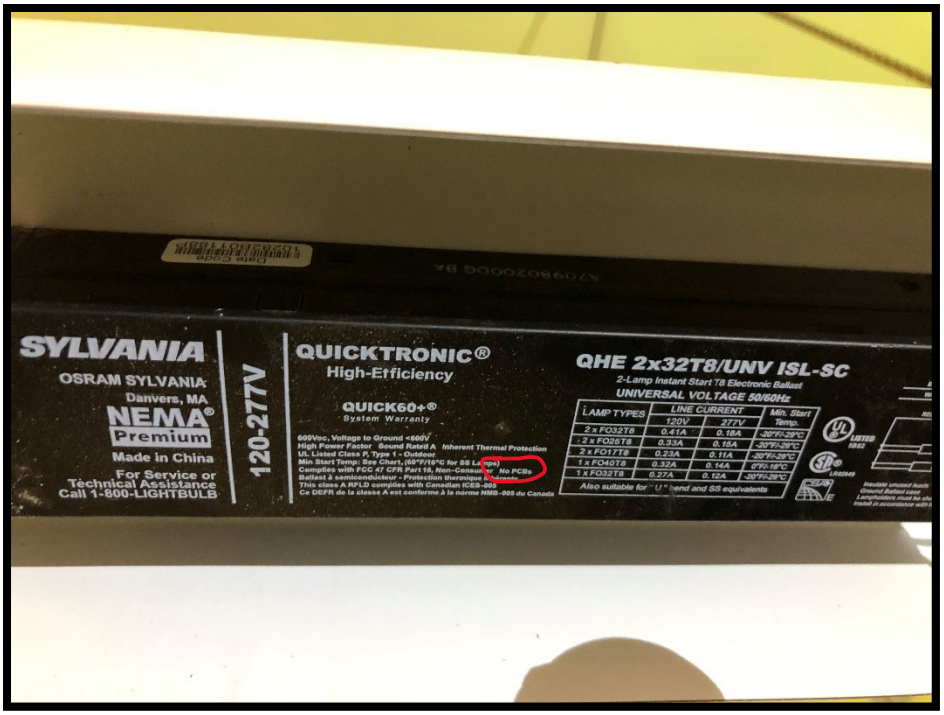


P45	LOCATION	DESCRIPTION
	Lower level Corridors	Ballast observed (non PCB containing)





P46	LOCATION	DESCRIPTION
	Upper Level Corridors	Ballast observed (non PCB containing)



P47	LOCATION	DESCRIPTION
	Lower Level Classroom	Ballast observed (non PCB containing)

P48	LOCATION	DESCRIPTION
	Various	Newer Identified fiber glass pipe insulation

P49	LOCATION	DESCRIPTION
	Lower Level	Fibreglass straight run pipe insulation with ACM fittings

P50	LOCATION	DESCRIPTION
	Furnace Room	ACM ceiling and breeching

P51	LOCATION	DESCRIPTION
	Upper Level	ACM parging cement in poor condition

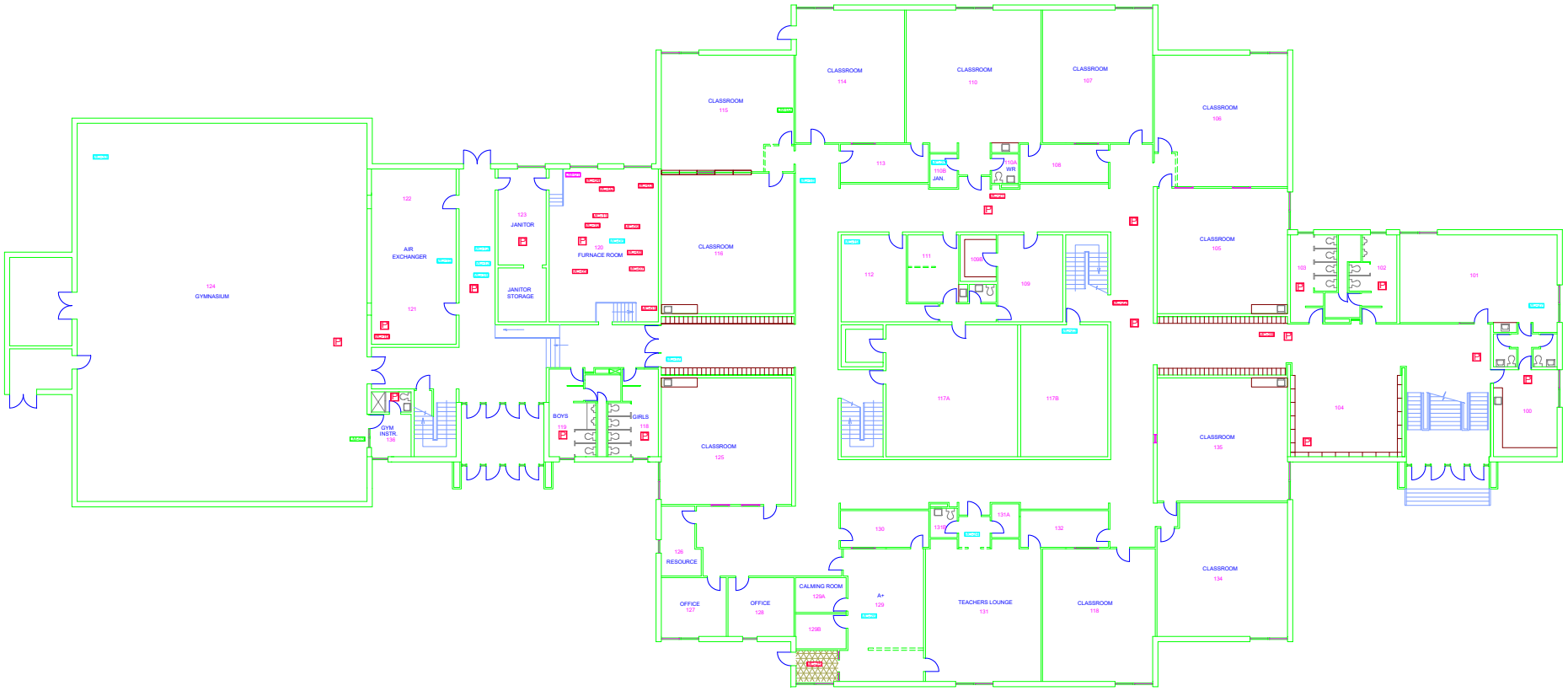
P52	LOCATION	DESCRIPTION
	Gymnasium	Exposed ACM fittings on roof drain in poor condition

