PROJECT MANUAL

VOLUME ONE

PROJECT: **EXHAUST FAN REPLACEMENT**
FATHER DANIEL ZANON CATHOLIC ELEMENTARY SCHOOL
ST. EDMUND CATHOLIC ELEMENTARY SCHOOL
ST. JUDE CATHIOLIC ELEMENTARY SCHOOL

OWNER: **DUFFERIN-PEEL CATHOLIC DISTRICT SCHOOL BOARD**

CONSULTANT:

ALLEN & SHERRIFF ARCHITECTS INC.
10350 YONGE STREET
RICHMOND HILL, ONTARIO L4C 5K9

TEL: 905-884-1117
FAX: 905-884-4970

CONSULTANT'S PROJECT No: **4235 -3**

DATE: **Issued for Review: April 12, 2019**

Issued for Tender: May 16, 2019

SUBCONSULTANTS:

MECHANICAL / ELECTRICAL

WSP Canada Group Limited
600 Cochrane Drive, 5th Floor
Markham, ON L3R 5K3

Phone: 905-475-7270
Fax: 905-475-5994

EXHAUST FAN REPLACEMENT
FATHER DANIEL ZANON CES
ST. EDMUND CES
ST. JUDE CES

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VOLUME 1

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SECTION 00200 - INSTRUCTIONS TO BIDDERS

1. INSTRUCTIONS TO BIDDERS

Instructions for submitting a Bid must be followed implicitly. Any Bid Submission that does not comply with the Instructions to Bidders, CCDC 2 – 2008 *Stipulated Price Contract, Supplementary General Conditions to CCDC 2 – 2008* and other pertinent sections of the Bidding Documents may be declared informal and might not be considered.

All Contractors have the opportunity via .PDF file to download, print, complete, sign and return all documentation (as stated below), with the exception of returning the Supplementary Information Form, the Mechanical Supplementary Bid Submission Form, and the Electrical Supplementary Bid Submission Form, which are to be returned directly to the Consultant by the low Bidder.

It is the responsibility of each Contractor to be registered with https://dpcdsb.bidsandtenders.ca. The Board is not responsible for any Contractor not being aware of any or all business opportunities.

NOTE: ALL QUESTIONS & ANSWERS will be posted as an AMENDMENT. All questions should be submitted through the Bidding System portal by clicking on the "submit question" button at https://dpcdsb.bidsandtenders.ca. Questions must be received on or before the date specified on the Bidding System no later than 2:00:00p.m. (14:00:00 hours) local time.

This procurement is subject to Chapter 5 of the Canadian Free Trade Agreement and to Chapter 19 of the Canada-European Union Comprehensive Economic and Trade Agreement.

1.1. DEFINITIONS

1.1.1. The words "Bidder" & "Contractor" and "Bids" or "Bid Submissions" & "Tenders" are interchangeable in the Contract Documents and their meanings are identical.

1.1.2. The words "Owner" & "Board" are interchangeable in the Contract Documents and their meanings are identical.

1.2. DESCRIPTION

1.2.1. Work under this Contract covers the construction of the Project as identified in the Contract Documents.

1.2.2. Work not included in Contract comprises of a list of items as identified in the General Instructions and other pertinent sections of the Contract Documents.

SECTION 00200 - INSTRUCTIONS TO BIDDERS

1.3. CONTRACT DOCUMENTS

1.3.1. Consult the Documents consisting of the following:

1.3.1.1. Form of Tender * Document 00410

1.3.1.2. Supplementary Information Form * Document 00431

Above Bidding Documents (marked by asterisk) are to be signed and executed by the Bidders.

1.3.1.3. Instructions to Bidders Document 00200

1.3.1.4. Supplementary General Conditions to CCDC-2 2008 and CCDC-2 2008 Document 00800

1.3.1.5. General Instructions Document 01001

And

1.3.1.6. Father Daniel Zanon C.E.S, St. Edmund C.E.S, St. Jude CES, Mechanical Supplementary Bid Submission Form* Document 00432

Above Mechanical and Electrical Supplementary Bid Submission Forms (marked by asterisk) are to be signed and executed by each of the prequalified Sub-Contractors named by the low Bidder in the Form of Tender.

And

1.3.1.7. Specifications as listed in the Specification Table of Contents prepared by the Architect and Sub-Consultants.

1.3.1.8. Drawings as listed in the Drawing Index and Detail Sheets as listed in the Detail Sheet Index and as applicable - prepared by the Architects and Sub-Consultants.

1.3.1.9. Any Addenda issued prior to the closing of Bid Submissions.

1.4. BID SUBMISSION (TENDER)

1.4.1. The Bid Submission is to be submitted on the Form of Tender in the bidding system, Document 00410 and shall be known as the Bid Submission. All information asked, and all prices, must be entered in the bidding system.

1.4.2. The Contractor must note that the Bid Submission (Form of Tender) requires the inclusion of the Contractor's Bid Bond and Agreement to Bond.

1.4.3. ELECTRONIC BID SUBMISSIONS ONLY must be received by the Bidding System on or before the closing date specified on the bidding system, no later than 2:00:00 p.m. (14:00:00 hours) local time. All Contractors shall have a Bidding System Vendor Account and be registered as a Plan Taker for this Request for Tender, which will enable the Contractor to download the documents required for the Bid Submission, to receive Addenda / Addendum email notifications, download Addenda and to submit a Bid Submission electronically through the Bidding System.

1.4.4. The Bidding System will send a confirmation email to the Contractor advising that the Bid Submission was submitted successfully. If the Contractor does not receive a confirmation email, the Contractor must contact technical support at Bids & Tenders via email: support@bidsandtenders.ca .

1.4.5. Late Bid Submissions shall not be accepted by the Board's Bidding System. Bid Submissions must be received by the Board's Bidding System not later than 2:00:00 p.m. (14:00:00 hours) local time, on the specified Closing Date. The Closing Time shall be determined by the Bidding System web clock. Contractors are cautioned that the timing of the Bid Submission is based on when the Bid Submission is RECEIVED by the Bidding System, not when a Bid Submission is submitted by a Contractor, as Bid Submission transmission can be delayed in an "Internet Traffic Jam" due to consideration such as file transfer size and transmission speed and other electronic considerations. For the above reasons, the Board recommends that Contractors allow sufficient time to upload Bid Submissions including all attachments thereto and to resolve any issues that may arise.

1.4.6. As a pre-qualified Contractor, it is imperative that the Contractor create a login from the link contained in the email invitation requesting a Bid Submission. DO NOT go directly to https://dpcdsb.bidsandtenders.ca website and create a separate vendor account. Notwithstanding the foregoing, it is recommended that when creating or updating a Bidding System Vendor Account, a Contractor add qualified additional Contractor contacts to create additional logins to the Bidding System. This will permit a Contractor's invited contacts with logins to manage (register, submit, edit and withdraw) Requests for Tender for which the Contractor is a pre-qualified Registered Plan Taker. In the event the primary contact of a Contractor is unavailable at critical times, additional contacts may act on the Contractor's behalf and will have authority to submit Bid Submissions electronically through the Bidding System, edit or withdraw Bid Submissions, or acknowledge any Addenda on the Contractor's behalf.

1.4.7. The bid shall be fully completed in the bidding system or the Bid Submission may be invalidated and may, at the discretion of the Board, be rejected.

1.4.8. The Supplementary Information Form must be signed by the appropriate officers of the Contractor's firm.

1.4.9. Drawings and Specifications shall be returned to the Consultants within ten (10) days of closing as identified in the bidding system.

1.4.10. Bid Submissions shall be valid and irrevocable for one hundred and twenty (120) calendar days from the date of closing as identified in the bidding system.

1.5. ADDENDA

1.5.1. Contractors must acknowledge receipt of any Addenda when submitting a Bid Submission through the Bidding System. Contractors must check a box for each Addendum and any applicable attachments that have been issued before a Contractor can submit a Bid Submission online.

1.5.2. Addenda will typically be issued through the Bidding System up to seven (7) days prior to the Closing Date and Time.

1.5.3. In the event an Addendum is issued within seven (7) days prior to the Closing Date and Time, it may include an extension of the Closing Date and Time. It is the responsibility of the Contractor to have received all Addenda that have been issued. The Contractor must check online at https://dpcdsb.bidsandtenders.ca prior to submitting a Bid Submission and up until the Bid Closing Date and Time in the event that additional Addenda are issued.

1.5.4. The Board recommends Contractors not submit a Bid Submission prior to seven (7) days before the Bid Closing Date and Time, in the event that an Addendum is issued thereafter by the Board, the Bidding System will automatically WITHDRAW previously submitted Bid Submissions and change the status thereof to INCOMPLETE (Not accepted by the Board). The Withdrawn Bid Submission can be viewed and re-submitted by the Contractor in the "MY BIDS" section of the Bidding System.

1.6. WITHDRAW / EDIT BIDS

1.6.1. Contractor may edit or withdraw a Bid Submission prior to the Closing Date and Time. In such case, the Contractor is solely responsible to:

1.6.1.1. make any required adjustments to the Bid Submission;

1.6.1.2. acknowledge any addenda, if applicable; and

1.6.1.3. ensure the re-submitted Bid Submission is RECEIVED by the Bidding System no later than 2:00:00 p.m. (14:00:00 hours) local time on the Closing Date.

1.7. MECHANICAL AND ELECTRICAL SUB-CONTRACT BIDS

1.7.1. Mechanical and Electrical bids are to be submitted directly to the Contractor Bidders.

1.7.2. Each of the Mechanical and Electrical Sub-Contract Bidders must submit an Agreement to Bond directly to the Bidder with their bids.

1.8. SUPPLEMENTARY INFORMATION FORM & SUPPLEMENTARY CONDITIONS FORM

1.8.1. Only the two (2) LOW BIDDERS will be required to submit the following documents to the offices of Allen & Sherriff Architects, 10350 Yonge St. Suite 200, Richmond Hill, Ontario Attention: Mr. Sean Irwin Telephone: (905) 884-1117 (ext. 251) Fax: (905) 884-4970 E:mail: sirwin@asarch.ca , on or before, **2:00:00 p.m.** local time on the day following the close of Bid Submissions,

Supplementary Information Form Document 00431

Father Daniel Zanon CES, St. Edmund CES, St. Jude CES
Mechanical Supplementary Bid Submission Form
Document 00432

Electronic or hand delivered.

1.8.2. The Supplementary Information Form and the Mechanical/Electrical Bid Submission Forms must be signed by the appropriate officers of the General Contractor's firm and each of the Sub-Contractors' Firms.

1.8.2.1. The two (2) LOW BIDDERS must complete IN FULL the requirements of the *Supplementary Information Form.*

1.9. MECHANICAL AND ELECTRICAL SUPPLEMENTARY BID SUBMISSION FORMS

1.9.1. Mechanical and Electrical Supplementary Bid Submission Forms are to be filled out in their entirety by the Mechanical and Electrical Sub-Contractors named in the Form of Tender by the Bidders, and submitted directly to the Contractor Bidders.

Electronic or hand delivered.

1.10. BOARD

1.10.1. The "Owner" of the project is:

Dufferin-Peel Catholic District School Board
40 Matheson Boulevard West
Mississauga ON L5R 1C5

1.10.2. The Contractor should note that after the Tender Award, all correspondence between the Contractor and the Consultants shall be copied to the Board's "Construction Department", at the following address:

Dufferin-Peel Catholic District School Board
Keaton Centre
5685 Keaton Crescent
Mississauga ON L5R 3H5

1.11. ARCHITECT

1.11.1. The Prime Consultant (Architect) on this project is identified in the Contract Documents.

SECTION 00200 - INSTRUCTIONS TO BIDDERS

1.12. CONSULTANTS

1.12.1. The Sub-Consultants on this project are identified in the Contract Documents.

1.13. BID SUBMISSION ACCEPTANCE AND OPENING

1.13.1. Upon review of all Bid Submissions immediately after the Closing Time, the Bid Price and any Alternative, Separate or Unit Prices that are being considered in the evaluation of Bid Submissions shall be posted on-line at https://dpcdsb.bidsandtenders.ca as unofficial results under the heading “Bids Submitted” within thirty (30) minutes of the Closing Time. Thereafter, official results will be posted on-line under the heading “Awarded Results” as soon as they are available.

1.14. RESERVED RIGHTS

1.14.1. The Board reserves the right to reject any or all Bid Submissions submitted, without explanations, and to waive any informality or minor irregularity in same. ***The lowest or any Bid Submission shall not necessarily be accepted.***

1.14.2. In addition, the Board reserves the right to:

1.14.2.1. make public the names of any or all Contractors;

1.14.2.2. verify with a Contractor that it satisfies the conditions for participation and is capable of fulfilling the terms of the contract, where in the sole discretion of the Board, it receives a Bid Submission from a Contractor with a price that is abnormally lower than prices in other Bid Submissions;

1.14.2.3. afford an opportunity to a Contractor to correct unintentional errors of form between the opening of Bid Submissions and the awarding of a contract and, if it does so, the Board shall afford the same opportunity to all participating Contractors;

1.14.2.4. where there is supporting evidence, to exclude a Contractor from participating in this Request for Tender on such grounds as:

- bankruptcy or insolvency;
- false declarations;
- significant or persistent deficiencies in performance of any substantive requirement or obligation under a prior contract or contracts;
- final judgments in respect of serious crimes or other serious offences;

- professional misconduct or acts or omissions that adversely reflect on the commercial integrity of the Contractor; or

- failure to pay taxes.

1.14.2.5. to negotiate or terminate negotiations of a contract with any Contractor at any time and for any reason without liability to such Contractor; or

1.14.2.6. cancel this procurement process at any stage and issue a new procurement process for the same or similar deliverables.

1.14.3. These reserved rights are in addition to any other rights which may be implied in the circumstances, and the Board shall not be liable for any expenses, costs, losses or any direct or indirect damages incurred or suffered by any Contractor or any party resulting from the Board exercising any of its express or implied rights hereunder.

1.15. SUB-CONTRACTORS

1.15.1. The Contractor Bidders are required to submit, on the Form of Tender, the names of the Mechanical and Electrical Sub-Contractors.

1.15.1.1. On the *Supplementary Information Form*, the bid amount of each of the named Mechanical and Electrical Sub-Contractors must be identified. The bid amounts are to be exclusive of Value Added Taxes (HST).

1.15.2. The two (2) low Bidders are also required to submit, on the Supplementary Information Form, a further list of Sub-Contractors. The Bidders shall name in this list the Sub-Contractors proposed to perform the Work under the Contract. No substitutions to these lists shall be made without the written approval of the Consultants and Owner.

1.15.3. Other than the Mechanical/Electrical Sub-Contractors, the selection of all other Sub-Contractors must be acceptable to the Board and to the Consultants. If the required substitution of a Sub-Contractor affects the sub- tender price, an adjustment will be made in the amount of the Bid Price only by the amount of the difference in sub-prices, without additional overhead or profit to the Bidder.

1.15.4. If the Bidder proposes to do Work with persons directly in the Contractor's employ, and not sub-contract the Work, then the Bidder shall insert the words "Contractor" provided that the Bidder can submit proof that his forces have had extensive experience in this field of endeavour.

1.15.5. Sub-Contractors shall be actually engaged as their own recognized business, in the line of Work including Labour and Materials required by the specifications and shall carry out themselves the Work which they are awarded by subcontract. They shall not be permitted to re-subcontract their Work or portions thereof, to other contractors. THIS INCLUDES SHOP DRAWINGS.

SECTION 00200 - INSTRUCTIONS TO BIDDERS

1.16. UNIT PRICES

1.16.1. Refer to Supplementary Information Form for specific requirements. The Bidder should be aware, however, that Unit Prices for additional Work shall not exceed Unit Prices for deducted Work by more than twenty percent (20%); that the Board reserves the right to accept or reject any or all of the Unit Prices prior to entering into a contract; and that the Board reserves the right to negotiate any of all of the Unit Prices with the Contractor prior to the signing of the Contract.

1.16.2. Should the Board and the Contractor be unable to mutually agree on the amounts of the unit prices, the Bidder agrees that the Board has the right to hire outside contractors to perform the pertinent Work under a separate contract, without any financial penalty whatever to the Board and without additional overhead and profit to the Contractor.

1.17. COMPLETION DATE

1.17.1. Bid Submissions must include all costs involved in having the Contract "Substantially Complete" by the date specified in the Form of Tender.

1.17.2. Work must continue during all adverse weather conditions as necessary to ensure completion by dates listed on the Form of Tender.

1.18. OCCUPANCY REQUIREMENTS

1.18.1. The building(s) shall be deemed to be ready for occupancy when the Contract meets the requirements of OAA/OGCA Document 100, Construction Lien Act (Latest Amendments) and occupancy approval of all Authorities Having Jurisdiction.

1.18.2. Refer to **Supplementary General Conditions to CCDC 2, 2008** for "*Board Occupancy*" and "*Occupancy prior to Substantial Completion*".

1.19. BID BOND, PERFORMANCE BOND, LABOUR & MATERIAL BOND / MAINTENANCE BOND

1.19.1. The undersigned encloses a Bid Bond in the amount of $10,000 made out in the name of the Dufferin-Peel Catholic District School Board, as well as an *Agreement to Bond* from an approved Bonding Company stating that the Bonding Company will issue a 50% Performance Bond and a 50% Labour and Material Payment Bond, if the undersigned's submitted Bid Price is successful and the Board awards the Contract to the undersigned.

1.19.2. This Bid Bond shall be forfeited if the Bidder declines to enter into a Formal Contract in the amount tendered, or as adjusted according to the separate prices included in the Bid Submission, and to furnish, when called upon to do so, a Performance Bond. This Bid Bond shall be accompanied by an Agreement from the Surety Company that a 50% Performance Bond and a 50%

Labour and Material Payment Bond will be issued to the Bidder if he/she is awarded the Contract. The cost of the Bonds shall be included in the amount of the Bid Submission.

1.19.2.1. The Bid Bond must be valid for a minimum of one hundred and twenty (120) calendar days from the closing date of Tender.

1.19.3. Retention and use of the Bid Bond, as outlined above, shall not be deemed a penalty, but a consideration to the Board for inviting and considering the Bid Submission and as part payment for sustained damages and costs incurred by the Board, which shall be deemed to be the difference between the bid price of this Bidder and the bid price of the next lowest Bidder acceptable to the Board.

1.19.4. A Performance Bond, equal to 50% of the Bid Price, shall be furnished through a Surety Company or Insurance Company approved by the Consultant and the Board according to terms and conditions acceptable to the Board and the Consultant.

1.19.5. Labour and Material Payment Bond, equal to 50% of the Contract is to be provided within ten (10) Working Days upon request, stating that Board will not be held responsible if payment to Sub-Contractors, as certified due by the Consultant, is not made by the Contractor when due.

1.19.6. On completion of the Work, the Performance Bond shall remain in force as a MAINTENANCE BOND for a period of one (1) year from the date of final completion as certified by the Architect. It shall form a *Guarantee of Workmanship and Materials* for the one (1) year period.

1.19.7. The Bidder to whom the Contract is awarded must properly sign the Contract and furnish a satisfactory Performance Bond, Labour and Material Payment Bond, Insurance Certificate and Workers' Compensation Board Certificate within ten (10) Working Days of acceptance of the Bid Submission by the Board, or forfeit the Bid Bond.

1.19.8. In addition, the Bidder shall require from the following Sub-Contractors a performance bond, issued by a duly licenced surety company authorized to transact a business of suretyship in the Province of Ontario, and which shall be maintained in good standing until the fulfilment of the Contract. The form of such bond shall be in accordance with the latest edition of the CCDC Bond forms. Performance Bond is to be in the amount of 50% of the Sub-Contractors' tendered sum.

1.20. PREQUALIFIED BIDDERS

1.20.1. Bid Submissions will only be accepted from **Prequalified General Contractors**

1.20.2. Bid Submissions (if required) will only be accepted from the following CONTROLS Sub-Contractors:

ESC Automation Toronto
Setpoint Building Automation Inc.

SECTION 00200 - INSTRUCTIONS TO BIDDERS

1.21. BIDDERS

1.21.1. The Bidder submitting Bid Submission proposals shall be actually engaged as their recognized business in the lines of Work required by the specifications, and shall be able to refer to Work of a similar character which has been satisfactorily performed by them.

1.22. FAIR WAGE AND LABOUR

1.22.1. Rate of wages, hours and conditions of Work shall be in accordance with Provincial Codes and as generally recognized and accepted in the locality. Building mechanics and labourers resident in the district are to be employed where suitable.

1.22.2. Labour forces employed on the site may have compatible affiliation with any labour organization. Union contract itself is not a prerequisite.

1.23. DISCREPANCIES AND OMISSIONS

1.23.1. All Bidders finding specified items unavailable, finding discrepancies in, or omissions from, the drawings or specifications or other Contract Documents, or having any doubt as to the intent or meaning of any part thereof, shall at once notify the Consultants.

1.23.2. Corrections of such discrepancies, and/or omissions, further explanations, definitions or additional information as necessary will be issued by the Consultant(s) during the time of bidding in the form of Addenda to all prequalified Bidders. These shall become part of the Contract Documents and the number of Addenda included in the Bid Price must be shown on the *Form of Tender*.

1.23.3. Minor typographical or spelling mistakes in the Contract Documents may not necessarily be corrected by Addenda if they do not significantly affect the meaning of the sentence or phrase in which they occur, or alter the intent of the Work.

1.23.4. NO ORAL INSTRUCTIONS WILL BE VALID.

1.24. BIDDING ASSUMPTIONS

1.24.1. All bids submitted, including bids by Sub-Contractors, are assumed to be based upon the complete set of Contract Documents. No alterations in prices for items of Work will be considered even if it is determined by the Consultants and/or Bidder that sub-bids were not based on the complete set of documents (e.g. bids based upon Specifications but not on drawings and vice-versa, omitted addenda etc.).

SECTION 00200 - INSTRUCTIONS TO BIDDERS

1.25. ERRORS IN BID SUBMISSION

1.25.1. The Board shall not entertain requests for gratuitous payments arising from errors or omissions alleged to have been made by the Bidder in a Bid Submission that the Board has accepted.

1.26. INQUIRY AND INSTRUCTION

1.26.1. All correspondence, inquiries, instructions, etc. in connection with the Work, *after award of tender*, shall be made through the office of the Architect (Prime Consultant) whose name address and telephone number appear below:

Allen & Sherriff Architects Inc.
10350 Yonge St. Suite 200
Richmond Hill, Ontario

Attention:	Mr. Sean Irwin
Telephone:	(905) 884-1117 (ext. 251)
Fax:	(905) 884-4970
E-mail:	sirwin@asarch.ca

1.27. EXAMINATION OF THE PLACE OF WORK

1.27.1. Before submitting the Bid, it is recommended that the Bidder and their qualified sub-trades submitting bids examine the Place of Work, Hazardous Building Materials Survey as may be included in the Bid Documents. The Bidder shall ascertain the extent and nature of the materials it may be necessary to remove or add required and shall be sure that the Bidder's determinations are made in accordance with the drawings and specifications.

1.27.2. Bids shall include the cost imposed by existing conditions and limitations of site and the accepted bid shall be held to have included such costs. NO ALLOWANCE WILL BE MADE FOR FAILURE TO EXAMINE THE EXISTING SITE.

1.27.3. The levels and other information shown on the drawings are furnished in good faith for the guidance of the Bidders. This information, however, shall in no way relieve the Bidder and sub-trades of the responsibility in ascertaining to his/her own satisfaction the nature of all conditions at the site.

1.28. BUILDING PERMIT

1.28.1. No Building Permit is required for this work.

1.28.2. The Contractor must, however, pay all other necessary fees, deposit and charges related to Municipal, Provincial and Federal requirements. The Contractor is responsible for determining the amounts of these permits, fees, etc.

SECTION 00200 - INSTRUCTIONS TO BIDDERS

1.29. CONTRACT DOCUMENTS

1.29.1. The Contract shall be subject to the **Canadian Standard Construction Document CCDC – 2 2008 for Stipulated Price Contract** all Supplementary Conditions thereto and Contract Documents as prepared by the Consultants. Successful Bidder must sign a Contract within ten (10) Working Days of notification of award. ***The Contractor shall not be entitled to any payment until the Contract is signed***.

1.29.2. All Bidders will be held to have examined and made themselves familiar with the various articles of these Standard Documents and shall be as binding for all sections of the following specifications as though written in full therein.

1.30. FINAL ACCEPTANCE

1.30.1. It must be clearly understood that final acceptance of this Tender is subject to approvals of the Board and other Authorities and these may delay final approval. There will be no adjustments in the tendered price for a period of one hundred and twenty (120) calendar days from tender closing date. Submissions due to delays resulting from obtaining necessary approvals.

1.31. TAXES

1.31.1. The Bid Submission amount shall include all applicable excise taxes, custom duties, freight, exchange and all other charges in effect and known to come into effect during the construction of the building described in this Contract. The Bid Submission (Form of Tender) shall exclude Value Added Taxes (**HST**).

1.31.2. The successful Bidder must provide the Bidder's HST Registration Number and each request for payment must show this number.

1.32. WORK HOURS

1.32.1. Work in all schools occupied by students or staff, (including summer school) whether additions, renovations or for deficiency corrections in new schools, should be specified as follows:

1.32.1.1. As per Board policy, the normal work hours in, or access to, occupied school buildings are from 4:00 pm. to approximately 11:00 pm., Monday to Friday.

1.32.1.2. Weekend work may be arranged with 72 hours' notice directly with the Board's Construction Department.

1.32.1.3. The Board does not allow any painting (other than minor touch-ups), gluing (resilient flooring), welding or any other activity that produces noxious smells on Monday through Friday.

1.32.1.4. Any asphalt paving or roofing work must be arranged for weekends and holidays.

1.32.2. There will be no interruption of utilities and life safety systems (fire alarm, emergency lighting and sprinklers) during occupied hours of the school. Where utilities must be interrupted, during unoccupied hours, the existing school and its equipment and/or contents must be protected and operation made good by qualified personnel.

1.32.3. All trades/ personnel must check in with the office and advise the Custodian the nature and location of their business. For emergency work, required during regular school hours, trades/personnel must report to the office and be accompanied at all times by school staff.

1.32.4. Criminal reference checks are required where personnel are required to access the occupied school, on a regular basis.

1.33 INSURANCE COVERAGE ON EXISTING SCHOOLS VACADED DURING CONSTRUCTION

1.33.1 On projects where the Board has vacated the premises and handed the building and /or property to the Contractor, it is the responsibility of the Contractor, as part of the Bid Submission, to carry and Insurance Policy the includes the value of the existing building and property, in addition to the value of the Contract.

Such Insurance Policy will remain in effect until the Completion of the Work as certified by the Architect.

1.33.2 The Owner has determined the value of the Board's building and property is **$10,000,000 for each school.**

— END OF INSTRUCTIONS TO BIDDERS —

DOCUMENT 00320 - EXISTING CONDITIONS

1. HAZARDOUS BUILDING MATERIALS ASSESMENT

.1 ***Father Daniel Zanon CES:***

Hazardous Materials Management Program by Norrox TSI, dated May 5, 2017 (last revision).
Asbestos Management Program by Norrox TSI, revised June 12, 2018.
Norrox TSI letter, dated May 4, 2019

.2 ***St. Edmund CES:***

Hazardous Materials Management Program by Norrox TSI, dated April 2, 2015 (last revision).
Asbestos Management Program by NorroxTSI, dated September 23, 2015 (last revision).
Norrox TSI letter, dated May 4, 2019.

.3 ***St. Jude CES:***

Hazardous Materials management Program by Norrox, dated June 11, 2014.
Asbestos Management Program by Norrox TSI, dated February 27, 2018 (last revision).
Norrox TSI letter, dated May 4, 2019.

.4 Reports are attached under **Appendix** and hereby offered in good faith for general information and guidance. Consultant assumes no responsibility for accuracy of these reports.

.5 Contractor shall not be entitled to extra payment and/or performance time for work which is required and which is reasonably inferable in report as being necessary.

.6 Designated Substance abatement work is part of this contract. If hazardous building materials are suspected or identified in the work area the Contractor shall halt work and inform the Consultant. Asbestos abatement, if any, is included in this contract. Refer to the Abatement specification below.

END

1. FORM OF TENDER

1.1. TENDER INFORMATION

NAME OF PROJECT: **EXHAUST FAN REPLACEMENT**
FATHER DANIEL ZANON CES
ST. EDMUND CES
ST. JUDE CES

Dufferin-Peel Catholic District School Board
40 Matheson Boulevard West, Mississauga ON L5R 1C5

1.2. EXAMINATION OF TENDER DOCUMENTS

Having carefully examined all of the drawings (architectural, landscaping, [if included] structural, mechanical, sprinkler, [if included] and electrical), and having carefully examined the Instructions to Bidders, the CCDC - 2 **2008** Stipulated Price Contract, General Instructions and Supplementary General Conditions to CCDC - 2 **2008** and all of the attached Specifications; including Addenda.

and

Having had the opportunity to visit the Place of Work, investigated and examined all conditions affecting the Work, including Geotechnical and Environmental Soil Reports and Surveys;

1.3. BID PRICE

The bidder, hereby offers to furnish all materials, labour, plant and equipment and to perform all duties and services called for by the **ENTIRE WORK INCLUDING ALL TRADES** for the project named above bid price to be submitted in the bidding system.

The results will be posted in the bidding system. All bids are carefully reviewed for compliance prior to making any recommendation for an award. The bid results posted are considered unofficial until compliance is confirmed and the award is posted on the electronic bidding system.

Bid price to be in lawful money of Canada, ***excluding*** Value Added Taxes (**HST)**, but ***including*** all other applicable excise taxes, custom duties, Insurances, freight exchange and all other charges.

1.4. CONTINGENCY AND CASH ALLOWANCES

The Bid Price ***includes*** a Contingency Allowance of $0.00

The Bid Price does include a Cash Allowance $15,000.00 ($5,000.00 for each school) as identified in the Contract Documents

Value Added Taxes (**HST)** on the Total Cash Allowance *are* ***NOT TO BE INCLUDED*** in the Tender Amount.

