SPECIFICATION

FOR

Summerside Intermediate School

Building Management System Upgrade

Summerside, Prince County, PEI

Project 610-19014

Prepared by:

PEI Department of Transportation, Infrastructure and Energy

June, 2019

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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, July 3rd, 2019, at 10:00 am. Contractors are asked to meet outside the main entrance of the building.**

END

Sealed tenders will be received at the Public Works and Planning Division of the Department of Transportation, Infrastructure and Energy, 3rd Floor Jones Building, 11 Kent Street, Charlottetown, PE until **2 PM, Local Time, on Thursday, July 11th , 2019.** Tenders are to be clearly marked to indicate the project being tendered on.

Summerside Intermediate School – Building Management System Upgrade
Summerside, Prince County, PE

Scope of Work: **Refer to Mechanical Specification - Sect 25 05 00**

Drawings and Specifications may be obtained from the Department of Transportation, Infrastructure and Energy, 3rd Floor Jones Building, 11 Kent Street, Charlottetown, PE, on a cheque deposit of $100.00 (refundable if documents are returned in good condition within 14 days from date of Tender Closing) made out to The Department of Transportation, Infrastructure and Energy.

Drawings and Specifications are available for viewing at the Construction Association offices in Charlottetown, Moncton, Saint John, Fredericton and Halifax.

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

Tenders will be opened at the above advertised time and place and Bidders are invited to be present at the opening. Lowest or any Tender will not necessarily be accepted.

Any additional information can be obtained by contacting **Tyler Gallant, at 902-620-3647 or fax 902-569-0590.**

END

1. GENERAL

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

   b) 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.

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

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 cannot begin prior to **July 2, 2019**.

b) The completion date for this project shall be **August 23, 2019**.

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

a) 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:	Orange Door Engineering

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. REJECTION OF TENDERS

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

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. TENDER SUBMISSION

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.

END

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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. <u>TAXES</u>

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. <u>PERMITS, NOTICES, LAWS AND RULES</u>

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. If the Contractor is delayed in completion of the work by labour disputes, strikes, lock-outs (including lock-outs decreed or recommended by a recognized Contractors' association for its members of which the Contractor is a member), fire, unusual delay by common carriers or unavoidable casualties or without limit to any of the foregoing by any cause of any kind whatsoever beyond the Contractor's control, then the time of completion shall be extended for a period of time equal to the time lost due to such delays. In addition and without limit to the foregoing, the time of completion shall be extended because of any cause whatsoever within the Contractor's control which the Consultant shall decide as justifying a delay for such reasonable time as the Consultant may decide.

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. <u>OWNER'S RIGHT TO DO WORK</u>

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. <u>OWNER'S RIGHT TO TERMINATE CONTRACT</u>

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 # 610-19014** herein, which is more particularly described in the Plans and Specifications titled **Summerside Intermediate School – Building Management System Upgrade** and dated **June, 2019** 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: Summerside Intermediate School
247 Central Street,
Summerside, PE C1N 3M5

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:

"Summerside Intermediate School – Building Management 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 _____

_____
Submitted by (Name of Bidder)

_____
Authorized Signature

END

1. REFERENCES

   a) CSA - S269.1 – [1975] Falsework for Construction Purposes.

   b) CAN/CSA - S269.2 – [M87] Access Scaffolding for Construction Purposes.

2. CONSTRUCTION SAFETY MEASURES

   a) Observe construction safety measures of:

      .1 Latest edition of the National Building Code of Canada

      .2 National Fire Code of Canada

      .3 Provincial Government, including but not limited to the:

         (a) Provincial Building Code Act

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

         (c) Workers' Compensation Act

         (d) Fire Prevention Act

         (e) Dangerous Goods Transportation Act

         (f) Industrial Best Practices for Equipment Isolation and Lockout Policy

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

   c) Maintain clear emergency exit paths.

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

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

3. OVERLOADING

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

4. FALSEWORK

   a) Design and construct falsework in accordance with CSA s269.2.

5. HOISTS AND CRANES

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

6. SCAFFOLDING AND FALL ARREST

   a) Design and Construct Scaffolding in accordance with CSA S269.

   b) Each user of scaffolding shall examine scaffolding for sufficiency before using it. He or she shall make it secure, or shall notify the Contractor in Writing that he or she will not commence work until it is made secure.

   c) Comply with the requirements of the Fall Protection and Scaffolding Regulations, Province of Prince Edward Island 1988.

7. EQUIPMENT AND TOOLS

   a) 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.

8. WHMIS

   a) 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.

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

9. HAZARDOUS MATERIALS

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

b) Any material which contains asbestos that is disturbed or removed during construction work (see Asbestos content Report), shall be removed in accordance with the regulations set out by the Occupational Health and Safety Act. All costs for proper cutting, removal and disposal of all asbestos on this contract shall be included in Tender. Refer also to Section 01900.

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.

10. SITE CLEANING

a) Except where special permission is obtained, maintain clear access on public sidewalks and roads

b) 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.

c) Remove snow and ice from public sidewalks.

11. FIRE SAFETY REQUIREMENTS

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

b) Hot Work will not be permitted on or within the building structure, tanks, or confined spaces, except as outlined herein. Prior to conducting hot work, a hot work permit shall be prepared and submitted. An example format for a hot work permit shall be included in the Safety document submission. The permit shall describe compliance with the following procedures. After tank or confined space interiors or building areas have been decontaminated, hot work may be conducted only when the tank or confined space is inverted. Hot work shall not be

performed unless monitoring indicates atmospheres within and immediately surrounding are less than eight percent (8%) oxygen inside less than ten percent (10%) of the LFL outside; continuous monitoring shall continue until the hot work is completed. The hot work prohibition includes welding, cutting, grinding, sawing, or other similar operations which could be expected to potentially generate combustion-producing temperatures or sparks, or which could produce potentially hazardous fumes or vapours. An individual at each hot work site shall be designated as a fire watch. This person's sole responsibility shall be to monitor the hot work and have immediate access to at least two (2) twenty (20) pound fire extinguishers located at each hot work site. All extinguishers shall be currently inspection tagged, approved safety pin and tamper resistant seal. A new permit shall be obtained at the start of each work shift during which hot work will be conducted.

c) Smoking permitted in designated areas only. Exercise care in the use of smoking materials.

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

e) Fire Separations:

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

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

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

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

12. <u>REPORTING FIRES</u>

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

b) Report immediately all fire incidents to the fire department as follows:

.1 Activate nearest fire alarm box, or

.2 Telephone 911

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

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

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. SAFETY DOCUMENT SUBMISSION

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

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

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

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

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

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

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

15. SAFETY DOCUMENT ORGANIZATION

a) Organize information in the form of an instructional manual as follows:

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

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

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

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

.5 Arrange content under Safety Document headings specified herein.

16. SAFETY DOCUMENT HEADINGS

a) Employee Safety Training

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

b) Company Safety Policy

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

c) Company Safety Rules in General Terms

.1 Place, under this heading, information of a general, global nature, applying to every work environment where the company has staff pertaining to rules directing compliance to policy. For example, state company safety rules with respect to use of hard hats, safety glasses, safety footwear, CSA approval on such items, use of alcohol or non-prescription drugs.

d) Hazard Assessment

.1 Place, under this heading, information identifying possible hazards specific to this project and identify safe methods and procedures for the execution of work to ensure safety in the work place.

.2 Arrange contents of this heading by technical section number on the project manual.

e) Emergency Action Plan

.1 Place, under this heading, information detailing action to be taken in the event of various emergencies.

.2 Arrange content under the following sub-headings:

(a) First Aid

i. Include information concerning establishment of a First Aid Station, related supplies, staff awareness of location and staff training in First Aid Care of Casualties.

(b) Contact Emergency Support Groups

i. Include relative information including phone location for emergency use, the emergency telephone numbers (and their location) for the various organizations which must be contacted in case of an emergency, and staff training in procedures.

(c) Cessation of Work

i. Include relative information how work cessation during emergencies is handled and communicated to persons present on site.

(d) Joint Occupational Health and Safety Committee Representative

i. Place under this heading information detailing membership and terms of reference.

17. <u>SAFETY OFFICER</u>

a) Provide a Safety Officer at the work site to perform safety management, surveillance, inspections, and safety enforcement for the Contractor. The Safety Specialist shall be the safety "competent person". The Safety Officer shall be at the work site at all times whenever work or testing is being performed, shall conduct daily safety inspections.

.1 Qualifications

(a) Qualifications of Safety Officer

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

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

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

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

(b) Qualifications of Qualified Person, Confined Space Entry:

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

(c) Qualification of Crane Operators must be submitted to the Consultant for approval and must be authorized to operate the crane.

.2 Meetings

(a) Preconstruction Conference

i. The safety officer shall attend the preconstruction conference (see outline attached).

(b) Meeting On Work Procedures

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

(c) Weekly Safety Meetings

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

(d) Work Phase Meetings

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

(e) New Employee Indoctrination

i. New employees will be informed of specific site hazards before they begin work. Documentation of this orientation shall be kept on file at the project site.

END

PRE-CONSTRUCTION CONTRACTOR SAFETY CHECKLIST

Use this text as a guideline for completing the attached checklist. This checklist is a general, *pre-construction* review of the Contractor safety program, as well as an information session to identify what the PEI Department of Transportation, Infrastructure and Energy (TIE) requires of our Contractors. Where the item requires a submission, ensure that it is received. If the item does not apply, enter N/A for not applicable.

The following information will assist you in establishing what will be reviewed in each section.

1. **Safety Policy:** Each employer is required by law (in Prince Edward Island) to have a safety policy and program and to implement that policy. TIE will ask for and receive a copy of that program.

2. **Safety Representative:** Each Contractor is required to advise TIE who their safety representative is. That representative has duties as described in the Occupational Health and Safety Act.

3. **Emergency Procedure:** Each Contractor must have a site specific layout and emergency plan complete with emergency phone numbers.

4. **Employee Orientation:** Each and every person working for a Contractor, including sub-contractors will be given an orientation to familiarize them with the site safety program. Unless otherwise specified, each sub-contractor is responsible for the orientation of their workers.

5. **Safe Work Plan:** Most Contractors are involved in tasks that subject workers to hazards. In order to ensure that these workers are secured from hazard, the Contractor will supply TIE with a written safe work plan which affords protection against the hazards. This plan must be signed by a company representative and communicated to the workers involved in the task.

6. **Personal Protective Equipment Review:** Advise that all workers require CSA Class “b” hard-hat, CSA “Green Patch” (eight inch) footwear, eye, ear, and respiratory protection as required (boots and hat at all times).

7. **Fall Protection:** Fall restraint or fall arrest protection required where a fall of 2.4 meters (8 feet) or more is possible. **NO EXCEPTIONS**

8. **Housekeeping:** Advise of daily, or as needed, clean-up requirements.

9. **Tool Box Talks:** Each Contractor is required to conduct weekly safety meetings with their forces and advise TIE they have been done.

10. **Material Handling/Storage:** Advise Contractor about storage areas and handling of material so as not to endanger their worker or another worker. Stacked material to be banded, chained, blocked, or otherwise secured.

11. **Landing Platforms:** Advise Contractor about movement of material on or off platforms, all material to be secured. Platform gates or chains to be kept closed at all times workers are on platform. If not possible, worker to be tied off with fall restraint system independent of platform.

12. **WHMIS Training:** Receive verification that all Contractor workers are trained and that the Contractor submits their MSDS.

13. **GFCI:** Advise Contractor that all tools are required to have ground fault circuit interrupters (where electricity is supplied by Contractor).

14. **Accident Investigations:** Any injury to any of their workers must be investigated and reported to TIE.

15. **Verbal, Written, Gone:** Explain Zero Tolerance Program.

16. **Joint/Worker Safety Committee:** Sites of over twenty (20) workers must establish a safety committee; over fifty (50), an additional worker committee. Workers required to attend committee meetings will do so and not be prevented by employers.

17. **Fire Protection:** All trades involved in performing hot work of any kind are required to provide fire protection at the work location.

18. **Guardrails:** Advise Contractors that where temporary removal of guardrails is necessary, the area around them must be cordoned off with a barrier. Guardrails must be replaced as soon as possible.

19. **First Aider:** Each Contractor is required to have a first aid kit and trained first aider. Employer must name their first aider.

20. **Visitors:** Advise Contractor that any visitors to site must be suitable protected from hazard. They must wear hard hat, safety vest, and proper safety footwear while on site.
21. **Task Lighting:** Review responsibilities of task specific lighting (who provides it).

22. **Swamper/Riggers Competency:** Where cranes are used, the Contractor must use a swamper/rigger. They shall provide TIE with a written statement identifying, by name(s), their rigger and that the named person is a competent worker as described in the construction reulations.

23. **Scaffolds:** Review scaffold building requirement:
    - Use all braces required by design
    - Access ladder for platform over 1.5 meters
    - Full width platform if height over 3 meters (10 feet)(PEI Regulations require double planks)
    - Full guardrails and toeboards
    - Tied in three times base dimension or use of outriggers
    - Engineered over 50 feet in height (standard frame type)

24. **Elevating Work Platforms:**
    - All boom and scissors lifts required to be CSA approved and have approval on machine
    - Operators manual required on machine at all times
    - Maintenance record on machine at all times
    - Operator must receive training in operation of equipment
    - Fall protection must be used at all times on a boom lift
    - Fall protection required to be used on scissor lift when unit is being moved

25. **Protruding Rebar:** Installer's of reinforcing steel must protect the protruding hazard or make arrangements to have it protected. Removal of protective coverings for task purposed only is allowed, however, protective covering must be replaced as soon as possible.

26. **WCB Clearance Certificates:** Advise Contractor that TIE will not release any funds for payment until Workers Compensation Board Clearance Certificate has been received by TIE.

