SPECIFICATION

FOR

Heating System Upgrade

Access PEI Summerside

Prince County, PEI

Project 2060-20051

Prepared by:

PEI Department of Transportation, Infrastructure and Energy

August, 2020

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1. GENERAL

   a) All bidders submitting tenders for this work shall first examine the site and all conditions thereon and/or therein. All tenders shall take into consideration all such conditions as may affect the work under this contract, no claims for extras resulting from conditions existing at the time of tender will be accepted by the Owner.

2. SITE VISIT

   a) There will be a recommended site visit held, **Wednesday August 26th, at 9:00 a.m.** Contractors are asked to meet outside the main entrance of the building.

END

TIE Public Works and Planning is moving forward with our capital building repair and construction program and will be issuing tenders as follows:

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

Tenders will continue to be advertised and posted to the PEI Government tender site: https://www.princeedwardisland.ca/en/tenders

Sealed tenders will be received at the Security Desk at the main entrance to Jones Building, 11 Kent Street, Charlottetown, PEI, CIA 7N8 until **2 PM, Local Time, on Thursday, September 3rd, 2020.** Tenders are to be clearly marked to indicate the project being tendered on.

Access PEI Summerside – Heating System Upgrade
Prince County, PE

Scope of Work:

1. Demolishing, removal and replacement of the existing oil fired boiler with a new propane boiler system.
2. Modifications to existing boiler room system, including but limited to the modification of piping, replacement of pumps, valves, etc.
3. Modifications and additions to existing radiator heating system, including zone valves and controls
4. Miscellaneous electrical modifications to allow for modifications to radiator heating system.
5. Site work to include but not limited to new propane tank, pad, bollards, grading and seeding.

Hard copies (paper copies) of tender documents will **not** be made available to bidders at this time. All 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 envelops must be clearly marked with the project Name.
- Tender documents will need to be received prior to 2PM on the date specified in the tender.

- No submissions will be accepted after that 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.

Refer to Instructions to Bidders for Bid Security and Contract Security requirements.

Lowest or any Tender will not necessarily be accepted.

Any additional information can be obtained by contacting **Derryl MacDonald, at 902-368-5128 or fax 902-569-0590.**

END

1. GENERAL

COVID-19

a) 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.

b) 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.

c) COVID-19. 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, Federal Government of Canada and the Construction Association of PEI:

    1. Government of PEI: www.princeedwardisland.ca/covid19
    2. Government of Canada: canada.ca/coronavirus
    3. CAPEI: www.capei.ca/

d) In response to the current COVID -19 pandemic we will require all Contractors to:

    a. 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

b. Contractor will be responsible to complete and return the "COVID-19 Contractor Affidavit", as part of the contract documents; it is not required to be submitted with the tender submission.

e) 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 CPHO. TIE will require that the Contractor develop a written site specific Pandemic Preparedness plan and have it available prior to the award of a tender.

f) The Tender Documents including General Conditions of Contract, the Instructions to bidders, Specifications, Tender Form and Drawings are all complementary and shall be read together.

g) Each Tenderer shall examine the Tender Documents as soon as possible after receipt thereof and should he or she discover any errors or omissions therein, he or she shall notify the Department as soon as possible and at least seven (7) days prior to the date set for receiving tenders so that further instructions and/or drawings may be issued to all Tenderers before the date set for receiving tenders.

2. ADDENDA

a) Tenders may, during the tendering period, be advised by addenda of required additions to, deletions from, or alterations to the requirements of the tender documents. All such changes shall become an integral part of the Tender Documents and shall be allowed for in arriving at the fixed sum tender figure. 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.**

3. BID AND CONTRACT SECURITY

BID SECURITY

a) Each Tender submitted shall be accompanied by the following security:

.1 General Contract Tender less than or equal to Three Million ($3,000,000.00) Dollars, including mechanical and electrical subcontract values:

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

A Security Deposit equal to at least ten percent (10%) of the Tender amount.

.2 General Contract Tender more than Three Million ($3,000,000.00) Dollars, including mechanical and electrical subcontract values:

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 Material Payment Bond in the amount of fifty percent (50%) of the total contract amount.

b) .1 All Bonds and Letter of Surety, provided by General Contractors, made payable to the Owner.

.2 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.

c) .1 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

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

(a) Payable to the bearer, or

(b) Accompanied by a duly executed instrument of transfer to the Owner, in the form prescribed by the Domestic Bonds of Canada Regulations, or

(c) Negotiated as to principal or as to principal and interest in the name of the Owner, pursuant to the Domestic Bonds of Canada Regulations.

d) Security deposits submitted through the Bid Depository shall be accompanied by the Bid Security. The subcontractors shall advise General Contractors what form of bid security is being used and what form of contract security will be used.

CONTRACT SECURITY

a) Upon award of a contract the Contractor is to provide the following contract security:

.1 General Contract Tender less than or equal to Three Million ($3,000,000.00) Dollars, including mechanical and electrical subcontract values:

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

OR

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 ($3,000,000.00) Dollars, including mechanical and electrical subcontract values:

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

b) .1 All bonds, provided by General Contractors, are to be made payable to the Owner.

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

.3 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 Certificate.

c) .1 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

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

(a) Payable to the bearer, or

(b) Accompanied by a duly executed instrument of transfer to the Owner, in the form prescribed by the Domestic Bonds of Canada Regulations, or

(c) Negotiated as to principal or as to principal and interest in the name of the Owner pursuant to the Domestic Bonds of Canada Regulations.

(d) 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.

(e) Contract security submitted by subcontractors, to General Contractors, shall be in a form satisfactory to the General Contractor.

4. CONSTRUCTION SCHEDULE

a) Work is to begin immediately following contract award unless indicated otherwise.

b) The completion date for this project shall be **December, 2020**.

c) Contractor to provide a construction schedule, safety policy, proof of insurance, and signed contract documents prior to starting work.

5. MATERIALS AND EQUALS

a) Materials, plant and equipment are described and named specifically in the Specifications ONLY to describe types and qualities of materials, plant and equipment required.

b) Suppliers or manufacturers wishing to have their material, plant or equipment approved as an equal shall submit complete technical information to the Consultant seven (7) days prior to the receipt of tenders. The Consultant shall review the material submitted and notify all prospective bidders of any materials, plant or equipment that have been accepted as equal.

c) All bidders submitting a tender shall include in their tender amount only materials, plant or equipment as specified or that have been approved as an equal.

6. ALTERNATE PRODUCTS

a) Approval may be given by the Consultant after the award of the Contract, on application in writing from the Contractor, for the substitution of a similar material, item or plant or equipment bearing another brand name or of other manufacture, subject to the following:

.1 Any top quality material or item of plant and equipment proposed as a substitute by the Contractor and considered by the Engineer to be of equal quality, value and price to that specified and suitable for the purpose intended, may be accepted as a substitute.

.2 Materials and items of plant and equipment which the Contractor proposes as substitutes and which are considered by the Engineer to be suitable for the purpose intended, but which are in their opinion of lesser value, quality and price than those specified will only be accepted as substitutes if reasonable credits are allowed for their use.

.3 Requests for alternates must be made by the Contractor well in advance of the time the item is to be ordered. The request shall be accompanied by sufficient information in the form of manufacturers literature, samples, and other data to permit proper investigation of the substitutes proposed.

b) Bidders are requested to include information on alternates as an appendix to this tender. The information should indicate the proposed credit or extra, to the tender amount, and include sufficient data to allow the Consultant to evaluate the item proposed as an alternate.

7. SUPERVISION AND COORDINATION

a) The Contractor shall be responsible for supervising and coordinating all aspects of the work.

b) The Contractor shall include in their quotation all cost relative to supervising sub-Contractors, including those submitting tenders directly to the Owner, which form a portion of the complete project and shall be assigned to the successful General Contractor.

8. RESPONSIBILITY

h) The Contractor shall be responsible to be fully familiar with the complete documents and shall include in their tender those items which are named, implied, or traditionally a part of the general contract work.

9. DEFINITIONS

In this specification the following terms shall have the definitions noted below:

OWNER:	**Government of Prince Edward Island as represented by the Minister of Transportation, Infrastructure and Energy**
CONSULTANT:	PEI Dept. of Transportation, Infrastructure and Energy

10. SITE INSPECTOR

a) There will be an Inspector representing the Department of Transportation, Infrastructure and Energy, 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 their opinion, there be a cause to do so.

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

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

c) The fact that the inspector does not reject any work shall not remove the responsibility for completing all work as specified; from the Contractor.

11. OWNERS RIGHT TO TERMINATE CONTRACT

a) The Owner reserves the right to remove the Contractor from the site if the work is not completed as specified in Paragraph 4. If the Contractor is removed, the Owner shall have the work completed and deduct the cost of this work from the amount owing the Contractor and their bid deposit.

12. SUB-CONTRACTORS

a) Bidders shall include with their tender, in the space in **Section E – Contract Tender**, 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 incapability or refusal.

b) 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. **Carrying Subcontractor options next to identified work will not be acceptable.**

c) 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.

d) 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.

e) All Sub-Contractors are advised to become familiar with all Specifications and Drawings. The General Contractor shall ensure that all sub-trades understand their entire responsibilities in order to complete the project. Sub-trade work may appear in various sections of Specifications and on various drawings.

13. GUARANTEES

a) The Contractor shall be required to guarantee the work of this Contract for a period of twelve (12) months after the Owner's acceptance of the work, against improper or defective materials and workmanship, and shall repair and make good at their own expense any damage to the building and contents through any of the above causes during this period. Any contract omissions and/or deficiencies reported to the Contractor within twelve (12) months after acceptance of the work shall be made good by the Contractor at their own expense.

b) Notwithstanding 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 (12) months. These specific requirements are to be found in various sections of the Specifications for this project.

14. ACCEPTANCE / REJECTION OF TENDERS

a) Bids shall remain open to acceptance and irrevocable for a period of 30 days after the bid closing date.
b) The Owner reserves the right to reject any and all tenders.

c) 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.

15. CONSULTANT'S INTERPRETATION

a) The Consultant's interpretation of plans and specifications shall be final. Should the Contractor have any doubt as to interpretation, he or she shall refer to the Consultant for clarification before submitting their tender. No allowances or extras will be made for misinterpretation of plans and specifications by the Contractor.

16. PERMITS, REGULATIONS AND TAXES

a) All permits and fees required for the proper completion and inspection of the work herein specified will be paid for by the Contractor. Except the building permit which will be paid for by the Owner. All applicable taxes shall be included in the tender price, excluding the Harmonized

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

b) The work shall be completed to the satisfaction of the Consultant and local inspecting authorities.

c) In the absence of any provisions contained herein, the applicable Provincial Codes or the National Building Code shall govern in that order.

d) The latest edition of the Canadian Electrical Code shall govern all Electrical work, whether prewired and/or assembled remote from the site or not.

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

f) All materials, components and equipment as well as construction methods shall comply with the latest edition of the National Building Code and all other applicable codes or regulations.

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

17. EXISTING CONDITIONS

a) Bidders will be held to have examined the Tender Documents, to have visited the site and to have informed themselves as to existing conditions and limitations.

b) 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 upon their own observation of such conditions, the Consultant shall promptly make such changes in the drawings and specifications as he or she 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”.

18. RECEIPT AND OPENING OF TENDERS

a) Tenders will be opened at the time and place stated in the tender call. The officer whose duty it is to open them will decide when the specified time has arrived. No responsibility will attach to any officer for the premature opening of a bid not properly addressed and identified.

19. AWARD OF CONTRACT

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

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

    a. The history of work performance of each bidder on similar or different types of work in prior Contracts with the Owner.
    b. 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 and the competence of the Bidder.

c) 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.

d) 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.

20. <u>TENDER SUBMISSION</u>

a) Tenders must be submitted on the form included with this specification. This form must be completely filled out in ink, or be typewritten with the signature in longhand. The completed forms shall be without interlineations, alteration or erasures.

b) The tender, together with the Tender Security described in this section must be addressed and delivered in a sealed envelope marked "Tender" and bearing the name of the Contractor submitting the tender, together with identification indicating the name of the project.

c) Tenders will be received at the place and time indicated in the tender call. Late tenders will not be accepted and will be returned unopened to the tenderer.

d) Amendments to the submitted offer will be permitted if received in writing prior to tender closing and if endorsed by the same party or parties who signed and sealed the offer. Amendments submitted by fax will be accepted, if received prior to tender closing. (Fax (902) 569-0590).

e) The 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 in the tender form. These lines shall be initialed by the person signing the tender after they have been filled in.

f) Any appendices to the tender form requesting information on suppliers, sub-contractors or alternate prices shall be filled in for the tender to be considered complete.

21. TAXES

a) All tenders submitted shall EXCLUDE the Harmonized Sales Tax.

22. CONFIDENTIALITY AND FREEDOM OF INFORMATION (Effective November 1, 2002)

a) 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.

b) 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 subject to appropriate consideration under the Freedom of Information and Protection of Privacy Act.

c) 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.

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

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1. DEFINITIONS

a) The Contract Documents shall include instructions to Tenderers, General Conditions, Supplementary General Conditions, Specifications, Drawings, Tender Form and the signed agreement.

b) The Owner, the Contractor and the Consultant are those names as such in the Agreement and Specifications.

c) The term 'Subcontractor' includes only a person, firm or corporation having a contract for the execution of a part or parts of the work included in the Contract, and a person, firm or corporation furnishing material called for in the Contract and worked to a special design according to the Drawings or Specifications, but does not include one who merely furnishes material not so worked.

d) The term 'work' includes all labour, materials and services required, as shown or described in the contract, documents, supplied and installed or erected complete at the place of building.

e) The term 'Other Contractor' means any person, firm or corporation employed by or having a contract directly or indirectly with the Owner otherwise than through the Contractor.

f) The place of building is the designated site or location of the completed work.

g) The law of the place of building shall govern the work.

h) For the purpose of contract signing authority, the Director is the Director of the Public Works and Planning Division of the PEI Department of Transportation, Infrastructure and Energy.

2. DOCUMENTS

a) The Contract Documents shall be signed in duplicate by the Owner and Contractor. The Contract Documents are complementary and what is called for by any one shall be as binding as if call for by all. The intention of the documents is to include all labour and materials reasonably necessary for the proper execution of the work. It is not intended however, that materials or work not covered by or properly inferable from any heading, section or trade in the specifications shall be supplied unless shown on the drawings. Descriptions of materials or work in words which so applied have well known technical or trade meanings shall be held to refer to such recognized standards. Should the specification conflict with the drawings, the specifications shall govern. In the case of discrepancies between drawings, those of larger scale, or if the scales are the same, those of later date shall govern.

All drawings and specifications shall be interpreted in conformity with the agreement and these General Conditions which shall govern.

3. DETAIL DRAWINGS & INSTRUCTIONS

a) The Consultant shall 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. The work shall be executed in conformity therewith and the Contractor shall do no work without such additional instructions. In giving such additional instructions, the Consultant shall have authority to make minor changes in the work, not inconsistent with the Contract.

If either the Contractor or the Consultant so request, they shall jointly prepare a schedule, subject to change from time to time in accordance with the progress of the work fixing the dates at which the various detail drawings will be required and the Consultant shall furnish them in accordance with this schedule, and on like request, a schedule shall be prepared, fixing the dates for the submission of shop drawings, for the beginning of manufacture and installation of materials and for the completion of the various parts of the work.

4. COPIES FURNISHED

a) The Consultant shall furnish to the Contractor, without charge, as many copies of all Drawings and Specifications as are reasonably necessary for the proper execution of the work.

5. SHOP DRAWINGS

a) The Contractor shall furnish to the Consultant, at proper times, all shop and setting drawings or diagrams which the Consultant may deem necessary in order to clarify the details of the work. The Contractor shall make any changes in such drawings or diagrams which the Consultant may require consistent with the Contract, and shall submit sufficient copies of the revised prints to the Consultant for approval – all but one of which shall be returned to the Contractor if approved by the Consultant. When submitting such shop and setting drawings, the Contractor shall notify the Consultant in writing of changes made therein from the Consultant's Drawings or Specification. The Consultant's approval of such drawings or of the revised drawings shall not relieve the Contractor from responsibility for errors made by the Contractor therein or for changes made from the Consultant's Drawings or Specifications not covered by the Contractor's written notification to the Consultant.

6. DRAWINGS AND SPECIFICATIONS ON THE WORK

a) The Contractor shall keep one copy of all Drawings, Specifications and approved shop drawing on the work, in good order, available to the Consultant and to his or her representatives.

7. OWNERSHIP OF DRAWINGS AND MODELS

a) All drawings, specifications and copies thereof and all models furnished by the Consultant are property of the Owner. They are not to be used on other work and, with the exception of the signed contract set of the Drawings and Specifications, are to be returned to him or her on request on the completion of the work. Any models furnished by the Contractor or the Owner are the property of the Owner.

8. SAMPLES

a) The Contractor shall furnish for the Consultant's approval such samples as he or she may reasonably require. The work shall be in accordance with approved samples.

9. MATERIAL TESTS AND MIX DESIGNS

a) The Contractor shall furnish for the Consultant's approval such material tests and mix designs as he or she may reasonable require. The cost of providing the foregoing beyond the extent called for in the specification shall be charged to the Owner. The work shall be in accordance with approved material tests and mix designs.

10. CONSULTANT AND CONTRACTOR

a) The Consultant is, in the first instance, the interpreter of the Contract and the judge of its performance; he or she shall use his or her powers under the Contract to enforce its faithful performance by both parties hereto. The Contractor shall, however, have complete control, subject to Article 12, of his or her organization. In case of the termination of the employment of the Consultant, the Owner shall appoint any Consultant whose status under the Contract shall be that of the former Consultant.

11. THE CONSULTANT'S DECISION

a) The Consultant shall decide on questions arising under the Contract Documents, whether as to the performance of the work or the interpretation of the Specifications and drawings, but should the Contractor hold such decisions to be at variance with the Contract Documents or to involve changes in the work already built, fixed, ordered or in hand in excess of the contract, or to be given in error, he or she shall notify the Consultant before proceeding to carry them out. In the even t of the Consultant and the Contractor failing to agree as to such excess or error and the Consultant deciding to carry out such disputed work, the Contractor shall act according to such decision. Any question of excess of cost due to the aforesaid cause may be decided in the manner hereinafter provided in Article 43.

12. SUPERINTENDENCE

a) The Contractor shall keep on the work, during its progress, a competent superintendent and any necessary assistants, all satisfactory to the Consultant. The superintendent shall not be changed except with the consent of the Consultant, unless the superintendent proves to be unsatisfactory to the Contractor or ceases to be in his or her employ. The superintendent shall represent the Contractor in his or her absence and directions on minor matters given to him or her shall be held to be given to the Contractor. Important directions shall be given in writing to the Contractor. The Contractor shall give efficient supervision to the work using his or her best skill and attention.

13. MATERIALS, APPLIANCES, EMPLOYEES

a) Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labour, water, tools, equipment, light and power necessary for the execution of the work. Unless otherwise specified all materials shall be new. Both workmanship and materials shall be of the quality specified. The Contractor shall not employ on the work any unfit person or anyone not skilled in the work assigned to him or her.

14. INSPECTION OF WORK

a) The Owner, or the Consultant on his or her behalf, and their representatives shall at all times have access to the work wherever it is in preparation or progress and the Contractor shall provide proper facilities for such access and for inspection. If the specifications, the Consultant's instructions, the laws, or the ordinances of any public authority require any work to be specially tested or approved, the Contractor shall give the Consultant timely notice of its readiness for inspection, and if the inspection is by an authority other than the Consultant, of the date and time fixed for such inspection. Inspections by the Consultant shall be promptly made. If any such work should be covered up without approval or consent of the Consultant, it must, if required by the Consultant, be uncovered for examination and made good at the Contractor's expense. Re-examination of questioned work may be ordered by the Consultant. If such work be found in accordance with the Contract, the Owner shall pay the cost of re-examination and replacement. If such work be found not in accordance with the contract, through the fault of the Contractor, the Contractor shall pay such cost.

15. REJECTED WORK

a) The Contractor shall promptly remove from the premises any defective work, whether the result of poor workmanship, use of defective materials, damage through carelessness or other act of the Contractor, which has been condemned by the Consultant as failing to conform to the Contract Documents, whether incorporated in the work or not. The Contractor shall

promptly replace and re-execute his or her own work in accordance with the contract and without expense to the Owner and shall bear the expense of making good all work of other Contractors destroyed or damaged by such removal or replacement. If the Contractor does not remove such condemned material or work within the time fixed by written notice, the Owner may remove them and may store such materials at the expense of the Contractor. If the Contractor does not pay the expense of such removal within Five (5) days thereafter, the Owner may, upon Ten (10) day's written notice, sell such materials at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs and expenses that should have been borne by the Contractor.

16. DEDUCTIONS FOR UNCORRECTED WORK

a) 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.

17. CORRECTION AFTER COMPLETION

a) 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 year from the date of substantial completion of the work and shall pay for any damage to other work resulting therefrom which appears within such period and neither the final certificate nor payment thereunder shall relieve the Contractor from responsibility hereunder. The Owner shall give notice of observed defects promptly. Questions arising under this Article may be decided as provided in Article 43.

18. EMERGENCIES

a) 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.

19. PROTECTION OF WORK AND PROPERTY

a) The Contractor shall maintain continuously adequate protection of all his or her work from damage and shall take reasonable precautions to protect the Owner's property from all injury arising in connection with this Contract. He or she shall make good any damage or injury to his or her work and shall make good any damage or injury to the property of the Owner resulting from the lack of reasonable protective precautions. He or she shall not be responsible,

however, for any damage or injury to his or her work and to the property of the Owner which may be directly due to errors in the Contract Documents or caused by the Owner, his or her agents, or employees, or from any work or risk which the Owner has agreed to insure, provided the Contractor has taken reasonable protective precautions. He or she shall adequately protect adjacent property as required by law and the Contract Documents.

20. CONTRACTORS' INSURANCE

a) INDEMNITY/HOLD HARMLESS

.1 The Contractor shall be liable for all injuries to persons and for damage to property caused by his or her operations, and those of his or her sub-contractors, and his or her and their employees, engaged on all operations in connection with the contract both on and off the site, and he or she shall indemnify and save harmless the Owner from all suits, claims, expenses, costs, demands, losses, and damages to which the Owner may be put by reason of injury, including death, to persons, and damage to property of the Owner and others, resulting from; negligence, carelessness and any other cause whatsoever in the performance of the work.