P53	LOCATION	DESCRIPTION
	Gymnasium	Exposed ACM fittings in poor condition

P54	LOCATION	DESCRIPTION
	Upper Level Corridor outside washrooms	Fibreglass straight run pipe insulation with ACM parging

APPENDIX IV

Site Drawings with sample locations and markings



NOTE 1:
This drawing has been produced from a sketch and is not to scale. The room sizes and their locations are only approximations of the as-built dimensions.

NOTE 2:

ALL-TECH
ENVIRONMENTAL SERVICES LIMITED
885 Bayside Dr
Saint John, N.B.
E2R 1A3
TEL : (506) 658-1058
FAX : (506) 652-7998

ASBESTOS LEGEND

- = CEILING
- = FLOOR
- = CEILING AND FLOOR
- = UNSURVEYED AREA
- [A] = APPLIANCE
- [M] = MECHANICAL
- [P] = PIPE MATERIAL
- [D] = DUCT WORK
- [E] = ELECTRICAL
- [W] = WALL

MC-00 = SAMPLE NUMBER ASBESTOS DETECTED
MC-00 = SAMPLE NUMBER ASBESTOS NON-DETECT
LM-00 = SAMPLE NUMBER LEAD DETECTED
LM-00 = SAMPLE NUMBER LEAD NON-DETECT

PROJECT:
HAZARDOUS MATERIALS ASSESSMENT
MONTAGUE CONSOLIDATED

SITE:
MONTAGUE CONSOLIDATED
622 PRINCESS DR
MONTAGUE, PE

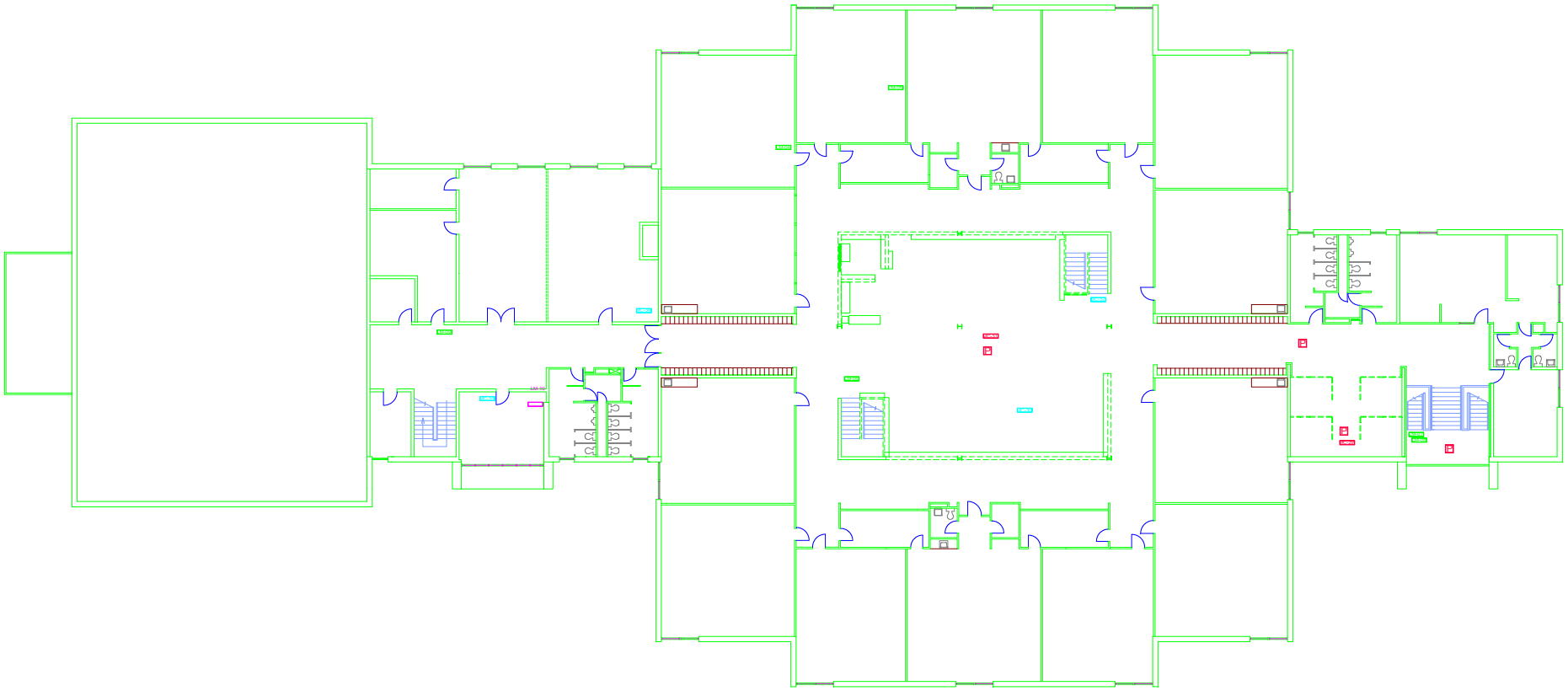
DRAWN BY: T. DeROCHE	DATE: 21-01-21	
CHECKED BY:	DATE:	
APPROVED BY:	DATE:	
SCALE: NOT TO SCALE		