PRE-CONSTRUCTION CONTRACTOR SAFETY CHECKLIST

PROJECT: _____ DATE: _____

CONTRACTOR: _____

WORK BEING PERFORMED: _____

_____ _____

_____ _____
(Print name and title) (Print name and title)

_____ _____
E-D Project Manager/Superintendent (Sign) Contractor Representative (Sign)

☑ Means Yes
☒ Means No

☐ 1. Safety Policy Submitted
☐ 2. Safety Representative
☐ 3. Emergency Procedure Review
☐ 4. Employee Orientation
☐ 5. Written Safe Work Plan Submitted
☐ 6. Personal Protective Equipment Review
Hard hats and Footwear
Safety Glasses
☐ 7. Fall Protection
☐ 8. Housekeeping
☐ 9. Tool Box Safety Talks (Weekly)
☐ 10. Material Handling/Storage
☐ 11. Landing Platforms
☐ 12. WHMIS Training Verification – MSDS received
☐ 13. GFCI Requirements
☐ 14. Accident/Incident Investigations Notification
☐ 15. Verbal, Written, Gone
☐ 16. Joint Worker Safety Committee
☐ 17. Fire Protection
☐ 18. Guardrails
☐ 19. First Aider on Staff – Name Supplied
☐ 20. Visitors and Safety Equipment
☐ 21. Task Lighting
☐ 22. Swampers/Riggers Competency (in writing)
☐ 23. Scaffolds
☐ 24. Elevating Work Platforms
☐ 25. Protruding Rebar Protection
☐ 26. WCB Clearance Certificate

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 manufacturers 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 ot 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

1.1. Related Sections

.1 Division 0

.2 Division 1

.3 Mechanical

.1 25 05 00

.2 25 06 00

.3 25 10 00

.4 25 90 00

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 Prime Contractor (Controls Contractor) shall bear the all the responsibilities noted in this section as noted by the contractor.

.3 The purpose of these specifications is to outline the responsibilities of the Contractor, all Trades, the Design Team, Owner and Commissioning Agent.

.4 The Contractor and applicable trades shall execute all related commissioning tasks as described in this section and throughout the entirety of the specifications.

1.3. Definitions

.1 *Commissioning:* The quality process for achieving, validating and documenting the performance of systems, subsystems and equipment to meet the defined objectives & criteria and to verify that the design, construction and training meets the owner's requirements.

.2 *Commissioning Authority (CxA)*: The designated entity who takes responsibility for reviewing the Commissioning Plan, and instituting the commissioning process.

.3 *Commissioning Plan*: The overall document that outlines the organization, scheduling, and allocation of resources and documentation pertaining to the commissioning for the individual facility.

.4 *Commissioning Report*: The document that records the results of the commissioning process.

.5 *Pre-Commissioning*: The process of determining that a component is correctly manufactured, installed, started adjusted and prepared for the performance tests.

.6 *Performance Verification*: The process of determining the ability of a system to function and deliver services in accordance with the design intent.

.7 *Functional Test*: The detailed sequential steps required for setting parameters and conditions required for testing system functionality and performance.

.8 *Validate:* To establish documented evidence, which provides a high degree of assurance that a system will consistently perform in accordance with the design intent.

.9 *Verify*: To implement a full range of reviews and tests carried out to determine if systems and interfaces between systems operate in accordance with the design intent.

.10 *Certify*: To review all drawings, including as built drawings, for accuracy and completeness and to record any deficiencies.

.11 *Witness*: To observe and record a summary of results.

1.4. Warranty

.1 The involvement of the Commissioning Authority shall not void any guarantees or warranties nor shall it relieve the Contractor of any contractual responsibilities.

1.5. Commissioning Process

.1 Check List

.1 These specifications include all the items to be commissioned.

.2 Training Plan

.1 The training plan will be created by the Contractor to provide required training to the owner's personnel (i.e. the operation and maintenance staff of the building). The training plan shall outline the duration of training, number of training sessions, seasonal training requirements, re-training requirements, location, attendees, topics, recording requirements, and required documentation.

.3 Commissioning Plan

.1 The Contractor will provide the commissioning plan to the CxA for review and comment. The Contractor shall arrange scheduling and ensuring the proper personnel are available and ensuring systems are ready for commissioning.

.4 Installation Review

.1 The CxA will review the installation of all commissioned equipment and systems and will provide commissioning review. The installation review will be based on the manufacturer's recommended installation instructions in conjunction with the project specifications.

.5 System Performance Verification

.1 The Contractor will check the performance of all systems and equipment as detailed in the testing plan. The CxA will witness all testing.

.6 Review of O&M Manuals

.1 The CxA will review the O&M manuals to confirm that all documentation from the commissioning process has been included.

1.6. On-site Commissioning Procedure

.1 The contractor shall provide a start-up, testing, and training schedule for the entire BMS.

.2 The contractor shall execute a point-point check-out to confirm all points are properly reading and registered based on the BMS I/O before any commissioning.

.3 The contractor shall execute the system performance verification with the CxA as witness for each commissioned equipment and system.

1.7. Additional Responsibilities

.1 Trend data points and provide reports to the CxA as required to show longer term operational testing.

.2 Provide qualified competent technicians for all commissioned equipment and system during commissioning to execute the commissioning plan and testing.

.3 Execute any deferred or seasonal testing at a later date agreed upon by the Contractor, Owner and CxA. Make any corrections needed to the O&M, balancing or as-builts as a result of the deferred or seasonal testing.

1.8. Systems to be Commissioned

.1 All points shall be checked for proper operating before commissioning.

.2 Provide a detailed report to the CxA before commissioning showing that all points have been checked and any deficiencies corrected as part of the check.

.3 The contractor shall provide functional testing as detailed in Appendix A.

2. Products

2.1. Testing Equipment

.1 The contractor shall provide all testing equipment and materials required to execute the start-ups, pre-commissioning checks, commissioning and functional testing.

3. Execution

3.1. General

.1 The contractor may request to produce alternative commissioning forms or alternative testing measures if the procedures provided by the CxA are not viable.

.2 The cost to correct any deficiencies found as a result of the commissioning process shall not be considered an extra to the original contract and shall be considered to be included in the original base bid.

.3 Where submittals from the contractor have insufficient information to complete the commissioning process, the submittals will be rejected and the contractor will re-submit with the additional information required.

3.2. System Check

.1 Submit to the CxA the detailed point-point verification check before scheduling the functional testing of equipment.

3.3. Owner's Training and Instructions

.1 The Contractor and equipment manufacturers shall provide operator training.

.2 Training and instruction shall be provided by qualified technicians and shall be conducted in a classroom setting. If necessary, hands on training shall be provided at each piece of equipment, illustrating the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.

.3 Training and instruction will begin when the Operating and Maintenance Manual has been approved and delivered to the Owner.

.4 The Contractor will be responsible for keeping a record of attendance and which personnel were trained on respective equipment as specified to meet the training needs.

.5 The training method and duration will be chosen to cover the training contents described further in this section.

.6 The Contractor shall assume the following training responsibilities:

.1 Prepare a detailed training and instruction plan based on the training plan issued by CxA and submit to CxA two weeks prior to the planned training.

.2 Provide designated Owner personnel with comprehensive training in the understanding of the systems and the operation and maintenance of each major piece of commissioned equipment or system.

.3 Provide training dockets for each system trained on. The system dockets to be given to each attendee and should cover brief description, principle of operation, block diagram, flow diagram , list of critical parts & special tools, predictive maintenance procedure to prevent break down,

common trouble shooting, important observations during start up and operation of system, references for operation, maintenance , parts procurement, technical support etc.

.4 Submit the completed training record and evaluation sheet.

.5 Provide a minimum of 2 – 4 hour sessions for training.

.6 Provide a minimum 2 hours of additional seasonal training.

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.

.3 The Controls trade shall be the prime contractor.

1.2. Scope of Work

.1 It is the intent of these specifications to describe a complete working building automation 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 The contractor shall include all plumbing, HVAC, electrical and other physical work required by specialized sub-contractors required in order to execute the intention of the controls system specified in these documents.

.3 As-built drawings with locations of equipment is not available. Contractor to site-verify the location of all devices. The Owner shall not be responsible for additional charges due to the contractor being unaware of existing conditions of the existing systems.

.4 Any components may be salvaged from the original installation unless otherwise specified. The components from the existing Walker system shall not be reused. The Automated Logic front end may be reused at the discretion of the contractor. If this front end is reused than the graphics must be seamlessly integrated into the existing system. The existing system is provided by Memco Controls: 506-854-2496.

.5 These specifications shall be read in conjunction with all other specifications for this project.

.6 Additional Work

.1 The following is additional work which may not be apparent in the specifications which is required to be included as part of this tender:

.1 Removal of return oil piping from existing oil tank to two existing boilers for a single ½” oil line with new tiger loop oil filter to supply boilers. This work is to facilitate the installation of the new oil meter which is under this contract.

.2 The replacement of the existing starters with variable speed drives for:

.1 C-1

.2 C-1A

.3 C-2

.4 AHU-2

.5 EF-7

.6 Installation of variable speed drives shall include removal of starters and additional wiring as required. VFD may be mounted on individual field fabricated stands near the units served. Include to extend wiring as required. VFD as required to be relocated where wiring distance precludes reusing the existing starter location.

.3 Installation of all water flow meters into existing hydronic piping. Flow meters shall be installed with manual isolation ball valves on each side (butterfly valves not allowed). Meters shall be installed with flanges or unions.

.4 Installation of new automatic shut-off valves into hydronic piping.

.5 Installation of new common supply piping between existing boilers.

.6 Installation of new water temperature wells into existing piping.

.7 Include for providing new insulation on new piping/devices and fixing existing insulation where disturbed.

.8 All electrical work required based on the additions/changes/deletions of the BMS points or devices.

.2 In general, it is expected that all material and labour associated with the installation, replacement or removal of all BMS points and devices listed in these specifications shall be included in this tender.

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 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.

.6 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. Cutting and Patching

.1 This Trade shall be responsible for all 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.

1.9. 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.

1.10. 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.

1.11. 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.

1.12. 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.

1.13. 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.

1.14. Testing and Commissioning

.1 Refer to Section 01 91 00 Commissioning

1.15. 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.

1.16. 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".

1.17. 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.

1.18. 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. Access Doors

.1 Access doors shall be by Acudor or equivalent. Doors shall be prime-coated where there is a paint finish and aluminum for tiled or similar unpainted areas. Doors shall be a minimum 8"x8" (200mm x 200m) size or larger as required for the application.

.2 Access doors in fire rated assemblies shall be ULC listed as a fire rated access door.

2.2. 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. Access Doors

.1 Provide access doors for all location where serviceable equipment are concealed in an inaccessible location.

3.2. 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.

.3 Where points are listed here, they shall be display on the graphically user interface.

1.2. Abbreviations

- AI: Analog Input
- AO: Analog Input
- DI: Binary digital input
- DO: Binary digital output

VFD: Variable speed drive

Point	Description	System	Type	Reuse/Replace /Remove/New	Notes
Existing Automated Logic System - All components may be used as noted					
OAT	Outdoor air temperature	-	AI	Replace	
Boiler 1 Alarm Monitoring	B-1 alarm	BOILER	DI	Reuse	
Boiler 2 Alarm Monitoring	B-2 alarm	BOILER	DI	Reuse	
C-1ASS	C-1A start/stop	BOILER	DO	Remove	
C-1AST	C-1A status	BOILER	DI	Remove	
C-1SS	C-1 start/stop	BOILER	DO	Remove	
C-1ST	C-1 status	BOILER	DI	Remove	
C1_SWT	Pump C-1/C-1a SWT	BOILER	AI	Replace	
C1_MV	Pump C-1/C-1a mixing valve	BOILER	AO	Reuse	
C2_SWT	Pump C-2 SWT	BOILER	AI	Replace	
C2_ST	Pump C-2 status	BOILER	DI	Remove	
C2_SS	Pump C-2 start/stop	BOILER	DO	Remove	
C2_MV	Pump C-2 mixing valve	BOILER	AO	Reuse	
SF-1 EAH	SF-1 exhaust air humidity	AHU-1	AI	Reuse	
SF-1 MAT	AHU-1 pre-heating coil supply air temperature	AHU-1	AI	Replace	
SF-1 FA Damper	AHU-1 fresh air damper	AHU-1	DO	Reuse	
SF-1 Start/stop	AHU-1 start/stop	AHU-1	DO	Reuse	
Pump C-4 Amps	Pump C-4 status	AHU-1	AI	Reuse	
C4S	Pump C-4 Start/stop	AHU-1	DO	Reuse	

SF-1 - Heating coil Valve	Pump C-4 mixing valve	AHU-1	AO	Reuse	
SF-1 - Humidifier	AHU-1 humidifier enable	AHU-1	DO	Reuse	
SF-1 - SAT	AHU-1 supply air temperature	AHU-1	AI	Replace	
EF1_ST	EF-1 status	AHU-1	DI	Reuse	
EF1_SS	EF-1 start/stop	AHU-1	DO	Reuse	
EF2_ST	EF-2 status	AHU-1	DI	Reuse	
EF2_SS	EF-2 start/stop	AHU-1	DO	Reuse	
EF3_ST	EF-3 status	AHU-1	DI	Reuse	
EF3_SS	EF-3 start/stop	AHU-1	DO	Reuse	
EF4_ST	EF-4 status	AHU-1	DI	Reuse	
EF4_SS	EF-4 start/stop	AHU-1	DO	Reuse	
EF5_ST	EF-5 status	AHU-1	DI	Reuse	

All points on existing Walker System shall be ported over as noted

WATER_METER	Water meter	-	DI	Reuse	
FIRE	Fire Alarm	-	DI	Reuse	
HVWST	C-2 Hot water supply temperature	HWS	AI	Replace	
HV	C-2 3-way valve	HWS	AO	Reuse	
C2ST	C-2 status	HWS	DI	Reuse	
C2	C-2 start/stop	HWS	DO	Reuse	
IFHWST	C-3 supply water temperature	HWS	AI	Replace	
IFHWV	C-3 supply water 3-way valve	HWS	AO	Reuse	
C3	C-3 start/stop	HWS	DO	Reuse	
C3S	C-3 status	HWS	DI	Reuse	
HWST	C-1 supply water temperature	HWS	AI	Replace	
C1ST	C-1 status	HWS	DI	Reuse	
C1	C-1 start/stop	HWS	DO	Reuse	
HWV	C-1 supply water 3-way valve	HWS	AO	Reuse	
R203T	Room 203 Space temperature	HWS	AI	Replace	
R202T	Room 202 Space temperature	HWS	AI	Replace	
R200T	Room 200 Space temperature	HWS	AI	Replace	
R128T	Room 128 Space temperature	HWS	AI	Replace	
R131T	Room 131 Space temperature	HWS	AI	Replace	