1.5. MECHANICAL AND ELECTRICAL SUB-CONTRACTORS

The Bid Price includes the Bid of the Mechanical and Electrical Sub-Contractors, whose Bids have been received directly by the bidder and with whom the bidder is prepared to execute formal agreements to perform the mechanical and electrical Work on this project. Name of the subcontractors to be included in the bidding system

1.5.1. Mechanical Bid (Includes "Controls")

Name of Mech. Sub-Contractor: To be named in the bidding system.

1.5.2 Electrical Bid

Name of Elec. Sub-Contractor: To be named in the bidding system.

The bidder acknowledges that each Sub-Contractor named in the bidding system is an independent Sub-Contractor. The bidder also warrants that the bidder has received Agreement to Bond from each of the Sub-Contractors named in the bidding system and will be made available to the Owner upon request.

1.6. BID VALIDITY

1.6.1. The bidder is submitting a valid tender and will enter into a formal contract if the bidder is notified upon award of the acceptance of the bidders Bid Price by THE BOARD within sixty (60) calendar days from the closing of the tender.

1.7. BID BOND AND AGREEMENT TO BOND

1.7.1. The bidder encloses a *Bid Bond* in the amount of $10,000 made out in the name of the Dufferin-Peel Catholic District School Board, as well as an *Agreement to Bond* from an approved Bonding Company stating that the Bonding Company will issue a fifty percent (50%) *Performance Bond* and a fifty percent (50%) *Labour and Material Payment Bond,* if the bidder submitted Bid Price is successful and the Board awards the Contract to the bidder.

1.7.2. The bidder acknowledges and will comply with the special provisions specified with respect to the wording and/or conditions under which the *Performance Bond* may be invoked and remain in force as a *Maintenance Bond.* The special conditions are specified in the enclosed ***Instructions to Bidders*** and documented in the enclosed ***Supplementary General Conditions to CCDC-2 2008***.

1.7.3. The bidder acknowledges and will comply with the terms and conditions of the ***Occupancy Requirements*** as outlined in the enclosed ***Supplementary General Conditions to CCDC 2 2008 Board Occupancy and Instruction to Bidders.***

1.7.4. The bidder acknowledges and will comply with all the terms and conditions of the ***Stipulated Price Contract***, ***CCDC-2 2008*** and the amendments as outlined in the ***Supplementary General Conditions to CCDC-2 2008.*** The bidder further agrees that *The Schedule of Values* shall provide for the establishment of a **RESERVE FUND** which shall be in addition to any required construction lien holdback, and accrued funds shall be subject to claims by the Board.

1.7.5. The bidder agrees and acknowledges the Bid Submission Deadline Time(s) as set forth in Document 00200 - ***Instructions to Bidders.*** The bidder agrees to provide, as required, all submissions, in the bidding system.

1.7.6. The bidder has included an *Agreement to Bond,* from an approved Bonding Company stating that the Bonding Company will provide a *Performance Bond and Labour* and *Material Payment Bonds,* as specified in the ***Instructions to Bidders.***

1.8. UNDERTAKING

1.8.1. The bidder solemnly undertakes, as an integral part of the bidder's bid and Bid Submission to:

1.8.1.1. Have the building substantially complete to meet requirements of OAA/OGCA Document 100, Construction Lien Act (Latest Amendments) and occupancy approval of all Authorities Having Jurisdiction by August 23, 2019.

1.8.1.2. Have the entire building totally complete by August 30, 2019.

1.8.2. The bidder confirms that all appropriate costs, such as but not limited to winter heat, frost breaking, inclement weather protection, and all overtime costs for all trades to meet the aforementioned schedule, have been included in the Bid Price to achieve these dates.

1.9. COMMENCEMENT OF WORK

1.9.1. The bidder, if notified of the acceptance of this Bid Submission, via a *Letter of Intent/Purchase Order* issued by the Board, will sign, seal and deliver the Contract Documents and will proceed with construction of the Work within two (2) weeks of receiving instructions to commence Work.

1.10. DECLARATION OF NO-CONFLICT

1.10.1 "The *Contractor* represents and warrants that in tendering for the *Work*, and in entering into a *Contract* with the *Owner* for the performance of the *Work* that the Contractor's Tender submission was made in good faith and without any connection, knowledge, comparison of figures, or arrangements with any other company, firm, or person making a Tender for the same work and is, in all respects, fair and without collusion with any other bidder for this Contract, and without fraud. The bidder also represents and warrants that, to the best of the bidders knowledge and belief, no actual or potential conflict of interest exists with respect to the submission of the Tender or performance of the Contract other than those disclosed hereunder. The bidder confirms that, where the Board discovers that the bidder has failed to disclose all actual or potential conflicts of interest, the Board may disqualify the bidder or terminate any Contract awarded to the bidder pursuant to this Tender process. The bidder understands that, for the purposes hereof, "conflict of interest" also includes:

.1 in relation to the Tender process, the bidder has an unfair advantage or engages in conduct, directly or indirectly, that may give the bidder an unfair advantage, including:

.1 having or having access to information in the preparation of the bidder proposal that is confidential to the Board and not available to other bidders;

.2 communicating with any person with a view to influencing preferred treatment in the Tender process; or,

.3 engaging in conduct that compromises or could be seen to compromise the integrity of the open and competitive process and render that process non-competitive and unfair; or,

.2 in relation to the performance of its contractual obligations in a Board contract, the bidders other commitments, relationships or financial interests:

.1 could or could be perceived to exercise an improper influence over the objective, unbiased and impartial exercise of the Board's independent judgment; or,

.2 could or could be perceived to compromise, impair or be incompatible with the effective performance of the undersigned's contractual obligations."

1.11. MUNICIPAL FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY ACT

1.11.1. The Contractor agrees that in tendering for the work, and in entering into a Contract with the Owner for this performance of the work that the Contractor's Tender and supporting documentation shall become the property of the Board. Information in a Tender is subject to potential disclosure to third parties after the award, in accordance with the provisions of the *Municipal Freedom of Information and Protection of Privacy Act,* R.S.O. 1990 ("MFOIPOP").

1.11.2. The bidder acknowledges that any personal or confidential information which the Bidders provide is being collected and will be used exclusively for the purposes of analyzing, evaluating and assessing the Bid Submission.

1.11.3. Any information a Bidder wishes to identify as propriety and have maintained as confidential, excluding unit pricing information as well as the total dollar value of the Bid Submission, must be clearly identified as such, and any proposed restrictions on disclosures specified.

1.11.4. For the purposes of a report to the Trustees of the Board, pricing information as well as the total dollar value of the Bid Submission may be reported in a public report and will not be considered confidential.

1.11.5. In addition, the Board may be ordered by the Information and Privacy Commissioner under the provisions of MFOIPOP to disclose additional information identified by a Bidder as proprietary and confidential.

1.12. SIGNING OF TENDER

The bidder is submitting this Bid Price Tender, name, and title of signing officer in the bidding system

I HAVE THE AUTHORITY TO BIND THE COMPANY

END OF FORM OF TENDER

1. SUPPLEMENTARY INFORMATION FORM

1.1. SUBMISSION REQUIREMENT

NOTE THAT THIS S***UPPLEMENTARY INFORMATION FORM*** IS TO BE SUBMITTED ONLY BY THE **TWO (2) LOW BIDDERS, TO THE OFFICES OF:**

Allen & Sherriff Architects Inc.
10350 Yonge Street, Suite 200 Richmond Hill, ON
Attention: Mr. Sean Irwin
Telephone: (905) 884-1117 (ext. 251)
Fax: (905) 884-4970
E-mail: sirwin@asarch.ca

No later than twenty-four (24) hours after the time of tender closing.

Electronic or hand delivered.

1.2. BID SUBMISSION BREAKDOWN

Exhaust Fan Replacement Father Daniel Zanon CES

1.2.1. The replacement of the Exhaust Fans includes all of the Work of all trades, including mechanical and electrical, the supply and installation of all specified equipment, base bid supply and installation.

$_____(***excluding*** **H.S.T**.)

Exhaust Fan Replacement St. Edmund CES

1.2.2. The replacement of the Exhaust Fans includes all of the Work of all trades, including mechanical and electrical, the supply and installation of all specified equipment, base bid supply and installation.

$_____(***excluding*** **H.S.T**.)

Exhaust Fan Replacement St. Jude CES

1.2.3. The replacement of the Exhaust Fans includes all of the Work of all trades, including mechanical and electrical, the supply and installation of all specified equipment, base bid supply and installation.

$_____(***excluding*** **H.S.T**.)

Total Tender

1.2.4

$_____(***excluding*** **H.S.T**.)

1.3. ATTACHMENTS

1.3.1. The Undersigned is enclosing the following attachments with this Supplementary Information Form:

Supplementary Conditions (Signed and executed by the Undersigned)
Mechanical Supplementary Bid Submission Form
Electrical Supplementary Bid Submission Form

1.4. MECHANICAL AND ELECTRICAL SUB CONTRACTORS

1.4.1. The Undersigned affirms that the names of the Mechanical and Electrical Sub- Contractors listed below are the same as the names listed on the Form of Tender previously submitted.

1.4.2. The Undersigned proposes to have the following Sub-Contractors perform the Work on this project and these are an integral part of this Tender.

1.4.3. The Undersigned warrants that the Undersigned has received Agreement to Bond from both of the Sub-Contractors named below.

1.4.4. The Undersigned confirms that we have investigated their reliability, bonding abilities and competence to carry out the Work as specified.

1.4.5. The Undersigned agrees that no changes to these names will be made without the express written approval of the Board.

1.4.6. **Mechanical Bid**

Name of Mechanical Sub-Contractor:_____

(Must be the same name as per Form of tender)

$_____(*excluding* H.S.T.)

$_____(excluding H.S.T.)

$_____(excluding H.S.T.)

1.4.7. **Electrical Bid**

Name of Electrical Sub-Contractor: _____

(Must be the same name as per Form of Tender)

$_____(*excluding* H.S.T.)

$_____(excluding H.S.T.)

$_____(excluding H.S.T.)

1.5. ADDITIONAL LIST OF SUB-CONTRACTORS

1.5.1. The Undersigned proposes to have the additional Sub-Contractors perform the Work on this project and these are an integral part of this Bid Submission.

1.5.2. Except in the event of any Sub-Contractor becoming bankrupt, the Undersigned confirms that the Undersigned shall not substitute other Sub-Contractors for any of the Sub-Contractors listed below. In the case of Sub-Contractor going bankrupt the Undersigned agrees that any such substitution shall be subject to the Consultants' and Board's approval.

1.5.3. Where the Undersigned proposes to do the Work the Undersigned shall so note by inserting the word, *"Contractor".* The list identified below, contains the names of Sub-Contractors other than those of Mechanical trades whose bids were received directly by the Undersigned.

1.5.4. The Undersigned confirms that the Undersigned has investigated their reliability, bonding abilities where required, and competence to carry out the Work as specified. The Undersigned agrees that no changes to this list will be made without the express written approval of the Board.

1.5.5. The Undersigned confirms that if more than one name is given for a specific sub-trade, the Board has the right to select the preferred trade without any adjustment to the Contract Amount.

1.6 WORK DIVISION

1.6.1 The Undersigned confirms that the Division of Work among all the Sub-Contractors and suppliers/installers is the Undersigned's responsibility and the Undersigned covenants that neither the Consultants nor the Board will be requested to act as an arbiter to establish sub-contract limits between Sections or Division of Work.

1.7 UNIT PRICES

1.7.1 The Undersigned agrees that the following unit prices will apply in connection with approved additions or deductions; that unit prices shall include statutory charges, overhead and profit, and that the unit prices shall be valid for the term of the Contract. The unit prices shall not include H.S.T.

1.7.2 The Undersigned further stipulate that UNIT PRICES FOR ADDITIONS WILL NOT TO EXCEED PRICES FOR DEDUCTIONS BY MORE THAN twenty percent (20%); that the Board reserves the right to accept or reject all unit prices, and that where changes exceed $15,000, a unit price will be negotiated which reflects a fair value for the Work involved.

1.7.3 The Undersigned agrees that the Board reserves the right to accept or reject

any or all of the unit prices prior to entering into a Contract.

1.7.4 The Undersigned agrees that the Board further reserves the right to negotiate any of all of the unit prices with the Undersigned prior to the signing of the Contract.

1.7.5 The Undersigned agrees that should the Board and the Undersigned be unable to mutually agree on the amounts of the unit prices, the Undersigned agrees that the Board has the right to hire outside contractors to perform the Work concerned under a separate contract, without any financial penalty whatever to the Board and without additional overhead and profit to the Undersigned.

1.7. LIST OF UNIT PRICES (INCLUDING ALL TAXES OTHER THAN VALUE ADDED TAXES WHICH ARE EXCLUDED)

		ADD	DEDUCT
1	Type H/15/CM concrete block	Per	Per
	4" (90mm) block	$ SM	$ SM
	6" (140mm) block	$ SM	$ SM
	8" (190mm) block	$ SM	$ SM
2	Paint	$ SM	$ SM
3	Acoustic Ceiling Tile	$ SM	$ SM

1.8. ALTERNATE, SEPARATE AND ITEMIZED PRICES

The Undersigned, has inserted in the attachment(s) prepared and requested by the Architects, all Alternate, Separate, and Itemized prices. The Undersigned agrees to the following:

1.8.1. All prices submitted take into consideration and allow for changes and adjustments in other Work as may be necessary, to provide a finished and functional result, unless specifically indicated otherwise.

1.8.2. **Alternate Prices** are for Work that is not included in the Bid Submission Price requested by the Architect and identified in this *Supplementary Information Form* or submitted by the Undersigned as an attachment to this *Supplementary Information Form*, but which may be substituted by the Board for Work which is included. (No price listed shall mean no change in the cost.)

1.8.3. **Separate Prices** are for Work that is not included in the Bid Submission Price listed in this *Supplementary Information Form,* but which may be added by the Board for the price quoted on the attachment(s).

1.8.4. **Itemized Prices** are for Work that is included in the Bid Submission Price to be supplied by the Tenderer as listed in the *Instruction to Bidders*.

1.8.5. The Undersigned confirms that the Board reserves the right to accept or reject any of the prices proposed on the Supplementary Information Form or as attachment(s) to this Form.

1.8.6. The Undersigned acknowledges that none of the prices listed on the attachment(s) include HST.

1.9. ITEMIZED PRICES (Included in Base Bid)

_____

$

_____

1.10. SIGNATURE OF SUPPLEMENTARY INFORMATION FORM

The Undersigned is submitting this *Supplementary Information Form* by duly signing same below and in accordance with ***Instructions to Bidders.***

NAME OF BIDDER

_____

PRINT NAME OF SIGNING OFFICER

_____

PRINT TITLE OF SIGNING OFFICER

_____

SIGNATURE OF AUTHORIZED SIGNING OFFICER

_____

I HAVE THE AUTHORITY TO BIND THE BIDDER

DATED AT_____THIS_____DAY OF_____2019

END OF SUPPLEMENTARY INFORMATION FORM

nin

1. MECHANICAL SUPPLEMENTARY BID SUBMISSION FORM

1.1. NAME OF PROJECT EXHAUST FAN REPLACEMENT

1.2. SUBMISSION REQUIREMENT

NOTE THAT THIS *MECHANICAL* ***SUPPLEMENTARY BID SUBMISSION FORM*** IS TO BE SUBMITTED IN ITS ENTIRETY BY THE PREQUALIFIED MECHANICAL BIDDERS DIRECTLY TO ANY OR ALL OF THE PREQUALIFIED GENERAL CONTRACT BIDDERS.

THIS MECHANICAL SUPPLEMENTARY BID SUBMISSION FORM IS TO BE INCLUDED WITH THE *SUPPLEMENTARY INFORMATION FORM* SUBMITTED BY **THE TWO (2) LOW GENERAL CONTRACT BIDDERS**,

NO LATER THAN TWENTY-FOUR (24) HOURS AFTER THE TIME OF TENDER CLOSING.

ELECTRONIC OR HAND DELIVERED.

1.3. PRINT MECHANICAL CONTRACT BIDDER'S NAME, PHONE, FAX & E-MAIL

Name:_____

Phone Number: _____Fax Number: _____

E-Mail Address _____

1.4. LIST OF SUB-CONTRACTORS

1.4.1. The Undersigned, proposes to have the following Sub-Contractors to the Mechanical Building Services perform the Work on this project, which are an integral part of this Bid.

1.4.2. The Undersigned has investigated their reliability, bonding abilities where required, and competence to carry out the Work as specified. The Undersigned agrees that no changes to this list will be made without the express written approval of the Consultants and the Board.

1.4.3. The Undersigned confirms that the division of Work among all the subcontractors and suppliers/installers is the Undersigned's responsibility and covenants that neither the Consultants, nor the Board, will be requested to act as an arbiter to establish sub-contract limits between Sections or Division of Work.

Section of Work:

Sheet Metal Name:_____

Insulation Name:_____

Building Management System Name:_____

1.5. LIST OF MANUFACTURERS AND SUPPLIERS

1.5.1. The Undersigned acknowledges that the Undersigned's Bid Price is based on the completed *List of Manufacturers/Suppliers* below.

1.5.1.1. The Undersigned agrees that if no name is circled, in the "Acceptable Alternate" Column, the name identified in the column entitled BASIS OF SUBMISSION shall be used.

1.5.1.2. Where more than one name is indicated in the ACCEPTABLE ALTERNATE column, and the Undersigned elects NOT to base the Bid on the BASIS OF SUBMISSION, the Undersigned has ***CIRCLED*** the one on which the Bid Price is based.

1.5.1.3. The Undersigned agrees that the Board reserves the right to accept or reject any of the proposed alternates listed in the "Acceptable Alternate" Column.

1.5.1.4. By circling a manufacturer/supplier from the "Acceptable Alternate" Column, the Undersigned assumes full responsibility for ensuring that all space, weight, connections, power and wiring requirements etc. are considered. The Undersigned understands that all costs incurred for additional components, changes to service, structural and space requirements, layouts and plans, etc. are included in the Undersigned's Bid.

MECHANICAL EQUIPMENT LIST

	BASIS OF SUBMISSION	ACCEPTABLE ALTERNATE
1. Exhaust fans	Greenheck	Loren-Cook, Twin-City Fans, Carnes,

1.6. LABOUR RATES

1.6.1. The Undersigned encloses herein the Labour Rates which are an integral part of the Undersigned's Bid. The Undersigned confirms that the Labour Rates shall be in effect for the duration of the Project Work. The Undersigned further stipulates that the Board is not obliged to accept any Labour Rates indicated.

1.6.2. The Undersigned warrants that the cost of labour at the following rates shall be applied for additions or deletions to the work not covered by Unit Prices. The Undersigned acknowledges that the Labour Rates quoted below represent the net cost *exclusive of overhead and profit* but *including* salary, and all agreed upon local union benefits, etc. (Refer to allowable percentages on "Overhead and Profit" in Supplementary General Conditions to CCDC 2, - 2008.)

Insulation Trade Person	$_____	Per Hour
Sheet Metal Trade Person (Shop)	$_____	Per Hour
(Field)	$_____	Per Hour

1.7. SIGNATURE OF THE MECHANICAL CONTRACT BIDDER

The Undersigned is submitting this *Mechanical Supplementary Bid Submission Form* by duly signing same below and in accordance with the *Instructions to Bidders.*

NAME OF BIDDER _____

PRINT NAME OF SIGNING OFFICER _____

PRINT TITLE OF SIGNING OFFICER _____

SIGNATURE OF AUTHORIZED SIGNING OFFICER _____

I HAVE THE AUTHORITY TO BIND THE BIDDER

DATED AT _____ THIS _____ DAY OF _____ 20

END OF MECHANICAL SUPPLEMENTARY BID SUBMISSION FORM

SUPPLEMENTARY GENERAL CONDITIONS
to CCDC 2, 2008 Stipulated Price Contract for Exhaust Fan Replacement for Father Daniel Zanon CES, St. Edmund CES, St. Jude CES

SC1 GENERAL

1.0 Where a General Condition or paragraph of the General Conditions of the *Contract* is deleted by the Supplementary General Conditions, the numbering of the remaining General Conditions or paragraph shall remain unchanged, unless stated otherwise herein, and the numbering of the deleted item will be retained, unused.

1.1 The General Conditions for Canadian Standard Construction Document, CCDC No. 2, 2008 edition for the construction of the Father Daniel Zanon CES, St Edmund CES, St Jude CES - Exhaust Fan Replacement Project, in Mississauga, Ontario are hereby amended, including Articles A-1 through A-8, the Definitions and the General Conditions GC 1.1 to GC 12.3 inclusive. These Supplementary General Conditions supersede, replace or amend the *Contract Document* clauses, as noted in each item. Supplementary General Conditions are indicated in this Document 00810 as "SC 1" (for Supplementary Condition No. 1), "SC 2", etc. General Conditions stated in the *Contract Document* are referred to in this Document 00810 as "GC 1.1" (for General Condition No. 1.1 of CCDC No. 2, 2008), "GC 2.1", etc.

1.2 Throughout the Contract Documents references to the "General Conditions of the Contract" or "General Conditions" shall include the Supplementary General Conditions listed in this Document 00810.

1.3 These Supplementary General Conditions shall apply to all Work.

1.4 Where any article, paragraph or sub-paragraph in the General Conditions is supplemented by one of the following paragraphs, the provisions of such article, paragraph or sub-paragraph shall remain in effect and the supplemental provisions shall be considered as added thereto.

1.5 Where any article, paragraph, or sub-paragraph in the General Conditions is amended, voided, or superseded by any of the following paragraphs, the provisions of such article, paragraph, or sub-paragraph not so amended, voided or superseded shall remain in effect.

AGREEMENT BETWEEN OWNER AND CONTRACTOR

SC2 ARTICLE A-3 – CONTRACT DOCUMENTS

SC 2.1 Add the following to the list of *Contract Documents* in paragraph 3.1:
"- Supplementary General Conditions to CCDC 2 – 2008 (this Document)
- *Drawings* and *Specifications*
- Bid Documents, including Instructions to Bidders, Form of Tender, and Tender addenda, if applicable
- Performance Bond
- Labour and Material Payment Bond"

SC3 ARTICLE A-5 – PAYMENT

SC 3.1 Amend the first sentence of paragraph 5.1, to read:
"5.1 Subject to the provisions of the *Contract Documents* and in accordance with legislation and statutory regulations respecting holdback percentages and, where

such legislation does not exist or apply, subject to a lien holdback of Ten percent (10%) PLUS a Reserve Fund of One percent (1%), the *Board* shall:"

SC 3.2 Delete paragraph 5.3.1 in its entirety and replace it with the following:

"5.3 Interest

.1 Should either party fail to make payments as they become due under the terms of the *Contract* or in an award by arbitration or court, interest shall also become due and payable on such unpaid amounts at 2% above the prime rate. Such interest shall be compounded on a monthly basis. The prime rate shall be the rate of interest quoted by the Bank of Canada for prime business loans, as it may change from time to time."

SC4 ARTICLE A-9 – CONFLICT OF INTEREST

SC 4.1 Add new Article A-9 – CONFLICT OF INTEREST as follows:

"ARTICLE A-9 CONFLICT OF INTEREST

9.1 The *Contractor*, all of the *Subcontractors* and *Suppliers* and any of their respective advisors, partners, directors, officers, employees, agents, and volunteers shall not engage in any activity or provide any services where such activity or the provision of such services creates a conflict of interest (actually or potentially, in the sole opinion of the *Owner*) with the provision of the *Work* pursuant to the *Contract*. The *Contractor* acknowledges and agrees that a conflict of interest, as described in this Article A-9, includes, but is not limited to, the use of *Confidential Information* where the *Owner* has not specifically authorized such use.

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

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

9.4 It is of the essence of the *Contract* that the *Owner* shall not have direct or indirect liability to any *Subcontractor* or *Supplier*, and that the *Owner* relies on the maintenance of an arm's-length relationship between the *Contractor* and its Subcontractors and Suppliers. Consistent with this fundamental term of the *Contract*, the *Contractor* will not enter into any agreement or understanding with any *Subcontractor* or *Supplier*, whether as part of any contract or any written or oral collateral agreement, pursuant to which the parties thereto agree to cooperate in the presentation of a claim for payment against the *Owner*, directly or through the *Contractor*, where such claim is, in whole or in part, in respect of a disputed claim by the *Subcontractor* or *Supplier* against the *Contractor*, where the payment to the *Subcontractor* or *Supplier* by the *Contractor* is agreed to be conditional or contingent on the ability to recover those amounts or a portion thereof from the *Owner*, failing which the *Contractor* shall be saved harmless from all or a portion of

those claims. The *Contractor* acknowledges that any such agreement would undermine the required arm's-length relationship and constitute a conflict of interest. For greater certainty, the *Contractor* shall only be entitled to advance claims against the *Owner* for amounts pertaining to *Subcontractor* or *Supplier* claims where the *Contractor* has actually paid or unconditionally acknowledged liability for those claims or where those claims are the subject of litigation or binding arbitration between the *Subcontractor* or *Supplier* and the *Contractor* has been found liable for those claims.

9.5 Notwithstanding paragraph 7.1.2 of GC 7.1 - OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK, SUSPEND THE WORK OR TERMINATE THE CONTRACT, a breach of this Article by the *Contractor*, any of the Subcontractors, or any of their respective advisors, partners, directors, officers, employees, agents, and volunteers shall entitle the *Owner* to terminate the *Contract*, in addition to any other rights and remedies that the *Owner* has in the *Contract*, in law, or in equity."

SC5 ARTICLE A-10 CONSTRUCTION SAFETY

SC5.1 Add new Article A-10 – CONSTRUCTION SAFETY as follows:

"ARTICLE A-10 CONSTRUCTION SAFETY

10.1 The *Contractor* represents and warrants that in tendering for the *Work*, and in entering into a *Contract* with the *Owner* for the performance of the *Work* that the *Contractor* will comply with all applicable statutory obligations, including without limitation, the obligations imposed by the Occupational Health and Safety Act (Ontario) and all Regulations thereto, and all amending and successor legislation, including without limitation, Bill 208 (the "Act"), in connection with all *Work* performed by either the *Contractor*, *Subcontractors*, or any other contractor on, or in connection with the *Project*."

10.2 The *Contractor* further declares and agrees that if awarded the *Contract,* the undersigned shall abide by all of the items identified under Construction Safety in the General Instructions of the *Contract Documents* and, for the purposes of the *Project*, the undersigned specifically agrees to be the "constructor" of the *Project* within the meaning of the Act, and as such, shall assume all the obligations and responsibilities, and observe all construction safety requirements and procedures and duties of inspection imposed by the Act on the "constructor", as defined in the General Instructions of the *Contract Documents*, for all work and services performed by the undersigned, the *Subcontractors* or other contractors on or in connection with the *Project*."

SC6 ARTICLE A-11 DECLARATION OF NO CONFLICT

SC6.1 Add new Article A-11 – DECLARATION OF NO CONFILCT as follows:

"ARTICLE A-11 DECLARATION OF NO CONFILCT

11.1 "The *Contractor* represents and warrants that in tendering for the *Work*, and in entering into a *Contract* with the *Owner* for the performance of the *Work* that the

Contractor's Tender submission was made in good faith and without any connection, knowledge, comparison of figures, or arrangements with any other company, firm, or person making a Tender for the same *Work* and is, in all respects, fair and without collusion with any other bidder for this *Contract*, and without fraud. The undersigned also represents and warrants that, to the best of the undersigned's knowledge and belief, no actual or potential conflict of interest exists with respect to the submission of the Tender or performance of the *Contract* other than those disclosed hereunder. The undersigned confirms that, where the *Board* discovers that the undersigned has failed to disclose all actual or potential conflicts of interest, the *Board* may disqualify the undersigned or terminate any *Contract* awarded to the undersigned pursuant to this Tender process. The undersigned understands that, for the purposes hereof, "conflict of interest" also includes:

.1 in relation to the Tender process, the undersigned has an unfair advantage or engages in conduct, directly or indirectly, that may give the undersigned an unfair advantage, including:
  .1 having or having access to information in the preparation of the undersigned's proposal that is confidential to the *Board* and not available to other bidders;
  .2 communicating with any person with a view to influencing preferred treatment in the Tender process; or,
  .3 engaging in conduct that compromises or could be seen to compromise the integrity of the open and competitive process and render that process non-competitive and unfair; or,

.2 in relation to the performance of its contractual obligations in a *Board* contract, the undersigned's other commitments, relationships or financial interests:
  .1 could or could be perceived to exercise an improper influence over the objective, unbiased and impartial exercise of the *Board's* independent judgment; or,
  .2 could or could be perceived to compromise, impair or be incompatible with the effective performance of the undersigned's contractual obligations."

SC7 DEFINITIONS

SC 7.1 Amend Definition 4 (*Consultant*) by adding the following to the end of the Definition:

"For the purposes of the *Contract*, the terms "*Consultant"*, "Architect" and "Engineer" shall be considered synonymous."

SC 7.2 Amend Definition 6 (Contract Documents) by adding "in writing" to the end of the Definition.

SC 7.3 Amend Definition 12 (*Owner*) by adding the following to the end of the Definition:

"The words "*Owner*" and "*Board*" shall be considered synonymous."

SC 7.4 Delete Definition 16 (Provide) in its entirety and replace with the following:

"*Provide*, when used in conjunction with *Products*, means to supply, *install* and put into service. *Provide* has this meaning whether or not the first letter is capitalized."

SC 7.4 Add the following **new** definitions 27 through 34:

27. Confidential Information

Confidential Information means all the information or material of the *Owner* that is of a proprietary or confidential nature, whether it is identified as proprietary or confidential or not, including but not limited to information and material of every kind and description (such as drawings and move-lists) which is communicated to or comes into the possession or control of the *Contractor* at any time, but *Confidential Information* shall not include information that:

1) is or becomes generally available to the public without fault or breach on the part of the *Contractor*, including without limitation breach of any duty of confidentiality owed by the *Contractor* to the *Owner* or to any third party, but only after that information becomes generally available to the public;
2) the *Contractor* can demonstrate to have been rightfully obtained by the *Contractor* from a third party who had the right to transfer or disclose it to the *Contractor* free of any obligation of confidence;
3) the *Contractor* can demonstrate to have been rightfully known to or in the possession of the *Contractor* at the time of disclosure, free of any obligation of confidence; or
4) is independently developed by the *Contractor* without use of any *Confidential Information*.