.2 The Contractor shall, until the date of issue of the final Certificate of Approval of the work by the Consultant, Indemnify and Save Harmless the Owner, and protect his or her own interests against:

(a) Theft, burglary or robbery of, and loss or damage to, all materials and equipment brought to the site for use in the work, whether or not such materials and equipment are incorporated in the work at the time that any such theft, burglary, robbery, loss or damage occurs.

(b) Theft or burglary of, and loss or damage to, any of his or her own plant and equipment being used on the Project and/or stored on the site.

b) BUILDERS RISK, ALL RISK PROPERTY INSURANCE

.1 The Contractor shall, without limiting its obligations or liabilities herein and at its own expense, provide and maintain the following insurances with Insurers and in forms and amounts acceptable to Government:

(a) The Contractor shall have Commercial General Liability coverage in an amount not less than Two Million ($2,000,000.00) dollars inclusive per occurrence against bodily injury and property damage. **The Government of Prince Edward Island is to be added as an additional insured under this policy**. Such insurance shall include, but not be limited to:

i) Blanket Written Contractual Liability;
ii) Personal Injury Liability;
iii) Non-owned Automobile Liability;
iv) Cross Liability;
v) Operation of Attached Machinery

Commercial General Liability insurance shall be endorsed to provide the Owner with thirty (30) day advance written notice of cancellation or material change and fifteen (15) days notice in the event of non-payment.

(b) Automotive liability coverage (Standard Automobile Policy) on all vehicles, the subject of this Agreement, owned, leased, operated or licensed in the name of the Contractor, in an amount not less than Two Million ($2,000,000.00) dollars

(c) If the work involves new construction or reconstruction of a property being repaired or maintained, the Contractor shall provide and maintain All Risk Course of Construction (Builder's Risk) to the full value of the work in the amount of the Contract Price. The policy will permit partial or complete use or occupancy by the Owner during the term of this insurance.

All the foregoing insurance shall be primary and not require the sharing of any loss by any insurer of the Government nor by any other form of recovery available such as the Provincial Self Insurance and Risk management Fund.

.2 Proof of Insurance

A Certificate(s) of Insurance and any renewals thereof, shall be furnished to the Government prior to commencement of work by the Contractor and must be updated as required during the Term.

The policies required by this Agreement shall be in a form and with insurers satisfactory to the Government. Default of deliver or receipt by the government shall not be construed as acknowledgement or concurrence that there has been compliance with the terms of this Agreement.

.3 Indemnification

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.

21. PERFORMANCE BOND

a) The Owner shall have the right to require the Contractor to furnish a bond covering the faithful performance of the Contract – including the corrections after completion provided for in Article 17 – and the payment of all obligations arising under the contract, in such form as the Consultant may prescribe and with such sureties as he or she may approve. If such bond is required by written instructions given previous to the receipt of bids, the premium shall be paid by the Contractor, if subsequent thereto, it shall be paid by the Owner.

22. CASH ALLOWANCES

a) The Contractor shall include in the contract sum all cash allowances mentioned in the Specifications, which allowances shall be expended in whole or in part as the Consultant shall direct and the amount of the contract sum being adjusted in conformity therewith. The Contract sum includes such sums for expenses and profit on account of such cash allowances as the Contractor requires except those allowances included for contingency purposes.

23. SUBSURFACE CONDITIONS

a) In the event that during the execution of the work, subsurface conditions at the site are found to differ materially from those indicated in the Contract Documents and soil reports, or otherwise represented by the Owner or Consultant to the Contractor, then the Contractor shall promptly notify the Consultant in writing of such conditions, the Consultant shall promptly investigate such conditions and if he or she finds that they differ materially and will result in an increase or decrease in the cost of, or time required for performance of this Contact, an equitable adjustment shall be made between the parties and the contract modified in writing accordingly. If the parties fail to agree upon the adjustment to be made, the dispute may be determined as provided for in Article 43.

24. CHANGES IN THE WORK

a) The Owner or the Consultant, without invalidating the contract, may make changes by altering, adding to, or deducting from the work, the contracts sum being adjusted accordingly. All such work shall be executed under the conditions of the Contract except that any claim for extension or reduction of time caused thereby shall be adjusted at the time of ordering such change. Except as provided in Article 18, no change shall be made unless in pursuance of a written order from the Consultant and no claim for an addition to or deduction from the contract sum shall be valid unless so ordered and at the same time valued, or agreed to be valued, as provided in Article 25.

25. VALUATION OF CHANGES

a) 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 (including Employment Insurance, Worker's Compensation, holiday pay) and actual equipment rental. 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 or her costs.

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

.3 For work less than $2,500 involving a Sub-Contractor only, the Sub-Contractor adds 20% to his or her costs, submits this price to the General Contractor who adds 10%.

.4 For work over $2,500 involving a Sub-Contractor only, the Sub-Contractor adds 15% to his or her cost, submits this price to the General Contractor who adds 5%.

.5

(a) For work less than $2,500 involving the General Contractor and Sub-Contractor, the Sub-Contractor adds 20% to his or her costs, submits his or her price to the General Contractor who adds 10%; to this amount the General Contractor adds the cost of his or her own work plus 20% of the cost of his or her own work only.

(b) The General Contractor does not add a further 10% to the cost of his or her own work.

.6

(a) For work over $2,500 involving the General Contractor and a Sub-Contractor, the Sub-Contractor adds 15% to his or her cost, submits this price to the General Contractor who adds 5%; to this amount the General Contractor adds the cost of his or her own work plus 15% of the cost of his or her own work only.

(b) The General Contractor does not add a further 5% to the cost of his or her own work.

.7 Deletions to Contract: A mark-up shall **not** be charged nor credited on a credit portion of a Change Order.

.8 Supervision related to Change Orders shall be considered as included in the allowable mark-up and shall **not** be included in the labour charges for a Change Order.

26. APPLICATION FOR PAYMENTS

a) The Contractor shall – before the first application for payment – submit to the Consultant a schedule of values of the various parts of the work aggregating to the total sum of the contract, divided so as to facilitate payments, made out in such form, and supported by such evidence as to its correctness as the Consultant may direct. This schedule, when approved by the Consultant, shall be used as a basis for applications of payment, unless it can be found to be in error.

b) The Contractor, as per current Provincial regulation, shall include on all invoices the Harmonized Sales Tax as an additional line item. This amount would be in addition to the tender amount which does not include HST. See article 28 of this Section.

27. CERTIFICATES AND PAYMENTS

a) Partial payments will be made monthly and within thirty (30) days after approval by the Owner and on the basis of a duly certified and approved estimate of work performed during the preceding period. In preparing estimates, the material delivered on the site and preparatory work done shall be taken into consideration.

b) In making such partial payments, there shall be retained a hold back in the amount of fifteen percent (15%) of the estimated amount on each partial payment estimate, less any holdback release which may have been made to specific sub-contractors under any progressive release of holdback provisions in Provincial Legislation.

c) All materials and work covered by partial payments made shall thereupon become the sole property of the Owner, but this shall not be construed as relieving the Contractor from the sole responsibility for the safety and preservation of all materials and work upon which payments have been made and restoration of any damaged work or as a waiver of the right of the Owner to require the fulfillment of all the terms of the contract. Nor shall Consultant's Certification of Partial Payment for any work be construed as his or her final or irrevocable acceptance of that work.

d) Document of Completion: Upon completion and acceptance of all work whatsoever required and the release of all claims against the Owner as specified, the Consultant shall file a written document with the Owner and with the Contractor as to the entire amount of work performed and compensation earned by the Contractor – including the extra work and compensation therefore.

e) Final Payment: Within sixty (60) days after the filing of such document of completion and minimum one (1_ day after the lien period, and upon receipt from the General Contractor of declarations signed by each of his sub-contractors that the sub-contractor has been paid up to,

and including the past previous partial payment, the Owner will pay the Contractor the amount stated therein less all deductions authorized by the terms of this contract and previous payments and advances whatsoever to or for the account of the Contractor. All previous estimates and payments, including those relating to extra work, shall be subject to correction at the time of this payment which is, throughout this contact, called Final Payment. Final Payment shall be subject to inspection and acceptance by the Owner or duly authorized representatives of the Owner and by representatives of all agencies having direct interest in the project.

Submittals to include:

- Certificate or letter of clearance from the Provincial Worker's Compensation Board

f) With the second and all subsequent applications for payment, the Contractor shall include a statutory declaration form CCDC 9B, or other similar acceptable form to the Owner, declaring that all labour and materials entering into the work, including Sub-Contractors, 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 Owner.

g) With application for release of lien holdback, the Contractor shall include certificates issued by the Worker's Compensation Board, indicating that Worker's Compensation premiums in relation to the project have been paid in full.

28. TAXES

a) Unless otherwise provided herein, the Contractor shall pay all government sales or excise taxes in force at the date of the Agreement, provided that any increase or decrease in such taxes shall increase or decrease the contract sum accordingly.

29. PERMITS, NOTICES, LAWS AND RULES

a) The Contractor shall apply and pay for all necessary permits or licenses required for the execution of the work (but this shall not include the obtaining of the Building Permit or permanent easement or right of servitude). The Contractor shall give all necessary notices and pay all fees required by law and comply with all laws, ordinances, rules and regulations relating to the work and to the preservation of the public's health. The Contractor shall be responsible for the safety of all workmen and equipment on the project in accordance with all applicable safety legislation passed by federal, provincial and local authorities governing construction safety.

If the Contract Documents are at variance therewith, any resulting additional expense incurred by the Contractor shall constitute an addition to the contract price.

30. PATENT FEES

a) The Contractor shall pay all royalties and license fees and shall save the Owner harmless from loss on account of suits or claims for infringement of patents in the doing of the work.

31. USE OF PREMISES

a) The Contractor shall confine his or her apparatus, the storage of materials and the operations of his or her workmen to limits indicated by laws, ordinances, permits or by direction of the Consultant and shall not unreasonably encumber the premises with his or her materials. The Contractor shall not load – or permit to be loaded – any part of the work with a weight that will endanger its safety. The Contractor shall enforce the Consultant's instructions regarding signs, advertisements, fires and smoking.

32. CLEANING UP

a) The Contractor shall at all times keep the premises free from accumulations of waste material or rubbish caused by his or her employees or work and, at the completion of the work, he or she shall remove all his or her rubbish and all tools, equipment and surplus materials from and about the work and shall leave the work "broom clean" or its equivalent, unless more exactly specified. In case of dispute, the Owner may remove the rubbish and charge the cost as the Consultant shall determine to be just.

33. CUTTING, PATCHING AND DIGGING

a) The Contractor shall do all cutting, fitting or patching of his or her work that may be required to make its several parts come together properly and fit it to receive or be received by work of Other Contractors shown upon, or reasonably implied by, the Contract Documents.

Any cost caused by ill-times work shall be borne by the party responsible therefore.

The Contractor shall not endanger any existing work by cutting, digging or otherwise and shall not cut or alter the work of any other Contractor save with the consent of the Consultant.

34. DELAYS

a) If the Contractor is delayed in the completion of the work by any act or neglect of the Owner, Consultant or any Other Contractor or any employee of any one of them or by changes ordered

in the work, then the time of completion shall be extended for such reasonable time as the Consultant may decide.

b) If the Contractor is delayed in the performance of the Work by:

.1 labor disputes, strikes, lock-outs (including lock-outs decreed or recommended for its members by a recognized contractors' association, of which the Contractor is a member or to which the Contractor is otherwise bound),

.2 fire, unusual delay by common carriers or unavoidable casualties,

.3 abnormally adverse weather conditions, or any cause beyond the Contractor's control other than one resulting from a default or breach of Contract by the Contractor the Contractor will make reasonable efforts to counter the circumstances giving rise to the delay or to otherwise remedy its inability to perform its obligations by utilizing all resources reasonably required in the circumstances, including obtaining supplies or services from other sources if the same are reasonably available (including seeking injunctive relief or other judicial, quasi-judicial or law enforcement remedy, provided that the Contractor will not be required to settle or resolve any labor disturbance, strike, lock-out, or work slowdown (collectively “Employment Matters”) but excluding any Employment Matters involving persons retained, employed or hired by the Contractor to supply materials or services to meet the Contractor’s obligations under this Contract; or any Employment Matter caused by, or attributable to, any act (including any pricing or other practice or method of operation) or omission of the Contractor. Only after the Contractor has made such reasonable efforts the Contract Time shall be extended for such reasonable time as the Consultant may recommend in consultation with the Contractor. The extension of time shall not be less than the time lost as the result of the event causing the delay, unless the Contractor agrees to a shorter extension. The Contractor shall not be entitled to payment for costs incurred by such reasonable efforts or delays unless such reasonable efforts or delays were required as a result of actions by the Owner, Consultant or anyone employed or engaged by them directly or hall be necessary.

No such extension shall be made for delay unless written notice of claim is given to the Consultant within seven (7) days of its commencement provided, however, that in the case of a continuing cause of delay only one claim shall be necessary.

If no schedule is made under Article 3, no claim for delay shall be allowed on account of failure to furnish drawings until two (2) weeks after demand for such drawings and not then unless such claim be reasonable.

The Consultant shall not, except by written notice to the Contractor, or as provided in Article 18, stop or delay any part of the work pending decisions or proposed changes either by him or herself or by the Owner.

35. OWNER'S RIGHT TO DO WORK

a) If the Contractor should neglect to execute the work properly or fail to perform any provision of this Contract, the Owner, after five (5) days written notice to the Contractor, may without prejudice to any other right or remedy he or she may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor; provided however, that the Consultant shall approve both such actions and the amount charged to the Contractor.

36. OWNER'S RIGHT TO TERMINATE CONTRACT

a) If the Contractor should be adjusted as bankrupt, or if he or she should make a general assignment for the benefit of his or her creditors, or if a receiver should be appointed on account of his or her insolvency or if he or she should – except in case of recited in Article 35 – refuse or fail to supply enough properly skilled workmen or proper materials after having received seven (7) days notice in writing from the Consultant to supply additional workmen or materials, or if he or she should fail to make prompt payment to Sub-Contractors or for material or labour, or persistently disregard laws, ordinances or the instruction of the Consultant, or otherwise be guilty of a substantial violation of the provisions of the Contract, then the Owner, upon the certificate of the Consultant that sufficient cause exists to justify such action , may, without prejudice to any right or remedy he or she may have, by giving the Contractor written notice, terminate the employment of the Contractor and take possession of the premises and of all materials, tools and appliances thereon and finish the work by whatever method he or she may deem expedient, but without undue delay or expense. In such case, the Contractor shall not be entitled to receive the expense of finishing the work, including compensation to the Consultant for his or her additional services; such excess shall be paid to the Contractor. If such expense shall exceed such unpaid balance, the Contractor shall pay the difference to the Owner. The expense incurred by the Owner as herein provided, shall be certified by the Consultant.

37. CONTRACTOR'S RIGHT TO SUSPEND WORK OR TERMINATE CONTRACT

a) If the work should be stopped under an order of any court or other public authority through no act or fault of the Contractor or of anyone employed by him or her, or if the Consultant fails to issue a certificate in accordance with Article 27, or if the Owner should fail to pay to the Contractor within seven (7) days of its maturing and presentation, any sum certified by the Consultant or awarded by arbitrators, then the Contractor may, upon five (5) days written notice to the Owner and the Consultant, stop work and/or terminate this Contract without

prejudice to any other right or remedy he or she may have and recover from the Owner payment for all work executed and any loss sustained upon the plant or material with reasonable profit and damages.

38. DAMAGES AND MUTUAL RESPONSIBILITY

a) If either party to this Contract should suffer damage in any manner because of any wrongful act or neglect of the other party or of anyone employed by him or her then he or she shall be reimbursed by the other party for such damage. Claims under this paragraph shall be made in writing to the party liable within a reasonable time after the first observance of such damage and not later than the time of final certificate, except as expressly stipulated otherwise in the case of faulty work or materials, and may be adjusted by agreement or in the manner set out in Article 43 and the party reimbursing the other party as aforesaid shall thereupon be subrogated to the rights of the other party in respect of such wrongful act or neglect if it be that of a third party. Should the Contractor cause damage to any other Contractor on the work the Contractor agrees – upon due notice – to settle with such other Contractor by agreement or arbitration, if he or she will so settle. If such other Contractor sues the Owner on account of any damage alleged to have been so sustained, the Owner shall notify the Contractor who shall defend such proceedings at the Owner's expense and if any final order or judgment against the Owner arises therefrom the Contractor shall pay or satisfy it and pay all costs incurred by the Owner provided that if the Contractor becomes liable to pay or satisfy any final order or judgment against the Owner, then the Contractor shall have the right upon undertaking to indemnify the Owner against any and all liability for sots to appeal, in the name of the Owner, such final order or judgment to any and all courts or competent jurisdiction.

39. SEPARATE CONTRACTS WITH OTHER CONTRACTORS

a) The Owner reserves the right to let separate contracts in connection with the undertaking of which the work is a part and the Contractor shall connect properly and coordinate this work with that of other Contractors. If any part of the Contractor's work depends – for its proper execution or results – upon the work of any other Contractor, the Contractor shall inspect the work prior to proceeding with his or her work as required by the Contract. Should the Contractor fail so to inspect and report, he or she shall have no claim against the Owner by reason of the defective or unfinished work of any other Contractor except as to latent defects not reasonably noticeable at the time of the commencement of the Contractor's work. In letting separate contracts, the Owner shall be responsible for the coordination of fire and other insurance coverages and shall take all precautions reasonable possible to avoid possible occurrence of a labour dispute or disputes on the work.

40. ASSIGNMENT

a) Neither party to the Contract shall assign the Contract without the written consent of the other.

41. SUB-CONTRACTS

a) The Contractor agrees that the list of names of sub-contractors supplied prior to the signing of the Contract is the list of Sub-Contractors proposed to be used to carry out those parts of the work noted thereon and he or she shall not employ any to whom the Consultant may reasonable object.

If the change of any name on such list is required by the Consultant and the work has to be awarded to a higher bidder, the contract price shall be increased by the difference between the two bids.

The Consultant shall, on request, furnish to any Sub-Contractor wherever practicable, evidence of the amounts certified to on his or her account.

The Contractor shall be held as fully responsible to the Owner for the acts and omissions of his or her sub-contractors and of persons directly or indirectly employed by them, as for the acts and omissions of persons directly employed by him or her. In view of this responsibility, the Contractor shall not be obliged to employ as a sub-contractor or supplier any person or firm to whom he or she may reasonable object.

42. RELATIONS OF CONTRACTOR AND SUB-CONTRACTOR

a) The Contractor agrees to bind every sub-contractor by the terms of the Contract Documents, as far as applicable to his or her work.

43. ARBITRATION

a) In the case of any dispute arising between the Owner (or the Consultant acting on his or her behalf) and the Contractor as to their respective rights and obligations under the Contract, either party hereto shall be entitled to give to the other notice of such dispute and to request arbitration thereof; and the parties may, with respect to the particular matters then in dispute, agree to submit the same to arbitration in accordance with the applicable law of the place of building.
Arbitration proceedings shall not take place until after the completion or alleged completion of the work except (a) on a question of certificate for payment, or (b) in a case where either party can show that the matter in dispute is of such nature as to require immediate consideration while evidence is available.

44. OWNER SIGNING AUTHORITY

a) Mr. Alan Maynard, P. Eng. is designated as the Director for the purposes of this agreement, the Director shall represent Government in all matters pertaining to the construction project being

provided pursuant to this agreement, and will administer said agreement, and shall complete necessary approvals of all plans and specifications provided for under this agreement on behalf of Government, provided however, that the Director shall not be authorized to amend the terms of the Agreement.

Government may replace the Director by providing written notice, in accordance with the notice requirements of this Agreement.

45. CONFLICT OF INTEREST

a) 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:

   i) Allow the Contractor to resolve the actual or potential conflict to the satisfaction of Government; or
   ii) Terminate the Agreement in accordance with the Termination section of this Agreement.

END

PROJECT:

1. GENERAL

a) The undersigned tenderer (hereinafter called the "Contractor") hereby offers to the Minister of Transportation, Infrastructure and Energy (hereinafter called the "Owner") to furnish all necessary tools, plant, services, materials and labour to execute and complete in a careful and workmanlike manner the work set out under the **Project # 2060-20051** herein, which is more particularly described in the Plans and Specifications titled **Access PEI Summerside – Heating System Upgrade** and dated **August, 2020** for the lump sum as set out in Clause 3.

The Contractor agrees:

.1 To complete the work by the date indicated on the Instructions to Bidders.

.2 That this Form of Agreement supersedes and cancels all communication, negotiations and agreements relating to the work other than contained in the completed tender.

.3 To use all suppliers and sub-contractors indicated on his or her tender unless prior approval is received from the Engineer to make a change.

2. ADDENDA

a) The following addenda are included in this contract:

_____

_____

_____

_____

3. CONTRACT PRICE

a) The Contract Price (*the lump sum referred to in Clause 1*:) which excludes value added taxes is:

_____

_____

b) Value added (HST)(of _____%) payable by the Owner to the Contractor are:

_____

_____

c) Total amount payable by the Owner to the Contractor for the construction of the work is:

_____

_____

4. CORRESPONDENCE

a) The Owner, Consultant, and Contractor may be contacted in writing at the addresses below:

Owner & Consultant

PEI Department of Transportation, Infrastructure and Energy
PO Box 2000
Charlottetown, PE
C1A 7N8

Contractor
_____
_____
_____
_____

5. CONTRACTOR'S ACCEPTANCE

a) Accepted and executed on behalf of the Contractor this _____ day of _____, 20___, in the presence of _____.

_____	_____
Witness	Signature & Corporate Seal

6. OWNER'S ACCEPTANCE

a) Accepted and executed on behalf of the Owner this _____ day of _____, 20___, in the presence of _____.

_____	_____
Witness	Signature & Seal

END

TENDER
SUBMITTED BY: _____
ADDRESS: _____
_____
PHONE: _____ FAX: _____
DATE: _____

FOR: Access PEI Summerside - Heating System Upgrade
120 Heather Moyse Drive
Summerside, PE

TO: Minister of Transportation, Infrastructure and Energy
11 Kent Street
PO Box 2000
Charlottetown, PE
C1A 7N8

HAVING examined the drawings and specifications for this project as well as any addenda issued, we hereby offer to furnish all materials, plant and labour necessary for the full and proper completion of:

"Access PEI Summerside - Heating System Upgrade"

INCLUDING all prime cost allowances, or other taxes in force at this date and **excluding HST**; but not including any additional or deductible allowance 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 sum of:
_____ Dollars ($_____)
in lawful money of Canada.