R130T	Room 130 Space temperature	HWS	AI	Replace	
R126T	Room 126 Space temperature	HWS	AI	Replace	
R132T	Room 132 Space temperature	HWS	AI	Replace	
R124T	Room 124 Space temperature	HWS	AI	Replace	
R121T	Room 121 Space temperature	HWS	AI	Replace	
R120T	Room 120 Space temperature	HWS	AI	Replace	
R122T	Room 122 Space temperature	HWS	AI	Replace	
R123T	Room 123 Space temperature	HWS	AI	Replace	
R119T	Room 119 Space temperature	HWS	AI	Replace	
R118T	Room 118 Space temperature	HWS	AI	Replace	
R117T	Room 117 Space temperature	HWS	AI	Replace	
R116T	Room 116 Space temperature	HWS	AI	Replace	
R303T	Room 303 Space temperature	HWS	AI	Replace	
R302T	Room 302 Space temperature	HWS	AI	Replace	
R300T	Room 300 Space temperature	HWS	AI	Replace	
R114T	Room 114 Space temperature	HWS	AI	Replace	
R113T	Room 113 Space temperature	HWS	AI	Replace	
R108T	Room 108 Space temperature	HWS	AI	Replace	
R109T	Room 109 Space temperature	HWS	AI	Replace	
R111T	Room 111 Space temperature	HWS	AI	Replace	
R112T	Room 112 Space temperature	HWS	AI	Replace	
R110T	Room 110 Space temperature	HWS	AI	Replace	
R105T	Room 105 Space temperature	HWS	AI	Replace	

R103T	Room 103 Space temperature	HWS	AI	Replace	
R101T	Room 101 Space temperature	HWS	AI	Replace	
R203V	Room 203 heating valve	HWS	AO	Reuse	
R202V	Room 202 heating valve	HWS	AO	Reuse	
R200V	Room 200 heating valve	HWS	AO	Reuse	
R128V	Room 128 heating valve	HWS	AO	Reuse	
R131V	Room 131 heating valve	HWS	AO	Reuse	
R130V	Room 130 heating valve	HWS	AO	Reuse	
R126V	Room 126 heating valve	HWS	AO	Reuse	
R132V	Room 132 heating valve	HWS	AO	Reuse	
R124V	Room 124 heating valve	HWS	AO	Reuse	
R121V	Room 121 heating valve	HWS	AO	Reuse	
R120V	Room 120 heating valve	HWS	AO	Reuse	
R122V	Room 122 heating valve	HWS	AO	Reuse	
R123V	Room 123 heating valve	HWS	AO	Reuse	
R119V	Room 119 heating valve	HWS	AO	Reuse	
R118V	Room 118 heating valve	HWS	AO	Reuse	
R117V	Room 117 heating valve	HWS	AO	Reuse	
R116V	Room 116 heating valve	HWS	AO	Reuse	
R303V	Room 303 heating valve	HWS	AO	Reuse	
R302V	Room 302 heating valve	HWS	AO	Reuse	
R300V	Room 300 heating valve	HWS	AO	Reuse	
R114V	Room 114 heating valve	HWS	AO	Reuse	
R113V	Room 113 heating valve	HWS	AO	Reuse	
R108V	Room 108 heating valve	HWS	AO	Reuse	
R109V	Room 109 heating valve	HWS	AO	Reuse	
R111V	Room 111 heating valve	HWS	AO	Reuse	
R112V	Room 112 heating valve	HWS	AO	Reuse	
R110V	Room 110 heating valve	HWS	AO	Reuse	
R105V	Room 105 heating valve	HWS	AO	Reuse	
R103V	Room 103 heating valve	HWS	AO	Reuse	
R101V	Room 101 heating valve	HWS	AO	Reuse	
R200SP	Room 200 temperature set-point	HWS	AI	Replace	
R130SP	Room 130 temperature set-point	HWS	AI	Replace	
R109SP	Room 109 temperature set-point	HWS	AI	Replace	
R130T	Room 130 temperature	AC-1	AI	Replace	

R130SP	Room 130 temperature set-point	AC-1	AI	Replace	
A/C_FANST	AC-1 status	AC-1	DI	Reuse	
A/C_FANSS	AC-1 start/stop	AC-1	DI	Reuse	
A/C_SS	AC-1 cooling enable	AC-1	DO	Reuse	
TANK_LOW_AL	Tank low alarm	BOILER	DI	Replace	
TANK_HI_AL	Tank high alarm	BOILER	DI	Replace	
DHWC5ST	Pump C-5 Status	DWH	DI	Reuse	
URINALS	Urinals flush	Urinals	DO	Reuse	
All points on existing Walker System shall be ported over as noted					
KEF1_STATUS	Kitchen exhaust fan status	AHU-2	DI	Reuse	
EF7ST	EF-7 status	AHU-2	DI	Reuse	
AHU2_SFST	AHU-2 fan status	AHU-2	DI	Reuse	
AHU2_FILTER	AHU-2 filter status	AHU-2	DI	Reuse	
AHU2_C8ST	C-8 status	AHU-2	DI	Reuse	
AHU2_DAMPER	AHU-2 fresh air damper open/close	AHU-2	DO	Reuse	
AHU2_SAH	AHU-2 supply air humidity	AHU-2	AI	Reuse	
AHU2_SAT	AHU-2 supply air temperature	AHU-2	AI	Replace	
AHU2_LL	AHU-2 low limit freezestat	AHU-2	DI	Reuse	
EFAN7HI	EF-7 high speed start/stop	AHU-2	DO	Remove	
EFAN7LO	EF-7 low speed start/stop	AHU-2	DO	Remove	
AHU2_SFANHI	AHU-2 high speed start/stop	AHU-2	DO	Remove	
AHU2_SFANLO	AHU-2 low speed start/stop	AHU-2	DO	Remove	
AHU2_C8	C-8 start/stop	AHU-2	DO	Reuse	
AHU2_HCV	AHU-2 heating coil mixing valve	AHU-2	AO	Reuse	
AHU2_HUMID	Humidifier enable	AHU-2	DO	Reuse	
AHU2_FADST	AHU-2 fresh air damper end switch	AHU-2	DI	Reuse	
AHU2_OVRD	Ventilation high-speed over-ride button	AHU-2	DI	Remove	
AHU3_FILTER	AHU-3 filter status	AHU-3	DI	Reuse	
AHU3_SFAN	AHU-3 fan start/stop	AHU-3	DO	Reuse	
AHU3_LL	AHU-3 low limit freezestat	AHU-3	DI	Reuse	
AHU3_SFST	AHU-3 supply fan status	AHU-3	DI	Reuse	
AHU3_FA DAMPER	AHU-3 fresh/mixed air damper actuator	AHU-3	AO	Reuse	
AHU3_FADST	AHU-3 fresh air damper end switch	AHU-3	DI	Reuse	

AHU3_RA DAMPER	AHU-3 relief air damper actuator	AHU-3	AO	Reuse	
AHU3_RADST	AHU-3 relief air damper end switch	AHU-3	DI	Reuse	
AHU3_HUMID	AHU-3 humidifier stop/start	AHU-3	DO	Reuse	
GYM_SPC	AHU-3 gym space temperature	AHU-3	AI	Replace	
GYM_HUM	AHU-3 gym space humidity	AHU-3	AI	Replace	
C6ST	C-6 Pump status	AHU-3	DI	Reuse	
C6	C-6 Pump stop/start	AHU-3	DO	Reuse	
AHU3_TIMER	AHU-3 over-ride timer	AHU-3	DI	Reuse	
AHU3_SAT	AHU-3 supply air temperature	AHU-3	AI	Replace	
AHU4_DAMPER	AHU-4 fresh air dampers	AHU-4	DO	Reuse	
AHU4_FADST	AHU-4 fresh air dampers end switch	AHU-4	DI	Reuse	
AHU4_FILTER	AHU-4 filter status	AHU-4	DI	Reuse	
AHU4_SFAN	AHU-4 fan start/stop	AHU-4	DO	Reuse	
AHU4_LL	AHU-4 freezestat	AHU-4	DI	Reuse	
AHU4_SFST	AHU-4 fan status	AHU-4	DI	Reuse	
AHU4_SAH	AHU-4 supply air humidity	AHU-4	AI	Reuse	
AHU4_SAT	AHU-4 supply air temperature	AHU-4	AI	Replace	
AHU4_HUMID	AHU-4 humidifier enable	AHU-4	DO	Reuse	
AHU4_C9ST	C-9 pump status	AHU-4	DI	Reuse	
AHU4_C9	C-9 pump start/stop	AHU-4	DO	Reuse	
AHU4_HCV	AHU-4 heating valve	AHU-4	AO	Reuse	
EFAN10	EF-10 stop/start	AHU-4	DO	Reuse	
EF10ST	EF-10 status	AHU-4	DI	Reuse	
AHU4_RAH	AHU-4 return air /EF-10 relative humidity	AHU-4	AI	Reuse	
EFAN11	EF-11 stop/start	AHU-4	DI	Reuse	
EF11ST	EF-11 status	AHU-4	DI	Reuse	
AHU5_FILTER	AHU-5 filter status	AHU-5	DI	Reuse	
AHU5_SFAN	AHU-5 fan start/stop	AHU-5	DO	Reuse	
AHU5_LL	AHU-5 freezestat	AHU-5	DI	Reuse	
AHU5_SFST	AHU-5 fan status	AHU-5	DI	Reuse	
AHU5_SAH5	AHU-5 supply air humidity	AHU-5	AI	Reuse	
AHU5_SAT	AHU-5 supply air temperature	AHU-5	AI	Replace	
AHU5_HUMID	AHU-5 humidifier enable	AHU-5	DO	Reuse	

AHU5_C10_STAT	C-10 pump status	AHU-5	DI	Reuse	
AHU5_C10	C-10 pump stop/start	AHU-5	DO	Reuse	
AHU5_HCV	AHU-5 heating valve	AHU-5	AO	Reuse	
AHU5_FADST	AHU-5 fresh air damper end switch	AHU-5	DI	Reuse	
AHU5_DAMPER	AHU-5 fresh air damper	AHU-5	DO	Reuse	
EF13	EF-13 stop/start	AHU-5	DO	Reuse	
EF13ST	EF-13 status	AHU-5	DI	Reuse	
EF12	EF-12 stop/start	AHU-5	DO	Reuse	
EF12ST	EF-12 status	AHU-5	DI	Reuse	
AHU5_RAH5	AHU-5 return / EF-12 humidity	AHU-5	AI	Reuse	
R100_SPC	Room 100 space temperature	HWS	AI	Replace	
R101A_SPC	Room 101A space temperature	HWS	AI	Replace	
R101B_SPC	Room 101B space temperature	HWS	AI	Replace	
R102_SPC	Room 102 space temperature	HWS	AI	Replace	
R103_SPC	Room 103 space temperature	HWS	AI	Replace	
R105_SPC	Room 105 space temperature	HWS	AI	Replace	
R109_SPC	Room 109 space temperature	HWS	AI	Replace	
R110_SPC	Room 110 space temperature	HWS	AI	Replace	
R113_SPC	Room 113 space temperature	HWS	AI	Replace	
R114_SPC	Room 114 space temperature	HWS	AI	Replace	
R116_SPC	Room 116 space temperature	HWS	AI	Replace	
R120_SPC	Room 120 space temperature	HWS	AI	Replace	
R123_SPC	Room 123 space temperature	HWS	AI	Replace	
R124_SPC	Room 124 space temperature	HWS	AI	Replace	
R126_SPC	Room 126 space temperature	HWS	AI	Replace	
R129_SPC	Room 129 space temperature	HWS	AI	Replace	

R131_SPC	Room 131 space temperature	HWS	AI	Replace	
R132_SPC	Room 132 space temperature	HWS	AI	Replace	
R117_SPC	Room 117 space temperature	HWS	AI	Replace	
R117_SPC_SP	Room 117 space temperature set-point	HWS	AI	Replace	
R100_HTG	Room 100 heating valve	HWS	DO	Reuse	
R101A_HTG	Room 101A heating valve	HWS	DO	Reuse	
R101B_HTG	Room 101B heating valve	HWS	DO	Reuse	
R102_HTG	Room 102 heating valve	HWS	DO	Reuse	
R103_HTG	Room 103 heating valve	HWS	DO	Reuse	
R105_HTG	Room 105 heating valve	HWS	DO	Reuse	
R109_HTG	Room 109 heating valve	HWS	DO	Reuse	
R110_HTG	Room 110 heating valve	HWS	DO	Reuse	
R113_HTG	Room 113 heating valve	HWS	DO	Reuse	
R114_HTG	Room 114 heating valve	HWS	DO	Reuse	
R116_HTG	Room 116 heating valve	HWS	DO	Reuse	
R120_HTG	Room 120 heating valve	HWS	DO	Reuse	
R123_HTG	Room 123 heating valve	HWS	DO	Reuse	
R124_HTG	Room 124 heating valve	HWS	DO	Reuse	
R126_HTG	Room 126 heating valve	HWS	DO	Reuse	
R129_HTG	Room 129 heating valve	HWS	DO	Reuse	
R131_HTG	Room 131 heating valve	HWS	DO	Reuse	
R132_HTG	Room 132 heating valve	HWS	DO	Reuse	
R117_HTG	Room 117 heating valve	HWS	DO	Reuse	
IFH_HTG	Infloor heating mixing valve	HWS	AO	Reuse	
IFH_SWT	Infloor heating supply water temperature	HWS	AI	Replace	
C7ST	C-7 pump status	IFH	DI	Reuse	
C7	C-7 pump start/stop	IFH	DO	Reuse	
R217_CLG	Room 217 cooling	RTAC	DO	Reuse	
R217_Ac1	Room 217 start/stop	RTAC	DO	Reuse	
R217_Ac1_SPC	Room 217 space temperature	RTAC	AI	Replace	
R217_Ac1_SPC_SP	Room 217 space temperature set-point	RTAC	AI	Replace	
R217_HTG	Room 217 heating valve	RTAC	AO	Reuse	
R227_CLG	Room 227 cooling	RTAC	DO	Reuse	
R227_Ac2	Room 227 start/stop	RTAC	DO	Reuse	