28. Construction Schedule

Construction Schedule means the schedule for the performance of the *Work* provided by the *Contractor* pursuant to GC 3.5, including any amendments to the *Construction Schedule* made pursuant to the *Contract Documents*.

29. Force Majeure

Force Majeure means any cause, beyond the *Contractor's* control, other than a lack of funds, which prevents the performance by the *Contractor* of any of its obligations under the *Contract* and the event of *Force Majeure* was not caused by the *Contractor's* default or active commission or omission and could not be avoided or mitigated by the exercise of reasonable effort or foresight by the *Contractor*. *Force Majeure* includes *Labour Disputes*, fire, unusual delay by common carriers or unavoidable casualties, civil disturbance, acts, orders, legislation, regulations or directives of any government or other public authority, acts of a public enemy, war, riot, sabotage, blockage, embargo, lightning, earthquake, or acts of God.

30. Install

Install means install and connect. *Install* has this meaning whether or not the first letter is capitalized.

31. Labour Dispute

Labour Dispute means any lawful or unlawful labour problems, work stoppage, labour disruption, strike, job action, slow down, lock-outs, picketing, refusal to work or continue to work, refusal to supply materials, cessation of work or other labour controversy which does, or might, affect the *Work*.

32. Overhead

Overhead means all site and head office operations and facilities, all site and head office administration and supervision; all duties and taxes for permits and licenses required by the authorities having jurisdiction at the *Place of the Work*; all requirements of Division 1, including but not limited to *Submittals*, warranty, quality control, insurance and bonding; calculations, testing and inspections; meals and accommodations; and, tools, expendables and clean-up costs.

33. Request for Information (RFI)

Request for Information or *RFI* means written documentation sent by the *Contractor* to the *Owner* or to the *Owner's* representative or the *Consultant* requesting written clarification(s) and/or interpretation(s) of the *Drawings* and/or *Specifications*, *Contract* requirements and/or other pertinent information required to complete the *Work* of the *Contract* without applying for a change or changes to the *Work*.

34. Submittals

Submittals are documents or items required by the *Contract Documents* to be provided by the *Contractor*, such as:

- *Shop Drawings*, samples, models, mock-ups to indicate details or characteristics, before the portion of the *Work* that they represent can be incorporated into the *Work*; and
- As-built drawings and manuals to provide instructions to the operation and maintenance of the *Work*.

SC8 GC 1.1 CONTRACT DOCUMENTS

SC8.1 Add the following sub-paragraphs to the end of paragraph 1.1.6:

".1 The *Specifications* are divided into divisions and sections for convenience but shall be read as a whole and neither such division nor anything else contained in the *Contract Documents* will be construed to place responsibility on the *Owner* or the *Consultant* to settle disputes among the *Subcontractors* and *Suppliers* with respect to such divisions.

.2 The *Drawings* are divided into groups, types and sets for convenience but shall be read as a whole and neither such grouping, nor separation of information from *Drawing* to *Drawing* nor anything else contained in the *Contract Documents* will be construed to place responsibility on the *Owner* or the *Consultant* to divide or control the *Work*, nor to settle disputes among the *Subcontractors* and *Suppliers* with respect to such divisions.

.3 The *Drawings* are, in part, diagrammatic and are intended to convey the scope of the *Work* and indicate general and appropriate locations, arrangements and sizes of fixtures, equipment and outlets. The *Contractor* shall obtain more accurate information about the locations, arrangements and sizes from study and coordination of the *Drawings*, including *Shop Drawings,* and shall become familiar with conditions and spaces affecting those matters before proceeding with the *Work*.

.4 Where site conditions require reasonable minor changes in indicated locations and arrangements, the *Contractor* shall make such changes at no additional cost to the *Owner*. Similarly, where known conditions or existing conditions interfere with new

installation and require relocation, the *Contractor* shall include such relocation in the *Work*.

.5 The *Contractor* shall arrange and *install* fixtures and equipment in such a way as to conserve as much headroom and space as possible.

.6 The Schedules are those portions of the *Contract Documents*, wherever located and whenever issued, which compile information of similar content and may consist of drawings, tables, charts and/or lists."

SC8.2 Add new paragraphs 1.1.7.5, 1.1.7.6, 1.1.7.7, 1.1.7.8 and 1.1.7.9 as follows**:**

"1.1.7.5 Noted materials and annotations on the *Drawings* shall govern over the graphic representation of the *Drawings.*

1.1.7.6 Finishes in the Room Finish Schedules shall govern over those shown on the *Drawings*.

1.1.7.7 Items, Procedures and Requirements as specified in the Sections of Division 01 – General Requirements of the *Specifications* shall form part of and be read in conjunction with the technical specification Sections found elsewhere in the (overall) *Specifications*.

1.1.7.8 Architectural *Drawings* shall have precedence over structural, plumbing, mechanical, electrical and landscape *Drawings* insofar as outlining, determining and interpreting conflicts over the required design intent of all architectural layouts and architectural elements of construction, it being understood that the integrity and installation of the systems designed by the *Consultant* or its sub-*Consultants* are to remain with each of the applicable *Drawing* disciplines.

1.1.7.9 Should reference standards and *Specifications* conflict with each other or if certain requirements of the *Specifications* conflict with other requirements of the *Specifications*, the more stringent requirements shall govern."

SC9 GC 1.4 ASSIGNMENT

SC9.1 Delete paragraph 1.4.1 in its entirety and replace with the following:

"1.4.1 The *Contractor* shall not assign the *Contract* or any portion thereof, without the prior written consent of the *Owner*, which consent may be unreasonably withheld. The *Owner* shall be entitled to assign the *Contract* to a corporation, partnership or other entity (the "Assignee"). Upon the assumption by the Assignee of the *Owner's* obligations under the *Contract*, the *Owner* shall be released from its obligations under the *Contract*".

SC10 GC 1.5 EXAMINATION OF DOCUMENTS AND SITE

SC10.1 Add new GC 1.5 – EXAMINATION OF DOCUMENTS AND SITE as follows:

"GC1.5 EXAMINATION OF DOCUMENTS AND SITE

1.5.1 The *Contractor* declares and represents that in tendering for the *Work*, and in entering into a *Contract* with the *Owner* for the performance of the *Work*, it has either investigated for itself the character of the *Work* to be done and all local conditions, including the location of any utility which can be determined from the records or other information available at the offices of any person, partnership, corporation, including a municipal corporation and any *Board* or commission thereof having jurisdiction or control over the utility that might affect its tender or its acceptance of the *Work*, or that, not having so investigated, the *Contractor* has assumed and does hereby assume all risk of conditions now existing or arising in the course of the *Work* which might or could make the *Work*, or any items thereof more expensive in character, or more onerous to fulfil, than was contemplated or known when the tender was made or the *Contract* signed.

1.5.2 "The *Contractor* also declares that in tendering for the *Work* and in entering into this *Contract,* the *Contractor* did not and does not rely upon information furnished by the *Owner* or any of its agents or servants respecting the nature or confirmation of the ground at the site of the *Work*, or the location, character, quality or quantity of the materials to be removed or to be employed in the construction of *Work*, or the character of the construction machinery and equipment or facilities needed to perform the *Work*, or the general and local performance of the *Work* under the *Contract* and expressly waives and releases the *Owner* from all claims with respect to the said information with respect to the *Work*."

SC11 GC 2.2 ROLE OF THE CONSULTANT

SC11.1 In paragraph 2.2.7, delete the words "Except with respect to GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER".

SC11.2 Amend paragraph 2.2.13 by adding the following to the end of that paragraph:

"If, in the opinion of the *Contractor*, the *Supplemental Instruction* involves an adjustment in the *Contract Price* or in the *Contract Time*, it shall, within ten (10) *Working Days* of receipt of a *Supplemental Instruction*, provide the *Consultant* with a notice in writing to that effect. Failure to provide written notification within the time stipulated in this paragraph 2.2.13 shall be deemed an acceptance of the *Supplemental Instruction* by the *Contractor*, without any adjustment in the *Contract Price* or *Contract Time*."

SC11.3 Add new paragraph 2.2.19 as follows:

"The *Consultant* or the *Owner*, acting reasonably, may from time to time require the *Contractor* to remove from the *Project* any personnel of the *Contractor*, including project managers, superintendents or *Subcontractors*. Such persons shall be replaced by the *Contractor* in a timely fashion to the satisfaction of the *Consultant* and the *Owner*, at no cost to the *Owner*."

SC12 GC 2.3 REVIEW AND INSPECTION OF THE WORK

SC12.1 Amend paragraph 2.3.2 by adding the words "and *Owner*" after the words "*Consultant*" in the second and third lines.

SC12.2 In the first and second lines of paragraph 2.3.4. insert the word "review" after the word "inspections".

SC12.3 Paragraph 2.3.5: In the first line after "*Consultant*", add "or the *Owner*".

SC12.4 Add a new paragraph 2.3.8 as follows:

"2.3.8 The *Owner* shall have access to the *Work* at all times. The *Contractor* shall provide sufficient, safe, and proper facilities at all time for the review of the *Work* by the *Owner* and the inspection of the *Work* by authorized agencies."

SC13 GC 2.4 DEFECTIVE WORK

SC13.1 Amend GC 2.4.1 by inserting "or the *Owner*" in the first sentence following "rejected by the *Consultant*".

SC13.2 Add new paragraphs 2.4.1.1 and 2.4.1.2 as follows:

"2.4.1.1 The *Contractor* shall rectify, in a manner acceptable to the *Owner* and the *Consultant*, all defective work and deficiencies discovered throughout the *Work*, whether or not they are specifically identified by the *Consultant*.

2.4.1.2 The *Contractor* shall prioritize the correction of any defective work, which, in the sole discretion of the *Owner*, adversely affects the day to day operations of the *Owner* or which, in the sole discretion of the *Consultant*, adversely affects the progress of the *Work*."

SC13.3 Add new paragraph 2.4.4 as follows:

"2.4.4 Neither acceptance of the *Work* by the *Consultant* or the *Owner*, nor any failure by the *Consultant* or the *Owner* to identify, observe or warn of defective *Work* or any deficiency in the *Work* shall relieve the *Contractor* from the *Contractor's* responsibility for rectifying such defects or deficiencies at the *Contractor's* sole cost."

SC14 GC 3.1 CONTROL OF THE WORK

SC14.1 Add a new paragraph 3.1.3 as follows:

"3.1.3 Prior to or concurrent with individual procurement, fabrication and construction activities, the *Contractor* shall verify at the *Place of the Work*, all relevant measurements and levels necessary for proper and complete fabrication, assembly and installation of the *Work* and shall carefully compare such field measurements and conditions with the requirements of the *Contract Documents*. Where dimensions are not included or exact locations are not apparent, and the *Contractor* requires additional information in order to proceed with *Work*, the *Contractor* shall immediately notify the *Consultant* in writing and

obtain written instructions from the *Consultant* before proceeding with the affected *Work*."

SC15 GC 3.2 CONSTRUCTION BY OWNER OR OTHER CONTRACTORS

SC15.1 Delete paragraphs 3.2.2.1, 3.2.2.2 and 3.2.2.4 in their entirety.

SC15.2 Add new paragraph 3.2.3.4 as follows:

"3.2.3.4 Subject to GC 9.4 CONSTRUCTION SAFETY, for the *Owner's* own forces and for other contractors, assume overall responsibility for compliance with all aspects of the applicable health and safety legislation in force at the *Place of the Work*, including all of the responsibilities of the "Constructor", pursuant to the Occupational Health and Safety Act (Ontario)."

SC16 GC 3.5 CONSTRUCTION SCHEDULE

SC16.1 Delete paragraph 3.5.1 in its entirety and replace with the following:

"3.5.1 The *Contractor* shall:

.1 Within five (5) calendar days of receiving written confirmation of the award of the *Contract*, prepare and submit to the *Owner* and the *Consultant* for their review and acceptance, a construction schedule in the format indicated below that indicates the timing of the activities of the *Work* and provides sufficient detail of the critical events and their inter-relationship to demonstrate the *Work* will be performed in conformity with the *Contract Time* and in accordance with the *Contract Documents.*

.1 Such schedule is to include a delivery schedule for *Products* whose delivery is critical to the schedule for the *Work* or are required by the *Contract* to be included in a *Products* delivery schedule; and,

.2 The *Contractor* shall employ construction scheduling software, being the latest version of "Microsoft Project"*,* that permits the progress of the *Work* to be monitored in relation to the critical path established in the schedule; and,

.3 The *Contractor* shall provide the schedule and any successor or revised schedules in both electronic format and hard copy; and,

.4 Once accepted by the *Owner* and the *Consultant*, the construction schedule submitted by the *Contractor* shall become the baseline construction schedule.

.2 Monitor the progress of the *Work* and report to the *Consultant* and *Owner* in writing on a weekly basis relative to the baseline construction schedule, or any revised schedule previously accepted by the *Owner*. Report on any variation from the baseline or slippage in the schedule.

.3 Update and submit to the *Consultant* and *Owner* the electronic and hard copy schedule on a monthly basis, at a minimum, or as required by the *Consultant*."

SC16.2 Add new paragraphs 3.5.2 and 3.5.3 as follows:

"3.5.2 If, at any time, it should appear to the *Owner* or the *Consultant* that the actual progress of the *Work* is behind schedule or is likely to become behind schedule, or if the *Contractor* has given notice of such to the *Owner* or the *Consultant* pursuant to subparagraph 3.5.1.3, the *Contractor* shall, either at the request of the *Owner* or the *Consultant*, or following giving notice pursuant to subparagraph 3.5.1.3, take appropriate steps to cause the actual progress of the *Work* to conform to the schedule or minimize the resulting delay. Within five (5) calendar days of the request by the *Owner* or the *Consultant* or the notice being given pursuant to subparagraph 3.5.1.3, the *Contractor* shall produce and present to the *Owner* and the *Consultant* a plan demonstrating how the *Contractor* will achieve the recovery of the last accepted schedule.

3.5.3 The *Contractor* is responsible for performing the *Work* within the *Contract Time*. Any schedule submissions revised from the accepted baseline construction schedule or revised schedule accepted by the *Owner* pursuant to GC 3.5 CONSTRUCTION SCHEDULE, during construction are not deemed to be approved extensions to the *Contract Time.* All extensions to the *Contract Time* must be made in accordance with the *Contract Documents*."

SC17 GC 3.6 SUPERVISION

SC17.1 In paragraphs 3.6.1 and 3.6.2 replace the word "representative" with "superintendent".

SC17.2 Add new paragraph 3.6.3, 3.6.4, 3.6.5 and 3.6.6 as follows:

"3.6.3 The superintendent for the *Project* shall be acceptable to the *Owner* and *Consultant*, and shall be in full time attendance at the *Place of Work* while the *Work* is being performed. The *Contractor* shall provide the *Owner* and the *Consultant* with the names, addresses and telephone numbers of the superintendent referred to in this paragraph 3.6.1 and other responsible persons who may be contacted for emergency and other reasons during non-working hours.

3.6.4 The superintendent shall not be changed by the *Contractor* without valid reason, which reason shall be provided in writing. The superintendent shall not be changed without prior consultation with and agreement by the *Owner* and the *Consultant*.

3.6.5 The *Contractor* shall replace the superintendent within 7 *Working Days* of the *Owner's* written notification, if the superintendent's performance is not acceptable to the *Owner*.

3.6.6 The superintendent must remain assigned to the *Project* and present at the *Place of the Work* from the start of the *Work*, through the lien period, and shall remain at the *Place of the Work* until all deficiencies are completed and accepted, unless otherwise authorized by the *Consultant* or the *Owner*."

SC18 GC 3.7 SUBCONTRACTORS AND SUPPLIERS

SC18.1 In paragraph 3.7.1.1 add to the end of the second line "including any warranties and service agreements which extend beyond the term of the *Contract*."

SC18.2 In subparagraph 3.7.1.2 after the words "the *Contract Documents*" insert the words "including any required surety bonding".

SC18.3 Add to the end of paragraph 3.7.2 the following sentences:

"Substitution of any *Subcontractor* and/or *Suppliers* after submission of the *Contractor's* bid will not be accepted unless a valid reason is given in writing to and approved by the *Owner*, whose approval may be arbitrarily withheld. The reason for substitution must be provided to the *Owner* and to the original *Subcontractor* and/or *Supplier* and the *Subcontractor* and/or *Supplier* shall be given the opportunity to reply to the *Contractor* and *Owner.* The *Contractor* shall be fully aware of the capability of each *Subcontractor* and/or *Supplier* included in its bid, including but not limited to technical ability, financial stability and ability to maintain the proposed construction schedule."

SC18.4 In paragraph 3.7.4, change the word "shall" to "may" in the second line.

SC18.5 Add new paragraphs 3.7.7 and 3.7.8 as follows:

"3.7.7 Where provided in the *Contract*, the *Owner* may assign to the *Contractor*, and the *Contractor* agrees to accept, any contract procured by the *Owner* for *Work* or services required on the *Project* that has been pre-tendered or pre-negotiated by the *Owner*.

3.7.8 The *Contractor* covenants that each subcontract or supply contract which the *Contractor* enters into for the purpose of performing the Work shall expressly provide for the assignment thereof to the *Owner* (at the option of the *Owner*) and the assumption by the *Owner* of the obligations of the *Contractor* thereunder, upon the termination of the *Contract* and upon written notice by the *Owner* to the other parties to such subcontracts or supply contracts, without the imposition of further terms or conditions; provided, however, that until the *Owner* has given such notice, nothing herein contained shall be deemed to create any contractual or other liability upon the *Owner* for the performance of obligations under such subcontracts or supply contracts."

SC19 GC 3.8 LABOUR AND PRODUCTS

SC19.1 Add new paragraphs 3.8.4 and 3.8.5 as follows:

"3.8.4 All manufactured *Products* which are identified by their proprietary names or by part or catalogue number in the *Specifications* shall be used by the *Contractor*. No substitutes for such specified *Products* shall be used without the written approval of the *Owner* and the *Consultant*. Substitutes will only be considered by the *Consultant* when submitted in sufficient time to permit proper review and investigation. When requesting approval for the use of substitutes, the *Contractor* shall include in its submission any proposed change in the *Contract Price*. The *Contractor* shall use all proprietary *Products* in strict accordance with the manufacturer's directions.

3.8.5 Materials, appliances, equipment and other *Products* are sometimes specified by reference to brand names, proprietary names, trademarks or symbols. In such cases, the name of a manufacturer, distributor, *Supplier* or dealer is sometimes given to assist the *Contractor* to find a source *Supplier*. This shall not relieve the *Contractor* from its responsibility from finding its own source of supply even if the source names no longer supplies the *Product* specified. If the *Contractor* is unable to obtain the specified *Product*, the *Contractor* shall supply a substitute product equivalent to or better than the specified *Product*, as approved by the *Consultant*, with no extra compensation. Should the *Contractor* be unable to obtain a substitute *Product* equivalent to or superior to the specified *Product* and the *Owner* accepts a different *Product*, the *Contract Price* shall be adjusted accordingly, as approved by the *Consultant*."

SC20 GC 3.10 SHOP DRAWINGS

SC20.1 Add new paragraph 3.10.13 as follows:

"3.10.13 Reviewed *Shop Drawings*, including comments and/or instructions marked thereon, shall not authorize a change in the *Contract Price* and/or the *Contract Time*."

SC21 GC 3.13 CLEAN UP

SC21.1 Add new paragraph 3.13.4 as follows:

"3.13.4 In the event that the *Contractor* fails to remove waste and debris as provided in this GC 3.13, then the *Owner* or the *Consultant* may give the *Contractor* twenty-four (24) hours written notice to meet its obligations respecting clean up. Should the *Contractor* fail to meet its obligations pursuant to this GC 3.13 within the twenty-four (24) hour period next following delivery of the notice, the *Owner* may remove such waste and debris and deduct from payments otherwise due to the *Contractor*, the *Owner's* costs for such clean up, including a reasonable mark-up for administration costs."

SC22 GC 3.14 *BOARD* OCCUPANCY

SC22.1 Add a new General Condition 3.14 – *BOARD* OCCUPANCY as follows:

"GC 3.14 *BOARD* OCCUPANCY

3.14.1 The *Board* and other contractors as assigned by the *Board* shall have the right to enter, use and occupy the *Place of the Work*, in whole or in part, and place fittings and equipment at or within the *Work* before completion of the *Contract*. The *Contractor* shall observe and protect the right of other contractors and persons authorized by the *Board* or *Consultant* to use the *Place of the Work*.

3.14.2 The *Contractor* shall provide free and safe access to the building should the *Board* require occupation prior to completion of the *Contract*. The *Contractor* shall not be entitled to an indemnity for any interference with the *Contractor's* operations and any *Work* still to be performed by the *Contractor* shall be performed at times other than when the building is occupied. *Board* costs for *Board* staff required to be present during *Work* being carried out by the

Contractor and/or by any of the *Subcontractors* on weekends and after hours shall be paid by the *Contractor*.

3.14.3 Such entry and occupancy by the *Board* shall not be considered as acceptance of the *Work* or relieve the *Contractor* of the *Contractor's* responsibility to complete the *Project* in an acceptable manner, to an acceptable level of quality, within the agreed Construction Schedule."

SC23 GC 4.1 CASH ALLOWANCES

SC23.1 Delete and replace the last sentence in paragraph 4.1.4 with the following sentence:

"4.1.4 Multiple cash allowances, if more than one exists, may be combined for the purpose of calculating the foregoing."

SC23.2 Delete and replace paragraph 4.1.5 with the following sentence:

"4.1.5 Where costs exceed the total amount of all Cash Allowances, the *Contract Price* shall be adjusted by Change Order. *Overhead* and Profit charges may only be charged to overruns on the sum total of the Cash Allowances. The maximum mark up on the authorized overrun on Cash Allowances shall be 5%."

SC23.3 Add new paragraphs 4.1.8 and 4.1.9 as follows:

"4.1.8 The *Owner* reserves the right to call, or to have the *Contractor* call, for competitive bids for portions of the *Work*, which are to be paid for from cash allowances."

4.1.9 Cash allowances cover the net cost to the *Contractor* of services, *Products*, Construction Equipment, freight, unloading, handling, storage, installation, and other authorized expenses incurred in performing any *Work* stipulated under the cash allowances but does not include any *Value Added Taxes* payable by the *Owner* and the *Contractor*."

SC24 GC 4.2 CONTINGENCY ALLOWANCE

SC24.1 Delete existing paragraph 4.2.1 and replace with the following:

"4.2.1 No contingency allowance is included in the *Contract*.

SC24.2 Delete existing paragraphs 4.2.2, 4.2.3 and 4.2.4 in their entirety.

SC25 GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER

SC25.1 Delete GC 5.1, including paragraphs 5.1.1 and 5.1.2 in their entirety.

SC26 GC 5.2 APPLICATIONS FOR PROGRESS PAYMENT

SC26.1 Delete and replace paragraph 5.2.3 with the following:

"5.2.3 The amount claimed shall be for the value, proportionate to the amount of the *Contract*, of *Work* performed and *Products* delivered and incorporated into the *Work* as of the last day of the payment period. No amount claimed shall include *Products* not incorporated into the Work (whether delivered to the *Place of the Work* or not) except when prior financial and/or security arrangements are made and agreed to by the *Contractor*, *Owner* and *Consultant*."

SC26.2 Add the following additional sentence to the end of paragraph 5.2.7:

"Such *Products* not incorporated shall, prior to any such consideration for payment, be free and clear of all security interests, liens and other claims of third parties."

SC26.3 Add new paragraph 5.2.8 as follows:

"5.2.8 Each application for payment, except the first, shall include a statutory declaration, in the CCDC 9A – 2001 form, up to the date of the application for payment, in a form approved by the *Consultant*. Each application for payment (including the first), shall also include:

.1 A certificate, issued by an agency or firm providing workers' compensation insurance to the *Contractor*, verifying that coverage is in force at the time of making the application for payment, and that coverage will remain in force for at least sixty (60) days thereafter.

.2 A declaration by the *Contractor*, in a form approved by the *Consultant*, verifying that the performance of the *Work* is in compliance with all applicable regulatory requirements respecting environmental protection, fire safety, public safety and occupational health and safety.

.3 A pre-approved schedule of values, supplied by the *Contractor*, for Divisions 1 through 14 of the *Work*, aggregating the total amount of the *Contract Price*.

.4 A separate pre-approved schedule of values, supplied by each *Subcontractor*, for each of Division 15 (Mechanical) and 16 (Electrical) of the *Work*, aggregating the total amount of the *Contract Price* for those divisions of *Work*.

.5 Invoices to support all claims against the cash allowance.

.6 An acceptable construction schedule pursuant to GC 3.5."

SC27 GC 5.3 PROGRESS PAYMENT

SC27.1 In the first sentence, after the words "after the receipt by the *Consultant*" add the word "complete".

SC27.2 Delete subparagraph 5.3.1.3 in its entirety and substitute as follows:

".3 The *Owner* shall make payment to the *Contractor* on account as provided in Article A-5 of the Agreement – PAYMENT no later than 30 calendar days after the date of a complete certificate of payment is issued by the *Consultant"*

SC27.3 Add new paragraphs 5.3.4 and 5.3.5 as follows:

"5.3.4 The schedule of values required by paragraph 5.2.4, shall provide for the establishment of a Reserve Fund equivalent to the value of One percent (1%) of the *Work* performed, which fund shall be held in an interest-bearing trust account in the name of the *Owner* and paid to the *Contractor* at the time of final completion of the *Work*. This Reserve Fund shall be in addition to any required Construction Lien Holdback. The funds shall be subject to claims by the *Owner* and others as provided for under the terms of the *Contract Documents.*

5.3.5 In the event of construction lien action affecting the *Project*, the *Contractor* agrees to indemnify and compensate the *Owner* for any expenses incurred. The *Owner* reserves the right to secure the possible cost of construction liens by retaining from the amount of the next payment certificate a sum equal to the amount of any lien claim plus an additional amount of 25% of any such lien amount. Funds so retained and not so expended, shall be released to the *Contractor* upon the full discharge of all liens and dismissal of all actions against the *Owner*."

SC28 GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK

SC28.1 Add new paragraphs 5.4.4, 5.4.5 and 5.4.6 as follows:

"5.4.4 Following the issuance of a certificate of *Substantial Performance of the Work*, the *Consultant* will review the *Work* and prepare a list of deficiencies and incomplete *Work* items.

.1 The *Consultant* will assign a monetary value to each item.

.2 Values assigned shall be those estimated to be required to have deficiencies corrected by an outside contractor, not currently engaged in the *Work* of the *Contract*.

.3 The total of such amounts will be withheld from payments form a portion of the Deficiency Holdback, conditions for which are listed in GC 5.10 – DEFICIENCY HOLDBACK.

.4 Re-review of deficiencies and incomplete *Work* items shall be in accordance with provisions and procedures as detailed in the *Specifications*, including payment and/or withholding of payment provisions and procedures.

5.4.5 Within the time prescribed by the construction/builder's lien legislation in force at the *Place of the Work*, or where there is no legislation or no time prescribed, within a reasonable time of receiving a copy of the certificate of *Substantial Performance of the Work* signed by the *Consultant*, the *Contractor* shall take whatever steps are required to publish or post a signed copy of the certificate, as is required by such legislation. If the *Contractor* fails to comply with this provision, the *Owner* may take the required steps pursuant to the legislation and charge the *Contractor* for any costs so incurred.

5.4.6 Following the issuance of the certificate of *Substantial Performance of the Work*, the following shall apply to completing the *Work*:

.1 *Contractor* is to complete the *Work* within sixty (60) calendar days, or such shorter time period as is established under paragraph 5.4.3.

.2 No payments will be processed following *Substantial Performance of the Work* and prior to the *Work* being classified as *Total Performance*.

.3 The *Owner* reserves the right to contract out any or all unfinished *Work* if it has not been completed within sixty (60) days of *Substantial Performance of the Work* without prejudice to any other right or remedy and without affecting the warranty period. The cost of completing the *Work* shall be deducted from the *Contract Price*.

SC29 GC 5.5 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF THE WORK

SC29.1 Amend paragraph 5.5.2 by adding the following sentence to the end of that paragraph:

"In addition to a Reserve Fund noted in SC27.3, paragraph 5.3.4, a Deficiency Holdback may also be retained by the *Owner* to secure the correction of deficiencies and/or warranty claims. Included in these amounts would be all *Consultant* and *Owner* costs related to the correction of deficiencies and/or warranty claims."

SC29.2 Delete paragraphs 5.5.3 and 5.5.5 in their entirety.

SC29.3 Add new replacement subparagraph 5.5.3 as follows:

"5.5.3 Failure by the *Contractor* to publish the certificate of *Substantial Performance of the Work* places no onus on the *Consultant* or *Owner* to do so. If the Certificate is not published, the *Owner* shall release the holdback to the *Contractor* 45 days after the contract is deemed complete, again having satisfied themselves as above."

SC30 GC 5.6 PROGRESSIVE RELEASE OF HOLDBACK

SC30.1 Delete paragraphs 5.6.1, 5.6.2 and 5.6.3 in their entirety and replace with the following paragraph 5.6.1:

"5.6.1 No progressive release of holdback on separate sub-contracts will be made. After *Substantial Performance of the Work* and until Deemed Complete, no payments will be made on the *Contract* with the exception of release of holdback."

SC31 GC 5.7 FINAL PAYMENT

SC31.1 Add to the end of paragraph 5.7.2 the following:

"The *Work* shall be deemed not to be completed until all of the documents listed in the *Contract Documents* have been delivered and confirmed as being satisfactory. The *Owner* may withhold payment in respect of the delivery of any documents in an amount determined by the *Consultant* in accordance with the provisions of GC 5.8 - WITHHOLDING OF PAYMENT."

SC31.2 Delete from the second line of paragraph 5.7.4 the words, "5 calendar days after the issuance" and substitute the words "30 calendar days after receipt of".