In submitting this tender we recognize the necessity to complete the information requested on any appendices, as well as the right of the Owner 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 deposit shall be forfeited to the Owner in lieu of any damages which he or she may suffer by reason of our failure or refusal to enter into such contract.
In the event of our tender not being accepted within thirty (30) days of the time stated for the closing of tenders, the bid deposit will be returned to us forthwith unless a satisfactory arrangement is made with us covering its retention for a further stated period.

This tender includes the following addenda:

Addendum #	Date	Initial

Prior to signing the Contract, the Contractor is to provide General Contractor and Stub-Trade labour rates to substantiate actual labour costs and wage levies for extra work (Change Orders).

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

Enter into a formal contract agreement with the Owners.
Furnish a general analysis of the contract sum, the total aggregating the amount of our tender.
Provide a Construction Schedule and complete the entire work on or before the dates stated.

Our tender includes the following sub-contractors and suppliers, (own forces may be used, see Item 12, Section B).

Mechanical _____
Electrical _____
Controls _____
Boiler / Boiler Supplier _____
Roofing _____
Carpentry _____

_____
Submitted by (Name of Bidder)

_____
Authorized Signature

END

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)

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.

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.

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.

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.

6. SUBMITTALS

.1 Submit site-specific Health and Safety Plan within seven (7) days after date of Notice to Proceed and prior to commencement of Work. (one copy electronically and one hard copy).
.2 Upon request, submit one copy electronically and one hard copy of the Contractor's authorized representative's worksite health and safety inspection reports to Consultant.
.3 Upon request, submit copies of construction safety tool box meetings and formal contractor safety meetings.
.4 Submit copies of incident and accident reports.
.5 Maintain Worker's Compensation Coverage for duration of contract. Submit Letter of Good Standing to Consultant prior to commencement of work.

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 are fitted and wear appropriate personal protective equipment (PPE).

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.

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.

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.

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.

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.

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.
.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.

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.

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.

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.

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

1. GENERAL

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

b) The General Contractor shall co-ordinate, administer and supervise all work and material acquisition unless noted otherwise in either the Specifications or Drawings. Faulty work by any Section which could have been avoided by proper co-ordination and/or supervision by the General Contractor will not be accepted.

c) Unless specified otherwise, the provisions of this Section shall apply to all Sections of the specifications.

d) Study all Contract documents to determine additional work required by your section on which the work of other sections depends.

e) Establish rates of wages and conditions of work in accordance with the Industrial standards Act of the Province of Prince Edward Island. Wherever possible give preference to local labour.

f) Workmanship shall be of highest quality in accordance with best standard practice for this type of work, except where specified more precisely.

2. SPECIFICATION FORMAT

a) These specifications are not intended as a detailed description of installation methods but serve to indicate particular requirements in the completed work.

b) Conform to the latest edition of the National Building Code, together with all its related supplements, hereinafter referred to as the “Code” or “code”. Where Drawings and Specifications exceed code requirements provide such additional requirements.

c) Where a material is designated on Drawings or in the Specifications for a certain application, unless otherwise specified, that material shall conform to standards designated in the latest edition of the National Building Code and any other Code, Act or Bylaw of Provincial or Local Application provided that in the case of conflict or discrepancy the more stringent requirement shall apply. Similarly, unless otherwise specified, installation methods and standards of workmanship shall also conform to standards invoked by the aforementioned code. Where no particular material is specified for a certain use, the bidder shall select from the choice offered in the code in each case.

d) References to codes, and standards, including manufacturer's direction for installation shall be the latest edition thereof.

e) Provide a copy of all certificates of acceptance issued by Provincial or Local authorities.

f) Parts of the specification are written in short form, therefore it is understood that where a component of the work is stated in a heading followed by a material or operation, the words "Shall be", "Shall consist of" or similar words or phrases are implied which denote complete supply and installation of such materials of operations for the component of work designated by the heading.

g) Where the aforementioned Code or this specification does not provide all information necessary for complete installation of any item, then the manufacturer's instructions for first quality workmanship shall be strictly complied with.

h) Where words in the Contract Documents occur in the singular number, they shall be taken as plural where applicable in accordance with the quantities required to satisfy the requirements of the Contract.

3. STANDARDS AND DEFINITIONS

a) Where a reference is made to specification standards produced by various organizations, conform to latest edition of standards, as amended and revised to date of Contract.

b) Have a copy of each specified standard which relates to your work available on the Site to be produced immediately on the Consultant's request.

4. CO-OPERATION

a) Co-operate with and co-ordinate with other trades as required for the satisfactory and expeditious completion of the work. Take field dimensions relative to this work. Fabricate and erect work to suit field dimensions and field conditions. Provide all forms, templates, anchors, sleeves, inserts and accessories required to be fixed to or inserted in the work and set in place or instruct the related trades as to their location. Pay the cost of extra work caused by and make up time lost as the result of failure to provide the necessary co-operation, information or items to be fixed to or built in, in adequate time.

b) This Section shall provide other Sections with and be responsible for levels and dimensions which other sections require for establishing proper locations for their work.

5. MATERIAL STORAGE AND HANDLING

   a) Store packaged materials in original, undamaged condition with manufacturers' labels and seals intact. Handle and store materials in accordance with manufacturers' and suppliers' recommendations and in a manner to prevent damage to materials during storage and handling.

6. SITE VISIT

   a) All bidders submitting tenders for this work shall first examine the site and all conditions therein. All tenders shall take into consideration all such conditions as may affect the work under this contract, no claims for extras resulting from conditions existing at the time of tender will be accepted by the Owner.

7. EXAMINATION

   a) All trades shall examine the existing conditions upon which their work depends. Report to the General Contractor with a copy to the Consultant in writing defects in such work. The application of their work or any part of it shall be deemed acceptance of the work upon which their work or that part of it which has been applied depends.

   b) Drawings are, in part, diagrammatic and are intended to convey scope of work and indicate general and approximate location, arrangement and sizes of building components.

8. CONSTRUCTION SAFETY

   a) Observe construction safety measures of the latest edition of the National Building Code Part 8, Provincial Government Workers/Workers Compensation Board and municipal authority provided in any case of conflict or discrepancy more stringent requirements shall apply.

   b) Comply with requirements of FCC no. 301.

   c) Ensure no part of Work is subjected to loading that will endanger its safety or will cause permanent deformation.

   d) Design and construct falsework in accordance with CSA S269.2.

   e) Operate such equipment only by qualified hoist or crane operators, and maintain current inspection certificate.

   f) Design and construct scaffolding in accordance with CSA S269.2.

g) Comply with the requirements of the Fall Protection & Scaffolding Regulations, Province of Prince Edward Island.

h) 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.

i) Comply with the requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and comply regarding labeling and provision of material safety data sheets.

.1 Have a copy of WHMIS data sheets available at the workplace on delivery of materials.

9. PROTECTION

a) Take reasonable and required measures, including those required by authorities having jurisdiction to protect the public and those employed on work from body harm and to protect adjacent public and private property from damage. Make full restitution for such harm and damage resulting from failure to take adequate protective measures. Make good damage to work from whatever cause.

b) Take all necessary precautions to guard site, premises, materials and the public at time other than when supervised work is in progress.

c) Provide and maintain in working order, suitable Underwriters' labeled fire extinguishers and locate in prominent position to approval of authorities having jurisdiction.

d) Provide all signs, ramps, barricades, and hoarding and protective measures necessary to the safe execution of the work and protection of the public.

e) Protect, relocate and maintain existing, active services wherever they are encountered. Wherever inactive services are encountered, cap them off and remove the unwanted portion, with the approval of the authorities having jurisdiction or the public utility concerned, in the manner approved by them.

f) All trades shall protect previously installed work while carrying out their own work.

g) Damaged work shall be made good by appropriate trades but at the expense of those causing damage.

h) Attach and fasten fixtures and fittings in place, in a safe, sturdy, secure manner so that they cannot work loose or fall or shift out of position during the occupancy of building as a result of vibration or other causes in normal use.

i) Protect existing buildings, landscaping, curbs, roads and lanes and utilities. If, during work, any buildings, landscaping, curbs, roads and lanes are damaged, repair or replace them at no extra expense to the Owner.

j) Provide safety helmets for Consultants, Owner's representatives and any other authorized visitors to site if required.

10. FASTENINGS

a) Supply all fastenings, anchors and accessories and adhesives required for fabrication and erection of the work.

b) Exposed metal fastenings and accessories shall be of same texture, colour and finish as base metal on which they occur.

c) Exterior anchors for windows and roofing sheet metal and anchors occurring on or in an exterior wall shall be noncorrosive or hot dip galvanized steel.

d) Anchoring and fastening devices or adhesive shall be of appropriate type and shall be used in sufficient quantity in such a manner as to provide positive permanent anchorage of the unit to be anchored in position. Install anchors at spacing to provide for required load carrying capacity.

e) Keep exposed fastenings to a minimum, evenly spaced and neatly laid out.

f) Supply adequate instructions and templates and, if necessary, supervise installation where fastenings or accessories are required to be built into work of other trades.

g) Fastenings shall be of permanent type. Wood plugs are not permitted.

h) Fastenings which cause spalling or cracking of material to which anchorage is being made are not permitted.

i) Do not use powder actuated fastening devises, which are stressed in withdrawal on any part of this work without written approval from the Consultant. Take particular stringent safety precautions when using powder actuated fastenings. Only low velocity plunger-type are permitted.

11. CUTTING, FITTING, AND PATCHING

a) All cutting and patching shall be the responsibility of the General Contractor.

b) All excavation backfilling and concrete work required to complete the work of Section 15 and or Section 16 shall be the responsibility of the General Contractor.

c) Where new work connects with existing and where existing work is altered, cut and patch and make good to match existing work.

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

12. EXISTING SERVICES

a) Where work involves breaking into or connecting to existing services, submit work schedule sufficiently in advance to allow coordination of possible interruption with the Owner. Confirm each interruption 24 hours immediately prior to scheduled date of implementation.

13. ENVIRONMENTAL PROTECTION

a) 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.

14. HAZARDOUS MATERIAL

a) Should material resembling hazardous materials (other than those identified within the Contract Documents), including, but not limited to spray or trowel applied asbestos, be encountered in course of work; stop work immediately. Do no proceed until written instructions have been received from Consultant.

b) Any material which contains asbestos that is disturbed or removed during construction work (see Asbestos Content Report (where applicable)), shall be removed in accordance with the regulations set out by the Occupational Health & Safety Act. All costs for proper cutting, removal and disposal of all asbestos on this contract shall be included in Tender. Refer also to Section 2C (as applicable).

c) 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 Jurisdictional Authority.

15. CLEANING

a) All rubbish and construction debris must be removed from the entire site on a regular basis, so that the site is maintained in a clean, safe condition. Materials removed are to be disposed of in a manner acceptable to the Provincial Department of Communities, Land & Environment.

b) Vacuum clean all areas prior to painting and close all areas after completion of painting to restrict access to authorized persons.

c) On completion of work, by other trades, mop clean all resilient flooring strip using wet method to remove all layers of new or existing finish. Reseal with one coat sealer and two coats wax (wax to contain a minimum of 22% solids). Vacuum clean all carpets. All cleaning to be carried out by competent cleaners.

d) Dust and clean all surfaces including glass (interior and exterior), doors and hardware.

e) Arrange and pay for replacement of heating, ventilation and air conditioning filters if operated during construction.

16. FIRES

a) Do not light fires of any sort to burn rubbish resulting from the work.

17. ACCESS TO SITE

a) Access to site shall be directed by the Consultant.

18. SITE LIMITS

a) The limits of the site are shown on the drawings and all activity relating to the contract shall be confined within these limits.

19. MAINTENANCE MANUALS

Prior to the issuance of the final certificate the following items shall be assembled and incorporated into a three ring binder complete with table of contents:

a) All warranties and guarantees submitted by manufacturers.

b) The printed or typewritten copies of recommended maintenance procedures for all items requiring regular maintenance.

c) A copy of all approved Shop Drawings.

20. PERMITS

a) Obtain and pay for all required permits, licenses, and inspections; required by applicable laws and regulations. Except the building permit which will be paid for by the Owner.

21. TOBACCO PRODUCT USAGE BAN

The use of Tobacco products is not permitted within the building or property.

a) Property – Includes all lands and buildings under the control of the Government of PEI.

b) Tobacco Products – Includes cigarettes, cigars, pipes, chewing tobacco, snuff, and any other products containing or reasonably resembling tobacco or tobacco products except approved cessation products used in approved cessation programs.

c) Tobacco Usage Ban – Includes smoking, chewing, dipping or any other form of use of tobacco products.

END

1. GENERAL

   a) This Section shall include finish grading, the supply and placing of topsoil, lime, fertilizer and planting of grass or placing of sod within the site limits and where indicated on the drawings.

2. TOPSOIL

   a) Spread previously stock piled topsoil over prepared sub-grade to depth of 150mm in all areas to be seeded.

   b) Import and spread, on site, additional clean friable topsoil if site supply is insufficient.

   c) Remove excess topsoil from the site.

   d) Rake and compress topsoil layer to produce even gradients between elevations given, free from depressions and ridges, remove all stones retained on 12.5mm screen.

3. FERTILIZER

   a) Spread and rake in fertilizer at a rate of 9.8kg per hundred square meters. Fertilizer shall be worked into top 100mm of topsoil

   b) Fertilizer shall be furnished in containers plainly marked as to chemical analysis and shall have the following composition by weight:

      .1 10-10-10

Nitrogen	10% min.
Available Phosphoric Acid (P205)	10% min.
Water Soluble Potash (k20)	10% min.

4. LIME

   a) Apply 24.4kg of lime per hundred square meters. Lime shall be worked into the top 150m of topsoil.

5. SOD

   a) Nursery Sod:

      .1 Quality and source to comply with standards outlined in *Guide Specification for Nursery Stock*, Section 17, 1978 edition, published by Canadian Nursery Trades Association.

(a) Number one Kentucky Bluegrass/Fescue Sod: sod grown from minimum 40% Kentucky Bluegrass, 30% Creeping Red Fescue.

(b) Broken, dry, discolored pieces will be rejected by Consultant.

b) Lay sod in rows, perpendicular to slope, and with joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.

c) Provide close contact between sod and soil by light rolling, use of heavy roller to correct irregularities in grade is not permitted.

d) Water sod immediately after laying to obtain moisture penetration into top 100mm of topsoil

e) Top dress sodded area, to fill in joints between sod; material for top dressing is to be dry friable clean topsoil with a high humus content.

f) Over-seed top dressed area using 1kg grass seed per 100 sq. meters, with seed mixture of 50% Kentucky Blue Grass and 50% Creeping Red Fescue.

END

1. MATERIALS

Materials used to make concrete shall be as follows:

a) Portland Cement: CSA Spec A5, Type 1, Use only one brand throughout job, unless otherwise approved.

b) Coarse Aggregates: Clean, sound graded gravel: CSA Spec A23-1. The maximum size of coarse aggregate shall not be larger than one-fifth the narrowest dimension between forms of the member for which the concrete is to be used, nor one-third the thickness of unreinforced slabs on ground nor three-fourths the minimum clear spacing between reinforcing bars, or between reinforcing bars and forms. Absorption in coarse aggregate shall not exceed five percent.

c) Fine Aggregates: Clean, sound, sharp, free from foreign matter; per CSA A5, fineness modulus not to vary more than 0.2 from approved sample unless further approval is given.

d) Water: Clean, free from oil, acid, and injurious amounts of vegetable matter, alkalis, or other salts.

e) Admixtures: Air entrainment agent shall be used, per manufacturer's recommendation, for all concrete exposed to the weather including foundation walls. Grace Construction Material "Darex AEA" or approval equal, meeting CSA A23 or ASTM C-260, to produce 4% - 6% entrained air. Accelerating agents or other additives to be used only on approval of the Consultant.

f) Membrane Curing Compound: The curing compound shall be a clear liquid suitable for spray or brush application. It shall conform to ASTM Specification C309-58. Coloured cure/seal shall be used where the finish schedule calls for coloured concrete.

2. MIX PROPORTIONS

a) All concrete shall be proportioned to yield a compressive strength of 25 MPa at 28 days.

b) To meet this requirement the average of any five consecutive strength tests of lab cured specimens shall meet or exceed the specified strength and not more than 10 percent of all the tests shall have values less than the specified strength and no three consecutive tests shall be less than the specified strength.

3. PLACING

a) Refer to structural plan for any notes that refer to reinforced concrete lintels, beams, etc. Do not start placing concrete until necessary preparations have been completed and Consultant's approval given. Preparations consist of completion of all form work involved, placing all reinforcing steel, pipes, conduits, sleeves, hangers, anchors, fastening devices and such work to be built into the concrete in section to be poured, and any other items supplied and/or located by other trades for embedment in the concrete.

b) All sub-soil for slabs on ground shall be approved before placing concrete.

c) Transport concrete to place of deposit as rapidly as practicable, by methods which prevent separation or loss of ingredients. Concrete conveyed by trucks shall be equipped to agitate the mixture after the mixing requirements above are met. Such conveyance shall not consume more than 1 ½ hours or allow more than 300 revolutions of the drum container at max. 2 RPM or the agitating speed recommended in writing by the manufacturer of the conveying equipment.

d) Place concrete within or on fully prepared formwork by methods which do not result in segregation, or displacement of reinforcing. The rate of depositing the concrete shall not be greater than that for which the formwork is designed.

e) During and immediately after deposition, thoroughly compact using high frequency compactors in formwork and spaces on ground. Thoroughly work around reinforcing, embedded fixtures and into all parts of forms. Do not agitate to point where segregation occurs.

f) Deposit continuously or in roughly horizontal layers of such thickness that no material will be deposited on concrete which has hardened sufficiently to cause formation of seams and planes within the section.

g) Whenever possible, concrete structures shall be cast in one operation. Where this is not possible, the resulting joints shall be roughened and cleaned of foreign materials, using a stiff wire brush and a stream of water; then be slushed with a mortar consisting of one part Portland cement and two parts sand.

h) If the placing of the concrete is suspended, all necessary grooves for joints for future work shall be made before concrete has had time to set.

i) Do not start during rain, not continue during rain after starting, except to come to a suitable cut-off point. Concrete placed during rain to have cement content increased in the amount of one sack of cement per cubic yard of concrete and cover shall be provided over deposited concrete promptly after depositing.

j) No concrete shall be placed in water, nor shall water be permitted to rise on it, without the approval of the Consultant.

k) Expansion and/or construction joints, shall be constructed where shown.

l) No wheeling, walking, working or other activities will be allowed on the finished surface within 48 hours after same has been placed.

m) The finished surface of the concrete floor slab shall be finished to a tolerance of 1/8" in 10'-0" from level over the entire surface area.

4. FINISHING

a) Float Finish: All horizontal concrete slabs shall be screeded and compacted to lines indicated on the plans, to full thickness shown. Hand floats may be used, surface straight and even, free from ridges or hollows.

5. CURING

a) Concrete shall be maintained in a moist condition for at least seven days after placing.

b) For foundation walls, columns and suspended slabs this shall be accomplished by one or more of the following methods:

.1 Surface remaining in contact with forms.
.2 Covering with burlap or cotton mats kept continuously wet.

c) Slabs on grade are to be kept in a moist condition for seven days after placing.

6. CONTROL JOINTS FOUNDATION WALLS

n/a

7. CONTROL JOINTS IN FLOOR SLAB

Where control joints are specifically identified on the drawings they shall be cut into the slab within 24 hours of slab finishing. The joints shall be 1/3 the depth of the slab.

8. COLOURED CONCRETE SLABS

n/a

END

1. General

1.1. Related Sections

.1 Division 0

.2 Division 1

.3 Division 21

.4 Section 22 07 00 Plumbing Insulation

.5 Section 22 10 00 Plumbing Piping

.6 Division 23

.7 Division 25

1.2. Inspection of Site

.1 This Trade shall visit the site and thoroughly review all existing conditions. It is expected that any work caused by existing conditions which could have been reviewed at the time of tender shall be included in the tender price. This includes, but is not limited to, re-routing of existing services, reconnecting to existing services, relocation or removal of superfluous materials.

1.3. Cooperation

.1 The drawings are diagrammatic in nature and cannot show all the details of the installation. This Trade is responsible for interpreting the drawings and providing suitable installations as best as possible based on the intent of the drawings.

.2 If dimensions are provided in the drawings or specifications, the implications shall be field checked before ordering any material. Notify the Consultant immediately if any interferences or discrepancies arise due to design parameters. Coordinate with all other trades with respect to any changes required in the contract documents for equipment or material installation.

.3 Store materials out of the way of other trades and keep all work areas clean daily.

1.4. Shop Drawings

.1 Refer to Divisions 0 and 1 for additional shop drawings requirements.

.2 Submit within two business days of award, a list of all equipment to be provided, complete with manufacturer and model number. Identify all equipment with expected long lead times.

.3 Shop drawings shall be reviewed and returned electronically.

.4 Shop drawings shall be specific to the project – generic shop drawings will be returned not reviewed. Shop drawings much provide all relevant performance data, dimensions and weight. All options must be selected. Shop drawings must be carefully reviewed by the Contractor and this Trade before being submitted for review. Shop drawings shall bear the mark of both the Contractor and this Trade.

.5 All applicable approvals shall be shown, such as CSA, ULC, FM, etc.

.6 All reviewed shop drawings shall be distributed by the Contractor to all effected trades for coordination. Clearly highlight any discrepancies between specified equipment and equipment provided. Any cost incurred by Trades by deviation from provided equipment specifications shall be at no cost to the Owner.

.7 Equipment and materials shall not be ordered until the Consultant as returned a shop drawing marked “reviewed” or “reviewed as modified”. The Trade shall assume all responsibility to ensure all modifications are made to shop drawings marked “reviewed as modified” before ordering equipment or materials.

1.5. Alternatives

.1 Equipment and materials specified in these specifications are for the purposes of design and coordination. This does not limit the Contractor or Trade from providing alternative products. Where products are listed as alternative in the specification, this Trade is still responsible for ensuring the product or materials meets all specifications. Listing of a manufacturer as an approved equal or alternative does not indicate that the manufacturer has an equivalent product. It does indicate that the manufacturer's level of quality is of a similar level to the specified.