R227_Ac2_SPC	Room 227 space temperature	RTAC	AI	Replace	
R227_Ac2_SPC_SP	Room 227 space temperature set-point	RTAC	AI	Replace	
R227_HTG	Room 227 heating valve	RTAC	AO	Reuse	
EFAN6	EF-6 stop/start	EF	DO	Reuse	
EF6_STATUS	EF-6 status	EF	DI	Reuse	
EFAN14	EF-14 stop/start	EF	DO	Reuse	
EF14_STATUS	EF-14 status	EF	DI	Reuse	
EFAN15	EF-15 stop/start	EF	DO	Reuse	
EF15_STATUS	EF-15 status	EF	DI	Reuse	
BLR1_FLAME	Boiler B-1 flame status	BOILER	DI	Reuse	
BLR2_FLAME	Boiler B-2 flame status	BOILER	DI	Reuse	
Provide new points as noted					
OAH	Outside air humidity	-	AI	New	
BLR1_OIL	Boiler B-1 oil consumption	BOILER	AI	New	
BLR2_OIL	Boiler B-2 oil consumption	BOILER	AI	New	
BLR1_FLOW	Boiler B-1 water flow rate	BOILER	AI	New	
BLR2_FLOW	Boiler B-2 water flow rate	BOILER	AI	New	
BLR_RWT	Boiler common return water temperature	BOILER	AI	New	
BLR1_SWT	Boiler B-1 supply water temperature	BOILER	AI	New	
BLR2_SWT	Boiler B-2 supply water temperature	BOILER	AI	New	
BLR1_SS	Boiler B-1 enable	BOILER	DI	New	
BLR2_SS	Boiler B-2 enable	BOILER	DI	New	
BLR1_V	Boiler B-1 isolation valve	BOILER	DO	New	
BLR2_V	Boiler B-2 isolation valve	BOILER	DO	New	
C5_FLOW	DWH C-5 pump flow rate	DWH	AI	New	
C5_SWT	DWH C-5 supply water temperature	DWH	AI	New	
C5_RWT	DWH C-5 Return water temperature	DWH	AI	New	
DWH_PWR	DWH - electric tank power consumption	DWH	AI	New	
C1_SS	Pump C-1 enable	HWS	DO	New	
C1_SP	Pump C-1 Speed	HWS	AO	New	
C1_ST	Pump C-1 status/alarm	HWS	DI	New	
C1A_SS	Pump C-1a enable	HWS	DO	New	
C1A_SP	Pump C-1a Speed	HWS	AO	New	
C1A_ST	Pump C-1a status/alarm	HWS	DI	New	

C2_SS	Pump C-2 enable	HWS	DO	New	
C2_SP	Pump C-2 Speed	HWS	AO	New	
C2_ST	Pump C-2 status/alarm	HWS	DI	New	
R217_HTG	Room 217 heating valve	RTAC	AO	New	
R227_HTG	Room 227 heating valve	RTAC	AO	New	
C4FLOW	C-4 flow rate	AHU-1	AI	New	
C4_SWT	C-4 supply water temperature	AHU-1	AI	New	
C4_RWT	C-4 return water temperature	AHU-1	AI	New	
AHU1_HPWR	AHU-1 humidifier power consumption	AHU-1	AI	New	
C8_FLOW	C-8 water flow rate	AHU-2	AI	New	
C8_SWT	C-8 supply water temperature	AHU-2	AI	New	
C8_RWT	C-8 return water temperature	AHU-2	AI	New	
AHU2_SPEED	AHU-2 speed	AHU-2	AO	New	
EFAN7_SPEED	EF-7 speed	AHU-2	AO	New	
AHU2_CO2	CO2 concentration in space	AHU-2	AI	New	
AHU2_SPTEMP	Room temperature sensor	AHU-2	AI	New	
AHU2_SPPRESS	Space pressure sensor	AHU-2	AI	New	
AHU2_OAPRESS	Outdoor air pressure	AHU-2	AI	New	
AHU2_HPWR	AHU-2 humidifier power consumption	AHU-2	AI	New	
AHU3_CO2	AHU-3 gym CO2 concentration	AHU-3	AI	New	
C6_SWT	C-6 supply water temperature	AHU-3	AI	New	
C6_RWT	C-6 return water temperature	AHU-3	AI	New	
C6_FLOW	C-6 water flow rate	AHU-3	AI	New	
AHU3_HPWR	AHU-3 humidifier power consumption	AHU-3	AI	New	
C9_SWT	C-9 supply water temperature	AHU-4	AI	New	
C9_RWT	C-9 return water temperature	AHU-4	AI	New	
C9_FLOW	C-9 water flow rate	AHU-4	AI	New	
AHU4_HPWR	AHU-4 humidifier power consumption	AHU-4	AI	New	
C10_SWT	C-10 supply water temperature	AHU-5	AI	New	

C10_RWT	C-10 return water temperature	AHU-5	AI	New	
C10_FLOW	C-10 water flow rate	AHU-5	AI	New	
AHU5_HPWR	AHU-5 humidifier power consumption	AHU-5	AI	New	

Device	Description	Size	System	Type	Reuse/Replace/ Remove/New	Notes
New devices in this section have no existing wiring/power or infrastructure.						
Variable Frequency Drive	C-1 VFD	Site Verify	HWS	BACnet	New	
Variable Frequency Drive	C-1A VFD	Site Verify	HWS	BACnet	New	
Variable Frequency Drive	C-2 VFD	Site Verify	HWS	BACnet	New	
Variable Frequency Drive	AHU-2 VFD	Site Verify	AHU-2	BACnet	New	
Variable Frequency Drive	EF-7 VFD	Site Verify	AHU-2	BACnet	New	
Oil consumption meter	Boiler B-1 oil meter	1/2"	BOILER	BACnet	New	
Oil consumption meter	Boiler B-2 oil meter	1/2"	BOILER	BACnet	New	
Valve and actuator	Boiler B-1 isolation valve	4"	BOILER	DO	New	
Valve and actuator	Boiler B-2 isolation valve	4"	BOILER	DO	New	
Flow meter	Boiler B-1 water flow rate	3" - 200 GPM Max.	HWS	AI	New	
Flow meter	Boiler B-2 water flow rate	3" - 200 GPM Max.	HWS	AI	New	
Flow meter	Pump C-5 water flow rate	1-1/2" - 35 GPM Max.	HWS	AI	New	
Flow meter	Pump C-4 water flow rate	2" - 55 GPM Max.	HWS	AI	New	

Flow meter	Pump C-8 water flow rate	1-1/2" - 35 GPM Max.	HWS	AI	New	
Flow meter	Pump C-6 water flow rate	1-1/2" - 35 GPM Max.	HWS	AI	New	
Flow meter	Pump C-9 water flow rate	2" - 90 GPM Max.	HWS	AI	New	
Flow meter	Pump C-10 water flow rate	1-1/2" - 35 GPM Max.	HWS	AI	New	
Actuator	Room 148 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 149 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 136 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 138 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 139 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 140 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 141 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 142 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 144 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 223 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 221 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 211 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 308 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 310 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 312 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 305 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 307 2-way valve	1/2"	HWS	AO	Reuse	1

Actuator	Room 309 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 311 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 420 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 418 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 418 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 412 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 411 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 408 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 407 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 506 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 508 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 509 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 510 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 511 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 512 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 513 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 514 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 208 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 209 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 210 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 213 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 214 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 217 2-way valve	1/2"	HWS	AO	Reuse	1

Actuator	Room 218 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 219 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 222 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 227 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 303 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 304 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 313 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 400 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 402 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 403 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 404 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 409 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 409 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 415 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 417 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 418 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 422 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 424 2-way valve	1/2"	HWS	AO	Reuse	1
Actuator	Room 504 2-way valve	1/2"	HWS	AO	Reuse	1

1. Existing valve and associated thermostat is pneumatic. Valves and thermostats to remain pneumatic and not connected to the BMS. No work required.

End of Section

1. General

1.1. Scope of Work

.1 The Building Automation System shall be as indicated on the drawings and described in these specifications. System must be fully integrated and coordinated with mechanical equipment DDC controllers furnished and installed in the equipment manufacturer's factory as specified in those sections. The intent of the BAS is to integrate all mechanical equipment into one system for global monitoring, control, and alarming associated with the building. It is the BAS manufacturer's responsibility to provide all the design, engineering, and field coordination required to ensure all equipment sequence of operations are met as specified and the designated BAS operators have the capability of managing the building mechanical system to ensure occupant comfort while maintaining energy efficiency.

.2 The BAS shall meet BACnet communication standards. BAS controllers shall be listed by BACnet Testing Laboratories (BTL) with appropriate classification. System controller shall be BTL listed BACnet Building Controller (B-BC) Equipment Controllers shall be BTL listed BACnet Application Specific Controller (B-ASC) or BACnet Advanced Application Controller (B-AAC), as appropriate for the purpose of the controller.

.3 Direct Digital Control (DDC) technology shall be used to provide the functions necessary for control of mechanical systems and terminal devices on this project.

.4 Communication between DDC controllers and all workstation(s) shall be over the existing network. The operator shall not have to know the controller identifier or location to view or control a point (object). Application Specific Controllers shall be constantly scanned by the Building Controllers to update point information and alarm information globally.

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

.6 The BAS manufactuers shall provide all devices required for the system to funcaiton properly. The Owner shall provide a workstation, meeting the BAS minimum requirements, in order to access the GUI.

1.2. Submittals

.1 Automation Network equipment

.1 Building controllers

.2 Application controllers

.3 System architecture

.4 Points list

1.3. Project Record Documents

.1 Upon completion of installation, submit three (3) copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and include:

.1 Project Record Drawings - These shall be as-built versions of the submittal shop drawings. One set of electronic media including CAD .dwg and .pdf drawing files shall be provided.

.2 Testing and Commissioning Reports and Checklists signed off by trained factory (equipment manufacturers) and field (BAS) commissioning personnel.

.3 Operating and Maintenance (O & M) Manuals - These shall be as-built versions of the submittal product data. In addition to the information required for the submittals, Operating & Maintenance manual shall include:

.1 Names, address and 24-hour/7-day per week telephone numbers of Contractor personnel managing and installing equipment, along with service personnel responsible for supporting the ongoing warranty and services of the control system.

.2 Procedures for operating the BAS including logging on/off, alarm management, generation of reports, trends, overrides of computer control, modification of setpoints, and other interactive system requirements.

.3 Description of the programming language including syntax, statement descriptions, algorithms, calculations, point database creation and modification, program creation and modification, and operator use of the editor.

.4 Explanation of how to design and install new points, new DDC controllers, and other BAS hardware.

.5 Preventative Maintenance and calibration procedures; hardware troubleshooting; and hardware repair and/or replacement procedures.

.6 Documentation of all software program logic created for Custom Programmable Controllers including the overall point database. Provide one set of magnetic media containing files of the software and point database.

.7 One set of electronic media containing files of all operator color graphic screens for the project.

.8 A list of recommended spare parts including pricing, manufacturer, supplier, and part numbers.

.9 Documentation, installation, and maintenance information for all third party hardware/software products provided including personal computers, printers, hubs, sensors, valves, etc.

.10 Original issue media for all software provided, including operating systems, programming language, operator workstation software, and graphics software.

.11 Licenses, Guarantee, and Warranty documents for all equipment and systems.

.12 Recommended preventive maintenance procedures for all system components including a schedule of tasks (inspection, cleaning, calibration, etc.) and task descriptions.

.4 Training Manuals: The BAS manufacturer shall provide a course outline and copies of training manuals at least two weeks prior to the start of any corporate training class to be attended by the Owner.

1.4. Warranty

.1 Warrant all work as follows:

.1 BAS system labor and materials shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. BAS failures during the warranty period shall be adjusted, repaired, or replaced at no charge to the Owner. The BAS manufacturer shall respond to the Owner's request for warranty service within 24 hours of the initiated call and will occur during normal business hours (8AM-5PM).

.2 At the end of the final start-up/testing, if equipment and systems are operating satisfactorily to the Owner and Engineer, the Owner shall sign certificates certifying that the BAS is operational, and has been tested and accepted in accordance with the terms of this specification. The date of Owner's acceptance shall be the start of the warranty period.

.3 Operator workstation software, project specific software, graphics, database, and firmware updates shall be provided to the Owner at no charge during the warranty period. Written authorization by the Owner must be granted prior to the installation of these updates.

.4 The BAS manufacturer shall provide a web-accessible Users Network for the proposed System and give the Owner free access to question/answer forum, user tips, upgrades, and training schedules for a one year period of time correlating with the warranty period.

.2 System Maintenance

.1 Perform Building Automation System preventative maintenance and support for a period of 1 year (beginning the date of substantial completion).

.1 Make a minimum of 2 complete Building Automation System inspections, in addition to normal warranty requirements. Inspections to include:

.1 System Review – Review the BAS to correct programming errors, failed points, points in alarm, and points that have been overridden manually.

.2 Seasonal Control Loop Tuning – Control loops are reviewed to reflect changing seasonal conditions and / or facility heating and cooling loads.

.3 Sequence of operation verification – Systems all verified to be operating as designed and in automatic operation. Scheduling and setpoints are reviewed and modified.

.4 Database back-up

.5 Operator coaching

.2 Technician shall review critical alarm log and advise owner of additional services that may be required.

.3 Technician shall provide a written report to owner after each inspection.

.2 Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of owner.