SC32 GC 5.10 DEFICIENCY HOLDBACK

SC32.1 Add a new General Condition 5.10 – DEFICIENCY HOLDBACK as follows:

"GC 5.10 DEFICIENCY HOLDBACK

5.10.1 Notwithstanding any provisions contained in the *Contract Documents* concerning certification and release of monies to the *Contractor*, the *Owner* reserves the right to establish a Deficiency Holdback, in addition to a Reserve Fund, at the time of the review for *Substantial Performance of the Work*.

5.10.2 Amount of the Deficiency Holdback shall be based upon one or more of the following:

.1 The total of the values assigned to Deficiency List items, as described in GC 5.4, Item 5.4.4.1;

.2 A premium to be determined, based upon individual *Project* completion circumstances present at the time of the deficiency review, up to a total of 100% of the dollar value of the deficiencies listed by the *Consultant*.

5.10.3 The *Owner* shall retain the entire Deficiency Holdback amount until completion of all of the deficiencies listed by the *Consultant* to the satisfaction of the *Consultant* and *Owner*."

SC33 GC 6.1 OWNER'S RIGHT TO MAKE CHANGES

SC33.1 Add new paragraphs 6.1.3 and 6.1.4 as follows:

"6.1.3 The *Contractor* agrees that changes resulting from construction coordination, including but not limited to, site surface conditions, site coordination, and *Subcontractor* and *Supplier* coordination are included in the *Contract Price* and the *Contractor* shall be precluded from making any claim for a change in the *Contract Price* as a result of such changes.

6.1.4 Labour costs shall be actual, prevailing rates at the *Place of the Work* paid to workers, plus statutory charges on labour including WSIB, unemployment insurance, Canada pension, vacation pay, hospitalization and medical insurance. The *Contractor* shall provide proof of these rates, when requested by the *Consultant*, for review and/or agreement."

SC34 GC 6.2 CHANGE ORDER

SC34.1 Add new paragraph 6.2.3 as follows:

"6.2.3 The value of a change shall be determined in one or more of the following methods as directed by the *Consultant*:

.1 by estimate and acceptance of a lump sum, such estimate including a detailed breakdown of all labour and materials involved in executing the change to the *Work*;

.2 by negotiated unit prices which include the *Contractor's overhead* and profit, as noted in paragraph 6.2.4, or;

.3 by negotiated and accepted lump sum amount, including the *Contractor's overhead* and profit, *as noted in paragraph 6.2.4."*

SC34.2 Add new paragraph 6.2.4 as follows:

"6.2.4 *Overhead* and profit charged on Changes, resulting in extra costs, shall be calculated as follows:
.1 Combined *overhead* and profit mark up on *Work* performed by the *Contractor's* own forces shall not exceed 10%.
.2 *Overhead* and profit shall not be charged on credits to the *Contract*. Where a change includes both credits and extras, *overhead* and profit shall apply only to the net extra amount.
.3 *Contractor's* combined *overhead* and profit mark up on subcontract *Work* shall not exceed 5%.
.4 Combined *overhead* and profit mark up charged by *Subcontractors* on their own *Work*, shall not exceed 10%."
.5 *Subcontractor's* combined *overhead* and profit mark up on subcontract *Work* shall not exceed 5%".

SC34.3 Add new paragraph 6.2.5 as follows:

"6.2.5 All quotations will be submitted in a complete manner listing:
.1 quantity of each material,
.2 unit cost of each material,
.3 man hours involved for each type of labour,
.4 cost per hour for each type of labour,
.5 *overhead* and profit (markup),
.6 *Subcontractor* quotations submitted listing items .1 to .5 above."

SC34.4 Add new paragraph 6.2.6 as follows:

"6.2.6 Allowances for *overhead* and profit shall cover all of the *Contractor's* and *Subcontractor's* administrative and incidental costs relating to a change including, without limitation, costs relating to project managers, superintendents, assistants, watchpersons and administrative personnel, *Shop Drawing* production, head office and site office expenses, worker tools, temporary facilities, bonds, insurance, transportation, record drawings, cleanup and disposal of waste materials".

SC35 GC 6.3 CHANGE DIRECTIVE

SC35.1 Delete and replace paragraph 6.3.6.1 with the following:

"6.3.6.1 *Overhead* and profit charged on Change Directive items shall be calculated as follows:
.1 Combined *overhead* and profit mark up on Work performed by the *Contractor's* own forces shall not exceed 10%.
.2 *Overhead* and profit shall not be charged on credits to the *Contract*. Where a change includes both credits and extras, *overhead* and profit shall apply only to the net extra amount.
.3 *Contractor's* combined *overhead* and profit mark up on subcontract *Work* shall not exceed 5%.
.4 Combined *overhead* and profit mark up charged by Subcontractors on their own *Work*, shall not exceed 10%."

.5 *Subcontractor's* combined *overhead* and profit mark up on subcontract *Work* shall not exceed 5%.

SC35.2 In subparagraph 6.3.7.1 insert "while directly engaged in the *Work* attributable to the change" after the words "in the direct employ of the *Contractor*".

SC36 GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

SC36.1 Add new paragraph 6.4.5 as follows:

"6.4.5 Prior to the submission of the bid on which the *Contract* was awarded, the *Contractor* confirms that it carefully investigated the *Place of the Work* and carried out such tests as it deemed appropriate and, in doing so, applied to that investigation an appropriate degree of care and skill.

.1 The *Contractor* is deemed to assume all risk of conditions or circumstances now existing or arising in the course of the *Work* which could make the *Work* more expensive or more difficult to perform than was contemplated at the time the *Contract* was executed. No claim by the *Contractor* will be considered by the *Owner* or the *Consultant* in connection with conditions which could reasonably have been ascertained by such investigation or other due diligence undertaken prior to the execution of the *Contract*."

SC36.2 Add new paragraph 6.4.6 as follows:

"6.4.6 Having regard to paragraph 6.4.5, if the *Contractor* believes that the conditions of the *Place of the Work* differ materially from those indicated in the *Contract Documents,* from those reasonably anticipated, or conditions which were reasonably concealed from discovery notwithstanding the conduct of the investigation described in paragraph 6.4.5, it shall provide the *Owner* and the *Consultant* with *Notice in Writing* no later than five (5) *Working Days* after the first observation of such conditions." If the Contractor does not provide *Notice in Writing* within five (5) *Working Days*, it will be understood by the *Owner* and *Contractor* that the conditions at the *Place of the Work* are as per *Contract* Drawings and *Specifications*."

SC37 GC 6.5 DELAYS

SC37.1 Delete paragraph 6.5.3 in its entirety and replace with the following:

"6.5.3 If the *Contractor* is delayed in the performance of the *Work* by *Force Majeure*, then the *Contract Time* shall be extended for such reasonable time as the *Consultant* may recommend in consultation with the *Contractor*. The extension of time shall not be less than the time lost as a result of the event causing the delay, unless the *Contractor* agrees to a shorter extension. The *Contractor* shall not be entitled to payment for costs incurred by such delays unless such delays result from the actions of the *Owner."*

SC37.2 Add new paragraphs 6.5.6, 6.5.7 and 6.5.8 as follows:

"6.5.6 If the *Contractor* is delayed in the performance of the *Work* by an act or omission of the *Contractor* or anyone directly or indirectly employed or engaged by the *Contractor*, or by any cause within the *Contractor's* control, then the *Contract Time* may be extended for such reasonable time as the *Owner* may decide in consultation with the *Consultant* and the *Contractor*. The *Owner* shall be reimbursed by the *Contractor* for all reasonable costs incurred by the *Owner* as the result of such delay, including, but not limited to, the cost of all additional services required by the *Owner* from the *Consultant* or any sub-*Consultants*, project managers, or others employed or engaged by the *Owner*, and in particular, the costs of the *Consultant's* services during the period between the date of *Substantial Performance of the Work* stated in Article A-1 herein, as the same may be extended through the provision of these General Conditions, and any later or actual date of *Substantial Performance of the Work* achieved by the *Contractor*.

6.5.7 No claim for delay shall be made and the *Contract Time* shall not be extended due to climatic conditions which are within normal or expected statistical maximums and minimums, within a ten year time period, or arising from the *Contractor's* efforts to maintain the Construction Schedule.

6.5.8 The parties acknowledge the construction of the *Work* is designed to accommodate the requirements of the *Owner* and failure to attain *Substantial Performance of the Work* by the date stipulated in the Agreement shall result in inconvenience and expense to the *Owner* and its teachers, students, and others – the exact extent of which is virtually impossible to calculate. Consequently, the parties agree that their best estimate of costs involved in delay beyond the stipulated date for *Substantial Performance of the Work* is $500 (Five Hundred Dollars) per day per school and said sum shall be paid by the *Contractor* to the *Owner* for each *Working Day* of the delay, and shall be deemed for all purposes as reasonable compensation to the *Owner* for delay costs only. This amount is not, and shall not be deemed to be a penalty, but is a fair estimate of the actual costs resulting from the delay, and shall be charged in addition to all other cost provided for in the *Contract Documents*.

SC38 GC 6.6 CLAIMS FOR A CHANGE IN THE CONTRACT PRICE

SC38.1 Delete GC 6.6 in its entirety.

SC39 GC 7.1 OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK OR TERMINATE THE CONTRACT

SC39.1 Add a new subparagraph 7.1.3.4 as follows:

"7.1.3.4 An "acceptable schedule" as referred to in subparagraph 7.1.3.2. means a schedule approved by the *Consultant* and the *Owner* wherein the default can be corrected within the balance of the *Contract Time* and shall not cause delay to any other aspect of the *Work* or the *Work* of other contractors, and in no event shall it be deemed to give a right to extend the *Contract Time*."

SC39.2 Add new paragraph 7.1.7 as follows:

"7.1.7 In addition to any changes certified by the *Consultant,* pursuant to the provisions of item 7.1.5.3 of the General Conditions, the *Contractor* shall:
.1 pay an allowance for the additional time and services required by the *Board's* representative and other employees equivalent to the relevant payroll costs, plus 150%.
.2 be responsible for all legal costs incurred by the *Board* with respect to liens arising out of this *Contract*. This includes all costs to perform more than one search per payment such that it includes the costs of all searches discovering liens registered against the *Board's* property, arising out of the *Contract*."

SC40 GC 7.2 CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT

SC40.1 Delete paragraph 7.2.2, in its entirety.

SC40.2 Delete subparagraphs 7.2.3.1, 7.2.3.2 and 7.2.3.3 in their entirety.

SC40.3 In subparagraph 7.2.3.4, delete the words "except for GC 5.1 - FINANCING INFORMATION REQUIRED OF THE OWNER".

SC40.4 Renumber paragraph 7.2.5 as paragraph 7.2.6. Add a new paragraph 7.2.5 as follows:

"7.2.5 If the default cannot be corrected within the 5 *Working Days* specified in paragraph 7.2.4, the *Owner* shall be deemed to have cured the default if it:
.1 commences correction of the default within the specified time;
.2 provides the *Contractor* with an acceptable schedule for such correction; and,
.3 completes the correction in accordance with such schedule."

SC40.5 Delete paragraph 7.2.6 (previous 7.2.5) entirely and replace with the following:

"7.2.6 If the *Contractor* terminates the *Contract* under the conditions described in GC 7.2 – CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT, the *Contractor* shall be entitled to be paid for all *Work* performed to the date of termination, as determined by the *Consultant*. The *Contractor* shall also be entitled to recover the direct costs associated with termination, including the costs of demobilization and losses sustained on *Products* and *Construction Equipment*. The *Contractor* shall not be entitled to any recovery for any special, indirect or consequential losses, including loss of profit."

SC40.6 Add new paragraph 7.2.7 as follows:

"7.2.7 The *Contractor* shall not be entitled to give *Notice in Writing* of the *Owner's* default or terminate the *Contract* in the event the *Owner* withholds certificates or payment or both in accordance with the *Contract* because of:
.1 the *Contractor's* failure to pay all legitimate claims promptly, or
.2 the *Contractor's* failure to correct deficiencies and incomplete *Work* in accordance with timelines set out elsewhere in the *Contract Documents*, or

.3 the failure of the *Contractor* to discharge construction liens which are registered against the title to the *Place of the Work."*

SC41 GC 8.2 NEGOTIATION, MEDIATION AND ARBITRATION

SC41.1 Delete paragraph 8.2.1 and substitute the following therefor:

"8.2.1 Subject to the consent of each of the *Owner* and *Contractor*, the parties may appoint a Project Mediator in accordance with the Rules for Mediation of Construction Disputes as provided in CCDC 40 in effect at the time of bid closing, within 20 *Working Days* after *Notice in Writing* is given by one party to another of a dispute which the parties have been unable to resolve amicably with the assistance of the *Consultant*".

SC41.2 Amend paragraph 8.2.4 by changing part of the second line from "the parties shall request the Project Mediator" to "and subject to paragraph 8.2.1 the parties may request the Project Mediator".

SC41.3 Delete paragraphs 8.2.6, 8.2.7 and 8.2.8 in their entirety.

SC41.4 Add new paragraph 8.2.6 as follows:

"8.2.6 The dispute may be finally resolved by arbitration under the Rules of Arbitration of Construction Disputes, as provided in CCDC 40 in effect at the time of bid closing, provided that both the *Contractor* and the *Owner* agree. If the *Contractor* and the *Owner* agree to resolve the dispute by arbitration, the arbitration shall be conducted in the jurisdiction of the *Place of the Work*."

SC42 GC 9.1 PROTECTION OF WORK AND PROPERTY

SC42.1 Delete subparagraph 9.1.1.1 in its entirety and substitute the following therefor:

".1 Errors in the *Contract Documents* which the *Contractor* could not reasonably have discovered applying the proper level of care and diligence;"

SC43 GC 9.2 TOXIC AND HAZARDOUS SUBSTANCES

SC43.1 Add a new subparagraph 9.2.5.5 as follows:

".5 In addition to the steps described in subparagraph 9.2.5.3, take any further steps it deems necessary to mitigate or stabilize any conditions resulting from encountering toxic or hazardous substances or materials."

SC43.2 Add new paragraphs 9.2.10, 9.2.11 and 9.2.12 as follows:

"9.2.10 The *Contractor*, *Subcontractors* and *Suppliers* shall not bring on to the *Place of the Work* any toxic or hazardous substances and materials except as required in order to perform the *Work*. If such toxic or hazardous substances or materials are required, storage in quantities sufficient to allow *Work* to proceed to the end of any current *Work* week only shall be permitted. All such toxic and hazardous materials and substances shall be handled and disposed

of only in accordance with all laws and regulations that are applicable at the *Place of the Work*.

9.2.11 The *Contractor* shall indemnify and hold harmless the *Owner*, the *Consultant* and their respective directors, officers, trustees, agents and employees, from and against any and all liabilities, costs, expenses, and claims resulting from bodily injury, including death, and damage to property of any person, corporation or other body politic, that arises from the use by the *Contractor*, *Subcontractors* and *Suppliers* of any toxic or hazardous substances or materials at the *Place of the Work*.

9.2.12 Renovation and/or Alterations Projects: Asbestos containing materials may have been used during the original construction or previous alteration of School Board facilities. If asbestos containing materials are discovered during the course of the *Project*, stop *Work* and immediately notify the *Owner* and the *Consultant*. Do not remove existing material containing asbestos fibres."

SC44 GC 9.4 CONSTRUCTION HEALTH AND SAFETY

SC44.1 Rename General Condition 9.4 to read: CONSTRUCTION HEALTH AND SAFETY

SC44.2 Delete paragraph 9.4.1 in its entirety and substitute as follows:

"9.4.1 The *Contractor* shall be solely responsible for construction safety at the *Place of the Work* and for compliance with the rules, regulations, and practices required by the applicable construction health and safety legislation and shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the *Work."*

SC44.3 Add new paragraphs 9.4.2 to 9.4.14 as follows:

"9.4.2 Observe and enforce construction safety measures required by the National Building Code (2010) Division B, Part 8; the Provincial Government; Workplace Safety and Insurance Board; and, Municipal authorities. In particular, the Occupational Health and Safety Act (Ont. Reg. 213/91), the Ontario Construction Safety Act, WHMIS, the regulations of the Ontario Ministry of Labour and Ontario Hydro Safety Requirements shall be strictly enforced.

9.4.3 The *Board* reserves the right to engage in separate contracts, beyond those of the *Contractor,* as part of the total construction of the Project. These separate contracts shall include, but need not be limited to, the supply and installation of plug-in/plug-out units; supply and installation of draperies, stage equipment, projection equipment and storage shelving units; the supply and installation of telephone, communication, computer and surveillance systems, equipment, wiring and components; the supply and placement of furnishings; and graphic art services.

9.4.4 The *Contractor,* hereafter called the "Constructor" as defined by the Occupational Health and Safety Act of Ontario, shall be responsible for supervising and directing any such contractors as the *Board* may choose to perform work at the *Place of the Work*. The "Constructor" shall ensure that all

contractors conform to the requirements of Health and Safety legislation and site policies while performing their work at the *Place of the Work*.

9.4.5 "Constructor" shall ensure that copies of all applicable construction safety regulations, codes and standards are available at the *Place of the Work* throughout the period of construction. All workers are to be informed that these documents are available for reference at any time.

9.4.6 The "Constructor" shall ensure that all supervisory personnel at the *Place of the Work* are fully aware of the contents of the Occupational Health and Safety Act (Ontario Regulation 213/91 - Construction Projects), as amended, and the "Workers' Compensation Act" and that they comply with all requirements and procedures prescribed therein including, but not limited to, the following construction safety requirements:

.1 "Constructor" to file "Registration of Constructors and Employers Engaged in Construction" (Form 1000) with the Director of the Occupational Health and Safety Division prior to commencement of *Work* on the *Project*, and (O. Reg. 213/91, sec 5).
.2 File a "Notice of Project" (Form 1075) with the Ontario Ministry of Labour, (O. Reg. 213/91, sec 6).
.3 Notification prior to trenching deeper than 1.2 m, (O. Reg. 213/91, sec 7).
.4 Establish a Joint Health and Safety and/or Worker Trades Committee, as required.
.5 Ensure that all activities arising out of the above are recorded and that minutes are available to an inspector of the Ontario Ministry of Labour.
.6 The *Contractor* shall be considered as the "Constructor" in consideration of the rights and responsibilities for all construction safety requirements, procedures, facilities and inspection of all *Work* performed by the *Contractor*, *Subcontractors*/sub-trades and other contractors engaged on this *Project*.
.7 In the event of a conflict between any of the provisions of the above authorities, **the most stringent provisions are to be applied**."

9.4.7 Material Safety Data Sheets (MSDS) must be available at the at the *Place of the Work* for any *Product* **designated hazardous** or containing **hazardous ingredients** prior to being used, installed or applied inside the building.

9.4.8 The "Constructor" must provide a job introduction or safety indoctrination session for all personnel and trades working, inspecting and/or supervising at the *Place of the Work*.

9.4.9 The "Constructor" will be responsible for taking all necessary steps to protect personnel (Workers, visitors, general public, etc.) and property from any harm throughout the duration of the *Contract*.

9.4.10 The "Constructor" shall supply **competent personnel** to implement the Health and Safety program and ensure compliance with the company's standards and those of the Occupational Health and Safety Act of Ontario.

9.4.11 The "Constructor" will include these provisions in any agreement with *Subcontractors* or trades and *Suppliers* and shall monitor compliance.

9.4.12 The "Constructor" is responsible for any delays in the progress of *Work* due to an infraction of legislated or site Health and Safety requirements.

.1 If, in the opinion of the *Consultant*, additional *Work* and steps to recover such delays are necessary to meet dates set in the *Contract*, the "Constructor" shall provide all such services without any additional cost to the *Board*.

9.4.13 During the course of the *Project*, if the Health and Safety policies of the "Constructor" are found to be deficient and/or the CAD-7 rating by the WSIB has changed adversely, additional full-time **accredited safety personnel** must be appointed without extra cost to the *Board*.

9.4.14 The *Contractor* shall promptly report in writing to the *Owner* and the *Consultant* all accidents of any sort arising out of or in connection with the performance of the *Work*, whether on or adjacent to the *Place of the Work*, giving full details and statement of witnesses. If death or serious injuries or damages are caused, the accident shall be promptly reported by the *Contractor* to the *Owner* and the *Consultant* by telephone or messenger in addition to any reporting required under the applicable safety regulations."

SC45 GC 10.2 LAWS, NOTICES, PERMITS, AND FEES

SC45.1 Amend paragraph 10.2.2 by deleting the words "building permit".

SC45.2 Delete and replace paragraph 10.2.3 to read:

"10.2.3 The *Contractor* shall be responsible for the procurement of permits, licenses, inspections, and certificates, which are necessary for the performance of the *Work*, except those as noted in paragraph 10.2.2 and as described in the *Specifications*, Section 01001 – Summary of Work and Special Conditions, Item 1.14.3 – Construction Related Fees, Permits, Building Permit."

SC45.3 Add new paragraph 10.2.8 as follows:

"10.2.8 "The *Contractor* shall furnish all certificates that are required or given by the appropriate governmental authorities as evidence that the *Work* as installed conforms with the laws and regulations of authorities having jurisdiction, including certificates of compliance for the *Owner's* occupancy or partial occupancy. The certificates are to be final certificates giving complete clearance of the *Work*, in the event that such governmental authorities furnish such certificates."

SC46 GC 10.4 WORKERS' COMPENSATION

SC46.1 Revise paragraph 10.4.1 to read as follows:

"10.4.1 Prior to commencing the *Work*, and with each and every application for payment thereafter, including the *Contractor's* application for payment of the holdback amount following *Substantial Performance of the Work* and again with the *Contractor's* application for final payment, the *Contractor* shall provide evidence of compliance with workers' compensation legislation in force at the *Place of the Work*, including payments due thereunder."

SC47 GC 12.1 INDEMNIFICATION

SC47.1 Inclusion of indemnification of *Consultant* by other parties:

Replace the words "*Owner* and the *Contractor*" with the words "*Owner,* the *Contractor* and the *Consultant"* in paragraphs 12.1.1, 12.1.2.1, 12.1.2.2, 12.1.4 and 12.1.6.

SC47.2 The provisions of GC 12.1 - INDEMNIFICATION shall survive the termination of the *Contract,* howsoever caused and no payment or partial payment, no issuance of a final certificate of payment and no occupancy in whole or in part of the *Work* shall constitute a waiver or release of any of the provisions of GC 12.1.

SC48 GC 12.2 WAIVER OF CLAIMS

SC48.1 Delete GC 12.2 – WAIVER OF CLAIMS, in its entirety.

SC49 GC 12.3 WARRANTY

SC49.1 Add new paragraphs 12.3.7 to 12.3.10 as follows:

"12..3.7 Where required by the *Contract Documents*, the *Contractor* shall provide a maintenance bond as security for the performance of the *Contractor's* obligations as set out in GC 12.3 WARRANTY.

12.3.8 The *Contractor* shall provide fully and properly completed and signed copies of all warranties and guarantees required by the *Contract Document*s, containing:
.1 the proper name of the *Owner*;
.2 the proper name and address of the *Project*;
.3 the date the warranty commences, which shall be at the "date of *Substantial Performance of the Work*" unless otherwise directed by the *Consultant* in writing.
.4 a clear definition of what is being warranted and/or guaranteed as required by the *Contract Documents*; and
.5 the signature and seal (if required by the governing law of the *Contract*) of the company issuing the warranty, countersigned by the *Contractor*.

12.3.9 Should any *Work* be repaired or replaced during the time period for which it is covered by the specified warranty, a new warranty shall be provided under the same conditions and for the same period as specified herein before. The new warranty shall commence at the completion of the repair or replacement.

12.3.10 The *Contractor* shall ensure that its Subcontractors are bound to the requirements of GC 12.3 – WARRANTY for the *Subcontractor's* portion of the *Work*."

SC50 PART 13 OTHER PROVISIONS

SC50.1 Add new Part 13 OTHER PROVISIONS, including GC13.1 as follows:

SC51 GC 13.1 CONSTRUCTION LIENS

SC51.1 Add new GC 13.1 – CONSTRUCTION LIENS, as follows:

"GC13.1 CONSTRUCTION LIENS

13.1.1 In the event that a claim for lien is registered against the *Project* by a *Subcontractor*, sub-*Subcontractor* or *Supplier*, and provided the *Owner* has paid all amounts properly owing under the *Contract*, the *Contractor* shall, at its own expense:

.1 within 10 calendar days, ensure that any and all claims for lien and certificates of action are discharged, released, or vacated by the posting of security or otherwise; and

.2 in the case of written notices of lien, ensure that such notices are withdrawn, in writing.

13.1.2 In the event that the *Contractor* fails to conform with the requirements of paragraph 13.1.1, the *Owner* may fulfil those requirements and set off and deduct from any amount owing to the *Contractor*, all costs and associated expenses, including the costs of posting security and all legal fees and disbursements associated with discharging or vacating the claim for lien or certificate of action and defending the action. If there is no amount owing by the *Owner* to the *Contractor*, then the *Contractor* shall reimburse the *Owner* for all of the said costs and associated expenses."

End of Document 00800 – Supplementary General Conditions to CCDC 2, 2008

REVISED MAY 2013

SECTION 01001 – GENERAL INSTRUCTIONS

PART 1 - GENERAL

1.1 The successful Contractor shall pay for all inspections as required by Jurisdictional Authorities. The costs for these inspections shall be included in the Tender Price.

.1 All work shall be carried out in strict accordance with all existing applicable by-laws and amendments thereto, the Ontario Building Code, Ontario Fire Code and all requirements of the Ontario Fire Marshall's Office, and/or all other Jurisdictional Authorities and save harmless, in all respects the Owner. Provide certificate from ESA for final Inspection of the installation.

1.2 Additional Requirements

.1 Contractor shall register with the Director of the Occupational Health and Safety Division prior to commencement of work on the Project.

.2 File a 'Notice of Project' and commencement of the Project.

.3 Establish a Joint Health and Safety and/or Worker Trades Committee.

.4 Ensure that all activities arising out of the above are recorded and that minutes are available to an Inspector of the Ontario Ministry of Labour.

.5 Contractor shall be responsible for all construction safety requirements, procedures, facilities and inspection of all work performed by the Contractor, Sub-contractors/ sub-trades and other Contractors engaged on the Project.

.6 In the event of a conflict between any of the provisions of the above authorities, the most stringent provisions will be applied.

.7 Material Safety Data Sheets (MSDS) must be available at the Project site for any product designated 'hazardous' or containing 'hazardous' ingredients prior to being used, installed or applied inside the building.

.8 Contractor is responsible for taking all necessary steps to protect personnel (workers, visitors and general public) and property from any harm throughout the duration of the contract.

.9 Contractor shall supply competent personnel to implement the Health and Safety program and ensure compliance with the company's standards and those of the Occupational Health and Safety Act of Ontario.

.10 All the above provisions shall be included in any agreement with sub-contractors or trades and the Contractor shall monitor compliance.

1.3 Award of Contract and Essential Date of Completion

.1 Owner anticipates an on-site start date of **July 2, 2019** (work hours 4:00 pm to 11:00 pm. After July 2, 2019 full day access).

.2 The work shall commence as soon as possible after this date. The Contract shall be Substantially Completed and Total Completed as noted on the Form of Tender or earlier.

1.4 Contractor on Site

.1 The Contractor shall ensure the procurement of all required materials prior to the commencement of work.

.2 The Contractor shall organize his work at the site in co-operation with the Board's Project Supervisor.

.3 Certain work may have to be done after hours and on weekends.

.4 Ensure safety of personnel at the job site.

.5 Smoking is NOT permitted in any of the Owner's building or on any of the Owner's properties. All smoking must be done off premises.

1.5 Protection and Making Good

.1 Provide proper and adequate protection for all property and equipment. Ensure that dust is contained within the area of work.

.2 The Contractor shall be responsible for moving all equipment as required and replacing same at the completion of the work all as directed by the custodian.

.3 Make good, at no additional cost to the Owner, all surfaces disturbed by the execution of this contract whether such surfaces are located within the area of work or not. Make good to new condition matching surrounding surfaces.

1.6 Public Utilities

.1 Verify limitations imposed on project work by presence of utilities and services and ensure that no damage occurs to them.

1.7 Construction Safety

.1 The Contractor shall be solely responsible for construction safety at the Place of the Work and for compliance with the rules, regulations, and practices required by the applicable construction health and safety precautions and programs in connection with the performance of the Work.

.2 Provide all safety requirements and protection necessary or as required by local by-laws, governing authorities, and the Board Designee including but not limited to: guard rails, barriers, night lights, sidewalk and curb protection, warning notices and hoarded entrance protection.

.3 Take all precautions and provide all required protection to ensure the safety of the general public and the workers in accordance with but not limited to the latest editions of the Occupational Health and Safety Act and Regulations for Construction Projects.

.4 Do not bring to the site any flammable liquids having a flashpoint lower than 43 degrees Celsius (except when in use as fuel in operating equipment) without permission of the Board or designee. All flammable liquids shall be confined in safety containers approved by Underwriter's Laboratories of Canada, and stored in locked storage areas.

.5 Assume complete responsibility for construction strength, placing, anchoring and operation of derricks, cranes, hoists and other equipment used for work; and ensure that loads carried thereon can be safely supported and be free from accidents to all persons.

.6 Provide and maintain, on site, suitable fire extinguishers in sufficient quantities, as required by the Safety Code.

1.8 Workmanship and Material

.1 The Contractor shall employ workmen skilled in each phase of the work as their recognized trade.

.2 Manufactured articles, material and equipment shall be applied, installed, connected, erected, cleaned and conditioned in strict accordance with the applicable manufacturer's instructions and directions.

.3 No deviations from the Tender Documents shall be made by the Contractor without written approval of the Owner.

.4 Materials shall be new, of Canadian manufacture where available, first quality and uniform throughout. Submit tender based on the use of materials and equipment specified, or on the listed acceptable alternate equipment as further detailed.

.5 Electrical materials shall be C.S.A. approved and be so labeled. Material not C.S.A. approved shall receive acceptance for installation by Ontario Hydro Special Inspections Branch before delivery, and modifications and charges required for such acceptance shall be included in work of this Section. Material shall not be installed or connected to the source of electrical power until approval is obtained.

1.9 Shop Drawings

.1 Submit three (3) copies of shop drawings for all equipment for review and approval by the Consultant, prior to ordering equipment.