.2 The Owner shall approved, and have the full right to refuse, any equipment or material proposed by the Contractor or Trade as an alternative or equal to the specified if not specifically noted in the contract documents.

1.6. Insurance

.1 This Trade shall obtain and maintain insurance which will fully protect themselves and the Owner for any and all claims.

1.7. Codes, Fees and Certificates

.1 This Trade shall procure and pay all fees for all work required by these specifications, unless specifically noted otherwise.

.2 All work done by this Trade shall be done in the strictest adherence with all applicable codes and standards.

.3 All changes required by the Authority having jurisdiction shall be made at no cost to the Owner.

1.8. Demolition

.1 This trade shall remove all superfluous materials and materials shown to be removed which relevant to these specifications.

.2 Cap all connection no longer required. Protect all equipment and material which are to remain.

.3 Any demolition of a structural nature shall not be performed by this trade.

1.9. Hazardous Materials

.1 Report to the Consultant any hazardous or dangerous materials in the existing building.

.2 The Owner will arrange to have any hazardous or dangerous materials removed, unless specifically noted as part of the Contract scope of work.

.3 Only qualified trades shall remove such materials.

1.10. Trial Period

.1 It is understood that the systems, equipment and materials installed under this contract are under a trial period until fully accepted by the Owner. Certificate of substantial performance is not acceptance of the system by the Owner.

1.11. Deficiencies

.1 The Contractor and Trade shall review their own work and make deficiency lists prior to review by the Consultant. Deficiencies are to be corrected when possible before the Consultant review, otherwise, the list shall be provided to the Consultant before the Consultant's review.

.2 The Consultant shall provide deficiency reports. This Trade shall correct all deficiencies in a timely manner and report the results to the Consultant. Photographic proof shall be provided for all final deficiencies.

1.12. Record Drawings

.1 This Trade shall keep a clean and neat record of all deviations made from the contract drawings.

.2 Provide to the Owner a clean set of drawings marked "As Built".

1.13. Operating & Maintenance

.1 Provide to the Owner, at the completion of the project, two complete sets of operation and maintenance manuals (O&M).

.2 Manuals shall include:

.1 All shop drawings. Where shop drawings were marked “reviewed as modified”, the Trade shall update the shop drawing for the O&M manual.

.2 All operating manuals for all equipment.

.3 As-built drawing

.3 The manual shall be provided in a 3-D-ring binder, complete with index. The binder shall not be more than 80% full.

.4 This trade shall provide training to the Owner or Owner’s representative for all equipment and systems installed. Where appropriate, the training shall be done by a representative of the manufacturer.

1.14. Guarantees and Warranties

.1 This trade shall guarantee the Owner a labour and materials warranty for all equipment, material and systems provided as part of this contact for a period of one year from the date of substantial performance unless otherwise specified.

2. Products

2.1. Identification

.1 Provide lamicoid or metal engraved name plate for all equipment. Name plates shall include tag number and all major performance data.

.2 Provide snap-around plastic labels for all piping. Labels shall provide the service and direction of flow. Lettering shall be a minimum of 50mm (2”).

3. Execution

3.1. Identification

.1 Provide snap-around plastic labels for all piping. Provide labels on each side of all pipe penetration and at minimum every 3 m (10’) in concealed areas and 6 m (20’) where easily visible.

End of Section

1. General

1.1. Related Sections

.1 Division 0

.2 Division 1

.3 Division 21

.4 Section 22 05 00 Common Work Results for Plumbing

.5 Section 22 07 00 Plumbing Insulation

.6 Section 22 30 00 Plumbing Equipment

.7 Section 22 40 00 Plumbing Fixtures

.8 Division 23

.9 Division 25

1.2. Scope of Work

.1 Provide all piping, fittings, valves, drains, traps, and materials as required to provide a complete and operational plumbing system.

.2 The scope of work includes all accessory drains from equipment.

1.3. Submittals

.1 Valves

2. Products

2.1. General

.1 All materials shall comply with all applicable codes and regulations.

2.2. Valves

.1 Provide: Toyo, Kitz, Nibco, Watts, Victaulic, Viega or Zurn valves. Valves shall have a 200 CWP rating. Valves shall all be from one manufacturer, where possible.

.2 Ball valves shall have stainless steel trim.

.3 Provide extended handle levers as required for insulation thickness.

.4 All stems shall be blow-out proof.

2.3. Hangers

.1 Provide hangers and supports from: Anvil, Crane, Myatt or Unistrut.

.2 Hangers shall be manufactured items and rated for the service type and size provided.

2.4. Drain Piping

.1 Above-ground sanitary piping shall be PVC or DWV copper.

.2 Provide sweat fittings for DWV copper piping. Use 95:5 tin-antimony solder.

.3 Provide solvent weld fittings for PVC.

.4 Provide mechanical joint couplies with neoprene or butyl rubber compression gaskets. Each coupling to have four or more type 304 stainless steel banks. Connection to meet ASTM C1540.02.

2.5. Water Piping and fittings

.1 Provide type L hard copper tubing.

.2 Sweat fittings for copper piping.

.3 Provide unions for connection to equipment up to 63 mm (2-1/2”). Provide flanges for larger connections.

3. Execution

3.1. General

.1 Install eccentric fitting to aid with drainage and air elimination.

.2 Where pipe size differs from equipment, provide reducing fittings at the equipment.

.3 Use dielectric fittings where connecting differing metallic materials.

3.2. Valves

.1 Provide types of valves shown on the drawings. Valve shall be line-sized unless otherwise noted.

.2 Provide valves where shown on the drawings, and on both sides of all equipment for isolation at a minimum, regardless if shown or not.

.3 Valve 2” (50 mm) and under shall be soldered or threaded or Victaulic. Larger valves shall be flanged or Victaulic.

3.3. Hangers

.1 Where implied from the drawings, hang equipment and material from the structure. Provide suitable hangers rods and beam clamps or insert.

.2 Hang equipment and material from structural elements only.

.3 Attach to the top chord only when hanging from joists.

3.4. Drain Piping

.1 Install with a minimum of 1:100 slope unless otherwise noted on the drawings.

.2 Plug or cap all pipes during construction to minimize debris from entering the piping.

3.5. Water Piping and Fittings

.1 Provide drains at all low points to allow for complete draining of the system.

.2 All water piping shall be pressure tested.

3.6. Drains

.1 Provide piping from equipment drains to nearest floor drain, or connect indirectly to nearest sanitary line.

End of Section

1. General

1.1. Related Sections

.1 Division 0

.2 Division 1

.3 Division 21

.4 23 07 00 Insulation for HVAC

.5 23 10 00 Facility Fuel Systems

.6 23 20 00 HVAC Piping and Pumps

.7 23 50 00 Central Heating Equipment

.8 Division 25

1.2. General Notes

.1 The requirements of Division 0 and Division 1 of these specifications apply to all section of these specifications.

.2 The term “Trade” refers to all trades that provide work within this section. The term “Contractor” refers to the General or Prime Contractor, however, it is this trade’s responsibility to ensure the Contractor knows and understand all the requirements in these specifications.

1.3. Scope of Work

.1 It is the intent of these specifications to describe a complete working HVAC system, conforming to all applicable codes and standards. All work shall be provided in such a manner as to provide a complete and working system.

.2 These specifications shall be read in conjunction with all other specifications for this project and all drawings sketches. There is a requirement for this Trade to coordinate services with all other trades.

1.4. Inspection of Site

.1 This Trade shall visit the site and thoroughly review all existing conditions. It is expected that any work caused by existing conditions which could have been reviewed at the time of tender shall be included in the tender price. This includes, but is not limited to, re-routing of existing services, reconnecting to existing services, relocation or removal of superfluous materials.

1.5. Cooperation

.1 The drawings are diagrammatic in nature and cannot show all the details of the installation. This Trade is responsible for interpreting the drawings and providing suitable installations as best as possible based on the intent of the drawings.

.2 If dimensions are provided in the drawings or specifications, the implications shall be field checked before ordering any material. Notify the Consultant immediately if any interferences or discrepancies arise due to design parameters. Coordinate with all other trades with respect to any changes required in the contract documents for equipment or material installation.

.3 Store materials out of the way of other trades and keep all work areas clean daily.

1.6. Shop Drawings

.1 Refer to Divisions 0 and 1 for additional shop drawings requirements.

.2 Submit within two business days of award, a list of all equipment to be provided, complete with manufacturer and model number. Identify all equipment with expected long lead times.

.3 Shop drawings shall be reviewed and returned electronically.

.4 Shop drawings shall be specific to the project – generic shop drawings will be returned not reviewed. Shop drawings much provide all relevant performance data, dimensions and weight. All options must be selected. Shop drawings must be carefully reviewed by the Contractor and this Trade before being submitted for review. Shop drawings shall bear the mark of both the Contractor and this Trade.

.5 All applicable approvals shall be shown, such as CSA, ULC, FM, etc.

.6 All reviewed shop drawings shall be distributed by the Contractor to all effected trades for coordination. Clearly highlight any discrepancies between specified equipment and equipment provided. Any cost incurred by Trades by deviation from provided equipment specifications shall be at no cost to the Owner.

.7 Equipment and materials shall not be ordered until the Consultant as returned a shop drawing marked “reviewed” or “reviewed as modified”. The Trade shall assume all responsibility to ensure all modifications are made to shop drawings marked “reviewed as modified” before ordering equipment or materials.

1.7. Alternatives

.1 Equipment and materials specified in these specifications are for the purposes of design and coordination. This does not limit the Contractor or Trade from providing alternative products. Where products are listed as alternative in the specification, this Trade is still responsible for ensuring the product or materials meets all specifications. Listing of a manufacturer as an approved equal or alternative does not indicate that the manufacturer has an equivalent product. It does indicate that the manufacturer’s level of quality is of a similar level to the specified.

.2 The Owner shall approved, and have the full right to refuse, any equipment or material proposed by the Contractor or Trade as an alternative or equal to the specified if not specifically noted in the contract documents.

1.8. Codes, Fees and Certificates

.1 This Trade shall procure and pay all fees for all work required by these specifications, unless specifically noted otherwise.

.2 All work done by this Trade shall be done in the strictest adherence with all applicable codes and standards.

.3 All changes required by the Authority having jurisdiction shall be made at no cost to the Owner.

1.9. Excavation and Cutting

.1 This Trade shall be responsible for all excavation, trenching, cutting and patching required, where such work is not explicitly shown on other Trade’s drawings and is implicit in the required work of this Trade.

.2 All materials placed in excavated trenches shall be placed in undisturbed soil. Backfill with clean sand and have the soil compacted to 95% MMDD with the compacted level to the top of the trench.

.3 Protect excavations with braces and supports as required in order to maintain a safe working environment. Provide pumps as required to maintain the bottom of the excavation dry.

.4 Restore any structures removed, modified or destroyed as a result of the trenching or excavation.

1.10. Supports

.1 Provide steel or concrete supports as required for all equipment and materials. This trade is responsible for all anchoring and setting of supports, unless specifically noted otherwise.

1.11. Penetrations

.1 Penetrations through wall, roofs, floors, etc shall be done by methods which do not allow the material to rub or wear on the building structure.

.2 For masonry and concrete penetrations, provide sleeves through the structure. For other penetrations, provide opening and protect the piping with wrap or insulation. Where insulation is specified, ensure the penetration or sleeve is of adequate size to allow the insulation to be continuous through the penetration.

.3 All penetrations through fire rated structures shall be properly fire-stopped to a listed assembly.

.4 This trade shall be responsible for all penetrations through the roof. Work to be performed by qualified roofing trades which maintain the roof warranty.

1.12. Demolition

.1 This trade shall remove all superfluous materials and materials shown to be removed which relevant to these specifications.

.2 Cap all connection no longer required. Protect all equipment and material which are to remain.

.3 Any demolition of a structural nature shall not be performed by this trade.

1.13. Hazardous Materials

.1 Report to the Consultant any hazardous or dangerous materials in the existing building.

.2 The Owner will arrange to have any hazardous or dangerous materials removed, unless specifically noted as part of the Contract scope of work.

.3 Only qualified trades shall remove such materials.

1.14. Trial Period

.1 It is understood that the systems, equipment and materials installed under this contract are under a trial period until fully accepted by the Owner. Certificate of substantial performance is not acceptance of the system by the Owner.

1.15. Start-up

.1 The Trade shall start-up all equipment as per the manufacturer's instruction.

.2 Complete all manufacturer's recommended start-up procedures and paperwork, and include the information in the operation and maintenance manual.

.3 Equipment shall be operated for a minimum of 1 week by this Trade before handing over to the Owner.

.4 Notify the Consultant and Owner before start-up tests are scheduled and allow the Consultant and/or Owner to witness the start-up.

.5 Where appropriate, the manufacturer's representative shall be present to conduct the start-up.

1.16. Testing and Commissioning

.1 Notify the Consultant and Owner before commissioning tests are scheduled and allow the Consultant and/or Owner to witness the testing.

.2 Test the equipment through all operations. Ensure proper operation and set-up of all equipment.

.3 Make record of any deficiencies in the operation and take measures to immediately correct deficiencies.

.4 The Trade shall return to site for each of the next three seasons to confirm the equipment is operating as intended. Coordinate with the Owner and weather for proper verification of operation.

1.17. Testing, Adjusting and Balancing

.1 Provide the services of a NEBB or AABC certified testing and balancing company (TAB) to adjust and balance all equipment and systems.

.2 The TAB trade shall provide all equipment and labour required to completely balance the entire system. Where reasonably inferred, the TAB trade shall made adjustment to systems and equipment serving the scope of the project but not necessarily supplied in the project.

.3 Testing, adjusting and balancing shall be conducted as soon as possible after the installation of the systems, but shall be cognizant of incomplete systems which could affect the final results.

.4 The TAB report shall include all the following information, where relevant:

- Equipment Tag/Number
- Manufacturer
- Model
- Motor HP
- Operating BHP, Amperage, Voltage, RPM
- Equipment curves
- Discharge and inlet pressures
- Discharge and inlet temperatures

1.18. Deficiencies

.1 The Contractor and Trade shall review their own work and make deficiency lists prior to review by the Consultant. Deficiencies are to be corrected when possible before the Consultant review, otherwise, the list shall be provided to the Consultant before the Consultant's review.

.2 The Consultant shall provide deficiency reports. This Trade shall correct all deficiencies in a timely manner and report the results to the Consultant. Photographic proof shall be provided for all final deficiencies.

1.19. Record Drawings

.1 This Trade shall keep a clean and neat record of all deviations made from the contract drawings.

.2 Provide to the Owner a clean set of drawings marked "As Built".

1.20. Operating & Maintenance

.1 Provide to the Owner, at the completion of the project, two complete sets of operation and maintenance manuals (O&M).

.2 Manuals shall include:

.1 All shop drawings. Where shop drawings were marked "reviewed as modified", the Trade shall update the shop drawing for the O&M manual.

.2 All operating manuals for all equipment.

.3 As-built drawing

.4 Start-up Reports

.5 Training material

.3 The manual shall be provided in a 3-D-ring binder, complete with index. The binder shall not be more than 80% full.

.4 This trade shall provide training to the Owner or Owner's representative for all equipment and systems installed. Where appropriate, the training shall be done by a representative of the manufacturer.

1.21. Guarantees and Warranties

.1 This trade shall guarantee the Owner a labour and materials warranty for all equipment, material and systems provided as part of this contact for a period of one year from the date of substantial performance unless otherwise specified.

2. Products

2.1. Identification

.1 Provide lamicoid or metal engraved name plate for all equipment. Name plates shall include tag number and all major performance data.

.2 Provide snap-around plastic labels for all piping. Labels shall provide the service and direction of flow. Lettering shall be a minimum of 50mm (2”).

3. Execution

3.1. Identification

.1 Provide identification for all piping and ductwork. Provide labels on each side of all penetrations and at minimum every 3 m (10’) in concealed areas and 6 m (20’) where easily visible.

.2 Provide all equipment with nameplates.

3.2. Fire-stopping

.1 Contractor to identify all fire separation on-site and provide fire-stopping for all penetrations through the fire separations.

.2 Fire stopping shall meet the requirements of the National Building Code.

3.3. Training

.1 Training may be provided either at substantial completion after commissioning, or later near the end of the 1 year warranty period and the discretion of the Owner.

.2 Provide a minimum of 2 hour on-site training for the Boiler and Control System.

3.4. Testing, Adjusting and Balancing

.1 Both boilers are to be checked for flow and recorded.

.2 New pumps are to be balanced as follows:

.1 Before construction starts:

.1 All zone valves in the building are to be opened.

.2 Existing pumps to operate as per existing operation.

.3 TAB trade shall measure using ultrasonic flow meter for existing flow rate.

.2 After construction:

.1 New pumps are to be installed.

.2 All zone valves in the building are to be opened.

.3 Modulate the new pump to produce the identical flow as the old pumps. Measure the flow rate using the CBV.

.4 Measure and record the supply and return pressures to determine the system differential pressure.

End of Section

1. General

1.1. Related Sections

.1 Division 0

.2 Division 1

.3 Division 21

.4 23 05 00 Common Work Results for HVAC

.5 23 10 00 Facility Fuel Systems

.6 23 20 00 HVAC Piping and Pumps

.7 23 50 00 Central Heating Equipment

.8 Division 25

1.2. Scope of Work

.1 Provide insulation for all piping and ductwork as described in Division 23 and as more thoroughly described in this section.

1.3. Submittals

.1 Provide submittals for all insulation materials. Mark the intended service and thickness for each material.

1.4. Flame Spread and Smoke Development Ratings

.1 All materials as provided shall meet the 50/25 flame spread and smoke development ratings in accordance with ASTM and ULC.

2. Products

2.1. Insulation for Piping

.1 Provide Johns Manville, CertainTeed, Knauf or Owens Corning insulation.

.2 For hydronic piping, provide fibreglass type insulation with factory applied vapour retarding jacket and pressure sensitive lap sealing system. Jacket shall be high-density, white kraft bonded to an aluminum foil reinforced with fibreglass.

2.2. Duct Insulation

.1 Rigid duct insulation shall be 50 kg/m^3 (3 lb/ft^3) density resin-bonded thermos-set glass fibre rigid insulation board with a type FSK vapour retarding facing.

2.3. Coverings

.1 PVC covering shall be molded fitted cover, taped or glued joints. PVC shall be minimum thickness of 0.5mm (0.020”).

2.4. Adhesives and Sealants

.1 Provide coatings, adhesives and sealants as recommended by the manufacturer of the insulation.

3. Execution

3.1. General

.1 Insulation thicknesses are based on standard RSI-28/m (R-4/inch) at 24°C ambient temperature. Variations of this thermal resistant shall require a revision in the minimum thickness applied.

.2 Ensure piping and ductwork is dry and clean before applying insulation.

.3 All pressure tests shall be conducted and passed before applying insulation.

.4 Insulation shall be continuous through penetrations. Protect insulation by means of sleeves or other acceptable means. Fire separations shall be provided with a listed penetration detail.

.5 Protect insulation using galvanized sheet steel where hangers support insulated piping. Use blocking of the thickness of the insulation to support the piping without crushing the insulation.

.6 Finish product shall be neat and clean.

.7 Where insulation has been removed for tie-ins to existing piping, restore existing insulation and covering.

.8 Ensure the final finish for all coverings have a flame spread rating 25 or lower and smoke index is 50 or lower.

3.2. Insulation for Piping

.1 Provide the following thickness for piping service:

.1 Hot Water Heating: 2” (75mm)

.2 Install insulation as per manufacturer’s recommendations.

3.3. Insulation for Piping

.1 Insulate the entire run for intake combustion air to the boiler with 2” of insulation.

.2 Insulate the last 6’ of the exhaust venting with 2” of insulation.

3.4. Coverings

.1 Do not install covering until the insulation has been inspected by the Consultant.

.2 Provide PVC covering for all exposed piping.

3.5. Existing Work

.1 Make good any insulation removed or damaged as a result of new work.

End of Section

1. General

1.1. Related Sections

.1 Division 0

.2 Division 1

.3 Division 21

.4 23 05 00 Common Work Results for HVAC

.5 23 07 00 Insulation for HVAC

.6 23 20 00 HVAC Piping and Pumps

.7 23 50 00 Central Heating Equipment

.8 Division 25

1.2. Scope of Work

.1 Provide a complete fuel system including piping, tanks, fittings, accessories, controls, gauges, ancillaries, equipment, etc. as more thoroughly described in this section.

.2 All work shall confirm to local bylaws and to the most recent publications of CSA B149.1 and CSA B139 and to the National Building Code of Canada 2015.

.3 Only qualified trades-people shall install equipment and materials related to this section.

.4 This Trade is responsible for applying for all permits for equipment installation and coordinating inspections with the regulatory authorities.

1.3. Qualifications

.1 Work performed in this sections shall be a petroleum contractor licenced in the Province of Prince Edward Island.

1.4. Submittals

.1 Piping

.2 Tanks

.3 Gauges

.4 Valves

.5 Fittings

.6 Vapourizer

2. Products

2.1. Piping

.1 Provide ASTM A53 grade B, schedule 40 ERW black steel pipe for 50mm (2”) and greater. Provide ASTM A53 continuously-welded steel piping for under 50mm (2”).

.2 Provide Class 150 threaded connections for 50mm (2”) and less.

.3 Piping 63mm (2-1/2”) and larger shall be butt welded to ANSI. Welding neck flanges shall be Class 150 or better.

.4 All fill and vent piping shall be galvanized. All other piping shall be painted with a corrosion resistant paint.

2.2. Valves

.1 All valves shall be CSA approved.

.2 Provide pressure regulating valves and relief valves as shown. Sizes shall be based on manufacturer's recommendations.

2.3. Gauges

.1 All gauges shall be CSA approved.

2.4. Tanks

.1 Coordinate arrangement of rental tank between Owner and Owner's propane supply company.

.1 Tanks shall meet the requirements of CSA B149.2 and CSA B51 with a working pressure of not less than 250 PSIG (1750 kPa).

.2 Tanks shall be provided with integral pressure relief.

.3 Tanks shall be horizontal suitable for installation outside on a concrete pad.

.4 Tanks shall be provided with openings as required for vapour and liquid delivery.

.5 Where tank filling connection exceeds 5 ft (1.5m) in height, provide steel steps for filling.