A DETAIL NO.
B LOCATION DRAWING NO.
C DRAWING NO. WHERE DETAILED

JOB TITLE:
PE282
MONTAGUE CONSOLIDATED
99 BURPEE AVE

DRAWING TITLE:
LOWER FLOOR

DRAWING NO.	SHEET NO.	REV.
	1 of 2	0



ALL-TECH
ENVIRONMENTAL SERVICES LIMITED

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TEL : (506) 658-1058
FAX : (506) 652-7998

ASBESTOS LEGEND

- = CEILING
- = FLOOR
- = CEILING AND FLOOR
- = UNSURVEYED AREA
- A = APPLIANCE
- M = MECHANICAL
- P = PIPE MATERIAL
- D = DUCT WORK
- E = ELECTRICAL
- W = WALL

MC-00 = SAMPLE NUMBER ASBESTOS DETECTED

MC-00 = SAMPLE NUMBER ASBESTOS NON-DETECT

LM-00 = SAMPLE NUMBER LEAD DETECTED

LM-00 = SAMPLE NUMBER LEAD NON-DETECT

PROJECT:
HAZARDOUS MATERIALS ASSESSMENT
MONTAGUE CONSOLIDATED

SITE:
MONTAGUE CONSOLIDATED
622 PRINCESS DR
MONTAGUE, PE

DRAWN BY:	T. DeROCHE	DATE:	21-01-21
CHECKED BY:		DATE:	
APPROVED BY:		DATE:	
SCALE:	NOT TO SCALE		

A DETAIL NO.
B LOCATION DRAWING NO.
C DRAWING NO. WHERE DETAILED

JOB TITLE:
PE282
MONTAGUE CONSOLIDATED
99 BURPEE AVE

DRAWING TITLE:
UPPER FLOOR

DRAWING NO.	SHEET NO.	REV.
	2 of 2	0

NOTE 1:
This drawing has been produced from a sketch and is not to scale. The room sizes and their locations are only approximations of the as-built dimensions.

NOTE 2:

APPENDIX V

Estimated ACM Quantities in Accessible Areas

Estimated Quantities of Asbestos-Containing Materials
Montague Consolidated School - December 2020

Location	Item	Descriptor (size, color, more details)	Quantity (units)			
			Good	Fair	Poor	Total
Lower Floor - Main Entry	parging cement on fittings	above ceiling tile / exposed		6		6
Lower Floor - Room 100	parging cement on fittings	above ceiling tile / exposed		24		24
Lower Floor - Boys WR 102	parging cement on fittings	above ceiling tile / exposed		2		2
Lower Floor - Girls WR 103	parging cement on fittings	above ceiling tile / exposed		3		3
Lower Floor - Boot storage 104	parging cement on fittings	above ceiling tile / exposed		4		4
Lower Floor - Corridor o/s 103	parging cement on fittings	above ceiling tile / exposed		12		12
Lower Floor - Corridor o/s 105	parging cement on fittings	above ceiling tile / exposed		10		10
Lower Floor - Corridor o/s 106	parging cement on fittings	above ceiling tile / exposed		3		3
Lower Floor - Corridor o/s 110A	parging cement on fittings	above ceiling tile / exposed		8		8
Lower Floor - Girls WR 118	parging cement on fittings	above ceiling tile / exposed		3		3
Lower Floor - Boys WR 119	parging cement on fittings	above ceiling tile / exposed		4		4
Lower Floor - Furnace Rm 120	parging cement on fittings	above ceiling tile / exposed		35		
	parging on boiler	around port holes / gauges				
	gasket on boiler	port hole		2		2
Lower Floor - Rm 121	parging cement on fittings	above ceiling tile / exposed			2	2
Lower Floor - Corridor o/s 121	parging cement on fittings	above ceiling tile / exposed			4	4
Lower Floor - Rm 123	parging cement on fittings	above ceiling tile / exposed		6		6
Lower Floor - Rm 136 WR	parging cement on fittings	above ceiling tile / exposed		8		8
Gymnasium 124	parging cement on fittings	fittings and roof drain			6	6
Upper Level - Library	parging cement	roof drains		3		3
Upper Level - Main entry stairwell	parging cement on fittings	above ceiling tile / exposed		6		6
Upper Level - Cubicle by stairwell	parging cement on fittings	above ceiling tile / exposed		3		3
Upper Level - Corridor o/s Girls WR	parging cement on fittings	above ceiling tile / exposed		5		5
		Totals:	0	147	12	124

Estimated Quantities of Asbestos-Containing Materials
Montague Consolidated School - December 2020

Location	Item	Descriptor (size, color, more details)	Quantity (linear feet)			
			Good	Fair	Poor	Total
Lower Floor - Furnace Rm 120	Boiler breeching straight run	20" diameter	24			24
	Hot water tank	48" diameter	6		2.5	8.5
	Cold water tank	36" diameter	5		2.5	7.5
						0
						0
						0
						0
						0
		Totals:	35	0	5	40

Estimated Quantities of Asbestos-Containing Materials
Montague Consolidated School - December 2020

Location	Item	Descriptor (size, color, more details)	Quantity (square feet)			
			Good	Fair	Poor	Total
Lower Floor - Furnace Rm 120	Hard board ceiling	painted	900			900
						0
						0
						0
						0
						0
						0
						0
		Totals:	900	0	0	900