1.10 Final Cleaning

.1 In addition to housekeeping required by Jurisdictional Authorities, work includes final cleaning.

.2 Remove grease, dust dirt, stains, fingerprints, and other foreign materials from interior and exterior surfaces.

.3 Clean finish hardware, mechanical fixtures, light fixtures, cover plates and equipment.

.4 Prior to calling for a final inspection the Contractor shall remove all excess material, equipment and debris and the site shall be left in a clean and tidy condition.

1.11 Guarantee

.1 All material and workmanship on this project shall be guaranteed for a period of one (1) year from the date of final acceptance of the work by the Owner.

1.12 Codes and Standards to Meet or Exceed

.1 Current Ontario Building Code, including all amendments up to project date.

.2 Current National Building Code, Part 8: Safety Measures at Construction and Demolition Sites.

.3 The Workers' Compensation Act, including all revisions and amendments up to project date.

.4 Current Ontario Fire Code, including all amendments up to project date.

.5 Occupational Health and Safety Act and related Regulations for Construction projects, latest edition.

.6 Canadian Construction Safety Code.

.7 Ministry of Labour, Health and Safety Guidelines.

.8 Rules and regulations of authorities having jurisdiction.

. .9 CSA S350-M1980, Code of Practice of Safety in Demolition of Structures. Adhere to the most stringent requirement when above noted codes and standards conflict. Review with the Owner and Board Designee situations which are ambiguous, before proceeding with work.

1.13 Examination of Documents and Site

.1 Contractor shall examine the Tender Documents and must also examine the site before submitting their Tender. They must satisfy themselves by personal examination as to specific conditions to be met with during the project. They shall make their own estimates of the facilities and difficulties to be encountered in completing the work under this Contract. They shall not claim at any time after submission of this Tender, that there was any misunderstanding of the terms and conditions relating to the site conditions. It is the Contractor's responsibility to understand all aspects of the bid and to obtain clarification from the Owner and/or Consultant before submitting the bid.

.2 No plea of ignorance of conditions that exist or that may be encountered in the execution of the work under this Contract as a result of the failure to make the necessary examinations and investigations will be accepted as an excuse for any failure or omission on the part of the Contractor to fulfill in every detail all requirements of said Contract Documents, or will be accepted as a basis for any claims whatsoever for extra compensation or any extension of time.

.3 The Specifications shall be considered as an integral part of the accompanying drawings. Any item or subject omitted from either the Specifications or the Drawings, but which is mentioned or reasonably implied in the other shall be considered as properly and sufficiently specified and must therefore be provided by the Contractor.

1.16 Contractor's Schedule

.1 Coordinate all schedules with Owner and Consultant to suit the Board requirements. Scheduling of the work shall be subject to the approval of the Owner and Consultant.

.2 Submit to the Consultant the initial schedule within five (5) working days after Contract award and prior to commencing work.

.3 Execute work with the least possible interference or disturbance to occupants, public and normal use of premises. Normal building routine will continue while work of this contract is being performed. Do not block fire exits.

.4 Regular inspection of work progress will be conducted as decided by the Consultant. Schedules are to be updated by Contractor in conjunction with, and to the approval of, the Consultant.

1.17 Documents Required At Job Site

.1 Specifications and Drawings.

.2 Addenda.

.3 Change Orders.

.4 Copy of approved work schedule.

.5 Inspection Certificates.

.6 Material Safety Data Sheets for all Controlled Products to be used at the facility.

1.18 Project Meetings

.1 Attend project meetings as requested by the Owner and/or the Consultant.

1.19 Site Supervision

.1 Provide on the project site at all times during construction hours a competent Supervisor, who shall be empowered to act on behalf of the Contractor in the execution of this Contract. .

1.20 Fair Wages and Labour

.1 The successful Contractor to provide fair wages and work conditions or their employees applicable to "Field Work". If this policy is violated, the Owner will not consider letting further contracts to said Contractor. In all cases of dispute the decision of the Owner is final.

.2 Provide a competent person on duty at all times for emergency calls after regular construction hours and on weekends. This person shall be named and approved by the Consultant and Owner prior to starting work. Supply Consultant and Owner with the name and telephone number of the approved person to be contacted during these periods.

1.21 Additional Costs

.1 Any additional costs requested by the Contractor, above the contracted price agreement, shall be presented to the Owner and accepted in writing prior to the commencement of additional work.

.2 A fully executed Change Order issued by the Consultant and signed by the Owner will signify acceptance of additional costs. Existing Services

.1 Where work involves breaking into or connecting to existing services, carry out work at times directed by governing authorities, with minimum disturbance to staff, pedestrian, and vehicular traffic.

.2 Before commencing work, establish location and extent of services in the area of work and notify Board Designee of findings.

.3 Submit schedule for and obtain approval from the Owners' representative for any shut-down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.

.4 Where unknown services are encountered immediately advise Board Designee in writing.

.5 Record locations of maintained, re-routed and abandoned services.

.6 Existing water and electricity are available for contractors' use. Modification to systems will not be permitted and use will be given on an as-is basis. Owner reserves the right to disallow the use of services at any time.

1.23 Alterations and Making Good

.1 Where new work affects existing conditions and where existing conditions are altered, carry out all necessary cutting and fitting to make satisfactory connections with the work under this contract.

.2 Where necessary, existing services shall be disconnected, relocated, and reconnected as required to complete the work. This work shall include, but not be limited to: plumbing, heating, ventilating, air conditioning, electrical, and gas services.

1.24 Concealed or Unknown Conditions

.1 If the Owner or the Contractor discovers conditions at the Place of the Work which are:

.1 Subsurface or otherwise concealed physical conditions which existed before the commencement of the Work which differ materially from those indicated in the contract documents, or

.2 Physical conditions of nature, which, differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided in the contract documents;

.3 Then the observing party shall notify the other party in writing before conditions are disturbed and in no event later than 5 Working Days after the observance of the conditions.

.2 The Owner will promptly investigate such conditions and make a finding. If the finding is that the conditions differ materially and this would cause an increase or decrease in the contractor's cost or time to perform the work, the Owner shall issue appropriate instructions for a change in the Work.

.3 If the Owner finds that the conditions at the Place of the Work are not materially different or that no change in the contract price or the contract time is justified, the Owner Designee shall report the reasons for this finding to the Owner and the contractor in writing.

1.25 Garbage Disposal

.1 At all times, maintain work area and site, free of accumulated waste and rubbish.

.2 Dispose of debris and garbage from the job site on a daily basis with minimum disturbance to Owner and occupants, and in accordance with authorities having jurisdiction.

.3 Provide garbage bins and chutes required for daily disposal of debris and garbage. Obtain approval from the Owner for the bin location prior to commencement of the work.

.4 Remove full garbage bins immediately. Do not stockpile debris or garbage on project site.

.5 During and upon completion of the work, the Contractor shall remove from the premises all surplus materials, equipment and debris.

1.26 Working Hours

.1 Work in School/Site, while occupied, may be carried out as follows.

4:00 pm. to 11:00 pm., Monday to Friday (After School)
The Board does not allow any painting, welding or any other activity that produces noxious smells, Monday through Friday.
There shall be no interruption of utilities and life safety systems such as fire alarm, emergency lighting and sprinklers during occupied hours of the School. Where utilities must be interrupted, during unoccupied hours, the existing School and its equipment and/or contents shall be protected.
All trades/ personnel shall check in with the Main Office and advise the Staff, nature and location of their business. They may be required to be accompanied by a School Staff.

.2 Protect building areas from the intrusion of dust, smoke or any other debris resulting from the work of the Contract.

1.27 As-Built Drawings

.1 Provide one (1) set of as-built drawings indicating all changes made during the course of Installation. Mark the revisions with a red pencil. Also provide as-built drawings on CAD disk.

.2 Provide two (2) sets of Manuals. Include the names of suppliers, contact name, telephone and fax numbers.

1.28 Building Permit

.1 Building Permit is not required for the maintenance project to be specified.

PART 2 – SCOPE OF WORK

.1 The "Work" shall consist of the following:

- Removal and replacement of control valves.
- Rewiring of temperature sensors.
- Coil cleaning.
- Installation of new BAS Systems.
- Provide necessary caulking, seals etc. to prevent roof leaks

Refer to the following documents, attached herewith, for details of Work to be performed:

A. Mechanical, Electrical Drawings & Specifications.

END OF SECTION

SECTION 01005 - GENERAL REQUIREMENTS

1. GENERAL REQUIREMENTS

.1 Division 1 requirements apply to all Sections of Work.

2. SUMMARY OF WORK

.1 Provide all items, articles, materials, services and incidentals, whether or not expressly specified or shown on Drawings, to make finished work complete and fully operational, consistent with the intent of the Contract Documents.

.2 Provide all work indicated in Contract Documents, regardless whether located within or outside Owner's property lines.

.3 The following work is not included in this Contract:

.1 Work designated N.I.C.

3. DIVISION OF WORK

.1 Work specified in the Specification has been divided into technical Sections for the purpose of ready reference. Division of work among Subcontractors and suppliers is solely the Contractor's responsibility and Consultant assumes no responsibility to act as an arbiter to establish subcontract limits between Sections or Divisions of work.

4. METRIC PROJECT

.1 This project is based on The International System of Units (SI). Measurements are expressed in metric (SI) units and depending on the progress made in the various sectors of the industry are either hard or soft converted units.

.2 All metric units specified shall be taken to be the minimum acceptable unless otherwise noted.

.3 It is the Contractor's responsibility to check and verify with manufacturers and suppliers on the availability of materials and products in either metric or imperial sizes.

.4 Where a material or product cannot be obtained in the metric size specified, provide the next larger imperial size available.

.5 Where both metric and imperial sizes or dimensions are shown, the metric size or dimension shall govern.

5. SAFETY AND SECURITY

.1 Be responsible for security of all areas affected by work of this Contract until taken over by Owner. Take steps to prevent entry to the Work by unauthorized persons and guard against theft, fire and damage by any cause.

.2 Provide suitable surveillance equipment and/or employ guard services, as required to adequately protect the Work.

.3 Maintain fire protection for work. Store paints and volatile substances in a separate and controlled location and inspect frequently. Inspect temporary wiring, drop cords, extension cables for defective insulation or connections frequently. Remove combustible wastes frequently. Prohibit smoking in areas where volatile and flammable substances are used.

.4 Do not cut, bore or sleeve through any loadbearing member, new or existing without Consultant's written authorization, unless specifically indicated on Drawings.

6. USE OF SITE

.1 Accept full responsibility for assigned work areas from the time of Contract award until Substantial Performance of the Work.

.2 Check means of access and egress, rights and interests which may be interfered with. Do not block lanes, roadways, entrances or exits. Direct construction traffic and locate access to site as directed by municipality.

.3 Where encroachment beyond property limits is necessary make arrangement with respective property owners.

END

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SECTION 01090 - ABBREVIATIONS

1. The abbreviations listed below, when used in the Contract Documents, shall have the meanings shown.

2. See Drawing Abbreviations and Room Finish Schedule for additional abbreviations.

ABBREVIATION	MEANING
AA	ALUMINUM ASSOCIATION
AAMA	ARCHITECTURAL ALUMINUM MANUFACTURERS` ASSOCIATION
AASHO	AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS
ACI	AMERICAN CONCRETE INSTITUTE
AGA	AMERICAN GAS ASSOCIATION
AIA	AMERICAN INSTITUTE OF ARCHITECTS
AIMA	ACOUSTICAL & INSULATING MATERIALS ASSOCIATION
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AISI	AMERICAN IRON AND STEEL INSTITUTE
AMCA	AIR MOVING AND CONDITIONING ASSOCIATION INC.
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIRCONDITIONING ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AWI	ARCHITECTURAL WOODWORK INSTITUTE (USA)
AWMAC	ARCHITECTURAL WOODWORK MANUFACTURERS ASSOCIATION OF CANADA
AWS	AMERICAN WELDING SOCIETY
CCA	CANADIAN CONSTRUCTION ASSOCIATION
CCRC	CANADIAN CODE FOR RESIDENTIAL CONSTRUCTION
CEC	CANADIAN ELECTRICAL CODE
CFUA	CANADIAN FIRE UNDERWRITERS ASSOCIATION
CGA	CANADIAN GAS ASSOCIATION
CGSB	CANADIAN GENERAL STANDARDS BOARD
CIQS	CANADIAN INSTITUTE OF QUANTITY SURVEYORS
CISC	CANADIAN INSTITUTE OF STEEL CONSTRUCTION
CITC	CANADIAN INSTITUTE OF TIMBER CONSTRUCTION
CLA	CANADIAN LUMBERMEN`S ASSOCIATION
CMHC	CANADA MORTGAGE & HOUSING CORPORATION
COFI	COUNCIL OF FOREST INDUSTRIES OF BRITISH COLUMBIA
CPCI	CANADIAN PRESTRESSED CONCRETE INSTITUTE
CRCA	CANADIAN ROOFING CONTRACTORS ASSOCIATION
CSA	CANADIAN STANDARDS ASSOCIATION
CSC	CONSTRUCTION SPECIFICATIONS CANADA
CSI	CONSTRUCTION SPECIFICATIONS INSTITUTE (USA)
CSPI	CORRUGATED STEEL PIPE INSTITUTE
CSSBI	CANADIAN SHEET STEEL BUILDING INSTITUTE
CUA	CANADIAN UNDERWRITERS` ASSOCIATION
CWB	CANADIAN WELDING BUREAU
CWC	CANADIAN WOOD COUNCIL
DND	DEPARTMENT OF NATIONAL DEFENCE, CANADA
FM	FACTORY MUTUAL ENGINEERING CORPORATION
FS	FEDERAL SPECIFICATION (USA)
IES	ILLUMINATING ENGINEERING SOCIETY

SECTION 01090 - ABBREVIATIONS

IGMAC	INSULATED GLASS MANUFACTURERS ASSOCIATION OF CANADA
LTIC	LAMINATED TIMBER INSTITUTE OF CANADA
MIA	MARBLE INSTITUTE OF AMERICA
MPMDD	MODIFIED PROCTOR MAXIMUM DRY DENSITY
NAAMM	NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (USA)
NBFU	NATIONAL BOARD OF FIRE UNDERWRITERS
NBC	NATIONAL BUILDING CODE OF CANADA
NBS	NATIONAL BUREAU OF STANDARDS (USDC)
NEMA	NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NHLA	NATIONAL HARDWOOD LUMBER ASSOCIATION (USA)
NLGA	NATIONAL LUMBER GRADES AUTHORITY
NRC	NATIONAL RESEARCH COUNCIL

ABBREVIATION	**MEANING**
OBC	ONTARIO BUILDING CODE
OHSA	OCCUPATIONAL HEALTH AND SAFETY ACT
OPSS	ONTARIO PROVINCIAL STANDARD SPECIFICATIONS
PCA	PORTLAND CEMENT ASSOCIATION
PCI	PRESTRESSED CONCRETE INSTITUTE
RAIC	ROYAL ARCHITECTURAL INSTITUTE OF CANADA
SDI	STEEL DECK INSTITUTE
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
SPMDD	STANDARD PROCTOR MAXIMUM DRY DENSITY
SSPC	STEEL STRUCTURES PAINTING COUNCIL
TTMAC	TERRAZZO, TILE & MARBLE ASSOCIATION OF CANADA
ULC	UNDERWRITERS' LABORATORIES OF CANADA
ULI	UNDERWRITERS' LABORATORIES, INC. (USA)
USAS	UNITED STATES OF AMERICA STANDARDS INSTITUTE
WSIB	WORKPLACE SAFETY AND INSURANCE BOARD

END

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SECTION 01210 - ALLOWANCES

1. GENERAL

.1 Comply with GC 4.1 CASH ALLOWANCES and GC 4.2 CONTINGENCY ALLOWANCE.

.2 Cash allowances are designated for additional work and services deemed to be necessary by Owner, from time to time, throughout the execution of the Work. Where a cash allowance refers to an item or category of work already included in Contract Documents, it shall be assumed to cover work or services in addition to that indicated, unless specifically indicated otherwise.

.3 Contractor may be required from time to time to assist in tendering of certain items of work covered by allowance, as directed by Consultant.

2. AUTHORIZATION

.1 Expenditures from allowances included in the Contract must be authorized in writing by the Consultant.

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

3. CASH ALLOWANCES

.1 Cash allowances include supply and installation unless specifically indicated otherwise.

.2 Supply only allowances shall include:

.1 Net cost of products
.2 Delivery to site
.3 Applicable taxes and duties (excluding HST)

.3 Supply and install allowances shall include:

.1 Net cost of products
.2 Delivery to site
.3 Unloading, storing, handling of products on site
.4 Installation, finishing and commissioning of products
.5 Applicable taxes and duties (excluding HST)

.4 Inspection and testing allowances shall include:

.1 Net costs of inspection / testing services
.2 Applicable taxes (excluding HST)

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

.6 Include in the Contract a cash allowance of $15,000.00

END

SECTION 01310 - PROJECT COORDINATION

1. PRE-CONSTRUCTION MEETING

.1 Immediately prior to construction, upon notification attend at location of Owner's choice, pre-construction meeting, along with authoritative representatives of certain key subcontractors as specifically indicated in the conference notice.

.2 Purpose of meeting is as follows:

.1 Review project communications procedures.

.2 Review contract administration requirements including submittals, payment and change order procedures.

.3 Identify all critical points on construction schedule for positive action.

.4 Identify any product availability problems and substitution requests.

.5 Establish site arrangements and temporary facilities.

.6 Review Consultant’s inspection requirements.

.7 Review any points which, in Owner's, Consultant's and Contractor's opinion, require clarification.

.3 The Consultant shall organize and chair the pre-construction meeting. Consultant shall record minutes of pre-construction meeting and distribute a copy to each participant within ten days of meeting.

2. SITE MEETINGS

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

.2 Organize and chair site meetings. Ensure that persons, whose presence is required, are present and that relative information is available to allow meetings to be conducted efficiently.

.3 Once a month or more often if directed by Consultant include review with Consultant and Owner of construction schedule and application for progress payment, during or immediately following site meeting.

.4 Record minutes of each meeting and promptly distribute copies to be received by all participants not later than seven days after meeting has been held. Distribute minutes of meetings to all Consultants, whether in attendance or not.

3. SUPERVISION

.1 Employ an experienced and qualified supervisor who shall be in complete charge of the Work from commencement to final completion of the Work and who shall be present at the site whenever work is being carried out. A working foreperson will not be acceptable. The supervisor shall not be changed after commencement of work without the Consultant's approval.

.2 Supervise, direct, manage and control the work of all forces carrying out the Work, including subcontractors and suppliers. Carry out daily inspections to ensure compliance with the Contract Documents and the maintenance of quality standards. Ensure that the supervisory staff includes personnel competent in supervising all Sections of Work required.

.3 Arrange for sufficient number of qualified assistants to the supervisor as required for the proper and

efficient execution of the Work.

4. DOCUMENTS ON SITE

.1 Contractor's field office shall at all times contain a complete set of Contract Documents (Drawings and Specifications) with all addenda, site instructions, change orders, reviewed shop drawings and samples, colour schedule, paint materials schedules, hardware list, progress reports and meeting minutes.

5. INTERFERENCE AND COORDINATION DRAWINGS

.1 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the spaces provided.

.2 Prepare drawings to indicate coordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus, and connections are coordinated.

.3 Ensure that clearances required by jurisdictional authorities and clearances for proper maintenance are indicated on drawings.

.4 Upon Consultant's request submit copies of interference drawings to Consultant.

6. SLEEVING AND INSERT SETTING DRAWINGS

.1 Prepare sleeving drawings for work of Division 15 and 16, showing size and location of all penetrations through load bearing elements. Submit sleeving drawings to Consultant for review not less than 15 days prior to construction of affected elements.

.2 Prepare insert setting drawings for work to be cast into concrete and / or mortared into masonry elements. Submit insert setting drawings to Consultant for review not less than 15 days prior to construction of affected elements.

END

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SECTION 01320 - PROJECT PROGRESS DOCUMENTATION

1. CONSTRUCTION SCHEDULE

.1 Within 14 days of Contract award, submit in format acceptable to Consultant, minimum 6 copies of Contractor's critical path construction schedule.

.2 Provide computer generated Schedule using suitable scheduling, software such as Gantt or Microsoft Project.

.3 Set up format to permit plotting of actual construction progress against scheduled progress.

.4 Schedule shall show:

.1 Commencement and completion dates of Contract.

.2 Commencement and completion dates of construction stages/phases, if any.

.3 Commencement and completion dates of each trade. Major trades shall be further broken down as directed by Consultant; generally follow Specification format.

.4 Order and delivery dates for major or critical equipment.

.5 Critical dates for shop drawing/sample submissions.

.6 Any other information relating to orderly progress of Contract, considered by Contractor or Consultant to be pertinent.

.5 Consultant, together with Contractor shall review construction progress once a month during or immediately following regular site meeting, or more often as directed by Consultant.

.6 Update construction schedule, whenever changes occur, in manner and at times acceptable to Consultant.

.7 Plot actual construction progress or schedule at least once a week.

.8 Submit copy of updated schedule to Consultant once a month, concurrently with application for payment.

2. CASH FLOW CHART

.1 Within 7 days after award of Contract, submit, in form approved by Consultant, cash flow chart broken down on a monthly basis in an approved manner. Cash flow chart shall indicate anticipated Contractor's monthly progress billings from commencement of work until completion.

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

3. PROGRESS RECORD

.1 Maintain on site, permanent written record of progress of work. Record shall be open to inspection by Consultant at all times and copy shall be furnished to Consultant upon request.

.2 This record shall show weather conditions, dates of commencement, progress and completion of various trades and items of work. Particulars pertaining to erection and removal of forms, pouring of concrete, installation of roofing and other critical or major components as well as number of employees of various trades and type and quantity of equipment employed daily, shall be noted.

.3 Display a copy of the construction schedule in the site office from start of construction to completion. Superimpose actual progress of work on schedule at least once each week.

SECTION 01320 - PROJECT PROGRESS DOCUMENTATION

4. RECORD DRAWINGS

.1 Obtain and keep on site at all times a complete and separate set of black line white prints.

.2 Note clearly, neatly, accurately and promptly as the work progresses all architectural, structural mechanical and electrical changes, revisions and additions to the work and deviations from the Contract Documents.

.3 Accurate location, depth, position, size and type of concealed and underground services, both inside and outside shall be included as part of these record drawings.

.4 Record drawings shall be available for review at each site meeting.

.5 Refer to Section 01770 for requirements on submission of record drawings.

5. PRODUCT DELIVERY CONTROL

.1 It is the responsibility of the Contractor to ensure that the supplier or distributor of materials specified or alternatives accepted, which he intends to use, has materials on the site when required. The Contractor shall obtain confirmed delivery dates from the supplier.

.2 Provide equipment delivery schedule, coordinated with construction and submittals' schedule, showing delivery dates for major and/or critical equipment.

.3 The Contractor shall contact the Consultant immediately upon receipt of information indicating that any material or item, will not be available on time, in accordance with the original schedule, and similarly it shall be the responsibility of all subcontractors and suppliers to so inform the Contractor.

.4 The Consultant reserves the right to receive from the Contractor at any time, upon request, copies of actual purchase or work orders of any material or products to be supplied for the work.

.5 If materials and products have not been placed on order, the Consultant may instruct such items to be placed on order, if direct communication in writing from the manufacturer or prime suppliers is not available indicating that delivery of said material will be made in sufficient time for the orderly completion of the Work.

.6 The Consultant's review of purchase orders or other related documentation shall in no way release the Contractor, or his subcontractors and suppliers from their responsibility for ensuring the timely ordering of all materials and items required, including the necessary expediting, to complete the work as scheduled in accordance with the Contract Documents.

END

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SECTION 01330 - SUBMITTALS

1. GENERAL

.1 Unless specified or directed otherwise, make all submissions to the Consultant at his office.

.2 Make all submissions required by the Contract Documents with reasonable promptness and in orderly sequence so as to cause no delay in the work.

2. RELATED REQUIREMENTS

.1 Make the following submissions in accordance with requirements specified elsewhere:

.1	Applications for payment:	GC 5.2
.2	Insurance certificates:	GC 11.1
.3	Bonds:	GC 11.2
.4	Construction schedule:	Section 01320
.5	Cash flow chart:	Section 01320
.6	Progress photographs:	Section 01320
.7	Equipment delivery schedule:	Section 01320
.8	Purchase order documentation:	Section 01320
.9	Waste audit and reduction plans:	Section 01410
.10	Maintenance and operations data:	Section 01770
.11	Record drawings:	Section 01770
.12	Maintenance materials:	Section 01770

3. SCHEDULE OF VALUES

.1 Submit schedule of values in accordance with requirements of GC 5.2 APPLICATIONS FOR PROGRESS PAYMENT.

.2 Follow specifications table of contents as basis for degree of breakdown required. Show breakdown for different construction phases/stages if required by Consultant.

.3 Break down cost for large items of work as directed by Consultant.

.4 Provide additional cost breakdown information if requested by Consultant.

4. SCHEDULE OF SUBMITTALS

.1 Within 15 days of submission of construction schedule submit a schedule of submittals for shop drawings, samples, lists of materials and other documentation requiring Consultant's review.

.2 For each item requiring submission and review show anticipated date of submission and critical date for return of reviewed submission.

.3 Design sequence of submissions to reflect requirements of construction schedule.

.4 Allow up to 15 days for Consultant's review for each submission. Stagger submissions as much as possible to permit adequate review time for each item submitted. If several submissions are made at the same time or within a short time of each other, indicate order of priority in which submissions should be reviewed.

.5 Include sufficient time to permit corrections and resubmission, if necessary, without affecting construction schedule.

5. SHOP DRAWINGS

.1 Submit shop drawings required by Contract Documents, in accordance with requirements of GC 3.11 SHOP DRAWINGS.

.2 Prepare shop drawings in metric measurements only. Shop drawings containing imperial measurements will be rejected.

.3 Unless otherwise directed by the Consultant, submit the following number of prints for each shop drawing required:

.1 Architectural shop drawings: Digital where possible
.2 Structural, mechanical, electrical shop drawings: Digital where possible

.4 After review Consultant will return a marked up print to the Contractor. Contractor shall obtain and distribute the necessary number of copies for each shop drawing.

.5 Shop drawings which require the approval of a legally constituted authority having jurisdiction shall be submitted by Contractor to such authority for approval. Such shop drawings shall receive final approval of authority having jurisdiction before Consultant's final review.

.6 No work requiring a shop drawing submission shall be commenced until the submission has received Consultant's final review. Do not use any shop drawing, erection drawing or setting drawing which does not bear the stamp and signature of the Consultant.

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

6. SAMPLES

.1 Submit samples required by Contract Documents and as directed by the Consultant.

.2 Unless indicated otherwise submit samples in duplicate.

.3 Where colour selection is required submit manufacturer's full colour range for specified product line.

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

.5 Prepay any shipping charges involved for delivering samples to destination point and returning to point of origin if required.

.6 No work requiring a sample submission shall be commenced until the submission has received

Consultant's final review.

END

SECTION 01350 - SPECIAL PROJECT REQUIREMENTS

1. OPERATIONAL LIMITATIONS

.1 Contractor's use of site is limited to areas indicated.

.2 At all times restrict access, parking, material deliveries, execution of work, operations and procedures to agreed locations and times and do not deviate from agreed procedures without prior approval by Consultant.

.3 Periodically review proposed construction operations with the Board and Consultant and co-operate as required to ensure that the Board's interests and requirements are not unduly compromised.

.4 Do not execute work adjacent and/or above occupied areas except where it can be demonstrated that adequate protective devices are in place.

.5 Separate work and storage areas from Board occupied areas in accordance with requirements specified in Section 01500. Where work is executed in stages, rearrange hoardings as required to suit each phase.

.6 Work causing discomfort to school occupants due to noxious fumes/odours, including but not necessarily limited to the following shall be carried out outside regular school hours, as directed by the Board.

.1 Liquid applied coatings

.7 Prevent spread of dust and noxious fumes, odours to occupied areas. Volatile substances shall not be used during regular school hours.

.8 1. Prevent disruption of existing life safety systems in occupied areas including fire detection and alarm systems, fire protection systems, exits, emergency lighting. Comply with "Guidelines for Maintaining Fire Safety During Construction in Existing Buildings" issued by the Office of the Fire Marshal, dated January 2003.

2. Comply with the Board’s Hot Works program as well as instructions from Board representative.

.9 Workers are not permitted inside occupied school areas except by prior arrangement with the approval of school.

.10 Where work is permitted to be carried out within occupied spaces take the following action upon completion of each authorized work period:

.1 Restore disturbed surfaces by patching, covering, painting, finishing as directed by Consultant.

.2 Remove construction materials, equipment and tools.

2. SCHEDULE / PHASING

.1 Execute the work in accordance with the scheduling / phasing instructions on the drawings.

3. ALTERATIONS, MATERIALS AND WORKMANSHIP

.1 Cut, alter, relocate, modify existing work as required to accommodate new work.

.2 Materials used in patching, making good and refinishing of existing construction and/or components shall be of a standard equal to that specified for new construction and if not specified, equal to or

exceeding that of original existing work.

.3 Quality of workmanship employed in alterations work shall be equal to that specified for new work if not specified, equal to or exceeding original existing work.

.4 Existing materials and equipment which are to be used in new work shall be repaired and refinished as necessary or additional new materials and components required shall be provided to facilitate reinstallation of such existing materials and equipment.

.5 As part of the work of this Section, remove and relocate, or temporarily remove and reinstall, existing materials and equipment as required to complete work of the Contract.

.6 Make good by restoring to original condition, existing construction, equipment, materials, finishes, features, not scheduled for alterations but damaged or disturbed due to work of this Contract.

.7 Prepare existing surfaces scheduled to receive new finish by grinding, filling, overcoating, washing, etching, shot blasting or other chemical or mechanical means, as required to ensure satisfactory installation of new finish.

.8 Unless otherwise detailed finish new surfaces flush with existing surfaces. Make junctions between existing and new work, or at replaced or remedial work visually undetectable. Make surfaces adjacent to one another of the same material, unit sizes, colour, and texture. If this is impossible, make a proposal of intended method of making good for approval, before proceeding.