1.5. System Performance

.1 Performance Standards. The BAS system shall conform to the following:

.1 Graphic Display. The system shall display a graphic with a minimum of 20 dynamic points. All current data shall be displayed within 10 seconds of the operator's request.

.2 Graphic Refresh. The system shall update all dynamic points with current data within 10 seconds.

.3 Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be 5 seconds. Analog objects shall start to adjust within 5 seconds.

.4 Object Scan. All changes of state and change of analog values shall be transmitted over the high-speed network such that any data used or displayed at a controller or workstation will be current within the prior 10 seconds.

.5 Alarm Response Time. The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed 10 seconds.

.6 Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.

.7 Programmable Controllers shall be able to execute DDC PID control loops at a selectable frequency from at least once every 5 seconds. The controller shall scan and update the process value and output generated by this calculation at this same frequency.

.8 Multiple Alarm Annunciations. All workstations on the network shall receive alarms within 5 seconds of each other.

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

Measured Variable	Reported Accuracy
Space Temperature	±0.5°C [±1°F]
Ducted Air	±1.0°C [±2°F]
Outside Air	±1.0°C [±2°F]
Water Temperature	±0.5°C [±1°F]
Relative Humidity	±5% RH
Air Pressure	±3 Pa [±0.01 "W.G.]
Carbon Dioxide (CO2)	± 50 PPM

1.6. Ownership of Material

.1 Project specific software and documantation shall become the owner's property upon project completion. This includes the following:

.1 Operator Graphic files

.2 As-built hardware design drawings

.3 Operating & Maintenance Manuals

.4 BAS System software database

.5 Controller application programming databases

.6 Application Specific Controller configuration files

2. Product

2.1. 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.

2.2. Operator Interface

.1 Building operator web interface

.1 The building operator web interface shall be accessible via a web browser without requiring any "plug-ins" (i.e. JAVA Runtime Environment (JRE), Adobe Flash).

.2 The building operator web interface shall support the following Internet web browsers:

.1 Internet Explorer 10.0+

.2 Chrome 35.0+

.3 The building operator web interface shall support the following mobile web browsers:

.1 iOS (iPad/iPhone) V7.0+

.2 Android (Tablet) V4.3+

.3 Android (Phone) V2.3+

.2 Mobile App Operator Interface

.1 Mobile App Operator Interface shall support the following Operating systems

.1 Apple iOS V 7/8

.2 Android V4.3/4.4

.2 The operator interface shall support system access on a mobile device via a mobile app to:

.1 Alarm log

.2 System Status

.3 Equipment status

.4 Space Status

.5 Standard Equipment graphics

.3 The operator interface shall support actions on a mobile device via a mobile app to:

.1 Override set points

.2 Override occupancy

.3 Acknowledge Alarms

.4 Comment on Alarms

.3 System Security

.1 Each operator shall be required to login to the system with a user name and password in order to view, edit, add, or delete data.

.2 User Profiles shall restrict the user to only the objects, applications, and system functions as assigned by the system administrator.

.3 Each operator shall be allowed to change their user password.

.4 The System Administrator shall be able to manage the security for all other users.

.5 The system shall include pre-defined “roles” that allow a system administrator to quickly assign permissions to a user.

.6 User logon/logoff attempts shall be recorded.

.7 The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user definable.

.8 All system security data shall be stored in an encrypted format.

.4 On-Line Help and Training

.1 Provide a context sensitive, on line help system to assist the operator in operation and configuration of the system.

.2 On-line help shall be available for all system functions and shall provide the relevant data for each particular screen.

.5 System Diagnostics

.1 The system shall automatically monitor the operation of all network connections, building management panels, and controllers.

.2 The failure of any device shall be annunciated to the operators.

.6 Equipment & Application Pages

.1 The building operator web interface shall include standard pages for all equipment and applications. These pages shall allow an operator to obtain information relevant to the operation of the equipment and/or application.

.2 Engineering Units

.1 Allow for selection of the desired engineering units (i.e. Inch pound or SI) in the system.

.2 Unit selection shall be able to be customized by locality to select the desired units for each measurement.

.3 Scheduling. A user shall be able to perform the following tasks utilizing the building operator web interface:

.1 Create a new schedule, defining the default values, events and membership.

.2 Create exceptions to a schedule for any given day.

.3 Apply an exception that spans a single day or multiple days.

.4 View a schedule by day, week and month.

.5 Exception schedules and holidays shall be shown clearly on the calendar.

.6 Modify the schedule events, members and exceptions.

.7 Alarm/Event Notification

.8 An operator shall be notified of new alarms/events as they occur while navigating through any part of the system via an alarm icon.

.9 Alarm/Event Log. The operator shall be able to view all logged system alarms/events from any building operator web interface.

.1 The operator shall be able to sort and filter alarms from events. Alarms shall be sorted in a minimum of 4 categories based on severity.

.2 Alarm/event messages shall use full language, easily recognized descriptors.

.3 An operator with the proper security level may acknowledge and clear alarms/events.

.4 All alarms/events that have not been cleared by the operator shall be stored by the building controller.

.5 The alarm/event log shall include a comment field for each alarm/event that allows a user to add specific comments associated with any alarm.

2.3. Controller Software

.1 Furnish the following applications software for building and energy management. All software applications shall reside and run in the system controllers. Editing of applications shall occur at the building operator interface.

.2 Scheduling. Provide the capability to schedule each object or group of objects in the system. Each of these schedules shall include the capability for start, stop, optimal start, optimal stop, and night economizer actions. Each schedule may consist of up to [10] events. When a group of objects are scheduled together, provide the capability to define advances and delays for each member. Each schedule shall consist of the following:

.1 Weekly Schedule. Provide separate schedules for each day of the week.

.2 Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. This exception schedule shall override the standard schedule for that day. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed it will be discarded and replaced by the standard schedule for that day of the week.

.3 Holiday Schedules. Provide the capability for the operator to define up to 99 special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator shall be able to define the length of each holiday period.

.4 Optimal Start. The scheduling application outlined above shall support an optimal start algorithm. This shall calculate the thermal characteristics of a zone and start the equipment

prior to occupancy to achieve the desired space temperature at the specified occupancy time. The algorithm shall calculate separate sets of heating and cooling rates for zones that have been unoccupied for less then and greater than 24 hours. Provide the ability to modify the start algorithm based on outdoor air temperature. Provide an early start limit in minutes to prevent the system from starting before an operator determined time limit.

.3 Alarm/Event Log

.1 Any object in the system shall be configurable to generate an alarm when transitioning in and out of a normal or fault state.

.2 Any object in the system shall allow the alarm limits, warning limits, states, and reactions to be configured for each object in the system.

.3 An alarm/event shall be capable of triggering any of the following actions:

.4 Route the alarm/event to one or more alarm log

.1 The alarm message shall include the name of the alarm location, the device that generated the alarm, and the alarm message itself.

.1 Route an e-mail message to an operator(s)

.2 Log a data point(s) for a period of time

.3 Run a custom control program

.4 Point Control. User shall have the option to set the update interval, minimum on/off time, event notification, custom programming on change of events.

.5 Timed Override. A standard application shall be utilized to enable/disable temperature control when a user selects on/cancel at the zone sensor, building operator interface, or the local operator display. The amount of time that the override takes precedence will be selectable from the building operator interface.

.6 Anti-Short Cycling. All binary output points shall be protected from short cycling

2.4. Building Controller

.1 There shall be one or more independent, standalone microprocessor based System Controllers to manage the global strategies described in Application and Control Software section.

.2 The System Controller shall have sufficient memory to support its operating system, database, and programming requirements.

.3 The controller shall provide a communications port for connection to a PC.

.4 The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.

.5 All System Controllers shall have a real time clock.

.6 Data shall be shared between networked System Controllers.

.7 The System Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:

.1 Assume a predetermined failure mode.

.2 Generate an alarm notification.

.3 Create a retrievable file of the state of all applicable memory locations at the time of the failure.

.4 Automatically reset the System Controller to return to a normal operating mode.

.8 Environment. Controller hardware shall be suitable for the anticipated ambient conditions. Controller used in conditioned ambient shall be mounted in an enclosure, and shall be rated for operation at -40° C to 50° C [-40° F to 122° F].

.9 Clock Synchronization.

.1 All System Controllers shall be able to synchronize with a NTP server for automatic time synchronization.

.2 All System Controllers shall be able to accept a BACnet time synchronization command for automatic time synchronization.

.3 All System Controllers shall automatically adjust for daylight savings time if applicable.

.10 Serviceability

.1 Provide diagnostic LEDs for power, communications, and processor.

.2 The System Controller shall have a display on the main board that indicates the current operating mode of the controller.

.3 All wiring connections shall be made to field removable, modular terminal connectors.

.4 The System controller shall utilize standard DIN mounting methods for installation and replacement.

.1 Memory. The System Controller shall maintain all BIOS and programming information indefinitely without power to the System controller.

.2 Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shut-down below 80% nominal voltage.

.3 BACnet Test Labs (BTL) Listing. Each System Controller shall be listed as a Building Controller (B-BC) by the BACnet Test Labs with a minimum BACnet Protocol Revision of 14.

2.5. Application Controller

.1 Application Controllers shall be microprocessor-based DDC controllers which, through hardware or firmware design, control specified equipment.

.1 Software

.1 To meet the sequence of operation for each zone control, the controller shall use programs developed and tested by the controller manufacturer that are either factory loaded or downloaded with service tool to the controller.

.2 Stand-Alone Operation: Each piece of equipment specified in section “A” shall be controlled by a single controller and provide stand-alone control in the event of communication failure. In case of communications failure stand-alone operation shall use default values or last values for remote sensors read over the network such as outdoor air temperature.

.3 For controlling ancillary devices and for flexibility to change the sequence of operation in the future, the controller shall be capable running custom programs written in a graphical programming language.

.2 Environment: Controller hardware shall be suitable for the anticipated ambient conditions.

.1 Storage: -55° to 203° F (-48° to 95° C) and 5 to 95% Rh, non-condensing.

.2 Operating: -40° to 158° F (-40 to 70° C) and 5 to 95% Rh, non-condensing.

.3 Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.

.4 Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° to 158° F [-40° to 70° C].

.3 Input/Output:

.1 For flexibility in selection and replacement of valves, the controllers shall be capable of supporting all of the following valve control types 0-10VDC, 0-5VDC, 4-20mA, 24VAC floating point, 24VAC - 2 position (Normally Open or Normally Closed).

.2 For flexibility in selection and replacement of sensors, the controllers shall be capable of reading sensor input ranges of 0 to10V, 0 to 20mA, pulse counts, and 200 to 20Kohm.

.3 For flexibility in selection and replacement of binary devices, the controller shall support dry and wetted (24VAC) binary inputs.

.4 For flexibility in selection and replacement devices, the controller's shall have binary output which are able to drive at least 12VA each.

.5 or flexibility in selection and replacement of motors, the controller shall be capable of outputting 24VAC (binary output), DC voltage (0 to 10VDC minimum range) and PWM (in the 80 to 100 Hz range).

.6 For future needs, any I/O that is unused by functionality of equipment control shall be available to be used by custom program on the controller and by another controller on the network.

.4 Software Retention: All Zone Controller operating parameters, setpoints, BIOS, and sequence of operation code must be stored in non-volatile memory in order to maintain such information for months without power.

.5 Transformer for the controller must be rated at minimum of 115% of ASC power consumption, and shall be fused or current limiting type. 24 VAC, +/- 15% nominal, 50-60 Hz, 24 VA plus binary output loads, for a maximum of 12 VA for each binary output.

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

.1 UL916 PAZX, Open Energy Management Equipment

.2 UL94-5V, Flammability

FCC Part 15, Subpart B, Class B Limit

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.

.1 DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in overvoltage and overcurrent protection and shall be able to withstand a 150% current overload for at least three seconds without trip-out or failure.

.1 Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MIL-STD 810C for shock and vibration.

.2 Line voltage units shall be UL recognized and CSA approved.

2.7. Control Devices

.1 Wired Temperature Sensors

.1 Temperature sensors shall be RTD or thermistor.

.2 Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m2 (10 ft2) of duct cross section.

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

.4 Provide matched temperature sensors for differential temperature measurement.

.2 Thermostats

.1 Temperature sensors as specified.

.2 Where shown with temperature set-point, provide LCD displaly with temperature feedback.

.3 Where in public areas, provide only temperature sensor with stainless steel cover

.4 Otherwise provide vented plastic cover with no temperature read-out.

.3 Static Pressure Sensors

.1 Sensor shall have linear output signal. Zero and span shall be field-adjustable.

.2 Sensor sensing elements shall withstand continuous operating conditions plus or minus 50% greater than calibrated span without damage.

.3 Water pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Sensor shall be complete with 4-20 ma output, required mounting brackets, and block and bleed valves. Mount in location accessible for service.

.4 Water differential pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (DP) and maximum static pressure shall be 3,000 psi. Transmitter shall be complete with 4-20 ma output, required mounting brackets, and five-valve manifold. Mount in a location accessible for service.

.4 Carbon Dioxide (CO_2) Senors

.1 CO_2 sensor shall be single purpose for carbon dioxide.

.2 Sensors shall be of NDIR type compensating for long-term drift with no maintenance or on-going calibration required.

.3 Scale output of 0 – 1000 ppm with maximum error of 2% of full scale.

.5 Relays

.1 Control relays shall be UL listed plug-in type with dust cover and LED “energized” indicator. Contact rating, configuration, and coil voltage shall be suitable for application.

.2 Time delay relays shall be UL listed solidstate plug-in type with adjustable time delay. Delay shall be adjustable ±200% (minimum) from setpoint shown on plans. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.

.6 Transformers and Power Supplies

.1 Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.

.2 Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.

.3 Unit shall operate between 0 C and 50 C.

.4 Unit shall be UL recognized.

.7 Local Control Panels

.1 All indoor control cabinets shall be fully enclosed NEMA 1 Type construction with hinged door, and removable sub-panels or electrical sub-assemblies.

.2 Interconnections between internal and face-mounted devices shall be pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600-volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.

.3 Provide on/off power switch with over-current protection for control power sources to each local panel.