2.5. Vapourizer

.1 Provide a vapourizer rated as per the drawings for connection to the propane tank.

.2 Vapourizers shall be Algas Torrexx Electric or similar.

.3 Vapourizers shall be rated for zero clearance to propane tanks. Explosion proof Class 1, Group D, Division 1.

.4 Equipment shall be CSA listed and meet all requirements of CSA B149.2.

.5 Vapourizers shall have an economizer valve to allow the tank to bypass the vapourizer.

.6 Provide single stage separator on the outlet of the vapourizer.

3. Execution

3.1. Regulatory Approvals

.1 This trade is responsible for paying all fees and obtaining all regulatory approvals for the petroleum design as intended and outlined in the specification and the drawings.

.2 The trade shall employ persons whom are qualified and experienced with obtaining environmental approvals. This trade is responsible for providing additional engineered drawings as required for regulatory approval.

.3 Approvals shall encompass all regulatory and permitting required to operate the building as generally designed.

3.2. Piping

.1 Provide adequate support for all piping.

.2 Install piping as recommended by the manufacturer.

.3 All piping penetrations shall be wrapped and sleeved.

.4 Provide piping in accordance with CSA B149.1.

3.3. Valves

.1 Provide valves at each connection to all equipment, where allowed by applicable codes and standards.

3.4. Gauges

.1 Provide gauges where shown on the drawings.

3.5. Tanks

.1 Install all tanks to manufacturer's recommendations.

.2 Provide minimum clearances around tanks as required.

3.6. Vapourizer

.1 Install to manufacturer's recommendations.

End of Section

1. General

1.1. Related Sections

.1 Division 0

.2 Division 1

.3 Division 21

.4 23 05 00 Common Work Results for HVAC

.5 23 10 00 Facility Fuel Systems

.6 23 07 00 Insulation for HVAC

.7 23 50 00 Central Heating Equipment

.8 Division 25

1.2. Scope of Work

.1 Provide a complete hydronic system, including piping, pumps, etc. as required and as more thoroughly described in this section.

1.3. Submittals

.1 Piping

.2 Wallfin

.3 Gauges

.4 Valves

.5 Fittings

2. Products

2.1. Hydronic Piping

.1 Provide ASTM A53 grade B, schedule 40 ERW black steel pipe for 50mm (2”) and greater. Provide ASTM A53 continuously-welded steel piping for under 50mm (2”).

2.2. Baseboard Radiation (Wallfin)

.1 Aluminum fins on copper tubes.

.2 16 Gauge casing, factory primed with powder coat or baked enamel paint. Colour to be selected by the Architect during shop drawings from no less than 10 standard colours.

.3 Open bottom inlet with bar grille outlet.

.4 End caps at all ends, and enclosure stop at all ends butting into walls.

.5 Provide camlock access door for access to all valves.

2.3. Fittings

.1 Metal piping shall be connected with threaded fittings for 50mm (2”) or smaller. For larger connections, flanged or welded.

.2 Provide union connections or flange connections to all equipment.

.3 Fittings shall be rated for 1.0 MPa (150 PSI).

2.4. Valves

.1 Valves shall be by: Toyo, Kitz, Nibco or Victaulic. All valves shall be from the same manufacturer where possible.

.2 Vavles 50mm (2”) and smaller shall be Class 150 or better. Larger valves shall be Class 300 or better.

.3 Ball valves shall have stainless steel trim.

.4 Size relief valves based on the total installed heating capacity according to ASME.

2.5. Gauges

.1 Provide Winters, Taylor, Trerice or WIKA gauges

.2 Provide 9” (230mm) adjustable stem thermometers with unbreakable glass, dual scale and separable socket and well, with contrasting fluid.

.3 Provide liquid 4” (100mm) filled pressure gauges. Scales to suite the pressure range and dual scale and contrasting colours.

.4 Provide isolation valve for each gauge.

2.6. Hangers

.1 Provide hangers and supports from: Anvil, Crane, Myatt or Unistrut.

.2 Hangers shall be manufactured items and rated for the service type and size provided.

2.7. Accessories

.1 Strainers shall be cast iron, semi-steel or bronze Y type. Screens shall have 1mm (1/32”) perforations. Provide drain with cap and chain.

.2 Mist eliminators shall be manual type complete with ball valve with stainless steel trim and screwdriver operated.

2.8. Base-Mounted Centrifugal Pump

.1 Pumps shall be by: B&G, Armstrong, Taco or approved equal.

.2 Contractor shall furnish and install new end suction long coupled pumps for hot water heating systems as indicated on the drawings. Pumps shall meet types, sizes, capacities, and characteristics as scheduled on the Equipment Schedule drawings. Pump substitutions shall be provided with connection sizes equal to those scheduled. Pump connections shall not be downsized. Pump substitutions shall not be provided at efficiencies less than those scheduled.

.3 The pumps shall be long coupled, base mounted, single stage, end suction, vertical split case design, in cast iron stainless steel fitted, specifically designed for quiet operation. Suitable standard operations at 225°F and 175 PSIG working pressure or optional operations at up to 250°F and 250 PSIG working pressures. Working pressures shall not be de-rated at temperatures up to 250F. The pump internals shall be capable of being services without disturbing piping connections, electrical motor connections or pump to motor alignment.

.4 The pumps shall be composed of three separable components a motor, bearing assembly, and pump end (wet end). The motor shaft shall be connected to the pump shaft via a replaceable flexible coupling.

.5 A bearing assembly shall support the shaft via two heavy-duty regreaseable ball bearings. Bearing assembly shall be replaceable without disturbing the system piping and shall have foot support at the coupling end. Pump bearings shall be regreaseable without removal of the bearings from the bearing assembly. Thermal expansion of the shaft toward the impeller shall be prevented via an inboard thrust bearing.

.6 The bearing assembly shall have a solid SAE1144 steel shaft. A stainless steel shaft sleeve shall be employed to completely cover the wetted area under the seal.

.7 Pump shall be equipped with an internally-flushed mechanical seal assembly installed in an enlarged tapered seal chamber. Application of an internally flushed mechanical seal shall be adequate for seal flushing without requiring external flushing lines. Seal assembly shall have Buna bellows and seat gasket, stainless steel spring, and be of a carbon ceramic design with the carbon face rotating against a stationary ceramic face.

.8 Bearing assembly shaft shall connect to a stainless steel impeller. Impeller shall be both hydraulically and dynamically balanced to ANSI/HI 9.6.4-2016, balance grade G6.3 and secured by a stainless steel locking cap screw or nut.

.9 Pump should be designed to allow for true back pull-out allowing access to the pump's working components, without disturbing motor or piping, for ease of maintenance.

.10 A center drop-out type coupling, capable of absorbing torsional vibration, shall be employed between the pump and motor. Pumps for variable speed application shall be provided with a suitable coupling sleeve. Coupling shall allow for removal of pump's wetted end without disturbing pump volute or movement of the pump's motor and electrical connections. On variable speed applications the coupling sleeve should be constructed of an neoprene material to maximize performance life.

.11 An ANSI and OSHA rated coupling guard shall shield the coupling during operation. Coupling guard shall be dual rated ANSI B15.1 and OSHA 1910.219 compliant coupling guard and contain viewing windows for inspection of the coupling. No more than .25 inches of either rotating assembly shall be visible beyond the coupling guard.

.12 Pump volute shall be of a cast iron design for heating systems with integrally cast pedestal volute support, rated for 175 PSIG with integral cast iron flanges drilled for 125# ANSI companion flanges. (Optional 250 PSIG working pressures are available and are 250# flange drilled.) Volute shall include gauge ports at nozzles, and vent and drain ports.

.13 Motors shall meet scheduled horsepower, speed, voltage, and enclosure design. Pump and motors shall be factory aligned, and shall be realigned after installation by the manufacturer's representative. Motors shall be non-overloading at any point on the pump curve and shall meet NEMA specifications and conform to standards outlined in EISA 2007.

.14 Base plate shall be of structural steel or fabricated steel channel configuration fully enclosed at sides and ends, with securely welded cross members and fully open grouting area (for field grouting). The minimum base plate stiffness shall conform to ANSI/HI 1.3.8.2.1-2019 for grouted Horizontal Baseplate Design standards.

.15 Pump shall be of a maintainable design and, for ease of maintenance, should use machine fit parts and not press fit components.

.16 The pump(s) vibration limits shall conform to Hydraulic Institute ANSI/HI 9.6.4-2016 for recommended acceptable unfiltered field vibration limits (as measured per ANSI/HI 9.6.4-2016 Figure 9.6.4.2.3.1) for pumps with rolling contact bearings.

.17 Pump manufacturer shall be ISO-9001 certified.

.18 Each pump shall be hydrostatically tested 1.5 times the maximum rated working pressure and name-plated before shipment.

.19 Pump shall conform to ANSI/HI 9.6.3.1-2012 standard for Preferred Operating Region (POR) unless otherwise approved by the engineer.

.20 Pump shall be provided with a factory supplied isolation based. Contractor to site verify size of existing pad before submitting shop drawings.

3. Execution

3.1. General

.1 Hydraulically pressure test all piping to twice the design pressure. Isolate equipment which have ratings less than the test pressure.

3.2. Piping

.1 Slope water piping and provide drains a low points.

.2 Install to maintain adequate access to valves and equipment. Ensure proper spacing to allow for installation of insulation.

3.3. Baseboard Radiation (Wallfin)

.1 Install according to piping layout. Provide for pipe movement during normal operation.

.2 Refer to manufacturer's installation drawings.

.3 Connect water equipment as per manufacturer's installation recommendations.

.4 Install all heating units in locations shown on plans complete with valves, etc., and/or as detailed on plans and specifications.

3.4. Fittings

.1 Use dielectric fittings when connecting dissimilar metals.

.2 For threaded connections, use dope or Teflon tape.

.3 Gaskets shall be 2mm (1/16”) thick.

.4 Where connection sizes to equipment differs from the pipe size, use reducers at the equipment.

.5 Connect to equipment using unions or flanges.

3.5. Valves

.1 When using grooved connections, all valves and accessories shall be Victaulic.

.2 For shut-off or isolation service, provide ball valves for sizes 40mm (2-1/2”) and smaller, provide butterfly valves for larger valves.

.3 Provide valve extensions to suite the thickness of the insulation.

.4 Provide pressure gauges on each size of pressure reducing valves.

.5 Install valve with stems upright or horizontal.

3.6. Gauges

.1 Provide gauges where shown on the drawings. At a minimum, provide pressure gauges as the inlets and outlet of pumps and temperature gauges on the inlets and outlets of all heating equipment.

.2 Locate gauges so they can easily be read from the floor in a convenient location.

3.7. Valves

.1 Provide types of valves shown on the drawings. Valve shall be line-sized unless otherwise noted.

.2 Provide valves where shown on the drawings, and on both sides of all equipment for isolation at a minimum, regardless if shown or not.

.3 Valve 2” (50 mm) and under shall be soldered or threaded or Victaulic. Larger valves shall be flanged or Victaulic.

3.8. Hangers

.1 Where implied from the drawings, hang equipment and material from the structure. Provide suitable hangers rods and beam clamps or insert.

.2 Hang equipment and material from structural elements only.

.3 Attach to the top chord only when hanging from joists.

.4 Provide supports for piping 32mm (1-1/4") and smaller at no less than 2.5m (8') intervals. Larger piping shall be supported no less than 3m (10') intervals.

.5 Provide spring hangers at the top of risers with guides at each floor and anchor at the lowest level. Provide swing joints at take-offs at each floor level.

.6 Comply with support requirements of CSA B149.1 for gas piping.

3.9. Accessories

.1 Provide mist eliminators at all high points and where shown on the drawings.

.2 Strainers shall be installed horizontal unless specifically design for vertical installation.

.3 Locate air vents at all high points.

3.10. Base Mounted Centrifugal Pumps

.1 All components shall be installed in accordance with manufacturer's installation instructions.

.2 Reduction from line size to pump connection size shall be made with eccentric reducers attached to the pump with tops flat to allow continuity of flow.

.3 Furnish and install triple duty valves on the discharge side of all pumps and furnish and install a line size shut-off valve on the suction side of all pumps. Anywhere that 5 straight pipe diameters of pipe cannot be provided on the inlet side of a pump a suction diffuser shall be used to provide appropriate flow distribution into the eye of the pump's impeller.

.4 Provide temperature and pressure gauges where and as detailed or directed.

.5 Proper access space around a device should be left for servicing the component. No less than the minimum recommended by the manufacturer.

.6 Circulating pump shall have sufficient capacity to circulate the scheduled GPM against the scheduled external head (feet) with the horsepower and speed as scheduled and/or as denoted on the drawings. Motors shall be of electrical characteristics as scheduled, denoted and/or as indicated on the electrical plans and specifications. Pump characteristics shall be such that the head of the pump under varying conditions shall not exceed the rated horsepower of the drive motor.

.7 Install foot mounted and base mounted pumps on vibration isolation pad or house keeping pad, via anchor bolts. Set and level and grout in place.

.8 All piping shall be brought to equipment and pump connections in such a manner so as to prevent the possibility of any loads or stresses being applied to the connections or piping. All piping shall be fitted to the pumps even though piping adjustments may be required after the pipe is installed.

.9 On components that require draining, contractor must provide piping to and discharging into appropriate drains.

.10 Provide drains for bases and seals, piped to and discharging into floor drains.

.11 Power wiring, as required, shall be the responsibility of the electrical contractor. All wiring shall be performed per manufacturer's instruction and applicable state, federal, and local codes.

.12 Control wiring for remote mounted switches and sensor / transmitters shall be the responsibility of the control's contractor. All wiring shall be performed per manufacturer's instructions and applicable state, federal, and local codes.

3.11. HVAC Water Treatment

.1 Before placing any piping into service, provide chemical cleaning of all hydronic systems.

.1 Add 1% by volume a neutral pH iron cleaner.

.2 Circulate fluid for a minimum of 72 hours

.3 Drain and re-fill each system with water after cleaning and placing into service.

.4 Provide report for Consultant's review.

End of Section

1. General

1.1. Related Sections

.1 Division 0

.2 Division 1

.3 Division 21

.4 23 05 00 Common Work Results for HVAC

.5 23 07 00 Insulation for HVAC

.6 23 10 00 Facility Fuel Systems

.7 23 20 00 HVAC Piping and Pumps

.8 Division 25

1.2. Scope of Work

.1 Provide a complete hydronic system, including piping, pumps, tanks, etc. as required and as more thoroughly described in this section.

1.3. Submittals

.1 Boilers

2. Products

2.1. Propane Condensing Boilers

.1 Factory-fabricated, assembled, and pressure tested, water-tube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including insulated jacket; flue-gas vent; water supply, and condensate drain connections. Each boiler shall be assembled with required wiring and piping as a self-contained unit.

.2 Heat Exchanger: Plasma welded 316L dual tube stainless steel heat exchanger and burner tube with high quality condensing heating surfaces. Each watertube shall be at least 7/8” ID. Stainless steel heat exchangers shall be inspected and tested to ASME Section IV requirements and shall bear the ASME section IV seal of approval. Only boilers employing nonferrous materials on all flue gas passes will be considered.

.3 Pressure Vessel: Carbon steel with welded heads and tube connections, counter-flow design with low- and high-temperature returns. The pressure vessel shall be in accordance with ASME Section IV pressure vessel code.

.4 Burner:

.1 Propane, premixed burner.

.2 The burner shall operate with a 10:1 turn down ratio

.5 Blower: Centrifugal fan to operate during each burner firing sequence and to pre-purge and post-purge the combustion chamber.

.6 Gas Train: The boiler shall be supplied with two gas valves designed with negative pressure regulation and shall be capable of the following minimum turndown ratios:

.7 Ignition: Pilot ignition with 100 percent main-valve shutoff with electronic flame supervision.

.8 Casing:

.1 Jacket: Sheet metal, with snap-in or interlocking closures.

.2 Finish: Electrostatic powder-coated protective finish.

.3 Insulation: Minimum 10mm thick, glass fiber insulation surrounding the heat exchanger.

.4 Combustion Chamber and Other Flue Passage Access: Full-sized front access

.5 Access: Side panels easily removed.

.9 Trim

.1 Include devices sized to comply with ANSI B31.9, "Building Services Piping."

.2 Boiler(s) shall be equipped with a multi-speed circulator pump on each module.

.10 Aquastat Controllers: Operating, firing rate, and high limit.

.11 Safety Relief Valve: ASME rated.

.12 Low Water Cut-off: Manual reset whenever boiler water level falls below safe level.

.13 Pressure and Temperature Gage: Combination water-pressure and -temperature gage. Gages shall have operating-pressure and -temperature ranges so normal operating range is about 50 percent of full range.

.14 Drain Valve: Minimum NPS 3/4 hose-end gate valve.

.15 Condensate Neutralization System:

.1 Provided factory installed of field installed.

.2 If exhaust venting requires a neutralizing tank, provide external or method of connection to neutralize condensate before draining to sanitary.

.16 Controls

.1 Boiler(s) shall be equipped with an integrated 7”color touch-screen controller that shall monitor and control all combustion process functions, control of the boiler water temperature to a value required by the connected components and shall display current water temperatures or fault conditions with changes in operation status.

.2 The boiler shall be provided with BACnet gateway for each boiler to provide BMS access to monitor and control the following variables at a minimum:

.1 Enable/disable

.2 Status

.3 Supply Water Set-point

.4 Return water temperature

.5 Supply water temperature

.6 Alarm

.17 Source Quality Control

.1 Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

.18 Venting

.1 Provide combustion air and exhaust venting using CPVC piping to the manufacturers recommendations.

.2 Provide condensate drain at the base of the exhaust vent and provide trapped outlet to neutralizing tank.

3. Execution

3.1. General

.1 Protect all equipment from the elements and moisture damage. Store inside. Prevent physical damage to all equipment. Replace any damaged panels before turn-over.

3.2. Propane Condensing Boilers

.1 Install boilers level on concrete base.

.2 Install gas-fired boilers according to NFPA 54.

.3 Assemble and install boiler trim.

.4 Install electrical devices furnished with boiler but not specified to be factory mounted.

.5 Install control wiring to field-mounted electrical devices.

.6 Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

.7 Install piping adjacent to boiler to allow service and maintenance.

.8 Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

.9 Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas train connection. Provide a reducer if required.

.10 Connect hot-water piping to supply- and return-boiler connections with shutoff valve and union or flange at each connection.

.11 Install piping from safety relief valves to nearest floor drain.

.12 Install CPVC flue venting to the manufacturer’s recommendations. Connect full size to boiler connections.

.13 Perform tests and inspections and prepare test reports.

.14 Manufacturer's Field Service: Engage a factory-authorized service representative or technician to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

.15 Tests and Inspections:

.1 Perform installation and startup checks according to manufacturer's written instructions.

.16 Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.

.17 Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.

.18 Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

.19 Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level, and water temperature.

.20 Set field-adjustable switches and circuit-breaker trip ranges as indicated.

.21 Remove and replace malfunctioning units and retest as specified above.

.22 Train Owner's maintenance personnel to adjust, operate, and maintain boilers. Refer to Section 23 05 00.

End of Section

1. General

1.1. General Notes

.1 The requirements of Division 0 and Division 1 of these specifications apply to all section of these specifications.

.2 The term “Trade” refers to all trades that provide work within this section. The term “Contractor” refers to the General or Prime Contractor, however, it is this trade’s responsibility to ensure the Contractor knows and understand all the requirements in these specifications.

1.2. Scope of Work

.1 It is the intent of these specifications to describe an addition to an existing working building automation system. The modifications to the existing system shall be seamless.

.2 These specifications shall be read in conjunction with all other specifications for this project and all drawings sketches. There is a requirement for this Trade to coordinate services with all other trades.

1.3. Cooperation

.1 The drawings are diagrammatic in nature and cannot show all the details of the installation. This Trade is responsible for interpreting the drawings and providing suitable installations as best as possible based on the intent of the drawings.

.2 If dimensions are provided in the drawings or specifications, the implications shall be field checked before ordering any material. Notify the Consultant immediately if any interferences or discrepancies arise due to design parameters. Coordinate with all other trades with respect to any changes required in the contract documents for equipment or material installation.

.3 Store materials out of the way of other trades and keep all work areas clean daily.

1.4. Shop Drawings

.1 Refer to Divisions 0 and 1 for additional shop drawings requirements.

.2 Submit within two business days of award, a list of all equipment to be provided, complete with manufacturer and model number. Identify all equipment with expected long lead times.

.3 Shop drawings shall be reviewed and returned electronically.

.4 Shop drawings shall be specific to the project – generic shop drawings will be returned not reviewed. Shop drawings much provide all relevant performance data, dimensions and weight. All options must be selected. Shop drawings must be carefully reviewed by the Contractor and this Trade before being submitted for review. Shop drawings shall bear the mark of both the Contractor and this Trade.

.5 All applicable approvals shall be shown, such as CSA, ULC, FM, etc.

.6 All reviewed shop drawings shall be distributed by the Contractor to all effected trades for coordination. Clearly highlight any discrepancies between specified equipment and equipment provided. Any cost incurred by Trades by deviation from provided equipment specifications shall be at no cost to the Owner.

.7 Equipment and materials shall not be ordered until the Consultant as returned a shop drawing marked “reviewed” or “reviewed as modified”. The Trade shall assume all responsibility to ensure all modifications are made to shop drawings marked “reviewed as modified” before ordering equipment or materials.

1.5. Trial Period

.1 It is understood that the systems, equipment and materials installed under this contract are under a trial period until fully accepted by the Owner. Certificate of substantial performance is not acceptance of the system by the Owner.

1.6. Electrical Wiring

.1 This Trade shall thoroughly review the electrical drawings to determine allowance for electrical wiring for this Trade. This Trade is responsible for all low-voltage wiring and all other higher voltage wiring not explicitly noted on the electrical drawings but required for a properly functioning system.

.2 All wiring shall comply with Division 26 specifications.

1.7. Testing and Commissioning

.1 Notify the Consultant and Owner before commissioning tests are scheduled and allow the Consultant and/or Owner to witness the testing.

.2 Test the equipment through all operations. Ensure proper operation and set-up of all equipment.

.3 Make record of any deficiencies in the operation and take measures to immediately correct deficiencies.

.4 The Trade shall return to site for each of the next three seasons to confirm the equipment is operating as intended. Coordinate with the Owner and weather for proper verification of operation.