.9 Where existing work, penetrating floors and/or roofs, has been removed, patch floors and/or ceilings to match existing construction.

4. EXISTING SERVICES

.1 Ensure that existing services (including but not limited to hot and cold water, drainage, power, heating, ventilation, cooling, life safety and security systems) required for occupied areas are not damaged or interrupted. Reconfigure, relocate, extend, modify existing services as required, to maintain services.

.2 Should existing services be accidentally disrupted, make complete restoration immediately and ensure adequate protection to avoid future disruption.

.3 Where existing building security system is breached due to Contractor's negligence, Contractor shall be responsible for any damage or theft of school property, regardless if area where damage or theft occurred is under Contractor's control or not.

.4 Schedule required disruptions of services to occupied areas during school holidays, weekends or nights. Notify the Board minimum 48 hours prior to executing any work which would disrupt services to occupied areas and obtain permission to proceed. Restore systems to their proper operating condition at the end of each interruption.

5. DESIGNATED SUBSTANCES

.1 Refer to Document 00320 - Existing Conditions.

.2 If, in the execution of the Work, any designated substances (as defined by Bill 208 of the Occupational Health and Safety Act), or PCB containing materials other than those previously identified, are encountered, cease work in area affected and inform Consultant immediately. Do not proceed with work in areas affected until receiving instructions from Consultant.

SECTION 01350 - SPECIAL PROJECT REQUIREMENTS

6. PROTECTION

.1 Keep area of work safe and secure at all times, denying access to unauthorized personnel.

.2 Protect existing work from damage. Make good any damage caused.

.3 Ensure that no part of the existing structure is overloaded due to work executed under this Contract.

.4 Take special measures when moving heavy loads or equipment. Protect floors, jambs and soffits of openings used as passageways or through which materials are moved. Use rubber tired conveyances only when moving materials and equipment inside building. Provide suitable coverings as required to protect existing work.

.5 Provide adequate guards, barricades and other temporary protection to prevent injury to persons.

.6 Protect existing building interiors from damage by weather, when executing work which affects integrity of exterior walls and roof. Schedule activities during dry periods and/or provide temporary weatherproof closures to protect openings made in exterior walls and roof. At no cost to the Board, replace interior finishes damaged by weather as a result of the Work of this Contract.

END

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SECTION 01410 - REGULATORY REQUIREMENTS

1. PERMITS, LICENCES, FEES

.1 Comply with requirements of GC 10.2.

.2 Where permits, licences and inspection fees are required by authorities having jurisdiction for specific trade functions, they shall be obtained by particular subtrade responsible for that work.

.3 Be responsible for ensuring that no work is undertaken which is conditional on permits, approvals, reviews, licences, fees, until all applicable conditions are met. No time extension will be allowed for delay in obtaining necessary permits.

.4 Report to the Consultant in writing any condition which would prohibit granting of any approval before work affecting such items is commenced.

.5 Give notice of completion of project prior to occupancy, as required by applicable legislation.

2. BUILDING CODE, BY-LAWS, REGULATIONS

.1 Carry out work in accordance with requirements of the Ontario Building Code, latest issue, including all amendments and revisions.

.2 Comply with requirements, regulations and ordinances of other jurisdictional authorities.

.3 Where it is necessary to carry out work outside property lines, such as sidewalks, paving or concrete curbs, comply with applicable municipal requirements.

.4 Promptly submit written notice to Consultant, of observed variance of Contract Documents from requirements of Building Code and authorities having jurisdiction. Assume responsibility for work known to be contrary to such requirements and performed without notifying Consultant.

3. CONSTRUCTION SAFETY

.1 Comply with requirements of GC 3.6.

.2 Be governed by pertinent safety requirements of Federal or Provincial Governments and of municipal bodies having authority, particularly the Ontario Construction Safety Act, and regulations of Ontario Ministry of Labour, and work in conjunction with proper safety associations operating under the authority of Ontario Workers' Compensation Act.

.3 Do not, in the performance of the work, in any manner endanger the safety or unlawfully interfere with the convenience of the public.

.4 Notify the Ontario Ministry of Labour of intended work of this Contract as required by the Occupational Health and Safety Act. One copy of the "Notice of Project" shall be handed to Consultant.

4. FIRE PROTECTION

.1 Refer to technical Sections of Specifications and Drawings for fire protection requirements.

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

.3 Upon request, furnish Consultant with evidence of compliance with project fire protection requirements.

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

.5 Fire rated door assemblies shall include doors, frame, anchors and hardware and shall bear label of fire rating authority showing opening classification and rating.

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

.7 Fire rated assemblies shall be constructed in accordance with applicable fire test report information issued by fire rating authority. Deviation from fire test report will not be allowed.

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

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

5. HAZARDOUS MATERIALS

.1 Comply with provisions of the Occupational Health and Safety Act as amended to include WHMIS (Workplace Hazardous Materials Information System).

.2 Ensure that Material Safety Data Sheets (MSDS) are available on site prior to first delivery to site of any controlled material or substance.

.3 Maintain on site for duration of Contract a hazardous materials log containing all required MSDS.

.4 Log shall be open for inspection for Owner, Consultant and all personnel on site.

.5 Ensure that workers are instructed in the purpose and content of MSDS.

6. WASTE MANAGEMENT

.1 Comply with applicable regulations of the Ministry of Environment and Energy governing waste management.

.2 Prepare and submit waste audit and waste reduction plan and source separation plan in accordance with applicable regulatory requirements.

END

SECTION 01450 - QUALITY CONTROL

1. INDEPENDENT INSPECTION AND TESTING

.1 Requirements specified herein apply to independent inspection and testing specified under technical Specification Sections, Divisions 2 to 16. Owner will pay separately for independent inspection and testing services.

.2 Requirements specified herein do not apply to the following:

.1 Inspection and testing required by laws, ordinances, rules, regulations and orders of public authorities.

.2 Inspection and testing performed exclusively for Contractor's convenience.

.3 Tests specified in Division 2 to 16 inclusive, to be included in Contract such as mill tests, certificates of compliance and testing to be carried out by Contractor under direction of Consultant.

.3 Failure by independent inspection and testing agency to detect defective work or materials shall not in any way prevent later rejection, when such defect is discovered, nor shall it obligate Consultant for final acceptance.

.4 Independent inspection and testing agency (hereinafter referred to as testing agency) is expected to do the following:

.1 Act on a professional and unprejudiced basis and carry out inspection and testing functions to establish compliance with requirements of Contract Documents.

.2 Check work as it progresses and prepare reports stating results of tests and conditions of work and state in each report whether specimens tested conform to requirements of Contract Documents, specifically noting deviations.

.3 Distribute reports as follows:
.1 Owner: 1 copy
.2 Consultant: 2 copies
.3 Subconsultants affected: 1 copy
.4 Contractor: 2 copies
.5 Building Department: 1 copy

.5 Testing agency is not authorized to amend or release any requirements of Contract Documents, nor to approve or accept any portion of work.

.6 Contractor shall do the following:

.1 Notify testing agency minimum 48 hours in advance of operations to allow for assignment of personnel and scheduling of tests without causing delay in work.

.2 Provide testing agency with access to work at all times.

.3 Supply material samples for testing.

.4 Supply casual labour and other incidental services required by testing agency.

.5 Provide facilities for site storage of samples.

.6 Make good work disturbed by testing agency.

.7 When initial inspection and testing indicates non-compliance with Contract Documents, any

subsequent reinspection and retesting occasioned by non-compliance shall be performed by same testing agency and cost thereof borne by Contractor.

2. MOCK UPS

.1 Where required by Contract Documents construct mock-ups of work on site, in size and at location directed by Consultant.

.2 Construct mock-ups prior to start of affected work. Allow sufficient time for Consultant's review. Work affected by mock-ups may not commence prior to acceptance of mock-up.

.3 Construct mock ups to include all related specified materials and workmanship. Make revisions as directed by Consultant, in accordance with intent of Contract Documents, until mock-ups are acceptable.

.4 Mock ups, reviewed and accepted by Consultant, shall become the standard of quality against which installed work will be measured.

.5 Mock ups, by prior arrangement, may be incorporated into finished work if approved by Consultant.

3. TOLERANCES

.1 Unless specific tolerances are required by a Section of the Specifications or a referenced standard, meet the following tolerances non-cumulative for installed work:

.1 "plumb" shall mean plumb within ±3 mm in 3 m of true plumb.

.2 "level" shall mean level within ±3 mm in 3 m of true level.

.3 "square" shall mean not in excess of 30 seconds less or more than 90°.

.4 "straight" shall mean within ±3 mm in 3 m under a 3 m straightedge.

END

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SECTION 01500 - TEMPORARY FACILITIES

1. GENERAL

.1 Provide all temporary facilities and controls required for the proper execution of the work.

.2 Provide and maintain temporary systems in accord with applicable regulations and requirements. Arrange for, obtain and pay for any permits required.

2. TEMPORARY ELECTRICITY & LIGHTING

.1 Provide temporary electrical lighting and power system for use by all Sections.

.2 Arrange, obtain and pay for service, including meter, of sufficient size to allow use of required tools and equipment and to ensure adequate lighting levels for the proper execution of work.

.3 Install and maintain temporary electrical systems in accord with Construction Safety Association's "Temporary Wiring Standards on Construction Sites", the Ontario Electrical Code and other authorities having jurisdiction.

3. TEMPORARY HEATING

.1 Furnish equipment, labour and fuel to provide temporary heat as required for proper execution of work.

.2 Heat enclosed building to minimum 15^{o}C at all times until taken over by Owner. Provide intermittent heating up to 21^{o}C as required for proper execution of work.

.3 Use propane or natural gas heaters of a type where the flame is not exposed. Open flame heaters are not permitted.

.4 Uniformly distribute heat to avoid hot and cold areas and to prevent excessive drying.

4. TEMPORARY VENTILATION

.1 Provide adequate ventilation for enclosed areas receiving architectural finishes, and where hazardous or volatile adhesives, coatings or substances are used.

.2 Do not allow excessive build-up of moisture inside building.

5. TEMPORARY COMMUNICATIONS

.1 Provide site telephone service for duration of Contract until completion.

.2 Make telephone available to Owner and Consultant.

.3 Make provisions to send and receive e-mail on site for duration of Contract.

6. TEMPORARY WATER

.1 Provide temporary water supply, for use by all Sections.

.2 Water shall be clean and non-staining.

7. TEMPORARY SANITARY FACILITIES

.1 Provide temporary toilet facilities, including handwash facilities, for all personnel on site.

.2 Keep facilities clean and sanitary and provided with required supplies at all times.

.3 Except where temporary sanitary facilities are connected to municipal sewer system, periodically remove wastes from site.

8. TEMPORARY FIRST-AID FACILITIES

.1 Provide site equipment and medical facilities necessary to supply first-aid service to injured personnel in accordance with regulations of the Workers' Compensation Act. Maintain facilities for duration of Contract.

9. TEMPORARY FIRE PROTECTION

.1 Provide and maintain in proper working order at least four fire extinguishers on each floor, prominently placed, until completion of work.

.2 Fire extinguishers shall be minimum 9 kg 4A 60BC type.

.3 Remove fire extinguishers from site, upon completion of work or when directed by Consultant.

.4 Where gas welding or cutting is to be done within 3 m or above combustible material, or above space that may be occupied by persons, interpose shields of non-combustible material. Tanks supplying gases for welding or cutting shall be placed at no greater distance from the work than is necessary and shall be securely fastened in an upright position. Such tanks shall be free from exposure to the sun or high temperature.

10. TEMPORARY USE OF NEW PERMANENT SERVICE & EQUIPMENT

.1 Do not use any new permanent service or equipment without Owner's written approval.

.2 Where permission is granted to use permanent services and equipment provide competent persons to operate services and equipment; inspect frequently and maintain facilities in proper operating condition at all times. Pay for all operating costs, including but not limited to fuel, operators' wages, temporary filters, maintenance costs.

.3 Permanent services and equipment shall be turned over to Owner in "as new" and perfect operating condition.

.4 Use of permanent systems and equipment as temporary facilities shall not affect the warranty conditions and warranty period for such systems and equipment. Make due allowance to ensure that Owner will receive full benefits of equipment manufacturers warranty after project takeover.

11. CONSTRUCTION AIDS

.1 Provide temporary stairs, ladders, ramps required for movement and placing of materials, equipment and personnel.

.2 Provide mechanical hoisting equipment and fully qualified operators as required during construction.

.3 Erect required scaffolding independent of walls, arranged to avoid interference with work of other Sections as much as possible.

.4 Provide and maintain required shoring and bracing in accordance with Construction Safety Act and other applicable regulations.

.5 Shoring and all false work over one tier in height shall be designed and shall bear the stamp of a registered professional engineer, having experience in this field.

.6 The use of explosive power tools will not be permitted under any circumstances unless equipped with a device which positively prevents free flight of the stud.

SECTION 01500 - TEMPORARY FACILITIES

12. BARRIERS

.1 Protect public and workmen from injury.

.2 Provide and maintain required hoardings, barricades, guardrails, and lights in accordance with applicable regulations.

13. TEMPORARY CONTROLS

.1 Provide protective coverings to protect work against damage caused by weather, including but not necessarily limited to rain, snow, ice, wind, frost and excessive heat.

.2 Provide wind breaks and sun shades to allow proper setting and curing of cementitious materials.

.3 Protect building materials from freezing.

.4 Prevent sprayed materials from contaminating air beyond application area, by providing temporary enclosures.

.5 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

.6 Prevent tracking of mud and dirt from work area to paved surfaces. Construct mud trap at truck exit points. Clean paved surfaces daily as requested, removing mud and dirt with scrapers and shovels and subsequently wash surfaces to satisfaction of Owner and municipal authorities.

14. PEST CONTROL

.1 Provide rodent control and other pest control programs during construction, in accordance with requirements of jurisdictional authorities.

15. SIGNS

.1 Except as specified here do not erect any signs unless approved by the Consultant.

.2 Erect signs relating to safety on the work, or mandatory regulation notices.

.3 Prior to commencement of work wherein hazardous or volatile cements, coatings, or substances are used, barricade entire area and post adequate number of "NO SMOKING" signs.

16. FIELD OFFICE AND SHEDS

.1 Maintain, until completion of Contract, for Contractor's use, a temporary office as required for work, large enough to accommodate site administrative activities and site meetings, complete with light, heating and cooling equipment to maintain 21°C, ventilation, telephone, fax machine (on separate line), copier (not combination fax/copier), table and chairs. Do not store materials, tools, equipment in meeting area; keep clean and tidy.

.2 Provide temporary covers, sheds and platforms of weatherproof construction as may be required for protection and preservation of materials, small tools, equipment which may be susceptible to damage.

END

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SECTION 01600 - PRODUCTS REQUIREMENTS

1. PRODUCT QUALITY

.1 Products supplied for work shall be new and as far as possible and unless otherwise specified, of Canadian manufacture.

.2 Materials used for temporary facilities are not required to be new, provided they are structurally sound and in suitable and safe operating condition.

2. STANDARDS AND TERMINOLOGY

.1 Where a standard has been adopted by these Specifications, incorporate minimum requirements of such standard into the work. Where requirements of Specifications are more stringent than those of the standard, follow more stringent requirements.

.2 Reference to standards, specifications, handbooks and manufacturer's catalogues refer to latest edition thereof and all amendments or revisions applicable at bid closing date, unless date suffix is included with document number.

.3 Wherever words "acceptable", "approved", "satisfactory", "selected", "directed", "designated", "permitted", "inspected", "instructed", "required", "submit", or similar words or phrases are used in standards or elsewhere in Contract Documents, it shall be understood, that "by (to) the Consultant" follow, unless context provides otherwise.

.4 Where the word "provide" is used in these Contract Documents, it shall be taken to mean "supply and install" unless specifically noted otherwise.

3. CERTIFICATION

.1 Building materials, components and elements specified without the use of trade or proprietary names shall meet requirements specified.

.2 If requested by Consultant, submit evidence of meeting requirements specified. Evidence shall consist of certification based on tests carried out by an independent testing agency.

.3 Certification based on previous tests for same materials, components or elements is acceptable. Certification shall be in form of written test reports prepared by testing agency.

4. AVAILABILITY AND SUBSTITUTIONS

.1 Products which are specified by their proprietary names or by part or catalogue number form the basis for Contract. No substitutes for these may be used without Consultant's approval in writing.

.2 Where it is found that specified materials have become unavailable for incorporating into work, notify Consultant immediately of proposed substitution.

.3 Proposed substitution shall be any top quality product considered by Consultant to be of equal quality and value to that specified, and suitable for purpose intended.

.4 Products proposed as substitutions, and which are considered by Consultant to be suitable for purpose intended, but which are in his opinion of lesser value and quality than those specified shall only be accepted as substitution if reasonable credits are allowed for their use.

.5 In order to substantiate equivalency of proposed materials, products or processes, submit samples, printed product descriptions, test data, installation instructions, standards, certification, sample, - guarantee/warranty forms, list of successful projects incorporating such proposals, and similar information requested by Consultant.

.6 Whenever a substitute is proposed, any change to contract price as a result of acceptance of proposed product shall include any adjustments to adjacent structure or space in order to accept minor differences in size or weight between proposed items and corresponding specified items.

.7 Prevent any substitution or request for substitution from delaying construction progress in any way.

.8 Requests for substitution resulting from failure to place orders in time will not be entertained. Be responsible for ordering products in time to ensure their required delivery; bear all costs for failure to comply with these requirements.

5. PRODUCT HANDLING AND STORAGE

.1 Suitably pack, crate and protect products during transportation to site to preserve their quality and fitness for the purpose intended.

.2 Store products in original, undamaged condition with manufacturer's labels and seals intact until they are being incorporated into completed work.

.3 Handle and store materials in accordance with manufacturer's and supplier`s recommendations and so as to ensure preservation of their quality, appearance and fitness for work.

.4 Arrange materials so as to facilitate prompt inspection, and remove faulty, damaged or rejected materials immediately from site.

END

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SECTION 01700 - EXECUTION REQUIREMENTS

1. EXAMINATION

.1 Examine the site, existing premises and surrounding areas and be fully informed as to the conditions and limitations under which the work has to be executed. Claims for additional costs will not be entertained with respect to conditions which could reasonably have been ascertained by an inspection prior to bid closing.

.2 Prior to commencement of work, make careful examination of previously executed work, existing conditions, levels, dimensions and clearances. Promptly advise Consultant of unsatisfactory preparatory work and substrate conditions; commencement of work implies acceptance of conditions.

2. PROTECTION

1. Ensure that no damage is caused to existing structures, buildings, foundations, pavement, fences, curbs, grounds, plants, property, utilities, services, finishes during the progress of Work. Repair and make good any damage caused at no extra cost to Owner to the complete satisfaction of the respective property owners and authorities having jurisdiction. Do not proceed with repairs or remedial work without written permission of the Consultant. Only trades specifically capable of performing the work will be allowed to make remedial or repair work.

.2 Keep surfaces to receive finished flooring dry and free from oil and grease. Stockpiling of damp or wet building materials and use of mixing boxes or water buckets without protecting floors from moisture gain by approved means, is prohibited.

.3 Keep municipal roads clean of mud and debris resulting from construction traffic.

.4 Prevent soiling of pavement due to spillage, mixing of material or any other cause. Make good any damage caused.

.5 Protect new work from damage with suitable protective coverings.

.6 Protect work during periods of suspension, regardless of reason for suspension.

3. SERVICES AND UTILITY SYSTEMS

.1 Consult with utility companies and other authorities having jurisdiction to ascertain the locations of existing services on or adjacent to site.

.2 Information as to the location of existing services, if shown on the Drawings, does not relieve the Contractor of his responsibility to determine the exact number and location of existing services.

.3 Give proper notices for new services as may be required. Make arrangements with authorities and utilities for service connections required.

.4 Pay any charges levied by utilities or authorities for work carried out by them in connection with this Contract, unless specified otherwise.

.5 Operate and maintain all utility systems affected by work of this Contract, until the building or specific portions thereof have been accepted by the Owner.

.6 Report existing unknown services encountered during excavation to Consultant for instructions; cut back and cap or plug unused services. Be responsible for the protection of all active services encountered and for repair of such services if damaged.

4. SLEEVES, SUPPORTS, AND FASTENERS

.1 Unless specified in other Sections, furnish, set and secure inserts, hangers, sleeves, fasteners,

adhesives, anchors and other supports and fittings required for proper installation of work.

.2 Use exposed metal fastenings and accessories of same texture, colour and finish as base metal on which they occur.

.3 Select appropriate type of anchoring and fastening devices and in sufficient quantity and in such manner as to provide positive permanent anchorage of unit to be anchored in position. Keep exposed fasteners to a minimum, evenly spaced and neatly laid out.

.4 Fasteners shall be of permanent type. Do not use wood plugs.

.5 Fasteners which cause spalling or cracking of material to which anchorage is being made shall not be used.

.6 Fasteners in contact with preservative pressure treated wood shall be stainless steel.

5. CONCEALMENT

.1 Conceal ductwork, piping, conduit and wiring located in finished areas, in ceiling spaces and furred construction unless specifically noted to be exposed.

.2 If any doubt arises as to means of concealment, or intent of Contract Documents in this connection, request clarification from Consultant before proceeding with portion of work in question.

6. CUTTING AND PATCHING

.1 Regardless of which Section of work is responsible for any portion of cutting and patching, in each case tradesmen qualified in work being cut and patched shall be employed to ensure that it is correctly done.

.2 Any cost caused by omission or ill-timed work shall be borne by party responsible therefore.

.3 Do not endanger any work by cutting, digging or otherwise altering, and do not cut nor alter any loadbearing element without written authorization by Consultant. Provide bracing, shoring and temporary supports as required to keep construction safely supported at all times.

.4 Cut holes carefully and not larger than required after they are located by Sections requiring them, using suitable equipment and tools.

.5 Patching and making good work shall be undetectable in finished work.

7. WORKMANSHIP

.1 All work shall be carried out in accordance with the best trade practice, by mechanics skilled in the type of work concerned.

.2 Products, materials, systems and equipment shall be applied, installed, connected, erected, used cleaned and conditioned in accordance with the applicable manufacturer's printed directions.

.3 Where specified requirements are in conflict with manufacturer's written directions, follow manufacturer's directions, but inform Consultant in writing prior to proceeding with affected work. Where specified requirements are more stringent than manufacturer's directions, comply with specified requirements.

8. LINES AND LEVELS

.1 Verify all elevations, lines, levels and dimensions as indicated and report errors, any conflicts, or

inconsistencies to the Consultant before commencing work or as soon as discovered.

.2 Arrange to have building base lines laid out by an Ontario Land Surveyor.

.3 Accurately lay out work and establish lines and levels in accord with requirements of Contract Documents.

.4 Set up, maintain and protect permanent reference points and provide general dimensions and elevations for all Sections of Work.

9. DIMENSIONS

.1 Check and verify dimensions wherever referring to work. Dimensions, when pertaining to work of another Section, shall be verified with Section concerned. Details and measurements of work which is to fit or conform with work installed shall be taken at site.

.2 Do not scale Drawings. If there is ambiguity, lack of information or inconsistency, immediately consult Consultant for directions. Be responsible for extra costs involved through the disregarding of this notice.

.3 Walls, partitions and screens shall be considered as extending from floor to underside of structural deck unless specifically indicated otherwise on Drawings.

10. LOCATION OF FIXTURES

.1 Location of fixtures, apparatus, equipment, fittings, outlets, conduits, pipes and ducts shown or specified, but not dimensioned, shall be considered approximate.

.2 Request direction from Consultant to establish exact location. Any relocation caused by Contractor's failure to request direction from Consultant shall be done by Contractor at no extra cost. Where job conditions require reasonable changes in indicated locations and arrangements, make changes at no additional cost.

.3 Conserve space and coordinate with work of other Sections to ensure that ducts, pipes, conduits and other items will fit into allocated wall and ceiling spaces, while ensuring adequate space for access and maintenance.

.4 Where ducts, piping and conduits are permitted to be exposed they shall be neatly and uniformly laid out parallel to adjacent building lines and parallel to each other where they run in the same direction. Review exposed installations with Consultant prior to start of work. At no cost to Owner make changes to exposed work as directed by the Consultant where such work is not installed in accordance with Consultant's prior review.

.5 Except where locations are specifically noted on Drawings, install exposed mechanical and electrical fixtures including outlets, switches, thermostats, panels and other items, located on walls, in orderly and neatly laid out manner, lining up with each other and grouped together where possible. Review installation with Consultant prior to start of rough-in work. Relocate at no cost to Owner any work which does not meet this requirement.

END

EXHAUST FAN REPLACEMENT
FATHER DANIEL ZANON CES
ST. EDMUND CES
ST. JUDE CES

SECTION 01740 - CLEANING

1. GENERAL

.1 Be responsible for cleanliness of assigned work areas to satisfaction of Consultant. Maintain work areas in neat and orderly condition at all times.

.2 Periodically, or when directed by the Consultant, remove from work areas rubbish and waste materials.

.3 Use only cleaning materials recommended by manufacturer of surface to be cleaned.

.4 Use cleaning material only on surfaces recommended by cleaning material manufacturer.

2. CLEANING DURING CONSTRUCTION

.1 Remove debris, packaging and waste materials frequently.

.2 Keep dust and dirt to an acceptable level, as directed.

.3 Remove oily rags, waste and other hazardous substances from premises at close of each day, or more often if required.

.4 Clear sidewalks of snow and ice, adjacent to construction site.

3. FINAL CLEANING

.1 Upon completion of work, or, where work is phased, upon completion of each phase, thoroughly clean all surfaces and components. Provide professional cleaning by a recognized, established cleaning company, to allow Owner to occupy without further cleaning except where specifically indicated otherwise.

.2 Remove stains, dirt and smudges from finished surfaces.

.3 Clean exposed finished surfaces in accordance with respective material manufacturer's recommendations.

.4 Clean mechanical and electrical fixtures and other fittings of labels, wrappings, paper and other foreign material.

.5 Replace heating, ventilation and air conditioning filters if units were operated during construction. Clean inside of ducts, blowers and coils.

.6 Remove from work areas all waste and surplus materials from all areas, including roofs and ceiling spaces.

.7 Steam clean existing masonry which becomes an interior exposed wall surface.

.8 Remove snow and ice from driveways, parking areas and walks.

.9 Power wash paved surfaces.

4. DISPOSAL OF WASTE MATERIALS

.1 All waste materials resulting from construction activities belong to the Contractor and shall be removed and legally disposed unless clearly stated otherwise.

.2 Separate recyclable/reusable materials to maximum extent possible from general waste stream and transport to recycling/reuse facilities.

.3 Fires and burning of waste materials are not permitted on site.

.4 Do not bury waste or materials on site.

.5 Do not dispose of liquid waste or volatile materials into watercourses, storm or sanitary sewers.

END

EXHAUST FAN REPLACEMENT
FATHER DANIEL ZANON CES
ST. EDMUND CES
ST. JUDE CES

SECTION 01770 - PROJECT CLOSEOUT

1. REFERENCE STANDARD

.1 Comply with provisions of OAA, OGCA Document No. 100, April 1997 "Take-Over Procedures" except as modified in these Specifications.

2. OPERATING AND MAINTENANCE MANUALS

.1 Provide operation and maintenance manuals. Data shall be contained in D-ring binders with soft vinyl covers. Binders shall have clear plastic pocket at back of spine identification containing label "Operation and Maintenance Manual" and project name and volume number, if applicable. Each manual shall contain a title sheet listing project name, date and volume number and names and addresses of Contractors and Subcontractors, Consultant and Subconsultants.

.2 Provide operating and maintenance data, prepared on 8 1/2" X 11" sheets in printed or typewritten form.

.3 Data shall be assembled in systematic order, generally following the specification format. Provide labelled, celluloid covered tabs fastened to hard paper dividers to identify different Sections.

.4 Provide the following material as applicable to work of this Contract:

.1 List of contents. If more than one volume is required, provide a cross-reference contents page at front of each volume.

.2 Complete list of subcontractors and suppliers, showing name, address, telephone/fax numbers, name of contact person and description of work done.

.3 Complete list of products used in the work showing product name, part number or code and manufacturer for each listing; follow specification format.

.4 Copy of finish hardware list, complete with all amendments and revisions.

.5 Schedule of paints and coatings. Include sufficient explanation to fully identify each surface with the applicable paint or coating used. Enclose copy of colour schedule.

.6 Maintenance instructions for all finished surfaces.

.7 Brochures, cuts of all equipment and fixtures.

.8 Operating and maintenance instructions for all equipment.

.9 Valve manual.

.10 Controls schematics.

.11 Extended warranties.

.12 Maintenance contracts.

.13 Other data required elsewhere in Contract Documents or deemed necessary by Consultant.

3. EXTENDED WARRANTIES

1. Definition: Warranty = guarantee.

2. Submission Requirements:

.1 Submit extended warranties as part of "Operating and Maintenance Manuals".

.2 Arrange extended warranties in systematic order matching Specification format. Include a table of contents listing warranties in same order.

.3 Each warranty must show:

.1 Name and address of Project
.2 Name of Owner
.3 Section Number and Title

.4 All extended warranties must be presented under Contractor's letterhead, seal and signature and must bear similar wording to that specified in Contract Documents.

.5 Submit manufacturers' Product warranties in accordance with GC 12.3.6.

4. RECORD DRAWINGS

.1 Prior to Substantial Performance provide marked up as-built drawings with all changes, revisions, deletions and additions made throughout the execution of the Work, from the set of prints kept on site to the consultant for transfer to the autocad files at a cost of $2,000 paid from Cash Allowance - Section 01210.

.2 Clearly and prominently mark each drawing "RECORD DRAWING prepared by _____ _____(name of Contractor).

.3 Submit CAD file of record drawings and one set of whiteprints of updated CAD file to Consultant prior to application for Final Payment.

5. MAINTENANCE MATERIALS

.1 Deliver to the location directed by Consultant maintenance materials as required elsewhere in these Specifications. Obtain receipt for delivered materials and submit copy of receipt to Consultant.

.2 Package materials so that they are protected from damage and loss of essential properties.

.3 Label packaged materials for proper identification of contents and project name.