APPENDIX 'B'
COVID-19 Contractor Affidavit

Public Works and Planning Division
Transportation and Infrastructure

PO Box 2000
Charlottetown
Prince Edward Island
Canada C1A 7N8

Tel 902 368 5160
Fax 902 569 0590
princeedwardisland.ca

Appendix A

COVID-19 CONTRACTOR AFFIDAVIT

DTI Project: _____

The undersigned ("Contractor") hereby acknowledges the Province's concerns regarding safety at the worksite due to the COVID-19 pandemic. The Contractor agrees that it shall conduct its operations in strict compliance with all applicable regulations, guidelines, and requirements imposed by the Chief Public Health Office (CPHO), Worker's Compensation Board (WCB), and that it will comply with the Construction Association of PEI (CAPEI) "Pandemic Planning For The Construction Industry – A Guide" for all construction sites and workers at all Public Works locations.

The Contractor understands that it is the Contractor's responsibility to develop, maintain, and follow a written Covid-19 Operational Plan specifying how it will meet its obligations. The Contractor is to provide a copy of their Covid-19 Operational Plan upon request by the DTI representative.

The Contractor, if acting as the General, also certifies that each Subcontractor, Sub-subcontractor, and other parties that will perform work on their behalf, will also comply and will satisfy these requirements.

The Contractor acknowledges and agrees that non-compliance with any of the requirements above, including failure to abide by its own COVID-19 Operational Plan, may result in suspension or termination of any or all work in progress.

_____
Contractor/ Company Name (Please Print)

_____
Contractor/Company Email (Please Print)

_____
Contractor/Company Phone

Certification:

By signing below, on behalf of the Contractor/Company, I certify we have COVID-19 Operational Plan, all staff have read and acknowledged the plan and we agree to the foregoing.

_____
Contractor/Company Representative (Please Print)

_____
Contractor/Company Representative (Please Sign)

_____
Signature Date

Please email completed form to adminpwp@gov.pe.ca prior to construction activity.

APPENDIX 'C'

Government of Prince Edward Island
Structured Cabling Standards

Government of Prince Edward Island
Structured Cabling Feb 26, 2016

Emerging technologies dictate that it is no longer allowable to simply integrate various manufacturers' components into a building's structured cabling. In order to guarantee network performance, a single manufacturer's "system" of matched components is required. Our standard is Belden IBDN System 4800, Data Twist Category 6.

It is also paramount that all new or renovated construction utilizes the latest available technology, eliminating the need and costly process of network infrastructure replacement, in the future.

The following standards apply to all network cabling installations:

1. All installers shall be familiar with and follow these industry standard documents:

   ANSI/TIA/EIA-569-A (CSA T530)
   ANSI/TIA/EIA-607 (CSA T527)
   ANSI/TIA/EIA-568-B.1, B.2, B.2-1 & B.3
   ANSI/TIA/EIA-606A
   ANSI/TIA/EIA-862
   TSB-155, IEEE 802.3an

2. The entire system shall meet or exceed the current day **Category 6** standard specifications, which includes four-pair, 23 gauge, copper cabling performance of 300 MHz. Only matched components from one manufacture`s system shall be used to provide an end -to-end solution. Provide complete system consisting of outlet boxes, cover plates, patch panels, patch cords, and cable, etc. The contractor shall verify that all system parts received meet specification, prior to installation.

3. 4-port angled face plates shall be for MDVO style jacks, with 3 ports used in each instance (2 data, 1 telephone). The upper ports are to be used for data terminations and the lower for voice, unless otherwise stated. The MDVO jacks in angled face plates are to be installed as designed by the manufacturer, which in this case has the printing inverted. This allows the release tab on the data cable to be facing upwards, making it easier to remove from the jack.

4. Each horizontal cable, data outlet, and patch panel port shall bear the same identifying number. The numbering scheme for the building data outlets shall be assigned in a logical, sequential manner. Numbering on the plates shall be *viewable from both in front and above*. A contractor must assign these jack numbers on the floor plans, prior to pulling in any cable.

5. Patch panels shall be Belden Category 6 Flex, for GigaFlex MDVO style jacks, for mounting in 19 inch floor mounted rack. Panels to be a matched components of the cabling system being installed; 24-port one rack unit high; 48-port two rack units high. Allow for 25% spares.

6. Patch cords shall be Category 6 Belden GigaFlex. Two patch cords required for each data line. Cable jacket and boots to match system color code:
   "Green" jacket and boots for Belden/CDT GigaFlex System
   "Blue or Grey" jacket and boots for Standard Cat5 UTP cable

7. Contractor to supply patch cords at both the main data rack and in the individual rooms. Number of patch cords required shall be determined by the number of data outlets shown on the Drawings. Patch cord length required in these amounts:
   - 4 feet, 70% of total count.
   - 7 feet, 20% of total count
   -10 feet, 10% of total count.

8. The installer shall be responsible for providing to IT Shared Services:
   - a map of the data outlet numbering and cable pathways on a copy of the building floor plan(s)
   - test results Perment Link with a Level IV meter, using the standard specifications for Category 6.

9. All cable terminations shall be installed and tested to the T-568A wiring standard.

10. The contractor shall guarantee that all aspects of their installation shall be free from defects, and shall warranty workmanship and materials for a period of one (1) year from the date of inspection and acceptance by the representative of Provincial Treasury, IT Shared Services. The contractor shall assume all costs associated with repair or replacement; any form of cable trauma will be considered a defect and shall require replacement.