1.8. Deficiencies

.1 The Contractor and Trade shall review their own work and make deficiency lists prior to review by the Consultant. Deficiencies are to be corrected when possible before the Consultant review, otherwise, the list shall be provided to the Consultant before the Consultant's review.

.2 The Consultant shall provide deficiency reports. This Trade shall correct all deficiencies in a timely manner and report the results to the Consultant. Photographic proof shall be provided for all final deficiencies.

1.9. Operating & Maintenance

.1 Provide to the Owner, at the completion of the project, two complete sets of operation and maintenance manuals (O&M).

.2 Manuals shall include:

.1 All shop drawings. Where shop drawings were marked "reviewed as modified", the Trade shall update the shop drawing for the O&M manual.

.2 All operating manuals for all equipment.

.3 Start-up Reports

.4 Training material

.3 The manual shall be provided in a 3-D-ring binder, complete with index. The binder shall not be more than 80% full.

.4 This trade shall provide training to the Owner or Owner's representative for all equipment and systems installed. Where appropriate, the training shall be done by a representative of the manufacturer.

1.10. Guarantees and Warranties

.1 This trade shall guarantee the Owner a labour and materials warranty for all equipment, material and systems provided as part of this contact for a period of one year from the date of substantial performance unless otherwise specified.

2. Products

2.1. Identification

.1 Provide lamicoid or metal engraved name plate for all equipment. Name plates shall include tag number and all major performance data.

3. Execution

3.1. Identification

.1 Provide all equipment with nameplates.

End of Section

1. General

1.1. Scope of Work

.1 This section generally describes the control points required for a complete system operation as more generally described in the other sections of Division 25.

.2 It is not the intention of this section to limit control points to only these listed.

1.2. Abbreviations

- AI: Analog Input
- AO: Analog Input
- DI: Binary digital input
- DO: Binary digital output
- VFD: Variable speed drive

1.3. Existing Boiler Plant

.1 Remove all existing points for the operation of the existing boiler plant.

1.4. New Condensing Propane Boilers

Description	Type	Device	Units	Remarks
Enable/Disable	DO	BACnet	On/off	1
Status	DI	BACnet	On/off	1
Supply Water Set-point	VF	BACnet	°C	1
Supply Water Temperature	AI	Thermistor	°C	1
Return Water Temperature	AI	Thermistor	°C	1
Firing rate	AI	BACnet	%	1
Alarm	DI	BACnet	Ok/alarm	1

.1 Points are per boiler

1.5. Existing Pump

.1 Remove all existing points for the existing pumps.

1.6. New Pumps

Description	Type	Device	Units	Remarks
Enable/Disable	DO	BACnet/VFD	On/off	1
Power	AI	BACnet/VFD	kW	1
System Pressure (SUPPLY)	AI	Pressure sensor	kPa	
System Pressure (RETURN)	AI	Pressure sensor	kPa	
Speed set-point	AI	Thermistor	°C	1
Alarm	DI	BACnet/VFD	Ok/alarm	1

.1 Points are per pump.

End of Section

1. General

1.1. Scope of Work

.1 Provide a system of controls which can integrate seamlessly with the existing building management system in order to provide additional controls as otherwise outlined in Division 25.

.2 The BAS manufacturer shall provide all hardware and software necessary to implement the functions and sequence of operations specified.

.3 The BAS manufactuers shall provide all devices required for the system to funcaiton properly. The Owner shall use the existing operators workstation. All graphics shall be updated based on this scope of work.

1.2. Submittals

.1 Automation Network equipment

.1 Application controllers

.2 Points list

1.3. System Performance

.1 Reporting Accuracy. Table below lists minimum acceptable reporting accuracies for all values reported by the specified system.

Measured Variable	**Reported Accuracy**
Water Temperature	±0.5°C [±1°F]

2. Product

2.1. Materials

.1 Use new products that the manufacturer is currently manufacturing and that have been installed in a minimum of 25 installations. Do not use this installation as a product test site unless explicitly approved in writing by the owner or the owner's representative. Spare parts shall be available for at least five years after completion of this contract.

2.2. Communication

.1 This project shall be comprised of a high speed Ethernet network utilizing BACnet/IP communications between System Controllers and Workstations. Each System Controller shall function as a BACnet Router to each unit controller providing a unique BACnet Device ID for all controllers within the system. Communications between System Controllers and sub-networks of Custom Application Controllers and/or Application Specific Controllers shall be as defined below.

2.3. Operator Interface

.1 Contractor is to reuese the existing operating terminal interface.

2.4. Application Specific Controller

.1 Application Specific Controllers (ASC) shall be microprocessor-based DDC controllers which, through hardware or firmware design, control specified equipment. They are not user programmable, but are customized for operation within the confines of the equipment they are designed to serve.

.2 Application Specific Controller are only allowed when the controller is provided by the equipment manufacturer and warrantied as part of the equipment.

.1 Agency Approval: The controller shall have meet the Agency Compliance:

.1 UL916 PAZX, Open Energy Management Equipment

.2 UL94-5V, Flammability

.3 FCC Part 15, Subpart B, Class B Limit

2.5. Input/Output Inteface

.1 Hardwired inputs and outputs may tie into the system through building, custom application, or ASCs.

.2 All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24V of any duration, such that contact with this voltage will cause no damage to the controller.

.3 Binary inputs shall allow the monitoring of on/off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against the effects of contact bounce and noise. Binary inputs shall sense “dry contact” closure without external power (other than that provided by the controller) being applied.

.4 Analog inputs shall allow the monitoring of low voltage (0 to 10 VDC), current (4 to 20 mA), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with and field configurable to commonly available sensing devices.

.5 Binary outputs shall provide for on/off operation or a pulsed low-voltage signal for pulse width modulation control. Binary outputs on building and custom application controllers shall have status lights. Outputs shall be selectable for either normally open or normally closed operation.

.6 Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0 to 10VDC or a 4 to 20 mA signal as required to provide proper control of the output device. Analog outputs shall not exhibit a drift of greater than 0.4% of range per year.

2.6. Power Supplies

.1 Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish overcurrent protection in both primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.

2.7. Auxilary Control Devices

.1 Wired Temperature Sensors

.1 Temperature sensors shall be RTD or thermistor.

.2 Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed. The well must withstand the flow velocities in the pipe.

.3 Provide matched temperature sensors for differential temperature measurement.

2.8. Wiring and Raceways

.1 General: Provide copper wiring, and raceways as specified in the applicable sections of this specification.

.2 All insulated wire to be copper conductors, UL labeled for 90°C (194°F) minimum service.

3. Execution

3.1. Examination

.1 The Contract Documents shall be thoroughly examined for coordination of control devices, their installation, wiring, and commissioning. Coordinate and review mechanical equipment specifications, locations, and identify any discrepancies, conflicts, or omissions that shall be reported to the Architect/Engineer for resolution before rough-in work is started.

.2 The BAS manufacturer shall inspect the jobsite in order to verify that control equipment can be installed as required, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

3.2. Protection

.1 The BAS installation contractor shall protect all work and material from damage by their work or personnel, and shall be liable for all damage thus caused.

.2 The BAS manufacturer shall be responsible for their work and equipment until final inspection, testing, and acceptance. The BAS installing contractor shall protect their work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3. General Workmanship

.1 Install equipment, piping, wiring/conduit, parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.

.2 Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

.3 Install all equipment in readily accessible locations as defined by National Electric Code (NEC). Control panels shall be attached to structural walls or properly supported in a free-standing configuration, unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.

.4 Verify integrity of all control wiring to ensure continuity and freedom from shorts and grounds prior to commencing the startup and commissioning procedures.

.5 All control device installation and wiring shall comply with Contract Documents, acceptable industry specifications, and industry standards for performance, reliability, and compatibility. Installation and wiring shall be executed in strict adherence to local codes and standard practices referenced in Contract Documents.

3.4. Field Quality Control

.1 All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Contract Documents.

.2 BAS manufacturer shall continually monitor the field installation for building code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.

.3 BAS installing Contractor(s) shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

3.5. Wiring

.1 All control and interlock wiring shall comply with the National, Local Electrical Codes, and Division 26 of these Contract Document specifications.

3.6. Communication Wiring

.1 All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.

3.7. Installation of Sensors

.1 Sensors required for mechanical equipment operation shall be factory installed and wired as specified in mechanical equipment specifications. BAS manufacturer shall be responsible for coordinating these control devices and ensuring the sequence of operations will be met. Installation and wiring shall be in accordance with the BAS manufacturer's recommendations.

3.8. Identification of Hardware and Wiring

.1 All field wiring and cabling, including that within factory mounted, and wired control panels and devices for mechanical equipment, shall be labeled at each end within 2" of termination with a cable identifier and other descriptive information for troubleshooting, maintenance, and service purposes. BAS manufacturer to coordinate this labeling requirement with mechanical equipment manufacturer as it relates to controls.

.2 Permanently label or code each point of field terminal strips to show the instrument or item served and correlate them to the BAS design drawings.

.3 Identify control panels with minimum 1-cm letters on laminated plastic nameplates.

.4 Identifiers shall match record documents. All plug-in components shall be labeled such that removal of the component does not remove the label.

3.9. Control System Checkout and Testing

.1 Start-up testing. All testing in this section shall be performed by the contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the owner’s representative is notified of the system demonstration.

.1 The contractor shall furnish all labor and test apparatus required to calibrate and prepare for service all of the instruments, controls, and accessory equipment furnished under this specification.

.2 Verify that all control wiring is properly connected and free os all shorts and ground faults. Verify that terminations are tight.

.3 Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to manufacturer’s recommendations.

.4 Verify all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starter, etc.) operate properly and normal positions are correct.

.5 Verify all analog output devices (I/Ps, actuators, etc) are functional, that startand span are correct, and that direection and normal positions are correct. The contractor shall check all control valves and autoatic dampers to ensure proper action and closure. The contractor shall make any necessary adjustments to valve stem and damper blade travel.

.6 Verify the system operation adheres to the sequences of operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops and optimal start/stop routimes.

.7 Alarms and Interlocks

.1 Check each alarm separately by including an appropriate signal at a value that will trip the alarm.

.2 Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction,

.3 Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

3.10. Control System Demonstration and Acceptance

.1 Demonstration: A complete demonstration of the capabilities of the BAS system shall be performed by the BAS manufacturer’s field personnel. The BAS manufacturer shall dedicate a

minimum of (16) hours on-site with the Owner representatives, and Engineer to demonstrate a complete functional test of all the BAS system requirements.

3.11. Training

.1 Refer to section 23 05 00 for Training requirements

End of Section

1. General

1.1. Scope of Work

.1 The following sequences of operation describe the general principles of operation expected for the control trade to implement. It is the responsibility of the controls trade to interpret the intent of the sequences and provide all automation equipment and labour required to implement the intention.

1.2. Boilers

.1 Overview

.1 Two boiler operate together to maintain supply water temperature set-point.

.2 Start-up

.1 The boiler system shall be engaged whenever the outdoor air temperature is below 15°C

.2 Before enabling the boiler system, enable the building heating pumps.

.3 Boiler pumps are operated directly from the boilers.

.3 Normal operation

.1 The supply water temperature set-point shall be reset based on outdoor air temperature. The reset schedule shall be easily modified by the user. Default schedule:

.1 OAT @ 15°C = SWT @ 40°C

.2 OAT @ -20°C = SWT @ 70°C

.2 On low load, enable only one boiler. On lead boiler firing over 50%, enable second boiler. On both boilers firing at 10%, disable lag boiler.

.4 Shut-down

.1 The boiler system shall be disabled whenever the outdoor air temperature is above 18°C

.5 Alarms

.1 Boiler alarm.

.2 Supply water temperature set-point is not meet for more than 10 minutes.

.3 Enable/status mis-match.

1.3. Pumps

.1 Overview

.1 Pumps circulate flow through the building. The new pumps are variable speed and replace existing constant speed pumps.

.2 System pressure is the differential pressure between the supply and return pressure sensors. Using matching sensor. Use the instantaneous difference, then noise filter and time average the signal to determine the differential system pressure.

.2 Start-up.

.1 Engage pumps for 5 minutes before starting the boilers.

.2 Start one pump a 30% speed.

.3 Rotate the lead pump every week based on total run time.

.3 Normal operation

.1 Operate one pump to maintain pressure set-point.

.2 If one pump (lead) is operating at 100% and pressure set-point cannot be maintained for 5 minutes, reduce to 30%, start second pump (lag) at 30% and ramp both pump identically to meet pressure set-point.

.3 If both pumps are operating at less than 50% for more than 5 minutes, stop the second pump (lag) and modulate the speed of the first pump (lead) pump to maintain system pressure.

.4 Shut-down

.1 Stop pumps 5 minutes after boilers have been disabled.

.5 Alarms

.1 VFD alarm.

.2 Status/command mis-match

End of Section

PART 1 – GENERAL

1.1 GENERAL

.1 This section covers items common to all sections of Divisions 26.

1.2 ELECTRICAL WORK INCLUDED

.1 The specification complements the drawings in describing the supply and installation of a complete electrical system. This system shall include but not necessarily be limited to the following:

.1 Connection of new boilers and boiler circulation pumps.
.2 Connection of propane vapourizer.
.3 Select Demolition;
.4 Relocation of existing outlets to accommodate new radiator cabinets;

1.3 CONTRACT DRAWINGS

.1 The specification together with the drawings are intended to provide a description of a complete electrical system and therefore there shall be no omission of the items necessary or required to make a finished, workmanlike, first class installation, even though each and every item of labour and material may not be mentioned in the specification or shown on the drawings.

.2 Items indicated on floor plans and not on riser diagrams, or vice versa, shall be considered fully covered by both.

.3 Runs of conduit and outlet locations indicated on the drawings are diagrammatic and exact locations must be determined by this contract as the work proceeds, with due regard to the structure and the work of other trades. This contract shall make any changes dictated by structural requirements, or conflicts with other trades, without charge.

.4 Apparent errors or omissions shall be referred to the Architect/Engineer whose decision shall be final.

1.4 CODES AND STANDARDS

.1 As a minimum standard perform all work in accordance with the requirements of the Provincial Department of Labour, Canadian Electrical Code C22.1-2018 Part 1, CSA Standards CAN Z32.4 and CAN Z32.2, National Building Code, and ULC-S524-2010. These standards together with all local or municipal rules, regulations, and ordinances shall be considered as the latest approved editions at the time of tender closing. In no instance, shall the standard established in these contract documents, be reduced by any codes.

.2 Abbreviations for electrical terms: to CSA Z85-1983.

.3 Comply with CSA Certification Standards and Electrical Bulletins in force at the time of tender submission.

1.5 INSPECTIONS, PERMITS AND FEES

.1 Obtain all inspections and permits required by all laws, ordinances, rules and regulations by the public authority having jurisdiction at the place of this building for work of this Contract, and obtain certificates of such inspections and submit same and pay all charges in connection therewith. The final certificate of inspection shall be obtained before final payment for work shall be considered due.

.2 Electrical Permit

- .1 Submit to the Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.
- .3 Furnish certificates of Acceptance from Inspection Department and AHJ on completion of work.

1.6 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

.1 Submit shop drawings, product data and samples in accordance with Division 1. Provide all shop drawings within 30 days after contract has been awarded. Failure to do so will delay progress payments.

.2 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.

.3 Where applicable, include wiring, single line and schematic diagrams.

.4 Include wiring drawings or diagrams showing interconnection with work of other Sections.

.5 Keep one copy of shop drawings and product data on site, available for reference at all times.

1.7 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for incorporation into Operation and Maintenance Manuals as specified in Division 1.

.2 Include in the operation and maintenance data:

- .1 Details of design elements, construction features, component function, and maintenance requirements to permit effective start up, operation, maintenance, repair, modification, extension, and expansion of any portion or feature of installation.
- .2 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical description of items and parts lists. **Advertising or sales literature not acceptable.**
- .3 Wiring and schematic diagrams and performance curves.
- .4 Names and addresses of local suppliers for items included in maintenance manuals.
- .5 Copy of reviewed shop drawings.
- .6 Signed receipt for all spare parts.

.3 Approvals:

- .1 Submit one draft of Operating and Maintenance Manual to Engineer for approval one month prior to estimated substantial completion date. Submission of individual data will not be accepted unless so directed by Engineer.

.2 Make any changes in submission as may be required and re-submit as directed.
.3 **Failure to do so will result in delay of progress payment.**
.4 Provide two (2) final bound copies of Operation and Maintenance Manuals to Owner and one (1) bound copy to Engineer.

1.8 PROJECT RECORD DOCUMENTS

.1 Provide Project Record Documents in accordance with Division 1.

.2 Submit record drawings to Architect/Engineer showing changes of wire sizes, circuit numbering and location of raceways, fittings, fixtures, panels and equipment, and their sizes, the location of which has changed or deviated during the work.

.3 Submit sepia or reproducible of record drawings after record drawings have been approved by the Engineer. Originals shall be made available by the Engineer for the making of sepia or reproducible of the contract drawings. All changes reflected on record drawings are to be indicated on these sepia or reproducible.

1.9 MAINTENANCE MATERIAL

.1 Provide maintenance materials in accordance with Division 1.

1.10 CARE, OPERATION AND START UP

.1 Instruct operating personnel in the operation, care and maintenance of the equipment.

.2 Arrange and pay for services of the manufacturer's service engineer to supervise start-up and to check, adjust, balance and calibrate components.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

1.11 VOLTAGE RATINGS

.1 Operating voltages to meet requirements of CAN3-C235.

.2 Motors, control and distribution equipment to operate satisfactorily at 60 Hz within normal operating limits established by the above standard. Equipment to operate in extreme operating conditions established in the above standard without damage to the equipment.

1.12 MATERIAL AND EQUIPMENT

.1 Provide materials and equipment in accordance with Division 1.

.2 Equipment and materials to be C.S.A. certified, and manufactured to standard quoted.

.3 Where there is no alternative to supplying equipment which is not C.S.A. certified, obtain special approval from C.S.A.

.4 Factory assemble control panels and component assemblies.

.5 For the purposes of uniformity similar materials shall be of one manufacturer (i.e. all panels; all motor control equipment; all fixtures in as much as is possible, etc.).

.6 To avoid the possibility of the work being delayed, order all materials as soon as the shop drawings are reviewed, and report at once to the Architect/Engineer any delays in the delivery of materials which would hold up the completion of the job.

1.13 GROUNDING

.1 All equipment and exposed non-current carrying metal, conduits and parts shall be permanently and effectively *bonded to ground* to meet minimum requirements of the C.E.C. Section 10, and as indicated on the drawings and further specified. Standards set either by drawings or specifications which are above those covered by C.E.C. Section 10, shall not be reduced under any circumstances.

1.14 ELECTRIC MOTOR, EQUIPMENT AND CONTROLS

.1 Provide final connections to all motors, equipment, controls, etc., indicated on the drawings. These motors, equipment, controls, etc., shall include those supplied under other sections of this specification, as well as Owner supplied items. Ensure that equipment will operate properly (e.g. proper rotation) and report any instance of defective equipment to the Architect/Engineer.

.2 Supplier and installer responsibility is indicated on electrical drawings, and in this specification and related mechanical responsibility is indicated on mechanical drawings, and in the Division 15 specifications.

.3 All electrical equipment, which is supplied and installed by this Contract or other contracts, that requires wiring at or above 50V, shall be wired by this Contract in accordance with terms and regulations established by this Specification.

.4 All electrical wiring and connections below 50V related to systems specified under other sections or contracts shall be done by their contractor in accordance with terms and regulations established by this Specification.

.5 All electrical wiring and connections below 50V related to systems specified by Division 26 shall be done by the Division 26 Contractor.

1.15 FINISHES

.1 Shop finish metal enclosure surfaces by removal of rust and scale, cleaning, application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor electrical equipment, "Equipment Green" finish to EEMAC Y1-1-1955.

.2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean, prime and paint exposed hangers, racks, and fastenings to prevent rusting.

.4 Where wire guards are specified in other sections, they are to be constructed of stainless steel. Painted steel is not acceptable.

1.16 EQUIPMENT IDENTIFICATION

.1 All disconnect panels, control panels, etc., shall have "Lamacoid" nameplates mounted on or adjacent for identification which shall include the panel designation, voltage, phase, wires overcurrent protection, H.P., KW and amperage as applicable. The nameplates shall be affixed to metal equipment with metal type pop rivets, and to all other equipment with contact type cement applied to the entire nameplate backing. Contact type cement shall be applied (buttered) to complete rear side of plate, as opposed to several points or locations on same.

.2 Size of identification shall be suitable for equipment and importance of information.

.3 All fused disconnect switches shall have lamacoid plates identifying the equipment they feed and a separate plate indicating maximum fuse size and type.

.4 Lettering shall be of sufficient size to be readable from normal viewing distance and the information required on the nameplates shall dictate the physical size of plates.

.5 Nameplates shall have **white lettering on black background** except for equipment connected to emergency power source, which shall have **white lettering on red background.**

.6 All "D" and "E" boxes 200mm x 200mm x 100mm or larger and "C" and "T" cabinets shall have lamacoid plates affixed indicating voltages and/or systems housed within.

.7 Nameplates:

.1 Lamicoid 3mm thick plastic engraving sheet on metal surfaces, 1.5mm where not applied to metals.

NAMEPLATE SIZES

Size 1	10mm x 50mm	1 line	5mm	high letters
Size 2	13mm x 75mm	1 line	6mm	high letters
Size 3	16mm x 75mm	2 lines	5mm	high letters
Size 4	19mm x 91mm	1 line	10mm	high letters
Size 5	38mm x 91mm	2 lines	12mm	high letters
Size 6	25mm x 100mm	1 line	12mm	high letters
Size 7	25mm x 100mm	2 lines	6mm	high letters
Size 8	50mm x 150mm	2 lines	12mm high letters	

.8 Labels:

.1 Embossed plastic labels with 6.5mm high letters unless specified otherwise.

.9 Wording on nameplates and labels to be approved by the Engineer prior to manufacture.

.10 Allow for average of forty (40) letters per nameplate and label.

.11 Identification to be English.

1.17 WIRING IDENTIFICATION

.1 Conductor insulation shall be colour coded as follows:

Phase A	-	Red
Phase B	-	Black

Phase C	-	Blue
Neutral	-	White/Grey
Ground /Bond	-	Green
Isolated Ground	-	Green w/Yellow stripe

This shall apply to all phase conductors up to and including #2AWG and all sizes of neutral, bond and ground conductors up to and including #3/0AWG.