6. OPERATING AND MAINTENANCE INSTRUCTIONS

.1 Prior to requesting Substantial Performance, at a time acceptable to Owner and Consultant, but not before operating and maintenance data has been reviewed and accepted by Consultant, instruct designated Owner's representatives in the operation and maintenance of all systems and equipment.

.2 Arrange training sessions for each type of operating system and equipment. Sessions shall be conducted by qualified instructors and shall be of sufficient duration and depth to adequately instruct participants.

.3 Throughout the training sessions make reference to reviewed operation and maintenance manuals to familiarize participants with the data provided.

.4 Prepare an attendance record for each training session, to be signed by each participant upon conclusion of session. Show date and time of session, subject of session and name, title and organization of each participant. Submit a copy of each record to Consultant.

.5 Subcontractor whose work is subject of training session and Contractor shall be represented during training session by qualified personnel.

SECTION 01770 - PROJECT CLOSEOUT

7. INSPECTION AND ACCEPTANCE OF WORK

.1 Prior to requesting Substantial Performance submit the following:

.1 Three copies of operating and maintenance manuals (manuals must be submitted minimum 6 weeks prior to requesting Substantial Performance).

.2 Inspection and acceptance certificates required from regulatory agencies.

.2 Advise the Consultant in writing, when work has been substantially completed. If Consultant agrees that this stage has been reached, prepare a complete list of deficiencies and submit this list to Consultant.

.3 On receipt of the above deficiency list in a satisfactory form, the Consultant, accompanied by Sub-consultants, the Contractor and the Owner, if deemed desirable, will carry out an inspection of the Project.

.4 Add to the deficiency list, in accordance with Consultant's directions, any additional deficiencies which are identified during inspection and reissue updated deficiency list.

.5 Upon completion, inspection and acceptance of work, Owner will take over and occupy completed work. Refer to Supplementary Conditions for procedures relating to certification of Substantial Performance and release of holdback.

8. FINAL SUBMISSION

.1 Prior to claiming Final Payment do the following:

.1 Submit record drawings.

.2 Submit one complete set of reviewed shop drawings, folded to 8-1/2" x 11" size, contained in heavy duty manila envelopes, numbered and labelled. Follow specification format with no more than one Section per envelope.

.3 Submit maintenance materials.

.4 Submit a final accounting of all approved changes to the Contract Price, including adjustments to cash allowances.

9. WARRANTY INSPECTION

.1 The Contractor shall organize a warranty inspection to take place two weeks prior to the expiration of the standard one-year warranty. The Consultant, sub-consultants, the Contractor, subcontractors and the Owner's representatives shall attend.

END

EXHAUST FAN REPLACEMENT
FATHER DANIEL ZANON CES
ST. EDMUND CES
ST. JUDE CES

SECTION 02225 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements of Division 1.

1.2 RELATED WORK

.1 Disconnecting, removal of mechanical and electrical services: Divisions 15 & 16

1.3 REGULATORY REQUIREMENTS

.1 Obtain and pay for necessary permits for work of this Section. Give required notices, and make submissions required by regulatory agencies.

.2 Comply with applicable requirements of jurisdictional authorities and CSA S350-M1980 "Code of Practice for Safety in Demolition of Structures".

.3 Comply with applicable regulations of the Ministry of Environment and Energy governing waste management.

1.4 SUBMITTALS

.1 Where required by authorities having jurisdiction, submit for approval, drawings, diagrams or details showing sequence of disassembly work or supporting structures and underpinning. Drawings for structural elements shall bear stamp of qualified professional engineer.

1.5 PROTECTION

.1 Prevent uncontrolled movement, settlement, or damage. Provide shoring and bracing required.

.2 Take steps to positively prevent uncontrolled falling of demolished materials.

.3 Ensure that no part of existing structure is overloaded due to work carried out under this Section.

.4 Prevent debris from blocking drainage systems.

.5 Ensure that temporary guards, hoardings are provided in accordance with applicable safety regulations.

1.6 EXAMINATION

.1 Visit the site and the existing building so as to fully understand all existing conditions, limitations and circumstances, and extent of work required. No increase in cost or extension of performance time will be considered for conditions, limitations and circumstances which could reasonably be determined prior to submission of bid.

1.7 COORDINATION

.1 Refer to Division 15 and 16 to determine demolition work covered by them and coordinate as required.

PART 2 - PRODUCTS Not Applicable

SECTION 02225 – SELECTIVE DEMOLITION

PART 3 - EXECUTION

3.1 PREPARATION

.1 Ensure that affected building areas are unoccupied and discontinued in use and that required separations between work areas and Owner occupied areas are in place prior to start of demolition and clearing work.

.2 Verify that existing services in areas affected by demolition work are disconnected, capped, removed or relocated, prior to start of work.

3.2 SALVAGE

.1 Prior to start of demolition/clearing carefully remove and temporarily store in protected location items required for reuse.

3.3 DEMOLITION

.1 Demolish existing work as shown and as required to accommodate new work.

.2 Demolish work in a safe and systematic manner, from top to bottom.

.3 Do not throw or drop demolished materials from heights. Use chutes, conveyors, or hoisting equipment to lower materials.

.4 Demolish in a manner to minimize dusting. Keep dusty materials wetted but prevent flooding or contaminated runoff.

.5 At all times leave work in safe condition, so that no part is in danger of uncontrolled toppling or falling.

3.4 DISPOSAL AND CLEAN-UP

.1 All materials, rubbish and debris resulting from demolition work shall become the Contractor's property and shall be removed from site and legally disposed of unless specifically indicated otherwise.

.2 Do not allow demolished materials to accumulate on site. Promptly, as work progresses, remove and legally dispose of materials away from site.

.3 Selling, burning and burying of materials on site is not permitted.

END

EXHAUST FAN REPLACEMENT
FATHER DANIEL ZANON CES
ST. EDMUND CES
ST. JUDE CES

SECTION 04060 - MORTAR

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements of Division 1.

1.2 RELATED WORK

.1 Masonry Repairs: Section 04500

1.3 QUALITY ASSURANCE

.1 Quality Standards: meet requirements of CSA A179-04.

.2 Source of Material: for mortar to remain exposed in finished project, brands of cementitious materials and source of supply of sand, shall remain the same for duration of work.

.3 Refer to Section 04200 for requirements of grout used in reinforced masonry.

1.4 PRODUCT HANDLING

.1 Store cementitious materials so as to prevent moisture absorption from any source. Do not use material affected by moisture.

.2 Store mortar aggregate materials to prevent contamination. Do not use contaminated materials.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Water: potable and non-staining.

.2 Sand: CSA A82-56-M1976.

.3 Portland cement: CSA-A5-03, Type 10.

.4 Masonry cement: CSA-A8-03, Type H.

.5 Lime: ASTM C207, Type S.

PART 3 - EXECUTION

3.1 PROPORTIONING AND MIXING

.1 Mix mortar in accordance with CSA A179-04 except as specified herein.

.2 Place an experienced and competent person in direct charge of mixing operations.

.3 Mortar for entire project shall be factory premixed type, requiring only addition of water on site. Use premixed mortar by one of the following:

.1 Maxi-Mix

.2 Jiffy

.3 Forwells

.4 King Products.

.4 Add water on site in quantity required to establish optimum workability.

.5 Except where specified otherwise do not add admixtures of any kind to mixes.

.6 All mortar shall be mixed for a period of not less than 3 minutes and not more than 10 minutes.

.7 Mix grout in different mixer from mortar.

3.2 TIME LIMITS AND RETEMPERING

.1 Use and place mortar in final position within following time limits after mixing:

.1 Air Temp. above 26.5ºC - 2 hours.
.2 Air Temp. below 26.5ºC - 2.5 hours.

.2 Standard mortar that has stiffened within above time limits because of evaporation of water may be retempered by adding water as frequently as needed to restore required consistency. Discard mortar not used within above time limits.

3.3 MORTAR SCHEDULE

.1 Exterior veneer 1-1-6 cement lime mortar.

.2 At foundations walls and solid bearing courses: type S mortar.

.3 Bearing walls and interior wythe of exterior walls: type S mortar.

.4 Non-bearing interior partitions: type N mortar.

.5 Provide grey mortar at all locations.

END

EXHAUST FAN REPLACEMENT
FATHER DANIEL ZANON CES
ST. EDMUND CES
ST. JUDE CES

SECTION 04500 - MASONRY REPAIR

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements of Section 01000.

1.2 RELATED WORK

.1 Mortar: Section 04060

.2 Sealants: Section 07920

1.3 QUALITY ASSURANCE

.1 Meet requirements of CSA A370-94, CSA A371-94 and CSA S304.1-94.

.2 Ensure that work is executed under the continuous supervision and direction of a competent foreperson.

.3 Provide standard tests carried out by an approved testing company on the actual production run of face brick showing compression, absorption and saturation coefficient. Provide 50-cycle freeze-thaw resistance test.

1.4 SUBMITTALS AND SITE MOCK-UPS

.1 Prior to start of work submit samples of all masonry accessories including horizontal reinforcement and masonry anchors used for restoration.

1.5 PRODUCT HANDLING AND STORAGE

.1 Deliver and handle masonry units so as to prevent soiling and chipping.

.2 Store masonry units above and off ground on level platforms which permit air circulation under stacks.

.3 During storage, protect masonry units against moisture absorption, damage and staining.

1.6 PROTECTION

.1 Protect finished work at corners, sills, projections and other areas likely to be damaged, with suitable coverings until completion.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Face Brick:

.1 Type: hard burned clay brick to CSA A82.1-M87: size: reuse existing, or new to match existing.

.2 Provide solid brick where required to avoid exposure of voids.

.3 Purchase face brick in one lot, sufficient for entire project.

.2 Concrete Block:

.1 To requirements of CAN3-A165 Series M-85:

.1 Standard weight: H/15/A/M and S/15/A/M.

.2 Lightweight: H/15/C/M and S/15/C/M.

.2 Units must be cured for at least 28 days before delivery and shall have a moisture content of not more than 30% of total absorption.

.3 Exposed concrete block units shall be uniform in size, free of perceptible warp or twist, without chipped, ragged or broken edges; have a uniform surface texture, free of cracks, blemishes or defects detrimental to appearance or performance.

.4 Where required provide solid units.

.5 Provide manufacturer's catalogued special units such as bullnose, corner, end, lintel block and others as indicated.

.3 Metal Reinforcement and Anchors:

.1 Material: high tensile strength steel wire meeting ASTM A82, for restoration work to connect face brick to existing concrete block back-up.

.2 Finish: stainless steel.

PART 3 - EXECUTION

3.1 ERECTION - GENERAL

.1 Lay masonry work in uniform manner.

.2 Cut exposed masonry units with power driven table model masonry saw only. Ragged or chipped edges will not be permitted.

.3 Do not shift or tap masonry units after mortar has taken its initial set.

3.2 CAVITY AND VENEER WALLS

.1 Modify existing exterior walls to accommodate installation of new work, where required. Do work using materials and construction matching existing. Provide new materials matching existing including but not limited to insulation, air barriers, membrane flashings, reinforcing, anchors, weep holes.

3.3 MASONRY BEARING

.1 Bearings in brick masonry walls: use solid face brick where exposed to view.

3.4 CONSTRUCTION JOINTS

.1 Where fresh masonry joins partially or totally set masonry, clean exposed surfaces of set masonry and remove loose mortar and foreign material prior to laying fresh masonry.

.2 If necessary to stop off a horizontal run of masonry, rack back one-half masonry unit length in each course. Toothing will not be permitted unless approved by the Consultant.

3.5 BRICKWORK

.1 Lay face brick in running bond except where shown otherwise. Provide header, soldier, rowlock and special band courses as indicated.

.2 Completed brickwork shall appear uniform and well blended, free of contrasting areas. Replace at no extra cost to Contract any brickwork which does not meet this requirement.

.3 Brickwork with an absorption rate of over 1 g/min./ 1000 mm^2, when tested in accordance with ASTM C67 shall be dampened before laying.

.4 Brickwork shall be laid up with the shove joint method in full bed of mortar with vertical and horizontal joints filled flush. Slushing mortar into joints after laying of brick is not permitted.

.5 All joints in brickwork, including bed and collar joints, shall be filled flush as each course is laid.

.6 Variations in size of brick shall be evenly distributed in wall so that mortar joints are uniform throughout.

3.6 BLOCKWORK

.1 Blockwork shall be laid up in bond matching existing except where shown otherwise. Unless otherwise indicated, blocks shall be of thickness required to produce total wythe thickness. Provide standard weight or lightweight block, matching existing.

.2 Do not wet blocks before laying.

.3 Units shall be laid with webs aligning one over the other in full bed of mortar over entire laying surface including webs.

.4 Exposed faces shall be full units laid out to minimize cutting with not less than 100 mm any at vertical edge or corner.

.5 Top course of block walls shall be laid with semi-solid blocks at window sills, at wall changes to brick and where shown.

.6 Use solid block for at least two courses under all point bearing loads.

.7 Provide bullnose block at all exposed vertical and horizontal block corners. Where directed by Consultant provide square corner block at first course above floor; grind corner above base to match bullnose above.

.8 Provide minimum 400 mm solid or grouted block for jambs of openings and at ends of walls.

.9 Cut with power saw exposed units to accommodate flush mounted electrical outlets, grilles and other components. Leave maximum 5 mm clearance. Cover plates and flanges must cover cut edges.

.10 Blockwork scheduled to be left exposed or painted shall be laid and pointed with utmost care. Distribute units of varying colour and texture evenly to achieve homogeneous blend. Replace at no extra cost to Contract, block units which in the opinion of the Consultant are too contrasting in appearance for satisfactory blending.

.11 Take special care to prevent mortar or other substances from staining exposed block faces. Replace stained blocks as directed by the Consultant at no extra cost to Contract.

3.7 JOINT WORK

.1 Make joints uniform and 10 mm thick unless otherwise shown.

.2 Joints in exposed and painted surfaces, and in masonry behind wall mounted and built-in fixtures, lockers and cabinetwork shall be tooled when thumbprint hard with a 25 mm o.d. plastic tool to produce a concave joint.

3.8 ANCHORING, BONDING AND REINFORCEMENT

.1 Tie brick veneer to back-up construction in accord with requirements of CAN3-A370-M84.

.2 Provide continuous horizontal metal reinforcement, installed at 400 mm o.c. vertically for all brick veneer which is anchored to existing building.

3.9 PATCHING AND CLEANING

.1 At completion of work, holes and other defects in masonry joints shall be repaired, and masonry surfaces shall be thoroughly cleaned.

.2 Holes in masonry joints shall be filled with mortar and suitably tooled. Cut out and repoint defective joints. Use coloured mortar to match existing.

.3 Remove mortar particles from clay masonry surfaces with wood paddles. Remove stains from clay masonry surfaces by wet cleaning in accordance with brick manufacturer's recommendations.

.4 Remove efflorescence from masonry surfaces by wet cleaning in accordance with manufacturer's recommendations.

END

EXHAUST FAN REPLACEMENT
FATHER DANIEL ZANON CES
ST. EDMUND CES
ST. JUDE CES

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements of Division 1.

1.2 RELATED WORK

.1 Division 15 & 16 work

.2 Painting: Section 09900

1.3 WORK SUPPLIED BUT NOT INSTALLED

.1 Supply following items for installation under other Sections of work: anchor bolts, bearing plates, sleeves and other inserts to be built into concrete and masonry elements and required for anchorage and support of metal fabrications.

.2 Supply other Sections with instructions, and if required, templates, necessary for accurate setting of inserts and components.

1.4 QUALITY ASSURANCE

.1 Qualifications of Welders: welding shall be performed by fabricator certified under CIA W47.1-03.

.2 Comply with applicable requirements of CAN/CSA-S16-01

1.5 SHOP DRAWINGS

.1 Submit detailed shop drawings of all metal fabrications required, showing profiles, members, fastenings, thicknesses, finishes and other pertinent data.

.2 Shop drawings for stairs, balustrades, railings and ladders shall bear stamp and signature of a professional engineer registered in Ontario.

1.6 PRODUCT HANDLING

.1 Deliver, handle and store fabricated components to prevent permanent distortion, corrosion and damage.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Steel sections and plate: CAN/CSA-G40.21-04, Grade 300W.

.2 Square steel tube: CAN/CSA-G40.21-04, Grade 350W.

.3 Steel pipe: ASTM A53, Type E, Grade A.

.4 Sheet steel: hot dip galvanized, cold rolled, with stretcher level degree of flatness to ASTM A653; zinc coating designation Z275.

.5 Metal gratings: hot dip galvanized welded or pressure locked steel gratings, type 19-4 by Dominion Bridge, Border, Armco, Fisher-Ludlow or other manufacturer approved by Consultant; stair treads with checkered nosing.

.6 Welding materials: CSA W59-03.

.7 Shop primer: CAN/CGSB-1.40-97.

.8 Zinc rich paint:

.1 Shop primer for exterior components to be painted: Inorganic zinc rich paint: Inorganic Coating No. 5536/5537 by Glidden, or equivalent product approved by Consultant.

.2 Touch-up: CAN/CGSB-1.181-99.

.9 Bituminous enamel: alkali resistant asphaltic coating.

.10 Non-shrink grout: Por-Rok by Hallemite Products Ltd., or SET 15 Minute Anchoring Cement by SET Products Ltd.

2.2 FABRICATION - GENERAL

.1 Fabricate components in the shop in largest size practicable to minimize field jointing.

.2 Fabricate components square, straight, true, free from warpage and other defects. Accurately cut, machine file and fit joints, corners, copes and mitres.

.3 Reinforce fabricated components to safely withstand expected loads.

.4 Make joints in built-up sections with hairline joints in least conspicuous locations and manner.

.5 Make allowance for thermal expansion and contraction when fabricating exterior work.

.6 Joints shall be welded unless otherwise indicated and unless details of construction do not permit welding. Exposed welds shall be continuous and shall be ground smooth.

.7 Close exposed open ends of tubular members with welded on steel plugs.

.8 Where work of other Sections is to be attached to work of this Section, prepare work by drilling and tapping holes, as required to facilitate installation of such other work.

.9 Work of this Section, supplied for installation under other Sections, shall be prepared as required ready for installation by: drilling, countersinking and tapping holes, forming shapes and cutting to required sizes.

.10 Grind off mill stampings and fill recessed markings on steel components left exposed to view.

2.3 FINISHES

.1 Thoroughly clean steel of loose scale, rust, oil, dirt and other foreign matter. Suitably prepare steel surfaces by power tool cleaning to receive specified finishes.

.2 Grind smooth sharp projections.

.3 Remove oil and grease by solvent cleaning.

.4 Apply coatings in the shop and before assembly. Where size permits, galvanize components after assembly.

.5 Interior components: shop apply coat of primer to interior components after fabrication except where stainless steel, galvanized or zinc rich paint finish is required.

.6 Exterior components to be painted, except where other finish is indicated: Blast clean metal to "Near White Grade" (SSPC-SP-10) and spray apply a coat of zinc rich paint, maximum 3 mils thick.

.7 Hot dip galvanize exterior components not scheduled to be painted, components located within exterior building elements, and where so indicated, interior components after fabrication in accord with requirements of CAN/CSA-G164-M92, minimum coating weight 380 g/m^2.

.8 Apply coat of bituminous enamel to contact surfaces of metal components in contact with cementitious materials and dissimilar metals.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install components plumb, square, straight and true to line. Drill, cut and fit as necessary to attach this work to adjoining work.

.2 Provide temporary supports and bracing required to position components until they are permanently anchored in place.

.3 Securely anchor components in place; unless otherwise indicated, anchor components as follows:

- .1 To concrete and solid masonry with expansion type anchor bolts.
- .2 To hollow construction with toggle bolts.
- .3 To thin metal with screws or bolts.
- .4 To thick metal with bolts or by welding.
- .5 To wood with bolts or lag screws.
- .6 Fill space between railing members and sleeves with non-shrink grout.

.4 Provide all components required for anchoring. Make anchoring in concealed manner wherever possible. Make exposed fastenings, where approved by Consultant, neatly and of same material, colour, texture and finish as base metal on which they occur. Keep exposed fastenings evenly spaced.

.5 Dissimilar metals and metals in contact with cementitious elements shall have contact surfaces coated with bituminous paint or be isolated by other means as approved by Consultant.

.6 After installation, clean and refinish injured finishes, welds, bolt heads and nuts. Refinish with zinc rich paint or primer to match original finish.

.7 Remove protective coverings from stainless steel components prior to Substantial Performance or when directed by Consultant.

3.3 SCHEDULE

.1 Provide all metal fabrications required whether listed hereunder or not, unless clearly covered by another Section.

.2 Unless otherwise shown provide:

SECTION 05500 - METAL FABRICATIONS

.1 Interior components: prime coated steel
.2 Exterior components: zinc rich paint coated steel.

.3 List of components:

.1 Metal fabrications as required for Exhaust Fan Replacement work - (lintels, brackets , trim…) at all three school locations.

END

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SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements of Division 1.

1.2 RELATED WORK

.1 Roof Repairs: 07590

.2 Metal Flashings: 07620

1.3 QUALITY ASSURANCE

.1 Lumber shall bear the grading stamp of an agency certified by The Canadian Lumber Standards Administration Board.

.2 All lumber shall be sound, straight, dressed all sides and kiln dried, and moisture content at any time during shipment and storage shall not exceed 19%.

1.4 WORK SUPPLIED BUT NOT INSTALLED

.1 Supply to other Sections anchors, bolts, rough hardware and other items required to be built into work of other Sections to receive, accommodate, secure work of this Section.

.2 Provide other Sections with instructions to ensure accurate setting of built-in items.

1.5 PRODUCT HANDLING

.1 Store materials on site to prevent deterioration, loss or impairment of their structural and other essential properties. Prevent excessive moisture gain of materials.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Lumber:

.1 Meet requirements of CSA-086-94 Strength Group D (spruce-pine-fir) and CAN/CSA-0141-05 and National Lumber Grading Authority (NLGA) Standard Grading Rules.

.2 Blocking, Copings, Nailers, Curbs: NLGA 122c "Standard".

.2 Plywood:

.1 All locations except backboards: Canadian Softwood Plywood to CSA 0151-04 Unsanded Sheathing Grade.

.2 Backboards: Canadian Softwood Plywood to CSA 0151-04, Sanded grade, solid two sides, fire retardant pressure treated.

.3 Fasteners and Connecting Hardware:

.1 Nails: to CSA B111-1974, hot dip galvanized steel for exterior work including components located in exterior walls and roofs; bright finish steel in all other locations. Unless otherwise indicated use common spiral flathead nails.

.2 Bolts, nuts, washers: ASTM A307, hot dip galvanized steel.

.3 Connectors, anchors, brackets, spikes: hot dip galvanized structural quality steel.

.4 Screws: zinc, cadmium or chrome plated.

.5 Fasteners in contact with preservative pressure treated wood shall be stainless steel.

2.2 WOOD TREATMENT

.1 Preservative pressure treated components: to CSA-080 Series-97 using copper and azole; arsenic free.

.2 Fire retardant pressure treated components: to CSA-080 Series-97 for maximum flame spread of 25 and labelled by ULC.

.3 Surface cut, bore and trim components to sizes required as much as possible prior to pressure treatment.

PART 3 - EXECUTION

3.1 GENERAL

.1 Erect work plumb, level, square and to required lines. Ensure that materials are rigidly and securely attached to each other and to adjacent building elements and will not be loosened by work of other Sections.

.2 Where other materials and components are to be applied directly over wood members recess heads of fastening devices below wood surfaces.

.3 Where work remains exposed to view, fasteners shall be uniformly and evenly spaced and neatly installed.

3.2 NAILERS, BLOCKING, COPINGS, GROUNDS, CURBS

.1 Provide wood nailers, blocking, copings, strapping, bucks, grounds and other rough carpentry components to sizes and in locations required for satisfactory support of fabricated items and other work. Provide wood blocking at steel stud framed gypsum board partitions for support of wall mounted components.

.2 Unless otherwise indicated, provide minimum 38 mm thick materials. Grounds may be 21 mm thick material unless otherwise indicated.

3.3 ANCHORS AND FASTENERS

.1 Provide rough hardware including nails, screws, bolts, washers, brackets, hangers, and fastening devices of all types.

.2 Unless otherwise indicated, attach wood members at maximum 600 mm o.c. as follows:

.1 To concrete and solid masonry with expansion or friction type anchor bolts.

.2 To hollow masonry with toggle bolts.

.3 To heavy gauge metal with bolts.

.4 To light gauge metal with screws or bolts.

.5 To wood with nails, screws or bolts as required to ensure stability.

3.4 BACKBOARDS

.1 Where required by Division 16 and by telephone system supplier, provide minimum 19 mm thick fire retardant treated plywood backboards mounted on strapping.

.2 Size backboards to adequately accommodate equipment to be mounted. Secure boards with countersunk fasteners to supporting walls in manner which will carry equipment load without damaging wall.

3.5 PRESSURE TREATED COMPONENTS

.1 Use preservative pressure treated lumber and plywood within exterior wall and roof systems and at other locations indicated.

.2 Where it is necessary to cut, bore or otherwise alter pressure treated components in the field, treat cut surfaces with heavy coat of wood preservative.

.3 Use fire retardant pressure treated plywood where plywood is installed on steel stud framed walls, behind gypsum board.

END

SECTION 07590 – ROOF REPAIRS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements of Division 1.

1.2 RELATED WORK

.1 Rough Carpentry: Section 06100

.2 Metal Flashings Section 07620

1.3 QUALITY ASSURANCE

.1 Roofer Qualifications: Member in good standing of the OIRCA or approved by the Consultant.

.2 Reference Standards: Where work required is not specified or shown in detail meet applicable requirements of CRCA Roofing Specification Manual, latest issue.

.3 Ensure compatibility between all roofing materials used.

1.4 PRODUCT HANDLING

.1 Store materials in dry location protected from inclement weather.

.2 Deliver and store materials in manufacturer=s original and sealed containers or packaging.

1.5 JOB CONDITIONS

.1 Protect existing work from damage. When using equipment with open flame, maintain at work area a 9 kg fire extinguisher, fully charged and operational.

.2 Do not apply roofing materials during precipitation nor over damp or otherwise unsuitable substrates.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Notwithstanding materials specified herein, in each case only use materials which are compatible with each other and with existing materials with which they are in contact.

.2 Felts:

.1 Inorganic: ASTM D-2178 Type IV.

.2 Organic: #15 perforated to CAN/CSA-A123.3-05.

.3 Asphalt: CAN/CSA-A123.4-04 Type 2 for slopes up to 1:15; Type 3 for slopes greater than 1:15.

.4 Asphalt primer: CAN/CGSB-37.5-M89.

.5 Membrane flashings:

.1 Base sheet: modified bitumen to CGSB 37-GP-56M, Type 2, Class C Grade 2.

.2 Cap sheet: modified bitumen to CGSB 37-GP-56M Type 1, Class A, B or C, Grade 2.

.6 Insulation and vapour retarder: match existing.

.7 Cant strips: 100 x 100 mm rigid fibreglass or rigid fibreboard.

.8 Gravel: clean, water washed pea gravel 6 mm to 16 mm, no fines.

.9 Metal flashings: prepainted, galvanized sheet steel, minimum 0.6 mm (24 ga) thick: Baycoat Prespectra (Whites, Colours, Earthtones) Series, colour selected by Consultant.

.10 Flashing locking strips: galvanized sheet steel ASTM A653 (Z275), minimum 0.9 mm (20 ga) thick.

PART 3 - EXECUTION

3.1 ROOF ALTERATIONS

.1 Coordinate work of this Section with that of Section 06100 and Division 15. Repair, make good, tie into and extend existing roof system, where new work penetrates existing roof.

.2 Ensure compatibility of new materials with existing. Perform material tests where type of existing material is uncertain.

.3 Cut existing roof system to straight line, to facilitate tie-in of new materials.

.4 Protect and temporarily seal adjacent roofing against intrusion of water. Make good roofing as promptly as possible.

.5 Remove existing gravel from built-up membrane for a distance of minimum 600 mm beyond junction between new and existing membrane.

.6 Remove debris and waste materials, clean deck and provide new vapour retarder, insulation and roof membrane, matching thickness and type of existing systems components, at disturbed areas. Provide cant strip at intersections with vertical surfaces.

.7 Install built-up membrane lapping onto existing membrane 200, 300, 400 and 500 mm. Ensure watertight junction between existing and new membrane.

.8 Make junctures at new or altered penetrations or added vertical surfaces, using modified bitumen sheet flashings, compatible with existing roof system, as follows:

.1 Base sheet: apply membrane in hot asphalt mopped at all parapets and over areas as shown on Drawings. Apply at the rate of 1 to 1.5 kg/m^2, lapping 75 mm laterally and 150 mm on ends. Apply membrane into asphalt. Extend base flashing 225 mm onto roof surface. Carry base sheet to the top of curb.

.2 Cap sheet: torch apply cap sheet to previously applied base sheet and install as for manufacturer's printed instructions. Extend cap flashing 300 mm onto the roof surface. Extend cap sheet over top of curb.

.3 Mechanically secure membrane flashings along top edge.

.9 Pour coat all altered, patched roof areas and cover with gravel matching existing.

.10 Provide metal flashings at new penetrations, secured with continuous locking strips. Provide flat locked seams at maximum 3 m o.c.; double back exposed edges.

.11 Notwithstanding requirements specified herein, match existing construction, unless specifically shown otherwise.

END

SECTION 07620 - METAL FLASHINGS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements of Division 1.

.2 Provide Flashings as required by work of division 15 & 16

1.2 RELATED WORK

.2 Rough Carpentry: Section 06100

.5 Roof Repairs Section 07590

1.3 DESIGN AND PERFORMANCE REQUIREMENTS

.1 Appearance: neatly and evenly lay out and install components. Exposed fastening devices not permitted.

.2 Effects of wind: resist positive and negative wind pressures without causing detrimental effects.

.3 Water control: prevent passage of water.

.4 Thermal movement: accommodate expansion and contraction of component parts without causing buckling, failure of joints, undue stress on fasteners and other detrimental effects.