11. Category 6 data cabling shall meet or exceed specifications for Category 6, be 4 pair, 23 AWG, with FT4 rated insulation. Accepted systems are color-coded to uniquely identify the individual system horizontal cabling. For cabling:
   Green Belden/CDT (Nordx) System (4812LX)
   Blue Standard Cat5 UTP cable
   White All telephone copper cable
   Cabling for telephone shall be of Category 6 type (Belden 2412)

12. If an installed base of a manufacturer's Category 5E or 6 system is already installed, consult with the IT Shared Services representative for the specification of product to be installed. If there are any deficiencies, anomalies, link length issues, design flaws, fit up problems regarding to the structured cabling system, the Contractor shall contact the IT Shared Services representative for clarification and/or resolution, before proceeding.

13. All Cat6 T-568A MDVO's shall bear the following colors for ease of identification, in the event of their usage:

Green	Belden/CDT (Nordx) Cat6 GigaFlex Data jacks
Blue	Regular Cat5 data jacks
White	Voice cable termination jacks GigaFlex
Black	Fax cable termination jacks GigaFlex

14. Patch panels shall only be mounted in IT Shared Services approved equipment racking device(s). This shall be in accordance with the attached Rack or Cabinet Package Documents. No substitutions.

15. Attachment of panels and devices to specified racks and cabinets shall use only 10-32 Robertson rack mounting screws; accepted - Middle Atlantic part # HS.

16. The Installer shall leave a minimum of 12" of excess UTP cable on the data outlet termination to facilitate future re-termination. The excess cable is to be stored in a sweeping "S" pattern; coils are <u>not</u> permitted.

17. The Installer shall leave a minimum of 3 meters of excess UTP cable on the patch panel end to facilitate future repositioning of panels on the rack unit. The excess cable is to be stored in a sweeping "S" pattern; coils are <u>not</u> permitted.

18. Where applicable, the rear outside of vertical cable management troughs shall be used to control cables attaching to the racking unit. This shall be in accordance with a document supplied to the installer, detailing the type and configuration of such device.

19. Where physical security is of concern, all network cables shall be enclosed in continuous conduit from the workstation outlet to the secure telecommunications room. The conduit shall be of sufficient size to meet the maximum forty (40) percent fill ratio and turn radius specifications.

20. Horizontal cabling shall be installed to the manufacturer's specifications, including but not limited to, the minimum bend radius. The contractor shall be responsible for proper bundling (with velcro wraps) and handing of all cables (with cable trays, Caddy Fasteners and/or "J" hooks) between the telecommunication closets and the workstation MDVOs, in common pathways (above corridors); the "home run" method is not permitted. Cable bundles should be supported at 2 foot intervals.

21. Each workstation outlet plate shall be configured with a minimum of 2 data drops plus telephone service if required. Data drops shall only be used to deliver data services and shall not be used for any other service to the workstation.

22. **Installer shall be trained by the manufacturer of the cabling system being installed, following methods demonstrated in that training, and shall pocess a valid Certificate of Completion from the manufacturer, for the courses taken. Training must have been taken within the previous three (3) years, to be considered "valid". Certificates must be made available to the IT Shared Services representative for review, upon request.**

23. Before deviating from these methods, contact the Department of Provincial Treasury IT Shared Services representative.

24.

Belden IBDN System 4800 components include:

NP296	Data Twist 4812, 4-pair, 23 AWG, CMR, Cat 6, Green,
AX101070	CAT6+ Modular Jacks, for Data
AX101065	CAT6+ Modular Jacks, for Voice
AX101066	CAT6+ Modular Jacks, for Fax
AX350056	Belden GigaFlex PS6+ patch cables 4 feet, green
AX350057	Belden GigaFlex PS6+ patch cables 7 feet, green
AX350058	Belden GigaFlex PS6+ patch cables 10 feet, green
AX101456	Flex Patch Panel, 1U , 24-port, black
AX101458	Flex Patch Panel, 2U, 48-port, black
A0645269	MDVO Angled Entry Faceplate
AX101437	Interface Plate, Flush, 4-port, White

25.

Relay Rack Package Components

PART: Description	Product Code/Ordering #	Manufacturer	Quantity per pkg
Relay Rack Package - no substitutions			
Relay rack with 2 vertical cable management, black	DRR-44 + 2 DRCC-44CAN	Middle Atlantic	1
Power strip for rack	PB-12-IS/6FTCRD	Electron Metal	1
Organizer Ring Panel Horizontal Cable Management	AO403977	Belden IBDN	6
Horizontal Cable Manager, 1U, Black	HCM-1D	Middle Atlantic	4
Rack Drawer, 3U	UD3	Middle Atlantic	1
Universal Rackshelf, 1U, frontmount	U1	Middle Atlantic	1
Vented Center mount shelf, 2U	U2MS	Middle Atlantic	2
Formed blank panel 1U, black	EB1	Middle Atlantic	4
Formed blank panel 2U, black	EB2	Middle Atlantic	6
Heavy Duty Sliding Shelf	SS	Middle Atlantic	1
10-32 Pan Head Rack mounting screws and washers	HS	Middle Atlantic	100
IEC Power Cord, 12 inch, 4 per pkg	IEC-12X4	Middle Atlantic	1
IEC Power Cord, 18 inch, 4 per pkg	IEC-18X4	Middle Atlantic	1
IEC Power Cord, 24 inch, 4 per pkg	IEC-24X4	Middle Atlantic	1
Velcro Roll, 75 feet	99-050-QT-1	Polygon	1
Cable Ties, 7 inch, bag of 100	TY-525-MX	Thomas & Betts	1
Homaco 1U Horizontal Cable Fiber Manager	FCM-19-1SRC	Ortronics	1

26. Acceptable Conduit Runs
    - Achieve the best direct route (e.g., usually parallel to building lines) with no bend greater than 90 degrees or an aggregate of bends in excess of 180 degrees between pull points or pull boxes.
    - No continuous sections longer than 30.5 m (100 ft).
    - Be bonded to ground on one or both ends in accordance with national or local requirements.
    - Withstand the environment to which they will be exposed.
    - For runs that total more than 30.5 m (100 ft) in length, pull points or pull boxes should be inserted so that no segment between points/boxes exceeds the 30.5 m (100 ft) limit.
    - Total conduit runs should be kept to 45.8 m (150 ft) or less (including the sections through pull boxes).