.2 For conductors exceeding sizes as described above, identification of wiring with approved coloured plastic tapes shall be acceptable. Attach to both ends of all conductor runs a minimum of 12” from terminations, and in all junction and/or pull boxes.

.3 Maintain phase sequence and colour coding throughout.

.4 Colour code shall be as per Section 26 05 21 2.1.1.

.5 Use color coded wires in branch circuit wiring, systems wiring and communication cables.

1.18 CONDUIT, CABLE AND JUNCTION/PULLBOX IDENTIFICATION

.1 Identify all conduit fittings and junction/pull boxes along with their covers with colours as described below. Boxes shall be coloured both inside and out where one colour is required, and inside only where two are required. Metal coverplates shall be completely painted where one colour is required, and shall have both colours applied diagonally where two colours are required. All junction boxes shall be colour identified prior to installation.

.2

System	Colour
347/600V Lighting & Power	Orange
120/208V Lighting & Power	Yellow
Grounding/bonding	Green

1.19 WIRING TERMINATION

.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors as indicated.

1.20 MANUFACTURERS’ AND CSA LABELS

.1 Manufacturers’ and CSA labels shall be visible and legible after equipment is installed.

1.21 WARNING SIGNS

.1 Provide warning signs, as specified and/or to meet the requirements of the Department of Labour Inspection Department.

.2 Use decal signs, minimum 175mm x 250mm size.

1.22 PROTECTION

.1 Protect exposed live equipment during construction for personnel safety.

.2 Shield and mark 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 electrician.

1.23 LOAD BALANCE

.1 Balance all phase currents of transformers, main switchboard, distribution Panel boards, etc., and where applicable, adjust transformer taps to obtain within 2% of the rated voltage of the load being supplied. Make adjustments and/or increase conductor size so as to limit voltage drops to 3% and make such adjustments under average load conditions in presence of Engineer.

.2 Submit to Engineer, at completion of work, a report listing the voltage, phase and neutral currents on the switchboard, Panel boards and dry-type transformers, operating under normal load. On the report also state hour and date on which each load was measured

1.24 CONDUIT AND CABLE INSTALLATION

.1 Install conduit, and sleeves, prior to pouring of concrete. Sleeves through concrete shall be constructed of sheet metal, sized for free passage of conduit, and protruding 50mm.

.2 Install cables, conduits, and fittings to be embedded neatly and close to building structure so furring can be kept to minimum.

1.25 FIRESTOPPING AND SMOKE SEALS

.1 All fire stopping and smoke seals required to properly accommodate the work of this Division shall be the financial responsibility of Division 26, and carried out by trades to the applicable ULC approved system of one of the approved Manufacturers provided in this document. Trades personnel must be trained by the manufacturer and provide documentation stating same.

.2 Refer to architectural drawings for locations of assemblies and refer to Division 1 for firestopping details and procedures.

1.26 TESTS

.1 Conduct and pay for tests of the following:

.1 Power distribution system including phasing, voltage, grounding and load balancing.

.2 Motors and associated control equipment including sequenced operation of systems where applicable.

.2 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.3 The Architect and/or Engineer reserves the right to use any piece of electrical equipment, device, or material installed under this contract for such reasonable lengths of time and at such times as he may require in order to make a complete and thorough test of the same, before the final completion and acceptance of the work.

.4 Such tests shall not be construed as acceptance of any part of the work.

.5 Submit test results for Architect's and/or Engineer's review.

1.27 INSULATION RESISTANCE TESTING

.1 Test all wiring, included in the work to ensure that there are no shorts and/or grounds are present on phase conductors for feeders or branch circuits and that insulation values are as required by the Canadian Electrical Code.

.2 All testing of conductors to be done prior to energization of conductors with 600 volt and 1000 volt meggers as required by the Canadian Electrical Code.

.3 Capacitive leakage testing of all phases and neutral feeder conductors at various system originating points, are to be recorded for each individual feeder with test results to be submitted to Architect and/or Engineer for approval.

.4 Systems to be tested for capacitive leakage are as follows: 120/208V/3PH/4W.

.5 Check resistance to ground before energizing. Ensure resistance to ground is not less than 50 megohms.

.6 Submit test results for Architect's and/or Engineer's review. Test results shall include time of test, feeder tested, and instrument readings.

1.28 COORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as over-current trips, relays, fuses, are installed to values and settings as indicated.

1.29 CLEANING

.1 Do final cleaning in accordance with Division 1.

.2 At time of final cleaning, clean lighting reflectors, lenses and other lighting surfaces that have been exposed to construction dust and dirt.

.3 On completion of work, remove debris resulting from work of this Division and leave the site neat and tidy. Equipment shall be checked for proper fitting and alignment, adjusted, cleaned, repainted where necessary, and left in first class condition.

.4 This section shall be responsible for the removal of spatters, droppings, soil, labels, and debris from finished surfaces and from surfaces to receive finishes, before the set up. Work and adjacent finished work shall be left in new condition.

.5 Only cleaning materials which are recommended for the purpose by both the manufacturer of the surface to be cleaned and of the cleaning material shall be used.

.6 Immediately before and during finishing work shall be made "broom clean". Interior areas shall be "vacuum cleaned" immediately before finish painting commences.

.7 Material at site cannot be burned or buried except where approved by Architect and/or Engineer. Removal shall be as often as required to avoid accumulation in order to ensure site is maintained clean.

.8 Volatile fluid wastes cannot be disposed of in storm or sanitary sewers or in open drain courses.

.9 Lowering of materials shall be controlled and shall not be dropped or thrown from stories above grade.

1.30 COORDINATION

.1 Cooperate and investigate with other trades to make maximum use of the spaces. Avoid conflicts with pipes, ducts, etc. Prepare shop drawings indicating the route of main conduits and ducts for submission to the Architect and/or Engineer for approval.

.2 Cooperate with other trades on the site and carry out the work, in such a way, as not to hinder or hold up the work of other trades.

.3 Consult with other trades, where their respective installations conflict and re-route conduits, ducts, outlets, equipment, etc., as required, subject to the approval of the Architect and/or Engineer.

.4 Obtain from the mechanical and other trades complete detailed wiring diagrams of equipment requiring connections and be responsible for pointing out any discrepancies or the reason why they cannot be adhered to.

.5 Locate all light fixtures, speakers, smoke detectors, etc. using Architect's reflected ceiling plan as a guide.

1.31 SUPERVISION

.1 Provide supervision and sufficiently qualified foreman for work of this Contract to ensure that the work proceeds in proper and efficient manner to its completion. If in the opinion of the Architect and or Engineer, such personnel are not competent to carry out the work, replace these men immediately upon written request of the Architect and/or Engineer.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

.1 CSA C22.2 No. 38 - Thermoset insulated Wires and Cables.

.2 CSA C22.2 No. 51 - Armoured cables.

.3 Wire and cable shall conform to the latest specification of the Canadian Standards Association (CSA), Electrical and Electronic Manufacturers Association of Canada (EEMAC), the Insulated Power Cable Engineers Association (IPCEA), and the American Society of Testing Materials (ASTM).

1.2 RELATED WORK

.1 Not Applicable

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit product data in accordance with Division 1.

1.4 OPERATION AND MAINTENANCE DATA

.1 Not Applicable

PART 2 - PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: Copper, soft drawn stranded, at least 98% conductivity for #12 AWG and larger. Insulation shall be chemically cross-linked thermosetting polyethylene rated 600 volts on all RW90 conductors and 1000 volts for RWU-90 for incoming service. Size as indicated on drawings and schedules. Conductor insulation shall be colour coded as follows:

Phase A	-	Red
Phase B	-	Black
Phase C	-	Blue
Neutral	-	White/Grey
Ground/Bond	-	Green
Isolated Ground	-	Green w/Yellow stripe

Isolated Power - as indicated hereinafter.

Where extra colours are required for three-way switches, etc., they shall be yellow.
Approved color coded tape is acceptable for color coding phase conductors #1 AWG and larger and for neutral and ground conductors #4/0 and larger.
Neutral conductors for feeders to branch panels feeding computerized equipment shall be sized at 200%.

2.2 CONTROL CABLES

.1 600 V Type: 2 stranded copper conductors, 95% conductivity, full size AWG gauge, sizes as indicated with PVC insulation Type TW with shielding of magnetic tape wire braid over each pair of conductors and overall covering of thermoplastic jacket. Colour code shall be yellow.

2.3 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90.

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Connectors: to manufacturer's recommendations.

2.4 SYSTEM WIRING

.1 Wiring for auxiliary systems will be as indicated in specification or on drawings and/or as recommended by Manufacturer of the system.

2.5 MANUFACTURERS

.1 Standard of Acceptance: Nexans or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION OF BUILDING WIRES

.1 Install all building wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34.

3.2 INSTALLATION OF CONTROL CABLES

.1 Install control cables in EMT conduit complete with all associated steel connectors and couplings where run on surfaces of walls or open ceilings. Conduits shall be extended to within 760mm of all devices associated with the piece of equipment which they control. Final connection shall be made using liquid-tight flexible metal conduit and associated liquid-tight connectors.

.2 EMT type conduit wall-stub c/w flush installed device box shall be located in all partitions to accommodate wiring between the device and the accessible ceiling space.

.3 EMT connectors complete with nylon insulated throat or threaded type bushing shall be installed on end of EMT stubs where they protrude through the wall above, and within finished accessible ceilings. CSA approved EMT plastic end cap bushings may also be used.

.4 All EMT conduit stubs shall be bonded to ground as required by CEC.

.5 Control cable shields, if applicable, shall be bonded to ground.

3.3 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

.2 Flexible type conduit c/w RW90 conductors sized as noted and/or flexible armoured cable AC90 (BX) complete with separate grounding conductor.

.3 “Fixture drop” is defined as that portion of AC90 cable or flexible conduit being used to make the final connection between the accessible type junction or outlet box located in ceiling space and its respective luminaire.

.4 Flexible type conduit c/w RW90 conductors sized as noted and/or flexible armoured cable AC90 (BX) complete with separate grounding conductor.

.5 AC-90 cable or RW90 in flex is to be used for branch circuit wiring drops from ceiling junction boxes to light fixtures, receptacles and other equipment requiring power in the same room only unless otherwise noted on the drawings. AC 90 (BX) cable used for fixture drops with a minimum size of No. 12. Total length of any individual AC-90 cable or flex c/w RW90 not to exceed 4500mm in length unless specifically indicated otherwise.. The use of AC90 for home runs or wiring between rooms is not permitted.

.6 All flex c/w RW90 or AC-90 cables used for fixture drops shall be secured within 300mm of the junction box.

.7 Where application of AC-90 cables and/or other types of pliable cables are to be used, they shall be installed parallel or perpendicular to the building lines unless otherwise noted.

.8 Support and securing of type AC-90 cables shall not be derived from either suspended ceiling support wires or directly laying atop of the ceiling grid system.

.8 All AC-90 feeds shall originate from the sides of outlet boxes and not from the box cover. There shall not be more than 4 drop feeds permitted from any one box regardless of its size. Where 3 or more drop feeds extend from any one box, that box shall be sized no smaller than 119mm square.

3.4 INSTALLATION - GENERAL

.1 Where pulling wires and cables, the use of an approved lubricant only will be permitted. No wires or cables shall be pulled in conduits until such conduits are free from moisture and in no case shall wires be pulled until approval of the Architect and/or Engineer is obtained.

.2 All stranded conductors prior to terminating under device bolts such as circuit breakers, light switches, receptacles, etc., to be twisted together to form a single conductor to ensure a reliable mechanical connection.

.3 All branch circuits are to utilize conduit pathways for home runs to each room or area, including rooms in which the panel is located. Where the branch circuit has multiple splices and/ or drop offs to multiple rooms, the use of AC90 for the drop off is permitted,

however, the home run conduit shall be continued until the final room destination splice or drop off is reached.

.4 "Labelling" of all branch circuit wiring including phase conductors, neutrals, grounding and/or bonding conductors to be done on **both ends** of all circuit wires plus in any junction and/or pull boxes located in between using "Panduit" write-on, self laminating labels Nos. PDL-1 and PDL-2 as required.

.5 The following wiring methods are designed to enhance the ability to perform capacitive leakage tests:

.1 All circuit conductors are to be individually tie wrapped to their corresponding labelled neutral conductor in all panelboards, pullboxes and junction boxes. Enough slack conductor length should be left to enable the ability to clamp the ground detector around the individually tie-wrapped circuit conductor and its corresponding labelled neutral. This wiring method is to be neat and of good workmanship quality.

.2 The tie wrapping of the neutral with its respective phase conductors is to be made at the closest point of entry into panelboards, pullboxes and junction boxes.

.3 The main switchboard, CDP's, panelboards, MCC's etc, are to have their respective feeder phase and neutral conductors tie-wrapped together and enough slack conductor length to enable the ability to clamp the ground detector around each set of feeders. This wiring method is to be neat and of good workmanship quality.

.4 After all electrical wiring has been completed by the Electrical Sub-Contractor, he is to test the grounded electrical distribution system to ensure there are not ground shorts and capacitive leakage in the system.

.5 All feeders or branch circuits which do not have neutral conductors are to have their respective phase conductors tie-wrapped together in accordance to the methods described previously.

.6 Run all circuits so that the voltage drop in no case exceeds 3% of the line volts. The neutral wire, wherever it is run, shall be continuous with no fuses, switches, or breaks of any kind.

.7 For 15 amp, 120 volt circuits the following table shall be used to determine the minimum conductor sizes required to compensate for voltage drop. In no case does this table allow a reduction in conductor size from that shown on the drawings or as specified elsewhere in the specifications.

.8 Find below the branch circuit maximum lengths (120 volt one way length from panelboard to load including vertical drops. Voltage drop shall not exceed 3% in any instance.

.1	From	0.3m to 24m	#12 Wire
.2	From	24m to 37m	#10 Wire
.3	From	37m to 55m	#8 Wire

.9 Increased wire sizes where required shall not be decreased in size in any portion of length of run between panelboard and the wiring device itself.

.10 All wiring shall be color coded as per Code requirements and/or as specified herein.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

.1 CSA C22.2 No. 41 - Grounding and Bonding Equipment.

1.2 RELATED WORK

.1 Electrical General Instructions: Section 26 05 00

.2 Wires and Cables, 0 to 1000V: Section 26 05 21

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Not Applicable

1.4 OPERATION AND MAINTENANCE DATA

.1 Not Applicable

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Clamps for grounding of conductor, size as required to electrically conductive ground rods.

.2 System and circuit, equipment, grounding conductors, bare stranded copper, un-tinned, soft annealed, un-armoured, size as indicated.

.3 Insulated grounding conductors to Section 26 05 21.

.4 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.
- .4 Thermit welded type conductor connectors.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors.

2.2 MANUFACTURERS

.1 Standard of Acceptance: Thomas & Betts.

.2 Other approved manufacturers: Burndy, McGraw Edison.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous, system and circuit, equipment, grounding systems including, electrodes, conductors, connectors, busbars, accessories, as indicated, to conform to requirements of Engineer, and local authority having jurisdiction over installation. Where EMT is used for panelboard or motor control board feeders, run a separate green ground wire in conduit.

.2 All conduits for all electrical systems shall contain a minimum # 14 AWG copper bond wire. Wire size shall be increased as required by Table 16 of the CEC or as otherwise noted.

.3 Bonding jumpers are permitted for conduit stubbed into a T-bar ceiling. All metallic conduit stubs shall be bonded regardless of length.

.4 Install connectors in accordance with manufacturer's instructions.

.5 Protect exposed grounding conductors from mechanical injury.

.6 Make buried connections, and connections to electrodes, using compression type connectors.

.7 Use mechanical connectors for grounding connections to equipment provided with lugs as follows:

- .1 Copper, one hole, short barrel (single crimp) type lugs shall be used for all wire sizes up to and including #6AWG;
- .2 Copper, two hole, long barrel (dual crimp) type lugs shall be used for all wire sizes #4AWG and larger;
- .3 Lugs shall be bolted to bus bars with concave or combination of flat and locking type washers c/w accompanying hardware as required.

.8 Soldered joints are not permitted.

.9 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.10 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.11 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

3.2 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to the neutral of the 120/208V systems as required.

.2 All cables, feeders and branch circuit conductors installed in conduit shall be complete with a separate minimum size #14AWG solid copper bond/ground wire as follows:

.1 Where bond wire sizes larger than #14AWG are required, they shall be increased as required by the Canadian Electrical Code Table 16 or as noted otherwise;

.2 #14AWG and larger size bond or ground conductors shall be of soft drawn stranded copper of 98% conductivity, and of full size and AWG gauge;

.3 Size of ground/bond conductors shall be based upon Table 16 of the Canadian Electrical Code;

.4 Minimum size #14AWG solid green insulated conductors are acceptable for bonding purposes associated with various other systems rated at 50 volts or less.

3.3 EQUIPMENT *BONDING*

.1 Install *bonding* connections to typical equipment included in, but not necessarily limited to following list: Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, distribution panels, and outdoor lighting.

3.4 TESTS

.1 Perform tests in accordance with Section 26 05 00.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Submit test results for Engineer's review.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCE STANDARDS

.1 Not Applicable

1.2 RELATED WORK

.1 Common Work Results Electrical: Section 26 05 00

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Division 1.

1.4 OPERATION AND MAINTENANCE DATA

.1 Not Applicable

PART 2 - PRODUCTS

2.1 SUPPORT DEVICES

.1 U shape, size 41mm x 41mm, 2.5mm thick, surface mounted or suspended as required.

.2 Supply and install all necessary inserts, rods, channels, brackets, etc., to form a support system capable of carrying at least twice the weight of the equipment supported.

.3 All hanger rods shall be 10mm diameter continuous threaded rod cut to required lengths. Cut off excess to within 13mm of bottom of channel.

.4 All conduits not installed on Unistrut or approved equal type support channels to be supported as follows:

.1 13mm up to and including 35mm conduits - one hole steel straps.
.2 41mm and larger sizes - two hole steel straps.

.6 All suspended conduit runs containing horizontal or vertical elbows shall have one additional support rod installed at not more than 300mm from midpoint of all 90 degree bends.

.7 Beam clamps to secure conduit to exposed steel work.

.8 In no case will the use of tye-wraps for supporting purposes be acceptable unless explicitly approved for the purpose, such as for securing wiring in-place.

.8 All trays, wireways, and multiple conduits, shall be supported by a steel channel support system with all components, hangers, wall supports, cable clamps, etc., specifically manufactured and approved for their application.

.9 Fastening devices for cabinets, boxes, supports, etc., shall be nut and bolt, ramset, expansion shields, wedge anchors, or toggle bolts, size and number to suit the

application or as detailed on the drawings. Toggle bolts shall not be used in gypsum wallboard construction.

.10 Fastening devices for outlet boxes shall be nut and bolt, ramset, expansion shields, wedge anchors or caddy clips, size and number to suit the application or as detailed on the drawings.

2.2 MANUFACTURERS

.1 Standard of Acceptance: Burndy.

.2 Other approved manufacturers: Erico, Electrovert, Pursley, Unistrut.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Secure equipment to hollow or solid masonry tile and plaster surfaces with lead anchors.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry wall, or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T-bars 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 Suspended support systems.

.1 Support individual cable or conduit runs with 10mm dia threaded rods and spring clips.

.2 Support 2 or more cables or conduits on channels supported by 10mm dia threaded rod hangers where direct fastening to building construction is impractical.

.7 For surface mounting of two or more conduits use channels at 1.5m on center spacing.

.8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.10 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Engineer.

.12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

.13 Coordinate the location of any insert to miss concrete reinforcement and obtain approval of Architect and/or Engineer prior to installing.

.14 Secure all equipment in a manner so as not to distort or cause undue stress on any components.

.15 Support of any equipment shall not rely on the strength of plaster or gypsum board construction.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA)

- .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
- .2 CSA C22.2 No. 45, Rigid Metal Conduit.
- .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83, Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211, Rigid PVC (Unplasticized) Conduit.
- .6 CAN/CSA C22.2 No 227, Flexible Nonmetallic Tubing.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with local requirements.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

.4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

PART 2 - PRODUCTS

2.1 CONDUITS

.1 Thin wall type electrical metallic tubing "EMT" with steel set screw couplings, galvanized, size as indicated.

2.2 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Not Applicable.

2.3 FISHCORD

.1 6.5 mm standard nylon pull rope with tensile strength of 5 kN.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.3 Use electrical metallic tubing (EMT) except in cast concrete and above 2.4 m not subject to mechanical injury.

.4 Use rain-tight connectors and couplings where vertical portion of EMT conduit runs terminate into the top of electrical equipment incorporating drip shields or hoods.

.5 Use liquid tight flexible metal conduit (minimum 3/8” internal diameter) for connection to motors or vibrating equipment in all locations, including controls and related devices

.6 Minimum conduit size for lighting and power circuits: 19 mm.

.7 Install EMT conduit from branch circuit panel to outlet boxes located in sub floor.

.8 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.9 Mechanically bend steel conduit over 19 mm diameter.

.10 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.11 Install fish cord in empty conduits.

.12 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.13 Dry conduits out before installing wire.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with minimum1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCE STANDARDS

.1 CSA C22.2 No. 39 - Fuseholder Assemblies.

.2 CSA C22.2 No. 4 - Enclosed switches.

1.2 RELATED WORK

.1 Common Work Results for Electrical: Section 26 05 00

.2 Fuses Low Voltage: Section 26 28 13

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit Shop Drawings and Product Data in accordance with Division 1.

1.4 OPERATION AND MAINTENANCE DATA

.1 Not applicable.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Fusible and non-fusible disconnect switches in CSA enclosures as indicated.

.2 Provision for padlocking in either on or off positions.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 ON-OFF switch position indication on switch enclosure cover.

.5 Fuseholders: suitable without adaptors, for type and size of fuse as indicated.

.6 Type “A”, quick-make, quick-break action.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00.

.2 Indicate name of load controlled on size 4 nameplate

.

2.3 MANUFACTURERS

.1 Standard of Acceptance: Cutler Hammer 1HD321 (30A indoor), 3HD322 (60A outdoor)

.2 Other approved manufacturers: Siemens HNFC321N (30A indoor) or HNFC322NR (60A outdoor), Square D CHU361N (30A indoor) or CHU362NRB (60A outdoor)

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install disconnect switches as indicated.

.2 Mount all disconnect switches in a secure manner, easily accessible, and at a height as specified in Section 26 05 00.