.8 Differential Pressure Type Switches (Air or Water Service)

.1 Shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application or as shown.

.9 Humidity sensor

.1 Outdoor humidity sensors shall be provided in outdoor weather enclosure. Wiring to the outside shall be sealed water-tight

.2 Accuracy of +/-1%RH within temperatures of 5°C - 30°C

.3 Linear output

.10 Fuel Oil Meter

.1 Provide positive displacement type fuel oil meter for each boiler.

.2 Accuracy of +/-1% of full scale.

.3 Operating temperature of -40°F to 300°F

.4 Stainless steel body. Buna-N o-ring.

.5 Intrinsicly safe 4 -20 mA proportional output.

.6 Flomec OM series or equivalent.

.11 Variable Frequency Drive

.1 Voltage and power as noted.

.2 Hand-off-auto operation.

.3 Max +/-3% of nominal phase to phase voltage.

.4 0.98 power factor.

.5 UL NEMA 1 enclosure.

.6 UL, cUL, BTL approvals.

.7 Maximum 3% power loss based on rated power.

.8 Integral cooling fans.

.9 Minimum 2 programbale analog inputs. Minimum 2 programmable digital outputs. Minimum 2 2A relay outputs.

.10 Native BACnet communication BACnet over IP.

.11 Single phase protection. Overcurrent trip limit. Overvoltage current regulation limit.Ground fault protected. Short circuit protected. Motor stall protection. Loss of phase protection. SCCR = 100,000 RMSA

.12 LCD operator control panel.

.13 Standard of acceptance: ABB

.12 Isolation Valves

.1 Butterfly valves shall be threaded lug type suitable for dead end service and modulation to the fully closed position, with carbon steel bodies and non-corrosive discs, stainless steel shafts supported by bearings, and EPDM seats suitable for temperatures from 20 to 250°F.

.2 The rated flow coefficient for butterfly valves shall be the value at 70% (60 degrees) open position.

.3 Valve leakage shall meet ANSI/FCI 70 2 Class VI leakage rating.

.4 The actuator shall have mechanical or electronic stall protection to prevent damage to the actuator throughout the rotation of the actuator.

.5 Where shown, for power-failure/safety applications, an internal mechanical, spring-return mechanism shall be built into the actuator housing.

.6 All 24 VAC/VDC actuators shall operate on Class 2 wiring

.7 All non-spring-return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered.

.8 Standard of acceptance: Belimo

.13 Control Valves

.1 Valves shall have stainless steel stems and stuffing boxes with extended necks to clear the piping insulation. Valve bodies shall meet ANSI/ASME B16.34 or ANSI/ASME B16.15 pressure and temperature class ratings based on the design operating temperature and 150% of the system design operating pressure.

.2 Unless otherwise specified or shown, valve leakage shall meet ANSI/FCI 70 2 Class IV leakage rating (0.01% of valve Kv). Unless otherwise specified or shown, valves shall have globe style bodies.

.3 Bodies shall be brass or bronze, with threaded or union ends.

.4 All characteristics of control valves shall be suitable for the required operations.

.5 The pressure drop across all modulating control valves shall be between 1.5 and 4 psi unless specified otherwise.

.6 The actuator shall have mechanical or electronic stall protection to prevent damage to the actuator throughout the rotation of the actuator.

.7 Where shown, for power-failure/safety applications, an internal mechanical, spring-return mechanism shall be built into the actuator housing.

.8 All 24 VAC/VDC actuators shall operate on Class 2 wiring

.9 All non-spring-return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered.

.10 Standard of acceptance: Belimo

.14 Water Flow meter

.1 Ultrasonic flow meter with emitter/receiver.

.2 0-10 VDC output signal.

.3 +/-2% accuracy and +/-0.5% repeatability.

.4 Maintenance free.

.5 Maximum pressure drop 5 ft.w.c. based on maximum flow.

.6 Install with minimum 5x pipe diameter straight length inlet.

.7 Standard of acceptance: Belimo or Onicon

.15 Power Monitoring

.1 Where noted in the schedules, provide sufficient sensors to monitor the power consumption of existing equipment.

.2 It is acceptable to monitor energy consumption by:

.1 Use of VFD for motors

.2 Use of voltage and current sensors for electric resistive equipment (humidifiers).

.3 Combined errors shall be no higher than 3% of full scale.

2.8. Wiring and Raceways

.1 Provide copper wiring, cable, and raceways.

.2 Where wiring cannot be installed in existing walls, conduit shall be provided.

.3 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. 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.

3.3. Wiring

.1 All control and interlock wiring shall comply with the National, Local Electrical Codes.

.2 All NEC Class 1 (line voltage) wiring shall be UL Listed in approved raceway according to NEC requirements.

.3 Do not install Class 2 wiring in conduits containing Class 1 wiring. Boxes and panels containing high voltage may not be used for low voltage wiring except for the purpose of interfacing the two via control relays and transformers.

.4 Conduit and wire sizing shall be determined by the BAS manufacturer in order to maintain manufacturer's recommendation and meet National and Local Codes.

.5 Follow manufacturer's installation recommendations for all communication and network bus cabling. Network or communication cabling shall be run separately from all control power wiring.

.6 Flexible metal conduits and liquid-tight flexible metal conduits shall not exceed 3' in length and shall be supported at each end. Flexible metal conduit less than 1/2" electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal conduits shall be used.

3.4. Communication Wiring

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

.2 Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.

.3 Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer shall not be exceeded during installation.

.4 Contractor shall verify the integrity of the entire network following cable installation. Use appropriate test measures for each particular cable.

.5 All runs of communication wiring shall be unspliced length when the length is commercially available.

.6 All communication wiring shall be labeled to indicate origin and destination.

3.5. 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.

.2 Sensors that require field mounting shall meet the BAS manufacturer's recommendations and be coordinated with the mechanical equipment they will be associated.

.3 Mount sensors rigidly and adequately for the environment the sensor will operate.

.4 Room temperature sensors shall be installed on concealed junction boxes properly supported by the block wall framing. For installation in dry wall ceilings, the low voltage sensor wiring can be installed exposed and must meet applicable National and Local Electrical Codes.

.5 All wires attached to wall mounted sensors shall be sealed off to prevent air from transmitting in the associated conduit and affecting the room sensor readings.

.6 Install duct static pressure tap with tube end facing directly down-stream of air flow.

.7 Install space static pressure sensor with static sensing probe applicable for space installation where applicable.

.8 All pipe mounted temperature sensors shall be installed in matched thermowells. Install all liquid temperature sensors with heat conducting fluid in thermal wells for adequate thermal conductance.

.9 Wiring for space sensors shall be concealed in building drywall. EMT conduit is acceptable within mechanical equipment and service rooms.

3.6. Actuators

.1 Mount and link multiple control damper actuators where required, per manufacturer's instructions.

.2 To compress seals when spring-return actuators are used on normally closed dampers, power the actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.

.3 Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions. Coordinate any installation problems with Sheet metal Contractor.

.4 Valves - Actuators shall be mounted on valves with adapters approved by both the actuator and valve manufacturer. Actuators and adapters shall be mounted in the factory as an approved design arrangement and shall not be field modified.

3.7. 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.

3.8. 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 of 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.

3.9. Cleaning

.1 Provide The BAS manufacturer's installing contractor(s) shall clean up all debris resulting from their installation activities on a daily basis. The installation contractors shall remove all cartons, containers, crates, etc. under his control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Owner, Construction Manager, General Contractor, and/or Mechanical Contractor.

.2 At the completion of work in any area, the installation contractor shall clean all of their work, equipment, etc., making it free from dust, dirt and debris.

.3 At the completion of work, all equipment furnished under this Section shall be checked for paint damage. Any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

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. General

.1 Where schedules are noted, all schedules are to be accessible and editable by the BMS operator.

.2 For set-points and resets shown, all values shall be user editable with defaults set as shown.

1.3. Boiler System

.1 Overview

.1 Two oil-fired boilers provide hot water for heating the school. Boiler operate lead/lag with second boiler as 2nd stage.

.2 Start-up

.1 Whenever the outdoor air temperature is below 67.5°F+/-2.5°F

.1 Enable C-1/C-1A and C-2 pumps

.2 After a delay, enable the lead boiler

.3 Normal Operation

.1 Boiler operate on internal controls

.2 BMS to monitor boilers output. BMS to average output every hour.

.1 When total average hourly boiler output exceeds 80% of rated capacity, start second boiler.

.2 When total average hourly boilers output is less than 30%, disable second boiler.

.3 Disabled boiler shall have their isolation valves closed.

.4 Shut-down

.1 Disable the boilers whenever the outdoor air temperature is above 67.5°F+/-2.5°F

.5 Alarms

.1 Boiler alarm

.6 Energy Efficiency Calculations

.1 Heat input:

.1 Q_{in} (MBH) = BLRx_OIL [GPH] x 139.6

.2 Heat output:

.1 Q_{out} (MBH) = 500 x (BLRx_SWT[°F] – BLR_RWT[°F]) x BLRx_FLOW [GPM]

1.4. Hot Water Distribution

.1 C-1/C-1A (Main hot water distribution pump)

.1 Modulate the C-1 valve to maintain supply water temperature at set-point.

.2 Set-point shall be reset based on valve demand:

.1 Minimum set-point shall be 120°F

.2 Maximum set-point shall be 190°F

.3 Reset the temperature between minimum and maximum values based on valve position of all heating valves.

.1 Increase temperature while less than 4 valves are wide open.

.2 Decrease the temperature until at least 2 valves are wide open.

.3 Modulate the speed of the lead pump to maintain discharge pressure set-point.

.1 Enable the second pump when discharge pressure set-point cannot be maintained.

.2 Disable the second pump when both pumps are operating at <50% speed.

.2 C-2 (Main hot water distribution pump)

.1 Modulate the C-2 valve to maintain supply water temperature at set-point.

.1 Minimum set-point shall be 120°F

.2 Maximum set-point shall be 190°F

.3 Reset the temperature between minimum and maximum values based on valve position of all heating valves.

.1 Increase temperature while less than 4 valves are wide open.

.2 Decrease the temperature until at least 2 valves are wide open.

.2 Modulate the speed of C-2 pump to maintain discharge pressure set-point.

.3 C-3 (In-floor heating – 2000)

.1 Operate the pump whenever there is a call for heating in the associated zone.

.4 C-4 (AHU-1 heating coil)

.1 Refer to AHU-1

.5 C-5 (DWH)

.1 Enable pump whenever the school is occupied and the boilers are operating.

.6 C-6 (Gymnasium heating)

.1 Enable pump on call for heating from the gymnasium.

.7 C-7 (In-floor heating – 2004)

.1 Operate pump whenever there is a call for heating in the associated zone.

.8 C-8 (AHU-2 heating coil)

.1 Refer to AHU-2

.9 C-9 (AHU-4 heating coil)

.1 Refer to AHU-4

.10 C-10 (AHU-5 heating coil)

.1 Refer to AHU-5

1.5. AHU-1

.1 Overview

.1 This system is a constant volume, constant temperature 100% ventilation system.

.2 Start-up

.1 Unit starts up based on a time-of-day schedule. Schedule shall allow for seasonal shut-downs over the summer.

.2 When the outdoor air temperature is < 60°F:

.1 Confirm heating valve open at 100% heating and pump C-4 is operating.

.3 Fresh air damper opens.

.4 AHU-1 supply fan and EF-1, EF-2, EF-3 and EF-4 start. Provide delay between each fan.

.5 Humidifier is enabled one minute after start-up for outdoor air temperature <55°F+/-2.5°F and absolute humidity <0.0050 lb_{water}/lb_{air}.

.3 Normal operation

.1 Supply fan and exhaust fans operates continuously.

.2 Modulate the heating valve to maintain 55°F supply air temperature.

.3 Humidifier to operate on internal controls

.4 Shut-down

.1 Shut-down on schedule or on fire alarm.

.2 Disable the humidifier, delay 30 seconds.

.3 Stop fans. Provide short delay between each fan.

.4 Close outdoor air damper.

.5 Open heating valve to full heating.

.6 C-4 pump to remain enabled when the outdoor air temperature is <60°F.

.1 Modulate the valve to maintain 50°F temperature at the duct.

.7 Shut down humidifier on temperature >60°F or absolute humidity >0.0060 lb_{water}/lb_{air}.

.5 Alarms

.1 Supply air temperature <40°F. Hardwire to shut-down AHU-1.

.2 Supply air humidity >90%RH. Shut-down humidifier and AHU-1.

.3 Pump C-4 command/status mismatch

.6 Energy Efficiency

.1 Calculate the amount of heat required to heat the ventilation air:

.1 Q (MBH) = 500 x (C4_SWT[°F] – C4_RWT[°F]) x C4_FLOW[GPM]

.2 Calculate the humidity power requirement and the apparent efficiency of the system. Refer to later section on humidity calculations.

1.6. AHU-2

.1 Overview

.1 This system is a variable volume, constant temperature 100% ventilation system.

.2 Start-up

.1 Unit starts up based on a time-of-day schedule. Schedule shall allow for seasonal shut-downs over the summer.

.2 Confirm heating valve open at 100% heating.

.3 C-8 is enabled when the outdoor air is <60°F.

.4 Fresh air damper opens and confirmation of damper open.

.5 AHU-2 supply fan and EF-7 start at minimum speed.

.6 Humidifier is enabled one minute after start-up for outdoor air temperature <55°F+/-2.5°F and absolute humidity <0.0050 lb_{water}/lb_{air}.

.3 Normal operation

.1 Supply fan modules speed to maintain CO2 concentration in the space.

.1 Supply fan speed overrides higher to maintain pressurization on negative space pressurization.

.2 ECONOMIZER: Modulate the fan speed higher to maintain space temperature set-point when:

.1 Outdoor air temperature is above 55°F AND

.2 Outdoor air temperature is less than space temperature

.3 Disable humidifier

.2 EF-7 modulates to maintain space pressurization. On negative pressure and EF-7 on minimum speed (30%), turn EF-7 off.

.3 Modulate the heating valve to maintain 55°F supply air temperature.