27. Conduit Capacity
    - cable capacity of horizontal pathway conduits that have no more than two 90 degree bends (180 degrees total) and are no longer than 30.5 m (100 ft).

    The table shows the conduit fill ratio guidelines for horizontal cables; however, the number of cables that can be installed is actually limited by the allowed maximum

		Cable Outside Diameter mm (in)							
Inside Diameter (mm)	Trade Size	3.3 (0.13)	4.6 (0.18)	5.6 (0.22)	6.1 (0.24)	7.4 (0.29)	7.9 (0.31)	9.4 (0.37)	13.5 (0.53)
16	1/2	1	1	0	0	0	0	0	0
21	3/4	6	5	4	3	2	2	1	0
27	1	8	8	7	6	3	3	2	1
35	1-1/4	16	14	12	10	6	4	3	1
41	1-1/2	20	18	16	15	7	6	4	2
50	2	30	26	22	20	14	12	7	4
63	2-1/2	45	40	36	30	17	14	12	6
78	3	70	60	50	40	20	20	17	7
91	3-1/2	—	—	—	—	—	—	22	12
100	4	—	—	—	—	—	—	30	14

    pulling tensions of the cables. Maximum conduit fill ratio is 40%.

28. Maximum Category 6 cable lengths apply to all horizontal distribution cables; from the Horizontal Cross-connect (patch panel) to the telecommunications outlet (workstation end), maximum cable length is 90 meters, (295 feet) including slack requirements. BAS horizontal link lengths are also limited to 90 meters, independent of the media type.

29. Maximum fiber optic cable lengths are as follows:

Subsystem	Backbone lengths up to:	Data rates up to:
Campus backbones (OM1 fiber)	2 km (1.2 mi)	155 Mb/s
Campus backbones (OM2 fiber)	550 m (1804 ft)	1 Gb/s
Building backbones (OM2 fiber)	300 m (984 ft)	1 Gb/s
Building backbones (OM3 fiber)	300 m (984 ft)	10 Gb/s
Campus/building backbones (OS1 fiber)	2000 m (6560 ft)	10 Gb/s

As a general guideline in premises applications for backbone cabling, OM1, 62.5/125 µm; OM2, 50/125 µm; or OM3, laser optimized 50/125 µm optical multimode fiber is recommended for applications supported for these lengths and data rates. Single mode fiber may also be required for premises applications.

30. Fiber optic backbone requirements shall be supplied on a separate design document.

APPENDIX 'D'
Material / Finish Schedule

Material / Finish Schedule

Montague Consolidated School

Date: May 06, 2021

Coles Associates Ltd. - 201104

NOTE: Contractor to confirm that all product names and numbers correspond. If a discrepancy is found, the consultant is to be notified immediately for clarification.

Revision: R0

TAG	TYPE	MANUFACTURER / SUPPLIER (Standard of acceptance)	DESCRIPTION / FINISH / TEXTURE	COLOUR	LOCATION	COMMENTS
Acoustic Ceilings						
ACT-1	Ceiling Tile	Armstrong	Product: Ultima High NRC 15/16" Square Lay-In Size: Refer to drawings Thickness: 19mm NRC: 0.75 CAC: 35 Fire Performance: Class A	White	Refer to reflected ceiling plans.	
n/a	Suspension System	Armstrong	Prelude XL 15/16"	White	Use with all ACT	
C-1	Gypsum Ceiling		1/2" Gypsum Board Painted Finish	White	Washrooms	
C-2	Ceiling Bulkhead		1/2" Gypsum Board Painted Finish	White	Refer to reflected ceiling plans.	
Concrete						
CO-1	Exposed Concrete		Sizes per drawings	natural colour	Refer to Plans	
Grout						
G-1	Grout	MAPEI		select from standard range to match adjacent tile colour	All Grout	
Glazing						
GL-1	Ceramic Safety Glass	FireLite	5mm Thick, smooth	Clear / Wireless	Provide in all rated doors and frames with glazing	
GL-2	Tempered Safety Glass		6mm Thick, unless noted otherwise on drawings, smooth	Clear		
Glazing Film						
GF-1	Window Film	See Spec		White / transparent		
Paint						
P-1	Paint	Sherwin Williams	Egg Shell	Dover White SW 6385	Field Colour	
P-2	Paint	Sherwin Williams	Semi Gloss	Enduring Bronze SW7055	All Doors	