.3 In finished areas mount disconnect switch on top of flush mounted junction box with conduit nipple on its coverplate into back of the switch.

END OF SECTION

PART 1 – GENERAL

1.1 SUMMARY

.1 The Variable Frequency Drive (VFD) system shall contain all components required to meet the performance, protection, safety and certification criteria of this specification.

1.2 REFERENCES

.1 National Electrical Manufacturers Association - NEMA 250 - Enclosures for Electrical Equipment.

.2 Underwriters Laboratory Inc. – UL 508.

.3 Canadian Standards Association International – CAN/CSA-C22.2 No. 14-05.

.4 International Electrical Code - IEC 146.

.5 Institute of Electrical and Electronics Engineers, Inc. - IEEE 519 - IEEE Standard Practices and Requirements for Harmonic Control in Electrical Power Systems.

1.3 SUBMITTALS

.1 Shop Drawings - Approval

- .1 Elevation Drawings: Include dimensional information and conduit routing locations.
- .2 Unit Descriptions: Include amperage ratings, enclosure ratings, fault ratings, nameplate information, etc. as required for approval.
- .3 Wiring Diagrams:
  - .1 Power Diagram: Include amperage ratings, circuit breaker frame sizes, circuit breaker continuous amp ratings, etc. as required for approval.
  - .2 Control Diagram: Include disconnect devices, pilot devices, etc.
  - .3 Major components list.

.2 Product Data Sheets

- .1 VFD and Operator Interface publications.
- .2 Data sheets and publications on all major components including but not limited to the following:
  - .1 Contactors
  - .2 Circuit breaker and fuse (power and control)
  - .3 Control power transformers
  - .4 Pilot devices
  - .5 Relays/Timers

.3 Test procedures shall be per the manufacturer’s standards.

1.4 CLOSE OUT SUBMITTALS

.1 Shop Drawings – Final as shipped

- .1 Elevation Drawings: Include dimensional information and conduit routing locations.

.2 Unit Descriptions: Include amperage ratings, enclosure ratings, fault ratings, nameplate information, etc. as required for approval.
.3 Wiring Diagrams:
.1 Power Diagram: Include amperage ratings, circuit breaker frame sizes, circuit breaker continuous amp ratings, etc. as required for approval.
.2 Control Diagram: Include disconnect devices, pilot devices, etc.
.4 Major components list.

.2 Product Data Sheets
.1 VFD and Operator Interface publications.
.2 Data sheets and publications on all major components including but not limited to the following:
.1 Contactors
.2 Circuit breaker and fuse (power and control)
.3 Control power transformers
.4 Pilot devices
.5 Relays/Timers

.3 Test procedures shall be per the manufacturer's standards.

.4 Operation and Maintenance Data
.1 Service and Contact information
.2 VFD and Operator Interface User Manuals
.3 Troubleshooting / Service Manuals

1.5 QUALITY ASSURANCE

.1 Qualifications:
.1 Manufacturers:
.1 The VFD and all associated optional equipment shall be CSA listed or recognized.
.2 The VFD shall contain a CSA label attached on the inside of the enclosure cabinet.

1.6 WARRANTY

.1 The manufacturer shall provide their standard parts warranty for eighteen (18) months from the date of shipment or twelve (12) months from the date of being energized, whichever occurs first.

.2 This warranty applies to variable frequency drive systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

.1 Allen-Bradley – PowerFlex or equal

2.2 VARIABLE FREQUENCY DRIVE UNIT

.1 Features

.1 Certifications

.1 Listed to UL508C and CAN/CSA-C22.2 No. 14-05

.2 In conformity with EMC Directive (2004/108/EC) and Low Voltage Directive

.3 Electric Power Research Institute. Certified compliant with standards SEMI F47 and IEC 61000-4-34

.2 Hardware

.1 Utilize diode bridge or SCR bridge on the input rectifier.

.2 Utilize DC bus inductor on all six-pulse VFDs only.

.3 Utilize switching logic power supply operating from the DC bus.

.4 Incorporate phase to phase and phase to ground MOV protection on the AC input line.

.5 Microprocessor based inverter logic shall be isolated from power circuits.

.6 Utilize latest generation IGBT inverter section.

.7 Battery receptacle for Lithium battery power to the Real Time Clock.

.8 Additional DPI port for handheld and remote HIM options.

.9 Dedicated Digital Input for hardware enable.

.10 Conformal coated printed circuit boards.

.11 Optional onboard 24V DC Auxiliary Control Power Supply.

.3 Control Logic

.1 Ability to operate with motor disconnected.

.2 Provide a controlled shut down, when properly protected, with no component failure in the event of an output phase to phase or phase to ground short circuit. Provide annunciation of the fault condition.

.3 Provide multiple programmable stop modes including Ramp, Coast, DC-Brake, Ramp-to-Hold, Fast Braking, and Current Limit Stop.

.4 Provide multiple acceleration and deceleration rates.

.5 Adjustable output frequency up to 650Hz.

.4 DeviceLogix Control

.1 Ability to control outputs and manage status information locally within the VFD.

.2 Ability to function stand-alone or complimentary to supervisory control.

.3 Ability to speed reaction time by processing in the VFD.

.4 Ability to provide scaling, selector switches, or other data manipulations not already built into the VFD.

.5 Ability to read inputs/write outputs and exclusively control the VFD.

.6 Ability to provide an option for decision making if communication is lost with main controller.

.7 Ability to control other VFDs via a peer-to-peer EtherNet/IP network.

.8 Ability to write programs off-line.

.5 Current Limit

.1 Programmable current limit from 20 to 160% of rated output current.

.2 Current limit shall be active for all drive states: accelerating, constant speed and decelerating.

.3 The drive shall employ PI regulation with an adjustable gain for smooth transition in and out of current limit.

.6 Acceleration / Deceleration

.1 Accel/Decel settings shall provide separate adjustments to allow either setting to be adjusted from 0 to 3600 seconds.

.2 A second set of remotely selectable accel/decel settings shall be accessible through digital inputs.

.7 Speed Profiles

.1 Programming capability shall allow the user to produce speed profiles with linear acceleration/deceleration or "S Curve" profiles that provide changing accel/decel rates.
.2 S Curve profiles shall be adjustable.

.8 Adjustments

.1 A digital interface can be used for all set-up, operation and adjustment settings.
.2 All adjustments shall be stored in nonvolatile memory (EEPROM).
.3 No potentiometer adjustments shall be required.
.4 EEPROM memory for factory default values shall be provided.
.5 Software must be available for trending and diagnostics, as well as online and offline programming functionality.

.9 Process PID Control

.1 The drive shall incorporate an internal process PI regulator with proportional and integral gain adjustments as well as error inversion and output clamping functions.
.2 The feedback shall be configurable for normal or square root functions. If the feedback indicates that the process is moving away from the set-point, the regulator shall adjust the drive output until the feedback equals the reference.
.3 Process control shall be capable of being enabled or disabled with a hardwire input. Transitioning in and out of process control shall be capable of being tuned for faster response by preloading the integrator.
.4 Protection shall be provided for a loss of feedback or reference signal.

.10 Skip Frequencies

.1 Three adjustable set points that lock out continuous operation at frequencies which may produce mechanical resonance shall be provided.
.2 The set points shall have a bandwidth adjustable from Maximum Reverse Speed to Maximum Forward Speed.

.11 Fault Reset / Run

.1 The drive shall provide up to nine automatic fault reset and restarts following a fault condition before locking out and requiring manual restart.
.2 The automatic mode shall not be applicable to a ground fault, shorted output faults and other internal microprocessor faults.
.3 The time between restarts shall be adjustable from 0.5 seconds to 30 seconds.

.12 Run on Power Up

.1 A user programmable restart function shall be provided to allow restart of the equipment after restoration of power after long duration power outages. Restart time dependent on presence of incoming signal.

.13 Fault Memory

.1 The last 32 fault codes shall be stored and time stamped in a fault buffer.
.2 Information about the drive’s condition at the time of the last fault such as operating frequency, output current, dc bus voltage and twenty-seven other status conditions shall be stored.
.3 A power-up marker shall be provided at each power-up time to aid in analyzing fault data.
.4 The last 32 alarm codes shall be stored and time stamped for additional troubleshooting reference.

.14 Overload Protection

.1 The drive shall provide internal class 10 adjustable overload protection.
.2 Overload protection shall be speed sensitive and adjustable.
.3 A viewable parameter shall store the overload usage.

.15 Auto Economizer

.1 An auto economizer feature shall be available to automatically reduce the output voltage when the drive is operating in an idle mode (drive output current less than programmed motor FLA). The voltage shall be reduced to minimize flux current in a lightly loaded motor thus reducing kW usage.
.2 When the load increases, the drive shall automatically return to normal operation.

.16 Terminal Blocks

.1 Separate terminal blocks shall be provided for control and power wiring.
.2 I/O terminal blocks shall be removable with wiring in place.

.17 Flying Start

.1 The drive shall be capable of determining the speed and direction of a spinning motor and adjust its output to "pick-up" the motor at the rotating speed. This feature is disabled by default.

.18 Inputs and Outputs

.1 The Input / Output option modules shall consist of both analog and digital I/O.
.2 No jumpers or switches shall be required to configure digital inputs and outputs.
.3 All digital input and output functions shall be fully programmable.
.4 The control terminal blocks shall be rated for 115V AC.
.5 Inputs shall be optically isolated from the drive control logic.
.6 The control interface card shall provide input terminals for access to fixed drive functions that include start, stop, external fault, speed, and enable.
.7 The VFD shall be capable of supporting up to 7 analog inputs, 7 analog outputs, 21 digital inputs, 7 relay outputs, 7 transistor outputs, and 3 positive temperature coefficient (PTC) inputs.
.8 The Input / Output option modules shall have the following features:
.1 Analog Inputs:
.1 Quantity two (2) differentially isolated, ±10V (bi-polar), 88k ohm input impedance, 11 bit plus sign.
.2 Analog inputs shall be user programmable for a variety of uses including frequency command and process loop input. Analog inputs shall be user programmable for function scaling (including invert), offset, signal loss detect and square root.
.2 Analog Outputs:
.1 Quantity two (2) ±10V (bi-polar) / 11 bit & sign, 2 kΩ minimum load, 4-20 mA, 11 bit plus sign, 400 Ω maximum load.
.2 The analog output shall be user programmable to be proportional to one of fourteen process parameters including output frequency, output current, encoder feedback, output power.
.3 Programming shall be available to select either absolute or signed values of these parameters.
.3 Digital Inputs:
.1 Quantity of six (6) digital inputs rated 24V DC/115V AC.
.2 All inputs shall be individually programmable for multiple functions including: Start, Run, Stop, Auxiliary Fault, Speed Select, Jog and Process PI functions.
.4 Digital Outputs:
.1 At least one (1) relay output (N.O. or N.C.).

.2 For 240V AC or 24V DC, N.O. contact output ratings shall be 2 amp max., general purpose (inductive)/resistive. N.C. contact output ratings shall be 2 amp max., resistive only.
.3 Relays shall be programmable to multiple conditions including: Fault, Alarm, At Speed, Drive Ready and PI Excess Error.
.4 Timers shall be available for each output to control the amount of time, after the occurring event, that the output relay actually changes state.
.5 At least one (1) transistor output.
.6 For 24V DC, transistor output rating shall be 1 amp max, Resistive.

.19 Reference Signals

.1 The drive shall be capable of using the following input reference signals:
.1 Analog inputs
.2 Preset speeds
.3 Remote potentiometer
.4 Digital MOP
.5 Human Interface Module
.6 Communication modules

.20 Loss of Reference

.1 The drive shall be capable of sensing reference loss conditions.
.2 In the event of loss of the reference signal, the drive shall be user programmable to the following:
.1 Fault the drive and coast to stop.
.2 Issue a minor fault - allows the drive to continue running while some types of faults are present.
.3 Alarm and maintain last reference.
.3 When using a communications network to control the drive, the communications adapter shall have these configurable responses to network disruptions and controller idle (fault or program) conditions:
.1 Fault
.2 Stop
.3 Zero Data
.4 Hold Last State
.5 Send Fault Configuration

.21 Metering

.1 At a minimum, the following parameters shall be accessible through the Human Interface Module, if installed:
.1 Output Current in Amps
.2 Output Voltage in Volts
.3 Output Power in kW
.4 Elapsed MWh
.5 DC Bus Voltage
.6 Frequency
.7 Heatsink Temperature
.8 Last eight (32) faults
.9 Elapsed Run Time
.10 IGBT Temperature

.22 Faults

.1 At a minimum, the following faults shall be accessible through the Human Interface Module:
.1 Power Loss

.2 Undervoltage
.3 Overvoltage
.4 Motor Overload
.5 Heat Sink Over-temperature
.6 Maximum Retries
.7 Phase to Phase and Phase to Ground Faults

.23 Predictive Diagnostics

.1 At a minimum, the following predictive diagnostic features shall be provided:
.1 Relay Output Life Cycles based on load type and amps.
.2 Hours of Fan Life based on load and ambient temperature.
.3 Motor Bearing life based on expected hours of use.
.4 Motor Lubrication schedule based on hours of use.
.5 Machine Bearing life based on expected hours of use.

.24 Real-Time Clock

.1 Shall be capable of providing time stamped events.
.2 Shall have the ability to be set locally or via a remote controller.
.3 Shall provide the ability to be programmable for month, day, year and local time zones in HH:MM:SS.

2.3 VFD PACKAGED SYSTEM

.1 Features

.1 Ratings
.1 Voltage
.2 Capable of accepting nominal plant power of 480V AC at 60Hz.
.7 The supply input voltage tolerance shall be ± 10% of nominal line voltage.
.3 Displacement Power Factor
.1 Six-pulse VFD shall be capable of maintaining a minimum true power factor (Displacement P.F. X Distortion P.F.) of 0.95 or better at rated load and nominal line voltage, over the entire speed range.
.2 Eighteen-pulse VFD shall be capable of maintaining a minimum true power factor (Displacement P.F. X Distortion P.F.) of 0.98 or better at rated load and nominal line voltage, over the entire speed range.
.4 Efficiency
.1 A minimum of 96.5% (+/- 1%) at 100% speed and 100% motor load at nominal line voltage.
.2 Control power supplies, control circuits, and cooling fans shall be included in all loss calculations.
.5 Operating ambient temperature range without derating: 0 °C to 40 °C (32 °F to 104 °F)
.6 Operating relative humidity range shall be 5% to 95% non-condensing.
.7 Operating elevation shall be up to 1000 Meters (3,300 ft) without derating.

.2 Sizing
.1 Systems rated at Normal Duty loads shall provide 110% overload capability for up to one minute and 150% for up to 3 seconds.
.2 Systems rated at Heavy Duty loads shall provide 150% overload capability for up to one minute and 180% for up to 3 seconds.

.3 Auto Reset/Run
.1 For faults other than those caused by a loss of power or any other non-critical fault, the drive system shall provide a means to automatically clear the fault and resume operation.

.4 Ride-Through
.1 The VFD system shall attempt to ride through power dips up to 20% of nominal. The duration of ride-through shall be inversely proportional to load. For outages greater than 20%, the drive shall stop the motor and issue a power loss alarm signal to a process controller, which may be forwarded to an external alarm signaling device.

.5 Run on Power Up
.1 The VFD system shall provide circuitry to allow for remote restart of equipment after a power outage. Unless indicated in the contact drawings, faults due to power outages shall be remotely resettable. The VFD system shall indicate a loss of power to a process controller, which may be forwarded to an external alarm signaling device. Upon indication of power restoration the process controller will attempt to clear any faults and issue a run command, if desired.

.6 Communications
.1 VFD shall be capable of communicating on multiple networks.
.2 VFD shall be capable of supporting the following network options:
.3 DeviceNet
.4 EtherNet/IP
.5 ControlNet Coax
.6 ControlNet Fiber
.7 Interbus
.8 CANopen
.9 Modbus/TCP
.10 Modbus RTU
.11 Profibus DP
.12 RS-485 DF1
.13 RS-485 HVAC
.14 Remote I/O

.7 Enclosure Door Mounted Human Interface Module (HIM)
.1 VFD shall provide a HIM with integral LCD display, operating keys and programming keys.
.2 An enclosure door-mounted HIM, rated NEMA/UL Type 1 shall be provided
.3 An optional VFD-mounted HIM, rated NEMA/UL Type 1, may be provided and shall be capable of connecting via a separate cable for use as a handheld terminal.
.4 The HIM shall have the following features:
.1 A seven (7) line by twenty-one (21) character backlit LCD display with graphics capability.
.2 Shall indicate drive operating conditions, adjustments and fault indications.
.3 Shall be configured to display in the following three distinct zones:

.1 The top zone shall display the status of direction, drive condition, fault / alarm conditions and Auto / Manual mode.
.2 The middle zone shall display drive output frequency.
.3 The bottom zone shall be configurable as a display for either programming menus / information or as a two-line user display for two additional values utilizing scaled units.

.4 Shall provide digital speed control.
.5 The keypad shall include programming keys, drive operating keys (Start, Stop, Direction, Jog and Speed Control), and numeric keys for direct entry.

.2 Enclosure
.1 Shall be rated NEMA/UL Type (1)
.2 Shall be painted per the manufacturer's standard.
.3 Shall provide entry and exit locations for power cables.

.4 Shall contain a label for UL508.
.5 The drive system nameplate shall be marked with system Short Circuit Current Rating (SCCR).

.3 Drive Enclosure Input Disconnect
.1 Provide an enclosure door interlocked disconnect with fusing.
.2 Operator Handles
.1 Provide externally operated main disconnect handle.
.2 Handles shall be lockable with up to three lockout / tagout padlock positions.

.4 Branch Circuit Protection
.1 Input fusing, motor circuit protector (MCP),

.5 Control Power Transformer
.1 Provide a control power transformer mounted and wired inside of the drive system enclosure.
.2 The transformer shall be rated for the VFD power requirements.

.6 Auxiliary Relays
.1 Provide relays for Drive Alarm, Drive Fault, Drive Run, and System Status Faults (as required).
.2 The relays shall be Allen-Bradley 700-HC (2 N.O. & 2 N.C.). The relay contacts shall be rated for 115V AC/30V DC, 5.0 amp resistive, 2.5 amp inductive.

.7 Control Interface
.1 The control terminals shall be rated for 115V AC.
.2 The control interface shall provide input terminals for access to VFD functions that include start, stop, external fault, speed select, and enable, as required.

.8 Motor Heater Control
.1 The drive system shall provide the drive control circuitry to energize an existing motor heater whenever the motor is not running via remote power.
.2 The heater control shall be interlocked with the drive and/or bypass and shall be energized whenever the motor is not running. The source shall be remotely provided.
.3 A pilot light with LED (Allen-Bradley Bulletin 800T (30mm) NEMA Type 1 shall be mounted on the drive system enclosure door for indication of Motor Heater On.

.9 Hand/Off/Auto Selector Switch
.1 Provide a "Hand/Off/Auto" selector switch, mounted on the enclosure door.
.2 The "Hand/Off/Auto" selector switch shall start the drive in the “Hand” mode and stop the drive in the “Off” mode.
.3 In the “Auto” mode the drive shall be started and stopped from a remote “RUN” contact.
.4 In all modes, Auxiliary and Enable inputs to the drive control interface board must be present before the drive will start.
.5 When a HIM is present, the stop function shall always be available to stop the drive regardless of the selected mode (“Hand” or “Auto”). The HIM will be non-functional (except for the display and programming) when the switch is in “Off” mode. The HIM shall stop the drive if the switch is in the “Auto” mode with the remote start contact initiated.
.6 The drive speed reference shall be controlled from the HIM, unless a separate door-mounted potentiometer is provided, when in “Hand” mode (factory default setting).

.7 The drive speed reference shall be controlled by a remote 4…20 mA input when in "Auto" mode.
.8 The device shall be an Allen-Bradley Bulletin 800T (30mm) NEMA Type 1, mounted on the drive system enclosure door.

.10 Drive Disable Mushroom Push Button
.1 Provide a maintained mushroom style push button, mounted on the enclosure door that when pushed, will open the drive enable input.
.2 The device shall be an Allen-Bradley Bulletin 800T (30mm) NEMA Type 1, mounted on the drive system enclosure door.

.11 Pilot Lights
.1 Provide LED pilot lights, mounted on the enclosure door, for indication of the following status:
.1 Run
.2 Drive Fault
.3 Control Power On
.4 Motor Fault
.2 The device shall be an Allen-Bradley Bulletin 800T (30mm) NEMA Type 1, mounted on the drive system enclosure door.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verify that location is ready to receive equipment.

.2 Verify that the building environment can be maintained within the service conditions required by the manufacturer of the VFD.

3.2 INSTALLATION

.1 Installation shall be in compliance with all manufacturer requirements, instructions and drawings.

3.3 START-UP SERVICE

.1 At a minimum, the start-up service shall include:
.1 Perform pre-Power Check
.2 Megger Motor Resistances: Phase-to-Phase and Phase-to-Ground
.3 Verify system grounding per manufacturer's specifications
.4 Verify power and signal grounds
.5 Check connections
.6 Check environment

.2 Drive Power-up and Commissioning:
.1 Measure Incoming Power Phase-to-Phase and Phase-to-Ground
.2 Measure DC Bus Voltage
.3 Measure AC Current Unloaded and Loaded
.4 Measure Output Voltage Phase-to-Phase and Phase-to-Ground
.5 Verify input reference signal

.3 All measurements shall be recorded.

.4 Drive shall be tuned for system operation.

.5 Drive parameter listing shall be provided.

3.4 TRAINING

.1 Manufacturer to provide a quantity of (_2_) (_1_)-hour sessions of on-site instruction.

.2 The instruction shall include the operational and maintenance requirements of the variable frequency drive.

.3 The basis of the training shall be the variable frequency drive, the engineered drawings and the user manual. At a minimum, the training shall:

- .1 Review the engineered drawings identifying the components shown on the drawings.
- .2 Review starting / stopping and speed control options for the controller.
- .3 Review operation of the Human Interface Module for programming and monitoring of the variable frequency drive.
- .4 Review the maintenance requirements of the variable frequency drive.
- .5 Review safety concerns with operating the variable frequency drive.

END OF SECTION

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Appendix A

COVID-19 CONTRACTOR AFFIDAVIT

TIE 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 TIE 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 or fax to 902-569-0590 prior to construction activity.