.4 Shut-down

.1 Shut-down on schedule or on fire alarm.

.2 Disable the humidifier, delay 30 seconds.

.3 Reduce AHU-2 and EF-7 speeds to minimum speeds, then stop fans.

.4 Close outdoor air damper.

.5 Open heating valve to full heating.

.6 C-8 pump to remain enabled when the outdoor air temperature is <60°F.

.7 Shut down humidifier on temperature >60°F or absolute humidity >0.0060 lb_{water}/lb_{air}.

.5 Alarms

.1 Supply air temperature <40°F. Hardwire to shut-down AHU-2.

.2 Space temperature <60°F.

.3 Supply air humidity >90%RH. Shut-down AHU-2.

.4 Pump C-8 command/status mismatch

.6 Energy Efficiency

.1 Calculate the amount of heat required to heat the ventilation air:

.1 Q (MBH) = 500 x (C8_SWT[°F] – C8_RWT[°F]) x C8_FLOW[GPM]

.2 Calculate the humidity power requirement and the apparent efficiency of the system. Refer to later section on humidity calculations.

1.7. AHU-3

.1 Overview

.1 This system is a constant volume, constant temperature ventilation and cooling system.

.2 Start-up

.1 System starts up based on timer.

.1 Humidifier is enabled based on an occupancy schedule when outdoor air temperature is <55°F+/-2.5°F and absolute humidity <0.0050 lb_{water}/lb_{air}.

.2 Fresh air damper open to 100% return air.

.3 AHU-3 fan starts.

.3 Normal operation

.1 Supply air temperature is reset based on a PID loop to maintain space temperature

.1 Reset the supply air temperature down to 55°F while the CO_2 concentration of the space if above the set-point.

.2 Space temperature set-point is based on an occupancy schedule.

.3 Fresh air dampers modulate to maintain supply air temperature.

.4 Relief air damper modulates equally based on the fresh air percentage open.

.5 C-6 cycles on/off as required to maintain heating set-point.

.4 Shut-down

.1 Shut-down humidifier.

.2 Stop AHU-3 fan.

.3 Close outdoor air damper. Close relief damper. Open return air damper.

.4 Shut down humidifier on temperature >60°F or absolute humidity >0.0060 lb_{water}/lb_{air}.

.5 Alarms

.1 Supply air temperature <40°F. Hardwire to shut-down AHU-3.

.2 Space temperature <60°F.

.3 Space humidity >90%RH. Shut-down humidifier.

.4 Pump C-6 command/status mismatch

.6 Energy Efficiency

.1 Calculate the amount of heat for the gym

.1 Q (MBH) = 500 x (C6_SWT[°F] – C6_RWT[°F]) x C6_FLOW[GPM]

.2 Calculate the humidity power requirement. Refer to later section on humidity calculations.

1.8. AHU-4

.1 Overview

.1 This system is a constant volume, constant temperature ventilation system.

.2 Start-up

.1 Pump C-9 to operate whenever the outdoor air temperature is <65°F +/-2.5°F.

.2 System starts up based on occupancy schedule.

.3 Confirm heating valve open 100% to heating.

.4 Fresh air dampers open. Confirm damper completely open to end switches.

.5 AHU-4 fan and EF-10 and EF-11 fans start.

.6 After 1 minute and when the OAT is <55°F+/-2.5°F and absolute humidity <0.0050 lb_{water}/lb_{air} the humidifier is enabled

.3 Normal operation

.1 Fan runs continuously.

.2 The heating valve modulates to maintain supply air temperature set-point.

.1 Supply temperature set-point shall be reset based on calls for heating from the associated rooms:

.1 Reset the temperature up while all zones are calling for heating.

a. Maximum supply air temperature shall be 60°F.

.2 Reset the temperature down while more than 4 zones are satisfied with radiation zone valve closed.

a. Minimum supply air temperature shall be 50°F.

.4 Shut-down

.1 Shut-down on schedule or fire alarm.

.2 Disable humidifier

.3 Stop AHU-4 and EF-10 and EF-11

.4 Close fresh air dampers.

.5 C-9 pump to remain enabled when the outdoor air temperature is <65°F.

.6 Shut down humidifier on temperature >60°F or absolute humidity >0.0060 lb_{water}/lb_{air}.

.5 Alarms

.1 Supply air temperature <40°F. Hardwire to shut-down AHU-4.

.2 Supply air humidify >90%. Shut-down AHU-4

.3 Pump C-9 command/status mismatch

.6 Energy Efficiency

.1 Calculate the amount of heat for ventilation

.1 Q (MBH) = 500 x (C9_SWT[°F] – C9_RWT[°F]) x C6_FLOW[GPM]

.2 Calculate the humidity power requirement and the apparent efficiency of the system. Refer to later section on humidity calculations.

1.9. AHU-5

.1 Overview

.1 This system is a constant volume, constant temperature ventilation system.

.2 Start-up

.1 Pump C-10 to operate whenever the outdoor air temperature is <65°F +/-2.5°F.

.2 System starts up based on occupancy schedule.

.3 Confirm heating valve open 100% to heating.

.4 Fresh air dampers open. Confirm damper completely open to end switches.

.5 AHU-5 fan and EF-12 and EF-13 fans start.

.6 After 1 minute and when the OAT is <55°F+/-2.5°F and absolute humidity <0.0050 lb_{water}/lb_{air} the humidifier is enabled

.3 Normal operation

.1 Fan runs continuously.

.2 The heating valve modulates to maintain supply air temperature set-point.

.1 Supply temperature set-point shall be reset based on calls for heating from the associated rooms:

.1 Reset the temperature up while all zones are calling for heating.

a. Maximum supply air temperature shall be 60°F.

.2 Reset the temperature down while more than 4 zones are satisfied with radiation zone valve closed.

a. Minimum supply air temperature shall be 50°F.

.4 Shut-down

.1 Shut-down on schedule or fire alarm.

.2 Disable humidifier

.3 Stop AHU-5 and EF-12 and EF-13

.4 Close fresh air dampers.

.5 C-9 pump to remain enabled when the outdoor air temperature is <65°F.

.6 Shut down humidifier on temperature >60°F or absolute humidity >0.0060 lb_{water}/lb_{air}.

.5 Alarms

.1 Supply air temperature <40°F. Hardwire to shut-down AHU-5.

.2 Supply air humidify >90%. Shut-down AHU-5

.3 Pump C-10 command/status mismatch

.6 Energy Efficiency

.1 Calculate the amount of heat for ventilation

.1 Q (MBH) = 500 x (C10_SWT[°F] – C10_RWT[°F]) x C10_FLOW[GPM]

.2 Calculate the humidity power requirement and the apparent efficiency of the system. Refer to later section on humidity calculations.

1.10. RTAC Systems

.1 Overview

.1 Sequences are a per-unit basis.

.2 Roof top cooling units provide cooling and baseboard radiation provide heating.

.2 Start-up

.1 System is always available.

.3 Normal operation

.1 When the space temperature is higher than the set-point (+/-2°F), the BMS shall enable cooling.

.2 When the space temperature is lower than the set-point (+/-2°F) modulate the heating valve to maintain space temperature.

.3 Space temperature is based on an occupancy schedule.

.4 Shut-down

.1 System is always available.

.5 Alarms

.1 Space temperature off set-point (+/-10°F)

.6 Energy Efficiency Calculations

.1 None.

1.11. AC-1 System

.1 Overview

.1 Sequences are a per-unit basis.

.2 Roof top cooling unit provide cooling.

.2 Start-up

.1 System is always available.

.3 Normal operation

.1 When the space temperature is higher than the set-point (+/-2°F), the BMS shall enable cooling.

.2 Space temperature is based on an occupancy schedule.

.4 Shut-down

.1 System is always available.

.5 Alarms

.1 Space temperature off set-point (+/-10°F)

.6 Energy Efficiency Calculations

.1 None.

1.12. In-floor Heating (Pump C-3 2000)

.1 Overview

.1 This is an in-floor tempered hot water heating system.

.2 Start-up

.1 Pump C-3 pump starts on call for heating from any of the associated zones.

.3 Normal Operation

.1 Valves modulate to provide tempered hot water at set-point.

.2 Supply water set-point is reset based on calls for calls for heating.

.1 Reset the temperature up while more than 4 zones are below set-point.

.1 Maximum supply water temperature shall be 120°F

.2 Reset the temperature down while all zones are satisfied.

.1 Minimum supply water temperature shall be 70°F

.3 Reset shall be done with a long-time PID loop to try to maintain only one call for heating.

.3 Schedule a run-time of 1 hour for each pump every week where the pump runs regardless of a call for heat.

.4 Shut-down

.1 Pumps stop when there is no call for heating for any associated zones.

.5 Alarms

.1 Tempered water temperature >140°F

.6 Energy Efficiency calculations

.1 None

1.13. In-floor Heating (Pump C-7 2004)

.1 Overview

.1 This is an in-floor tempered hot water heating system.

.2 Start-up

.1 Pump C-7 pump starts on call for heating from any of the associated zones.

.2 Mixing valve is set to fully recirculating.

.3 Normal Operation

.1 Mixing valve modulates to maintain supply water temperature at set-point.

.2 Pump C-7 operates continuously for OAT <65°F+/-5°F.

.3 Pump C-7 cycles for 1 hour (scheduled) each week regardless of temperature.

.1 During scheduled cycling, mixing valve is 100% recirculation and all zone valves are open.

.4 Supply water set-point is reset based on calls for calls for heating.

.1 Reset the temperature up while more than 4 zones are below set-point.

.1 Maximum supply water temperature shall be 120°F

.2 Reset the temperature down while all zones are satisfied.

.1 Minimum supply water temperature shall be 70°F

.3 Reset shall be done with a long-time PID loop to try to maintain only one call for heating.

.5 Open/close in-floor heating zone valves based on call for heating from thermostats.

.6 Space temperature set-points are based on an occupancy schedule.

.4 Shut-down

.1 Pump C-7 stops on OAT >70°F

.5 Alarm

.1 Supply water set-point > 140°F.

.2 Space temperature >10°F below set-point.

.3 C-7 command/status mismatch.

.6 Energy Efficiency calculations

.1 None

1.14. Radiation

.1 Overview

.1 Spaces are heated with baseboard radiation.

.2 Start-up

.1 System is always available when main boiler pumps are on.

.3 Normal Operation

.1 Modulate 2-way valve to maintain space at space temperature set-point.

.2 Space temperature is based on an occupancy schedule.

.4 Shut-down

.1 System is always available when main boiler pumps are on.

.5 Alarms

.1 Space temperature <10°F below set-point.

.6 Energy Efficiency calculations

.1 None

1.15. Local Heaters

.1 Spot heating is provided by unit heaters or force flow heaters.

.2 Unit controls are stand-alone without any temperature sensing or control by the BMS.

1.16. EF-16

.1 Spot exhaust is provided by exhaust fan.

.2 Fan operates directly from a reverse acting thermostat without any sensing or control by the BMS.

1.17. Central Exhaust Fans

.1 Overview

.1 Distributed exhaust fans throughout the building.

.2 Normal Operation

.1 BMS operates the exhaust fans based on a schedule.

.3 Alarm

.1 Command/status mismatch.

1.18. Urinals

.1 BMS to flush urinals 3 time per day for 30 seconds based on occupancy schedule.

.2 BMS to flush urinals 1 time per day for 15 seconds on unoccupied days.

1.19. Humidity Energy Calculations

.1 Calculate the amount of energy required to humidity the ventilation air:

.1 Power meter: P_{input} (kW)

.2 Obtain measurements every 5 minutes in kWh

.3 Multiply the kWh by 0.0833 to obtain an average kW

.2 Calculate the apparent efficiency of the humidifier (hourly average of 5 minute calculations)

.1 Enthalpy of the air before the humidifier:

.1 $h_e = C_{pa} \times EAT + X \times (C_{pw} \times EAT + h_{we})$

.2 C_{pa} = 0.240 Btu/lb-°F

.3 C_{pw} = 0.444 Btu/lb-°F

.4 h_{we} = 1061 Btu/lb

.5 X = humidity ratio

.6 Humidity ratio to be determined from look up table based on relative humidity and temperature. Standard pressure can be assumed. Formulas may be used where the plot between -13°F to 60°F can be shown to be within 3% accuracy.

.2 Enthalpy of the air after the humidifier:

.1 $h_L = C_{pa} \times LAT + X \times (C_{pw} \times LAT + h_{we})$

.2 C_{pa} = 0.240 Btu/lb-°F

.3 C_{pw} = 0.444 Btu/lb-°F

.4 h_{we} = 1061 Btu/lb

.5 X = humidity ratio

.6 Humidity ratio to be determined from look up table based on relative humidity and temperature.

.3 Calculate the energy added to the airstream:

.1 $h_{humid} = h_L – h_e$ (Btu/lb)

.2 BMS to take reading every 5 minutes and multiply the resulting Btu by 0.0833 to obtain Btu/h/lb.

.3 The air can be assumed to be 0.075 lb/ft^3 density. Multiply the Btu/h/lb by 0.075 lb/ft^3 and by the airflow (either measured or from the balancing report) to obtain Btu/h. (P_{output} (Btu/h))

.4 EAT = Entering air temperature upstream of humidifier (downstream of heating coil)

.5 LAT = Leaving air temperature (downstream from humidifier)

.4 Calculate the apparent efficiency:

.1 % = P_{output} (Btu/h) / (3.412 x P_{input} (kW))

.3 Trend the humidifier efficiency.

1.20. Energy Efficiency Graphs

.1 General

.1 Provide the following trending and graphical representation of the system values. Information shall be available directly from the related equipment and from a separate energy efficiency screen.

.2 All trends shall be average hourly values. All hourly average values shall be stored. Calculate monthly average hourly values and on-going average hourly values.

.1 Monthly basis:

.1 For any given hour, provide the average hourly value for that hour for all previous days in the month.

.2 On-going basis

.1 For any given hour, provide the average hourly value for that hour for all previous months.

.2 Boilers efficiency (provide separate trends/graphs for each boiler)

.1 Graph with respect to outdoor air temperature.