Material / Finish Schedule

Montague Consolidated School

Date: May 06, 2021

Coles Associates Ltd. - 201104

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Revision: R0

TAG	TYPE	MANUFACTURER / SUPPLIER (Standard of acceptance)	DESCRIPTION / FINISH / TEXTURE	COLOUR	LOCATION	COMMENTS
P-3	Paint	Sherwin Williams	Semi Gloss	Dover White SW 6385	Door Frames	
P-4	Paint	Sherwin Williams	Matte	Ceiling Bright White SW 7007	Ceilings	
P-5	Paint	Sherwin Williams	Semi Gloss	Black	New Handrails, Guardrails, Existing Stringrs and bottom side of stairs	
Plastic Laminate						
PL-1	Plastic Laminate	Formica	Matte	Ginger Root Maple 7288-58	Millwork	
PL-2	Plastic Laminate	Formica	Matte	Paloma Dark Grey 6366-58	Counters	
PVC Edging						
PVC-1	Edge Banding	Doellken	Thickness: 3mm Width: As required Texture: smooth	Closely match laminate. Consultant to select colour from standard range	Cabinets and Countertops	
Resilient Base						
RB-1	Rubber Base	Johnsonite	Height: 102mm with Toe, Vinyl	Brown to match existing RB	Refer to room finish schedule	
Resilient Flooring						
RF-1	Vinyl Composite Tile	Tarkett	Collection: VCT Shape: Tile Size: 12" x 12"	1347 Beige Field Colour	Refer to Finish Floor Plans	
RF-2	Vinyl Composite Tile	Tarkett	Collection: VCT Shape: Tile Size: 12" x 12"	1365 DK Taupe Accent Colour	Refer to Finish Floor Plans	
RF-3	Resilient Flooring	JOHNSONITE / TARKETT	Angle fit rubber stair tread wth integrated riser.	Fawn #80 WG Solid Colour Rubber Insert: Fawn #80 WG	Stairs treads and risers	
RF-4	Resilient Flooring	JOHNSONITE / TARKETT	Solid Rubber Tile Homogenious solid colour rubber Thickness: 3mm Size: 305mm x 305mm	Fawn #80	Stair landings	

Material / Finish Schedule

Montague Consolidated School

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Revision: R0

TAG	TYPE	MANUFACTURER / SUPPLIER (Standard of acceptance)	DESCRIPTION / FINISH / TEXTURE	COLOUR	LOCATION	COMMENTS
RF-5	Resilient Flooring	JOHNSONITE / TARKETT	Solid Rubber Tile Homogenious solid colour rubber tile Thickness: 3mm	Fawn #80	Tactile warning at stairs	
Roller Shades						
RS-1	Roller Shades	See Spec			All exterior windows	
Tile						
T-1	Ceramic Tile	Centura	Collection: Basaltina Size: 30 x 60	Mid Grey	Washroom floor	Tile to go up 100mm as baseboard
T-2	Ceramic Tile	Olympia Tile	Collection: Piccadilly Size: 4 x 12 Pattern: stack bond, horizontal Glazed Ceramic	Bianco	Washroom wall tile	1500 high
Transition strips						
TS-1	Resilient Transition Strip	Johnsonite	Consultant to select profile from standard range	Consultant to select colour / finish	Resilient flooring to other floor materials.	
Tile Trim						
TT-1	Tile Trim	Schluter Systems	Consultant to select profile from standard range	Colour to match tile	Tile to other materials.	

APPENDIX 'E'
Toilet Accessories Schedule

Toilet Accessories

Montague Consolidated School - Contract #2 Interior Fit-Up

Date: May 6, 2021

Coles Associates Ltd. - 201104

NOTE: Contractor to confirm that all product names and numbers correspond. If a discrepancy is found, the consultant is to be notified immediately for clarification.

Revision: R0

TAG	TYPE	MANUFACTURER / SUPPLIER (Standard of acceptance)	DESCRIPTION	COLOUR	FINISH / TEXTURE	LOCATION	COMMENTS
Toilet Accessories							
CH	COAT HOOK	Bobrick	B-76717 Single Robe Hook Stainless Steel		Satin Finish	(1) at each barrier free washroom, and barrier free stall, mount on side wall	Contractor supply & install
CR	CURTAIN ROD	Bobrick	B-207 x 915mm Shower Curtain rod with concealed mounting 25mm diameter rod 20Ga type 304 stainless steel		satin stainless steel	(2) at each shower, See Plan	Contractor supply & install
GB1	GRAB BAR	Bobrick	B-5806.99 x 610mm 32mm Diameter Straight Grab Bar, Peened 18ga., stainless steel tubing Concealed mounting flange		304 satin finish peened	Behind barrier free toilets (horizontal)	Contractor supply & install
GB2	GRAB BAR	Bobrick	B5898.99 762mm x 762mm 32mm Diameter 90 Grab Bar, Peened 18ga., stainless steel tubing Concealed mounting flange		304 satin finish peened	adjacent wall at barrier free toilets	Contractor supply & install
JMS	JANITOR MOP STRIP	Bobrick	B-239-34 Janitor Mop Strip c/w Shelf & 3 clamps & 4 hooks Size: 865w x 330h		satin stainless steel	(1) at each mop sink	Contractor supply & install
MIR	MIRROR	Bobrick	B-290 Series One-piece, roll-fromed 19x19 angle frame Type 304 Stainless steel angle with satin finish No. 1 quality, 6mm glass mirror Size: 610w x 915h		satin stainless steel	(1) at each sink	Contractor supply & install
ND	NAPKIN DISPOSAL	Bobrick	B-254 Surface-Mounted Sanitary Napkin Disposal Size: 270w x 385h x 105d		satin stainless steel	(1) in each washroom	Contractor supply & install

Toilet Accessories

Montague Consolidated School - Contract #2 Interior Fit-Up

Date: May 6, 2021

Coles Associates Ltd. - 201104

NOTE: Contractor to confirm that all product names and numbers correspond. If a discrepancy is found, the consultant is to be notified immediately for clarification.

Revision: R0

TAG	TYPE	MANUFACTURER / SUPPLIER (Standard of acceptance)	DESCRIPTION	COLOUR	FINISH / TEXTURE	LOCATION	COMMENTS
PTD	PAPER TOWEL DISPENSER	Bobrick	B-72860 Surface Mounted Touch free pull towel mechanism Size: 320w x 395h x 240d accommodates 205w x up to 205 dia. rolls		satin stainless steel	See Plan	Contractor supply & install
SC	SHOWER CURTAIN	Bobrick	204-2 Shower Curtain Size: 1067w x 1830h Opaque vinyl with Antibacterial and flame retardant agents Nickle-plated brass grommets 150mm o.c.	white	matte	(1) at each shower	Contractor supply & install
SCH	SHOWER CURTAIN HOOKS	Bobrick	204-1 Shower Curtain Hook			(1) set for each shower	Contractor supply & install
SD	SOAP DISPENSER	Bobrick	B-2111 Series: Classic Series Surface Mounted Soap Dispenser Concealed wall fastening Size: 120w x 205h x 90d		satin stainless steel	See Plan	Contractor supply & install
SH	SHELF	Bobrick	B-295 Stainless Steel Shelf Size: 405w x 75h x 125d 18Ga. Type 304 stainless steel		satin stainless steel	See Plan	Contractor supply & install
SHD	SHARPS DISPOSAL	Bobrick	B-350169 Surface Mounted Size: 349w x 486h x 130d		satin stainless steel	(1) in each washroom	Contractor supply & install
TPD	TOILET PAPER DISPENSER	Bobrick	B-2840 Toilet Tissue Dispenser with Utility Shelf Size: 405w x 100h x 125d Holds (2) rolls up to 140 dia.		satin stainless steel	(1) at each toilet	Contractor supply & install
WR	WASTE RECEPTACLE	Bobrick	B-277 Series: Contura Surface Mounted Size: 385w x 585h x 215d		satin stainless steel	(1) in each washroom	Contractor supply & install

APPENDIX 'F'
Luminaires Schedules

LUMINAIRE SCHEDULE			
TYPE	DESCRIPTION	SOURCE	MOUNTING
A1	2' X 4' LED FLAT PANEL C/W ALUMINUM HOUSING, WHITE SATIN LENS, 0-10VDC DIMMABLE TO 10%, 120V DRIVER. LITHONIA #EPANL 2X4 4000LM 80CRI 35K MIN10 ZT MVOLT	LED 4000 LUMENS 39W L70 AT 54,000h 80 CRI 3500K	RECESSED IN T-BAR CEILING.
A2	2' X 4' LED FLAT PANEL C/W ALUMINUM HOUSING, WHITE SATIN LENS, 0-10VDC DIMMABLE TO 10%, 120V DRIVER. LITHONIA #EPANL 2X4 3000LM 80CRI 35K MIN10 ZT MVOLT	LED 3000 LUMENS 29W L70 AT 54,000h 80 CRI 3500K	RECESSED IN T-BAR CEILING.
A3	1' X 4' LED FLAT PANEL C/W ALUMINUM HOUSING, WHITE SATIN LENS, 0-10VDC DIMMABLE TO 10%, 120V DRIVER. LITHONIA #EPANL 1X4 3000LM 80CRI 35K MIN10 ZT MVOLT	LED 3000 LUMENS 27W L80 AT 36,000h 80 CRI 3500K	RECESSED IN T-BAR CEILING.
A4	1' X 4' LED FLAT PANEL C/W ALUMINUM HOUSING, WHITE SATIN LENS, 0-10VDC DIMMABLE TO 10%, 120V DRIVER. LITHONIA #EPANL 1X4 1500LM 80CRI 35K MIN10 ZT MVOLT	LED 1500 LUMENS 14W L80 AT 36,000h 80 CRI 3500K	RECESSED IN T-BAR CEILING.

LUMINAIRE SCHEDULE			
TYPE	DESCRIPTION	SOURCE	MOUNTING
B1	4" DIAMETER, RECESS MOUNTED LED DOWNLIGHT C/W MEDIUM WIDE DISTRIBUTION, SELF-FLANGED AND SEMI-SPECULAR CLEAR REFLECTOR, 0-10VDC DIMMABLE TO 1%, 120V DRIVER. LITHONIA #LBR4 AL01 35K AR LSS MWD MVOLT UGZ	LED 750 LUMENS 9W L80 AT 36,000h 80 CRI 3500K	RECESSED IN DRYWALL CEILING.
C1	24" LONG SURFACE MOUNTED VANITY LED C/W ACRYLIC DIFFUSER AND HOUSING, CHROME FINISH, 120V DRIVER. LITHOINA #FMVCCL 24IN MVOLT 30K 90CRI KR	LED 1400 LUMENS 9W 90 CRI 3000K	WALL MOUNTED ABOVE MIRROR. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT ON SITE PRIOR TO ROUGH-IN.
D1	2' LONG, SURFACE MOUNTED LED STRIP FIXTURE C/W FROSTED ACRYLIC ROUND DIFFUSED LENS AND GENERAL DISTRIBUTION, WHITE FINISH, 120V DRIVER. LITHONIA #CLX L24 15000LM SEF RDL MVOLT GZ20 35K 80CRI WH	LED 1500 LUMENS 11W L70 AT 100,000h 80 CRI 3500K	WALL MOUNTED TO DRYWALL CEILING AT 1830mm AFF. COORDINATE EXACT LOCATION AND MOUNTING HEIGH ON SITE PRIOR TO ROUGH-IN.
D2	4' LONG, SURFACE MOUNTED LED STRIP FIXTURE C/W FROSTED ACRYLIC ROUND DIFFUSED LENS AND GENERAL DISTRIBUTION, WHITE FINISH, 120V DRIVER. LITHONIA #CLX L48 5000LM SEF RDL MVOLT GZ20 35K 80CRI WH	LED 5000 LUMENS 35W L70 AT 100,000h 80 CRI 3500K	SURFACE MOUNTED TO DRYWALL CEILING.