.2 Graph with respect to total combined boiler output.

.3 Graph with respect to C-1 supply water temperature.

.4 Trend boiler outputs, outdoor air temperature, supply water temperature and efficiency for each hour.

.3 Heat Load

.1 Trend/graph heat load for each AHU.

.2 Calculate the remaining building perimeter heating load based on total output by the boilers minus all ventilation and DWH heat loads.

.3 Graph radiation load based on outdoor air temperature (separately occupied and unoccupied schedules).

.4 Graph AHU heat output based on outdoor air temperature.

.1 Note that AHU-3 should be associated with pump C-6.

.5 Totalize the amount of heat used by each AHU. Graph daily values based on average occupied outdoor air temperature.

.4 Humidifier load (per humidifier)

.1 Trend humidifier load based on outdoor air absolute humidity.

.2 Totalize humidifier load based on average daily average absolute humidity

.3 Graph humidifier efficiency based on outdoor absolute humidity.

.5 Domestic Water Heater (DWH)

.1 Trend hourly average energy consumption of the DWH system and provide daily graph.

.2 Totalize amount of heat per day and provide graph of daily usage.

.3 Provide average hourly (for last 30 days) and provide graph to compare to daily graph. (i.e.

.4 Show C-5 heat and electric tank heat both separately and together.

End of Section

1. AHU-1

Functional Performance Test	Pass	Fail	Remarks
Equipment Data			
Tag#			
Model#			
Serial#			
Location#			
Physical Condition			
Running in Auto			
Properly tagged			
Supply fan bearing lubricated			
Operating without excessive noise or vibration			
Normal Start-up			
Unit off on schedule			
Start unit on schedule			
Confirm status			
Normal Shut-down			
Running in auto			
Stop unit through BMS schedule			
Confirm status			
Point Check-out			
None			
Safeties			
None			

2. AHU-2

Functional Performance Test

	Pass	Fail	Remarks

Equipment Data

Tag#
Model#
Serial#
Location#

Physical Condition

Running in Auto
No air leaks
All section accessible
Control panel accessible
Properly tagged
Outdoor air damper closes completely.
Outdoor air damper open completely.
Supply fan bearing lubricated
Heating valve strokes completely between A & B ports.
Filters are clean
Coils are clean
No internal obstructions
EF-7 operating without excessive noise or vibration
KEF-1 operating without excessive noise or vibration

Normal Start-up

Unit off on schedule
Start unit on schedule
When outdoor air temperature is <60°F, heating pump C-8 is on and heat valve is open full
Outdoor air damper opens.
Supply fan starts at minimum speed.
EF-7 starts at minimum speed.
Humidifier is enabled after delay if the outdoor air temperature is less than 52.5°F.

Normal Operation

CO2 tracking
- Decrease CO2 limit, supply fan airflow increases to compensate.

- EF-7 increases to track pressure of the space.

Economizer function

- Provide call for cooling while OAT >55°F
- Override space temperature and temperature set-point to obtain economizer operation
- Fan increases speed to maintian space temperature

Heating

- Heating valve modulate to maintain minimum 55°F supply air temperautre

KEF-1

- Manually turn on KEF-1
- EF-7 and AHU-2 to modulate speed to maintain neutral space pressure

Normal Shut-down

Running in auto
Space temperatures normal
Stop unit through BMS schedule
Humidifier disabled
Reduce AHU-2 and EF-7 speeds to minimum.
Supply fan stops.
Outdoor air dampers closes.
Heating valve opens.
C-8 Pump remain on when outdoor air temperautre <60°F

Point Check-out

Stop pump. Confirm status.
Start pump. Confirm status.
Stroke mixing valve to A port.
Stroke mixing valve to B port.
Confirm supply air temperature sensor.
Enable pump and confirm status
Disable pump and confirm status
Enable EF-7 and confirm status
Disable EF-7 and confirm status
Manually turn on KEF-2 and confirm status
Manually turn off KEF-2 and confirm status
Pre-humidifier air temperature

Safeties

Stop on tripped low-limit temperature

3. AHU-3

Functional Performance Test	Pass	Fail	Remarks
Equipment Data			
Tag#			
Model#			
Serial#			
Location#			
Physical Condition			
Running in Auto			
No air leaks			
All section accessible			
Control panel accessible			
Properly tagged			
Outdoor air damper closes completely.			
Outdoor air damper open completely.			
Return air damper closes completely.			
Return air damper open completely.			
Relief air damper closes completely.			
Relief air damper open completely.			
Supply fan bearing lubricated			
Filters are clean			
Coils are clean			
No internal obstructions			
Normal Start-up			
Unit off on schedule			
Start unit on schedule			
Outdoor air and relief air dampers remain closed			
Return air damper opens.			
Supply fan starts			
Humidifier is enabled after delay if the outdoor air temperature is less than 52.5°F.			
Normal Operation			
Increase space temperature set-point. Outdoor air damper closes. Relief air closes.			

Confirm supply air temperature matches supply air temperature set-point.
Decrease space temperature set-point. Outdoor, return and relief dampers modulate partially open.
Confirm supply air temperature matches supply air temperature set-point.
Decrease CO2 set-point. Outdoor, return and relief dampers modulate partially open.
Confirm relief air damper matches outdoor air damper.
Confirm return air damper matches inverse of outdoor air damper.
Increase space temperature and confirm C-6 comes on.
Decrease space temperature and confirm C-6 turns off.
Confirm cooling and heating set-point have a deadband of at least 5°F.

Normal Shut-down

Running in auto
Space temperatures normal
Stop unit through BMS schedule
Supply fan stops.
Outdoor and relief air dampers closes.
Return air damper opens.
C-8 Pump remain on when outdoor air temperautre <60°F

Point Check-out

Stop pump. Confirm status.
Start pump. Confirm status.
Confirm supply air temperature sensor.
Enable pump and confirm status
Disable pump and confirm status

Safeties

Stop on fire alarm
Stop on tripped low-limit temperature

4. AHU-4

Functional Performance Test	Pass	Fail	Remarks
Equipment Data			
Tag#			
Model#			
Serial#			
Location#			
Physical Condition			
Running in Auto			
No air leaks			
All section accessible			
Control panel accessible			
Properly tagged			
Outdoor air dampers close completely.			
Outdoor air dampers open completely.			
Supply fan bearing lubricated			
Heating valve strokes completely between A & B ports.			
Filters are clean			
Coils are clean			
No internal obstructions			
EF-10 operating without excessive noise or vibration			
EF-11 operating without excessive noise or vibration			
Normal Start-up			
Unit off on schedule			
Start unit on schedule			
When outdoor air temperature is <62.5°F, heating pump C-9 is on and heat valve is open full			
Outdoor air damper opens.			
Supply fan starts			
EF-10 & EF-11 start after delay			
Humidifier is enabled after delay if the outdoor air temperature is less than 52.5°F.			
Normal Operation			
Heating valve modulate to maintain temperature set-point.			

Change temperature set-point. Check supply air temperature.
Override outdoor air temperautre. Set-point to adjust.

Normal Shut-down

Running in auto
Space temperatures normal
Stop unit through BMS schedule
Humidifier disabled
Stop supply fan.
Stop exhaust fans.
Outdoor air dampers close.
C-9 Pump remain on when outdoor air temperautre <65°F

Point Check-out

Stop pump. Confirm status.
Start pump. Confirm status.
Stroke mixing valve to A port.
Stroke mixing valve to B port.
Confirm supply air temperature sensor.
Enable EF-10 and confirm status
Disable EF-10 and confirm status
Enable EF-11 and confirm status
Disable EF-11 and confirm status
Pre-humidifier air temperature

Safeties

Stop on tripped low-limit temperature
Stop on fire alarm.

5. AHU-5

Functional Performance Test	Pass	Fail	Remarks
Equipment Data			
Tag#			
Model#			
Serial#			
Location#			
Physical Condition			
Running in Auto			
No air leaks			
All section accessible			
Control panel accessible			
Properly tagged			
Outdoor air dampers close completely.			
Outdoor air dampers open completely.			
Supply fan bearing lubricated			
Heating valve strokes completely between A & B ports.			
Filters are clean			
Coils are clean			
No internal obstructions			
EF-12 operating without excessive noise or vibration			
EF-13 operating without excessive noise or vibration			
Normal Start-up			
Unit off on schedule			
Start unit on schedule			
When outdoor air temperature is <62.5°F, heating pump C-10 is on and heat valve is open full			
Outdoor air damper opens.			
Supply fan starts			
EF-12 & EF-13 start after delay			
Humidifier is enabled after delay if the outdoor air temperature is less than 52.5°F.			
Normal Operation			
Heating valve modulate to maintain temperature set-point.			

Change temperature set-point. Check supply air temperature.
Override outdoor air temperautre. Set-point to adjust.

Normal Shut-down

Running in auto
Space temperatures normal
Stop unit through BMS schedule
Humidifier disabled
Stop supply fan.
Stop exhaust fans.
Outdoor air dampers close.
C-10 Pump remain on when outdoor air temperautre <65°F

Point Check-out

Stop pump. Confirm status.
Start pump. Confirm status.
Stroke mixing valve to A port.
Stroke mixing valve to B port.
Confirm supply air temperature sensor.
Enable EF-12 and confirm status
Disable EF-12 and confirm status
Enable EF-13 and confirm status
Disable EF-13 and confirm status
Pre-humidifier air temperature

Safeties

Stop on tripped low-limit temperature
Stop on fire alarm.

6. RTAC

Functional Performance Test	Pass	Fail	Remarks
Equipment Data			
Tag#			
Model#			
Serial#			
Location#			
Physical Condition			
Running in Auto			
No rust			
Control panel accessible			
Properly tagged			
Outdoor air dampers close completely.			
Outdoor air dampers open completely.			
Supply fan bearing lubricated			
Filters are clean			
Coils are clean			
No internal obstructions			
Heating valve opens fully.			
Heating valve closes fully.			
Normal Start-up			
Unit off on temperature			
Start unit on temperature			
Normal Operation			
Override outdoor air temperature. Enable cooling. Unit to provide economizer.			
Override outdoor air temperature. Enable cooling. Unit to provide mechanical cooling.			
Increase temperature set-point. Heating valve to modulate to maintain space temperature.			
Normal Shut-down			
Running in auto			
Space temperatures normal			
Stop unit through temperature.			

Stop supply fan.

Outdoor air dampers close.

Point Check-out

None.

Safeties

None.

7. AC-1

Functional Performance Test

	Pass	Fail	Remarks

Equipment Data

Tag#
Model#
Serial#
Location#

Physical Condition

Running in Auto
No rust
Control panel accessible
Properly tagged
Supply fan bearing lubricated
Filters are clean
Coils are clean

Normal Start-up

Unit off on temperature
Start unit on temperature

Normal Operation

Override outdoor air temperature. Enable cooling.
Unit to provide mechanical cooling.

Normal Shut-down

Running in auto
Space temperatures normal
Stop unit through temperature.
Stop supply fan.

Point Check-out

None.

Safeties

None.

8. BOILERS

Functional Performance Test

	Pass	Fail	Remarks
Equipment Data			
Tag#			
Model#			
Serial#			
Location#			
Physical Condition			
Running in Auto			
No leaks in breaching			
Combustion air provided and interlocked			
Oil lines provided with no leaks			
Operating pressure between 15 PSI and 30 PSI			
Normal Start-up			
Enable boiler on outdoor air over-ride			
Confirm boiler start-up on internal controls.			
Confirm both boilers start-up			
Normal Operation			
Confirm boiler hot water set-point			
Confirm boiler hot water supply temperature			
Supply temperature matches set-point			
Confirm operation with all pumps running on boiler water.			
Confirm operation with all pumps off.			
Normal Shut-down			
Disable boiler on outdoor air over-ride			
Confirm both boilers shut-down			
Point Check-out			
Check boiler alarm - wire conductivity test			
Safeties			
None			

9. PUMPS

Functional Performance Test

	Pass	Fail	Remarks

Equipment Data

Tag#
Model#
Serial#
Location#

Physical Condition

Running in Auto
Bearing rotating freely
No vibrations
No leaks

Normal Start-up

Enable pump on call for heating
Confirm pump status

Normal Operation

Confirm mixing valve maintaining supply water temperature at scheduled value.
Change scheduled value and confirm change to supply water temperature.
Override outdoor air temperature and confirm change to supply water temperautre.

Normal Shut-down

Disable the pump on lack of call for heating
Confirm pump status

Point Check-out

None

Safeties

None

10.IN-FLOOR HEATING

Functional Performance Test

	Pass	Fail	Remarks

Equipment Data

Tag#
Model#
Serial#
Location#

Physical Condition

Running in Auto
Bearing rotating freely
No vibrations
No leaks

Normal Start-up

Enable pump on call for heating
Enable pump on outdoor air temperature
Confirm pump status.

Normal Operation

Mixing valve modulate to maintain water at set-point.
Override set-point. Valves to match new set-point.

Normal Shut-down

Disable the pump on lack of call for heating
Disable pump on outdoor air temperature override
Confirm pump status.

Point Check-out

None

Safeties

Shut-down pumps on supply water temperature over 130°F.
Manually open valve for higher water temperature.

11.RADIATION

Functional Performance Test

	Pass	Fail	Remarks

Equipment Data

Tag#
Model#
Serial#
Location#

Physical Condition

Valve opens completely
Valve closes completely

Normal Operation

Increase temperature set-point. Valve to modulate partially open.
Decrease temperature set-point. Valve to modulate partially closed.

Point Check-out

None

Safeties

None

12.EXHAUST FANS

Functional Performance Test	Pass	Fail	Remarks
Equipment Data			
Tag#			
Model#			
Serial#			
Location#			
Physical Condition			
Running in Auto			
Properly tagged			
Supply fan bearing lubricated			
Operating without excessive noise or vibration			
Normal Start-up			
Unit off on schedule			
Start unit on schedule			
Confirm status			
Normal Shut-down			
Running in auto			
Stop unit through BMS schedule			
Confirm status			
Point Check-out			
None			
Safeties			
None			

End of Section