.5 Compatibility: components shall be compatible with dissimilar metals and materials with which they are in contact or fastened to so as to prevent corrosion, staining and other detrimental effects. If required, treat or separate contact surfaces with inert and non-staining insulation material to achieve compatibility.

1.4 SAMPLES

.1 Submit minimum 300 mm long samples of typical flashings showing profile, method of locking and anchoring and corner condition, fabricated from materials specified.

1.5 JOB CONDITIONS

.1 Schedule and co-ordinate installation of metal flashing components with work of other Sections where it is integral or contiguous therewith.

.2 Install metal counter and cap flashings immediately after installation and inspection of roofing membrane base flashings.

1.6 WARRANTY

.1 At no cost to Owner, remedy any defects in work, including work of this and other Sections, due to faults in materials and/or workmanship provided under this Section of Specifications appearing within a period of 2 years from date of Substantial Performance.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Prepainted sheet steel: galvanized sheet steel, pretreated, primed and finish coated with nominal coating thickness of 0.025 mm: Match adjacent existing finish and colour.

.2 Galvanized sheet steel: ASTM A653, Grade A, zinc coating designation Z275.

.3 Mechanical fastening devices: non-corrosive metal compatible with sheet metal.

.4 Sealant: One part polysulphide to ASTM C920, one part low modulus silicone to ASTM C920 or Dymeric by Tremco. Consultant will select colour of sealant exposed in finished work.

.5 Asphaltic paint: Alkali resistant asphalt based enamel.

.6 Splashpads: 600 x 600 x 50 mm concrete pavers to CSA A231.1-06 with 25 mm thick extruded polystyrene spacer.

2.2 FABRICATION - GENERAL

.1 Shop fabricate metal flashing components to profiles indicated. Where flashings are required but not detailed follow applicable requirements of SMACNA Architectural Manual. Provide the following minimum thicknesses unless otherwise indicated:

.1 Flashings: 0.6 mm (24 ga)
.2 Cleats, lockstrips: 0.9 mm (20 ga)

.2 Provide components free from distortion, waves, twists, buckles and other defects detrimental to performance and appearance. Form sections square, true and accurate to size.

.3 Double back exposed edges at least 12 mm.

.4 Seams: space seams uniformly at maximum 2.5 m o.c. Unless otherwise indicated, use flat locked seams, lapped 25 mm. Make horizontal seams in directions of water flow. Mitre and seal corners.

.5 Unless otherwise indicated, counter flashings shall completely cover base flashings.

.6 Furnish everything necessary for complete metal flashing installation, including clips and fastening devices.

.7 Back paint metal flashings with asphaltic paint.

2.3 SLEEVE FLASHING SYSTEMS

.1 Aluminum 1.5 mm thick 3-part flashing system: by Thaler Roofing Specialties Products.

.2 Fabricate sleeve flashings square or circular and of size to suit component being flashed. Unless otherwise indicated fabricate sleeves 400 mm high.

.3 System shall consist of sleeve with flange and rain collar, and where applicable, bitumen protection cup.

.4 Inside of jacket base flange and all sides of protection cup shall be coated with bituminous paint.

.5 Size sleeves to allow minimum 25 mm thick insulation between component and sleeve.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Provide metal flashings at roof curbs, copings, penetrations, at junctions of roof to walls, at expansion joints and where shown. Provide all wall cap flashings except those at metal wall cladding systems.

.2 Protect all membrane flashings with metal counter flashings.

.3 Clean surfaces to be covered with metal flashings of dirt and other foreign matter. Drive projecting

nails flush with substrate. Do not apply metal flashings over substrates likely to cause rupture.

.4 Provide underlay of resin sized paper under metal flashings installed over masonry, concrete or wood. Lay underlay dry as sheet metal work is installed. Secure in place and lap joints 100 mm.

.5 Secure flashings to supporting building elements with concealed continuous cleats and locking strips; avoid exposed surface fasteners.

.6 Provide flat seam corners at coping flashings.

.7 Where flashing is punctured by bolts, provide sheet lead or neoprene washers, 6 mm larger than bolt hole.

.8 At reglets in masonry walls, secure metal flashings to reglet with mechanical fasteners at maximum 610 mm o.c.

.9 Where vertical portion of metal flashing exceeds 300 mm provide vertical standing seams at 600 mm o.c.

.10 Install sleeve flashing systems at penetrations through roof membrane. Install systems in accordance with manufacturer's directions and as follows:

.1 Prior to installation of roofing membrane place bead of sealant around pipes, vent stacks and other components penetrating roof. Place bitumen protection cups over pipes into sealant.

.2 Insulate between penetrating elements and sleeve with 25 mm thick fibrous insulation.

.3 Prime contact surfaces with mastic cement; place flashing jackets onto roof membrane so that base flange is in contact with mastic cement placed on membrane.

.4 Sweat solder or weld on rain collar.

.11 Install vent stacks in accordance with manufacturer's directions, similar to sleeve flashing systems.

.12 Imperfections in metal flashing work such as holes, dents, creases, or oil-canning will not be accepted.

END

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SECTION 07920 - SEALANTS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements of Division 1.

1.2 RELATED WORK

1.3 DEFINITION

.1 Caulking = Sealant.

1.4 QUALITY ASSURANCE

.1 Sealants must be installed by qualified caulking contractor with minimum five years experience and proven record of being able to produce good quality work.

.2 Upon Consultant's request arrange for sealant manufacturer's technical representative to visit the site, investigate conditions and make recommendations in connection with work of this Section.

1.5 PRODUCT HANDLING

.1 Deliver sealants to site in sealed containers bearing manufacturer's name, brand name of sealant and reference standard to which sealant complies.

.2 Store materials in a dry area having an ambient temperature within limitations recommended by material manufacturer.

1.6 JOB CONDITIONS

.1 Unless otherwise specified, apply sealants when air temperature is between 10°C and 25°C. When air temperature is above 25°C or below 10°C follow sealant manufacturer's recommendations regarding application.

1.7 WARRANTY

.1 At no cost to Owner remedy any defects in work, including work of this and other Sections, due to faults in materials and workmanship provided under this Section appearing within a period of 3 years from date of Substantial Performance.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Sealants:

.1 Exterior sealant for vertical joints: two-part medium modulus silicone sealant with joint movement capability of ±50%; custom colour selected by Consultant: ASTM C920, Type S, Grade NS, Class 25, uses NT, G, A, O; standard of acceptance: Dow Corning 790 Silicone Building Sealant.

.2 Interior sealant for vertical joints: one part acrylic latex with joint movement capability of ±7 ½%, paintable: ASTM C834 Type OP, Grade - 18°C standard of acceptance: Tremflex 834.

.3 Interior sealant for horizontal joints: multi-component, self-levelling, chemically curing polyurethane: ASTM C920, Type M, Grade P, Class 25: standard of acceptance Tremco

THC-900.

.4 Interior sealant for wet locations: mildew-resistant silicone formulated with fungicide: ASTM C920, Type S, Grade NS, Class 25, uses NT, G, A: standard of acceptance: Dow Corning 786 Mildew Resistant Silicone Sealant.

.5 Colours: selected by Consultant, not necessarily from manufacturer's standard colours.

.2 Primers, thinners, cleaners: as recommended by sealant manufacturer, non-staining type.

.3 Pre-moulded backup for sealant: non-gassing closed cell foam rope, compressed 25% when in joint: Sof-Rod by Tremco, or Cera Rod by W.R. Meadows.

.4 Bond breaker: polyethylene or vinyl foam tape, self-adhering one side.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine joints to be caulked and report in writing to the Consultant any defects in work of other Sections which would impair installation, performance and warranty of sealants.

.2 Do not commence installation of sealants until conditions are acceptable.

.3 Start of work implies acceptance of conditions.

3.2 PREPARATION

.1 Clean and prepare joints to be caulked to produce clean sound surfaces for sealant adhesion.

.2 Remove dust, oil, grease, water, frost, loose mortar and other foreign matter. Remove loose particles by blowing joint out with compressed air.

.3 Chemically clean non-porous surfaces such as metal and glass, taking care to wipe solvents dry with a clean cloth. Use solvents recommended by sealant manufacturer.

.4 Clean porous surfaces such as masonry, concrete and stone by mechanical abrading.

.5 Surfaces adjacent to joints to be primed and which may be stained by primer shall be masked with tape before primer is applied.

.6 Prime joints in accordance with sealant manufacturer's recommendations. Apply primer before installing pre-moulded backup.

.7 Install pre-moulded backup in joints 6 mm and more in width. Roll rope type backup into joint, do not stretch or braid. Install bond breaker in joints less than 6 mm in width.

.8 Protect adjacent surfaces from stains and contamination. Make good any damage caused.

3.3 APPLICATION

.1 Apply sealants under pressure using suitable equipment. Gun nozzle shall be of proper size to fit, and seal joint.

.2 Force sealant into joints in full bead, making certain that void free contact is made with sides of joint. Tool joints to produce a slightly concave surface.

.3 Caulking must appear as a concave recessed joint, free of ridges, wrinkles and embedded foreign matter. Caulking shall not spread or bulge beyond surfaces on each of joint.

.4 Apply sealants in accordance with following table:

Joint Width	Sealant Depth
5 mm	5 mm
10 mm	5 mm
15 mm	7 mm
20 mm	10 mm
25 mm	12 mm

.5 Vent exterior joints in accordance with Consultant's direction.

3.4 CLEANING

.1 As work progresses, remove sealant smears and stains from adjacent surfaces. Use cleaning method recommended by sealant manufacturer.

.2 Leave adjacent surfaces in neat and clean condition.

3.5 SCHEDULE

.1 Apply sealant at the following exterior locations:

.1 Between dissimilar materials in exposed locations except where specifically indicated otherwise.
.2 Control joints in masonry elements.
.3 At penetrations through exterior building elements.
.4 Where indicated.

.2 Apply sealant at the following interior locations:

.1 Between dissimilar materials in exposed locations except where specifically indicated otherwise.
.2 Perimeter of door frames.
.3 Control joints in masonry elements, and joints between bearing and non-bearing masonry walls.
.4 Perimeter of fire extinguisher cabinets, access panels, and control panels.
.5 Between vanities/countertops and wall.
.6 Between interior door frame and flooring.
.7 Where indicated.

.3 At interior locations use acrylic emulsion sealant except:

.1 At floor control joints use polyurethane for floors.
.2 At vanities/countertops and at ceramic wall tile control joints use silicone sealant.
.3 Where expected joint movement exceeds movement capability of acrylic emulsion sealant, use sealant specified for exterior use as directed by Consultant.

END

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SECTION 09250 - GYPSUM BOARD

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements of Division 1.

1.2 RELATED WORK

.1	Thermal insulation:	Section 07200
.2	Firestopping and smoke seals:	Section 07840
.3	Caulking: (except concealed acoustic caulking specified herein):	Section 07920
.4	Supply of steel door frames:	Section 08110
.5	Painting:	Section 09900
.6	Supply of access doors:	Divisions 15 & 16

1.3 DEFINITION

.1 Drywall = gypsum board.

1.4 FIRE PROTECTION REQUIREMENTS

.1 Provide fire rated gypsum board components and assemblies as indicated.

.2 Where firehose cabinets, electrical panels or other fixtures or equipment are recessed into fire rated gypsum board partitions, provide fire rated backing to maintain required fire rating.

.3 Protect recessed fixtures in fire rated gypsum board ceilings in accordance with fire rated assembly design report and/or as indicated.

.4 Gypsum bulkheads/partitions in ceiling spaces above fire rated glazed screens, doors or other elements shall have same fire rating as screens/doors over which they occur.

1.5 WORKMANSHIP STANDARDS

.1 Interior metal framing and furring: comply with applicable requirements of ASTM C754 and ASTM C840 unless otherwise shown.

.2 Gypsum board application and finishing: comply with requirements of ASTM C840, unless otherwise shown.

1.6 PRODUCT HANDLING AND STORAGE

.1 Handle gypsum board panels to prevent damaged and broken edges.

.2 Store materials in dry place so as to preserve their quality and fitness for work.

1.7 JOB CONDITIONS

.1 Install and finish gypsum board when ambient temperature is between 14 and 22^{o}C. Maintain this temperature range in areas to receive gypsum board for 24 hours before and during application and until joint cement and adhesives are fully cured.

.2 Apply gypsum board after building has been completely enclosed. Ensure that work to be concealed by gypsum board has been installed, tested, inspected and approved before starting work.

PART 2 - PRODUCTS

2.1 FRAMING, FURRING AND TRIM

.1 Unless otherwise specified, provide framing members of minimum 0.5 mm core thickness steel hot dip galvanized (wipe coat) to ASTM A653.

.2 Studs, interior locations: channel shaped screw-on type: depth as indicated; with knurled supporting flanges at least 34 mm wide; with service pass-through holes at 610 mm o.c. in web. Provide minimum 0.9 mm thick studs where cementitious board and abuse resistant gypsum board is required and where stud depth exceeds 92 mm.

.3 Top and bottom runners: channel sections, 35 mm legs and service pass-through holes at 610 mm o.c. Depth to suit studs.

.4 Rough framing members: 38 x 13 x 1.2 mm and 19 x 13 x 1.2 mm galvanized steel channels.

.5 Furring and strapping members to receive gypsum board: 19 mm deep channel shaped section with outstanding flanges and 35 mm wide knurled supporting face.

.6 Corner beads: beaded angle with perforated flanges.

.7 Casing beads: channel shaped; beaded corners.

.8 Hangers: minimum 3 mm galvanized steel wire.

.9 Tie wire: minimum 1.5 mm soft annealed galvanized steel.

.10 Metal control joint section: bellows shaped section with perforated flanges.

.11 Reveal mouldings: extruded aluminum, profiles as indicated on drawings, by Fry, Pittcon or Gordon.

2.2 GYPSUM BOARD

.1 Exposed gypsum board for interior use: tapered edge: ASTM C1396.

.2 Unexposed gypsum board for interior use: backing board: ASTM C1396.

.3 Fire rated gypsum board: Type 'X' board: ASTM C1396.

.4 Abuse resistant gypsum board: 16 mm thick, fire rated and non-fire rated: Sheetrock Mould Tough VHI by CGC, or equivalent product by CertainTeed.

.5 Moisture resistant gypsum board: ASTM C1396: Pro Roc M2 Tech by CertainTeed or equivalent product by GCG.

.6 Exterior sheathing: 12 mm thick Dens Glass Gold by Georgia Pacific.

2.3 CEMENTITIOUS BOARD

.1 Board for paint finish:

.1 Board: Polymer modified, fibreglass mesh reinforced concrete board, 12 mm thick, tapered edges: PermaBoard by Unifix.

.2 Joint tape: 75 mm wide alkali resistant fibreglass mesh tape: Unitape by Unifix.

.3 Joint compound: acrylic based: Acryjoint by Unifix.

.4 Skim coat: acrylic based: Acrybase by Unifix.

.2 Board for textured finish: Duracrete by CGC 12 mm thick, or equivalent product by other manufacturer approved by Consultant.

2.4 FASTENING AND FINISHING MATERIALS

.1 Drywall screws: self-drilling, self-tapping, case hardened. Use zinc, nickel or cadmium plated screws for fastening of cementitious board.

.2 Laminating adhesive: CGC Durabond 90 compound by Canadian Gypsum, or equivalent by Westroc.

.3 Joint tape: 50 mm perforated type.

.4 Joint filler and topping cement: casein, vinyl or latex base, slow setting.

2.5 ACOUSTICAL MATERIALS

.1 Acoustic Insulation inside partitions and above ceilings: AFB Acoustic Fire Batt by Roxul or equivalent product by Fibrex.

.2 Caulking: to CAN/CGSB-19.21-M87: Acoustical Sealant by Tremco, or CGC Acoustical Sealant.

PART 3 - EXECUTION

3.1 METAL FRAMING

.1 General:

.1 Framing and furring indicated is schematic and shall not be considered exact or complete. Location and spacing of members, bracing, supports and securement shall be in accord with referenced standards as required to provide complete and finished work.

.2 Make provision for supporting recessed and surface mounted fixtures and equipment. Provide additional framing, supports and stiffeners as required.

.3 Neatly frame around recessed fixtures and openings.

.4 Examine mechanical and electrical drawings and coordinate with Divisions 15 and 16 to determine openings required.

.2 Partitions:

.1 Unless specified or shown otherwise, extend steel studs to underside of structural slab above.

.2 All steel studs shall be spaced at 400 mm maximum, except where indicated otherwise. At curved walls/partitions space studs closer so as to maintain uniform curvature.

.3 Install runner channels at top and bottom of partition and secure to supporting building elements at maximum 610 mm o.c.

.4 At partition corners extend one runner channel to end of corner and butt other runner channel; allow clearance for gypsum board thickness; do not mitre runner channels.

.5 Install steel studs vertically; fix studs to runner channels by crimping or screwing on both sides of stud.

.6 Install additional studs as detailed and required at partition intersections, openings and terminations at dissimilar materials. Place studs not more than 50 mm from abutting walls, openings and each side of corners.

.7 Stiffen partitions over 3m in height at mid-height with horizontal bracing channel extending full length of partition.

.8 Provide slip joint at top of partitions to accommodate deflection of structure without causing damage to partition.

.3 Ceilings:

.1 Erect suspension and furring system level with a maximum tolerance of ±3 mm over a 3000 mm length.

.2 Suspension system shall support ceiling assemblies, with maximum deflection of L/360, L being span between supports.

.3 Hangers for suspended ceilings shall support grillage independent of walls, columns, pipe and ducts. Space hangers at maximum 1220 mm o.c. along rough furring members and not more than 150 mm from ends. Do not place hangers in front of access panels.

.4 Space rough furring members at maximum 915 mm and not more than 150 mm from perimeter walls.

.5 Space furring channels transverse to runner channels at maximum 610 mm o.c. except at exterior soffits, and secure to each support with clip or saddle tie with 2 loops of tie wire. Install furring channels so as not to contact perimeter walls.

.6 Where ductwork, piping and other elements within ceiling spaces interfere with direct suspension of ceiling from structure, install additional framing securely fastened to main structure to accommodate proper hanging of ceiling.

.7 At soffits exposed to wind loads suspend soffit framing with metal studs and brace system to withstand positive and negative wind pressures without detrimental effects. Fasten furring members to surrounding walls. Space primary furring channels at maximum 610 mm o.c. Provide Z-shaped furring members at maximum 400 mm o.c. Framing and furring members shall be minimum 0.9 mm thick.

.4 Bulkheads, Coves, Furring:

.1 Frame to profiles shown, rigid, square, true to line and securely fastened to supporting building elements.

.2 Space furring members to receive gypsum board at maximum 610 mm o.c.

.3 Provide rough framing and bracing members as required to ensure stability and accuracy of work.

.4 Where indicated, provide resilient furring channels, spaced at maximum 600 mm o.c.

3.2 GYPSUM BOARD INSTALLATION

.1 Unless otherwise specified, erect gypsum board vertically or horizontally, whichever results in fewer end joints.

.2 Locate board end joints over supporting members.

.3 Cut and fit gypsum board as required to accommodate other work.

.4 Unless otherwise shown or specified, extend gypsum board on both sides of partitions to underside of structural deck above. Fasten gypsum board to studs, not to top channel. Allow for 13 mm deflection.

.5 Do not install gypsum board until wood blocking or other back-up components are installed. Remove and reinstall gypsum board at no extra cost to Contract where this requirements is not complied with.

.6 Provide corner beads at external corners.

.7 Provide casing beads around openings and where gypsum board abuts dissimilar material and construction.

.8 Fasten gypsum board to supports with screws spaced at maximum 305 mm o.c.

.9 Install gypsum sheathing horizontally at outside of exterior wall steel studs. Fasten each board at each stud with minimum 3 screws.

.10 Adhesive bonded gypsum board; apply 13 x 13 mm ribbons of laminating adhesive to back side of board, parallel to long dimension; space adhesive ribbons at max.150 mm o.c. temporarily brace boards until complete adhesive bond develops.

.11 Where double layer is required screw fasten second layer through first into steel framing. Select screws of suitable length to ensure positive fastening. Offset joints in second layer.

3.3 GYPSUM BOARD FINISHING

.1 Tape and fill exposed joints, fastener heads, edges, corners, to produce an acceptable surface ready for decoration.

.2 Conceal exposed flanges of corner beads, casing beads and other trim sections with at least 3 coats of cement, feathered out minimum 200 mm.

.3 Fill depressions at fastener head with cement, then apply 2 additional coats of cement to produce smooth, level surface.

.4 Treat joints using 3 coat method as follows:

.1 Apply thin uniform layer of cement and embed joint tape.

.2 Immediately apply thin skim coat of cement over tape and allow to dry.

.3 Apply 2 additional coats of cement. Allow first coat to dry before applying second coat.

.5 Sand each coat of topping cement with fine sandpaper as required to produce smooth surface. Do not sand paper face of gypsum board.

.6 Finish concealed fastener heads at fire rated gypsum board elements in manner specified for exposed work.

.7 Finish concealed joints at fire rated and at acoustically insulated gypsum board elements in manner specified for exposed work.

3.4 CONTROL AND RELIEF JOINTS

.1 Control Joints:

.1 Provide control joints at maximum 10m o.c.

.2 Break continuity of gypsum board and framing system at control joints; install continuous metal control joint section.

.2 Relief Joints:

.1 Provide relief joints where gypsum board assemblies abut dissimilar construction.

.2 Stop gypsum board 6 mm from abutting construction at dissimilar building elements.

.3 Where gypsum board comes into contact with window frames or exterior door/screen frames install thermal break. Adhere self-sticking tape to casing bead and compress during installation of gypsum board.

.4 Where indicated, install reveal mouldings. Provide reveal moulding where ceilings meet curved wall surface.

3.5 SOUND CONTROL

.1 Partitions:

.1 Provide acoustical insulation in gypsum board partitions as indicated. Unless otherwise noted provide 50 mm thick insulation. Extend acoustical insulation over full height of partition, including portions located above ceiling.

.2 Provide acoustical caulking at all partitions scheduled to receive acoustical insulation as follows:

.1 At perimeter of partitions.

.2 Around objects penetrating partition.

.3 Provide 2 bead caulking system around horizontal and vertical perimeters. Apply continuous sealant beads at each side of horizontal runner tracks and vertical end studs, between gypsum board and adjacent construction.

.4 Caulk around objects such as electrical outlets, light switches, electrical and mechanical panels and boxes, grilles, and other objects penetrating. Caulk behind metal control joint sections.

.5 Where acoustically insulated non-fire rated partitions meet steel deck running perpendicularly to partition, provide steel deck closure.

3.6 DOOR FRAMES / ACCESS DOORS

.1 Install access doors supplied by Divisions 15 and 16. Build doors into gypsum board elements flush and parallel to walls and securely fastened.

3.7 SCHEDULE

.1 Use Type 'X' gypsum board at fire rated elements.

.2 Use abuse resistant gypsum board where indicated.

.4 Use exterior wall sheathing at steel stud framed exterior walls.

.5 Unless otherwise shown, provide 16 mm thick standard gypsum board.

END

EXHAUST FAN REPLACEMENT
FATHER DANIEL ZANON CES
ST. EDMUND CES
ST. JUDE CES

SECTION 09510 - ACOUSTICAL CEILINGS - NON RATED

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements of Division 1.

1.2 RELATED WORK

.1 Mechanical fixtures: Division 15

.2 Electrical fixtures: Division 16

1.3 QUALITY ASSURANCE

.1 Comply with applicable requirements of ASTM C636.

1.4 SUBMITTALS

.1 Submit statement from suspension system manufacturer verifying that suspension system will support light fixtures within deflection criteria in referenced standards.

.2 Samples: submit two samples of each type of acoustical panel specified; size: 300 mm x 300 mm. Upon Consultant's request submit samples of suspension system components.

.3 Maintenance materials: provide Owner with two sealed cartons of each type panel used. Obtain receipt and submit copy to Consultant.

1.5 PRODUCT STORAGE

.1 Store material in dry place, keep free of dampness.

1.6 JOB CONDITIONS

.1 Install ceiling systems after building has been completely enclosed and not before cementitious building elements are complete and cured and humidity levels are acceptable in the opinion of the Consultant.

.2 Ensure that work to be concealed by ceiling systems has been installed, tested, inspected and approved before starting work.

.3 Co-ordinate with Divisions 15 and 16 for work to be built into work of this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Panel Type: 16 mm thick, mineral fibre board with square edge: nominal size 610 x 1220 mm Fine Fissured Humiguard Pluz 1729 by Armstrong or equivalent product by CGC or BPB; Colour: match existing adjacent colour.

.2 Suspension system: exposed non-fire rated grid system: DONN DX-FAST LOC by CGC, Prelude by Armstrong or equivalent system by Bailey.

.1 Main tees: 38 x 25 mm bulb section, minimum 0.4 mm thick cold rolled galvanized steel. Main tee members shall be 3660 mm long.

.2 Cross tees: 25 mm wide, minimum 0.4 mm thick cold rolled galvanized steel; profile designed to limit deflection to 1/360 of span; designed to have suitable detail to rest on, automatically engage, level and lock to main tee.

.3 Wall moulding: pre-finished 22 x 22 mm exposed face galvanized steel angle. Provide flexible moulding at curved surfaces.

.4 Hangers: minimum 2.5 mm (No. 12 SWG) galvanized steel wire.

.5 Carrying channels: minimum 1.2 mm thick cold rolled galvanized steel channels 38 x 13 mm.

.6 Finish for exposed metal surfaces: satin enamel, matching panel colour.

.4 Accessories: splicers and fasteners, as required to provide complete and finished work; manufacturer's standard types.

PART 3 - EXECUTION

3.1 CEILING LAYOUTS

.1 Lay out ceilings in accordance with reflected ceiling plans and symmetrical within each area to obtain uniform borders. Where layout is not shown install ceilings as directed by Consultant.

.2 Finished work shall be plumb, level and square with adjoining work.

3.2 SUSPENSION SYSTEM

.1 Suspend ceilings directly from structural members or from carrying channels supported from structural members. Do not fasten hangers to ducts, pipes, conduits.

.2 Erect suspension systems level with a maximum tolerance of 3 mm over 3 m length.

.3 Install main tees in accord with module size. Suspend at maximum 1220 mm o.c.

.4 Install cross tees perpendicular to main tees in accord with module size. Interlock with main tees.

.5 Hangers for suspended ceilings shall support grillage independently of walls, columns, pipes and ducts. Space hangers at maximum 1220 mm o.c. along supporting grillage and not more than 150 mm from ends. Do not place hangers in front of access panels.

.6 Make provisions for carrying fixtures occurring on and in suspended ceilings. Install additional hangers and reinforcing to ensure that loads being carried do not compromise integrity of system. Frame around fixtures and openings as required.

.7 Where ductwork, piping and other elements within ceiling spaces interfere with direct suspension of ceiling from structure, install additional framing securely fastened to main structure to accommodate proper hanging of ceiling.

.8 Exposed members shall be as long in length as practical to minimize joints. Distribute joints to prevent clustering in one area. Joints shall be made square, tight and flush so that exposed faces of intersecting members are on same plane.

.9 Joints in suspension system members shall be reinforced with splines or other suitable methods.

.10 Install perimeter moulding at abutting vertical surfaces.

.11 Where work of other Sections is fastened to acoustical ceilings, reinforce suspension system and/ or acoustical panels in manner acceptable to Consultant.

3.3 PANELS

.1 Install panels so that work is clean and unmarked.

.2 Neatly cut and fit panels as required to suit ceiling layout and to accommodate other work.

.3 Recessed items shall replace or be centred on panel unless otherwise indicated.

3.4 CLEANING

.1 After installation, clean and touch up minor surface defects on panels.

.2 Remove damaged and badly marked units and replace with new unmarked material.

END

EXHAUST FAN REPLACEMENT
FATHER DANIEL ZANON CES
ST. EDMUND CES
ST. JUDE CES

SECTION 09590 - FIRE RATED ACOUSTICAL CEILING - INSTALLATION AND REPLACEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

.1 Do the following work at locations shown on Drawings and in accordance with other applicable Contract Documents:

.1 Remove and salvage existing ceiling panels where required for overhead work. Store salvaged ceiling panels (only full size, clean, undamaged tiles).

.2 Dispose of damaged ceiling panels.

.3 Repair existing ceiling grid where damaged due to overhead work. Provide new ceiling grid elements as required.

.4 Provide new acoustic ceiling panels as required.

1.2 QUALITY ASSURANCE

.1 Comply with the requirements of the following:

.1 Floor/Ceiling assemblies: ULC Design No. I217.

.2 Roof/Ceiling assemblies: ULC Design No. R210.

.2 Comply with applicable requirements of ASTM C636, Intermediate Duty unless otherwise shown or required.

1.3 SUBMITTALS

.1 Samples: submit two samples of each type of acoustical panel specified; size: 300 mm x 300 mm. Upon Consultant's request submit samples of suspension system components.

.2 Maintenance materials: provide one extra carton of type of panel used. Obtain receipt and submit copy to Consultant.

1.4 PRODUCT STORAGE

.1 Store material in dry place, keep free of dampness.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Acoustic panels: fire rated, 16 mm thick, mineral fibre board: Fine Fissured Fire Guard Square Lay-In, #1830 by Armstrong; nominal size 610 x 1220 mm; colour: White. Equivalent products are subject to Consultant’s review.

.2 Suspension system: exposed fire rated grid system: DX/DXL by CGC.

.1 Main tees: 38 x 25 mm bulb section, minimum 0.4 mm thick cold rolled galvanized steel. Main tee members shall be 3660 mm long.

.2 Cross tees: 25 mm wide, minimum 0.4 mm thick cold rolled galvanized steel; profile designed to limit deflection to 1/360 of span; designed to have suitable detail to rest on, automatically engage, level and lock to main tee.

.3 Wall moulding: pre-finished 22 x 22 mm exposed face galvanized steel angle. Provide flexible moulding at curved surfaces.

.4 Hangers: minimum 2.5 mm (No. 12 SWG) galvanized steel wire.

.5 Carrying channels: minimum 1.2 mm thick cold rolled galvanized steel channels 38 x 13 mm.

.6 Finish for exposed metal surfaces: satin enamel, matching panel colour.

.3 Accessories: splicers and fasteners, as required to provide complete and finished work; manufacturer's standard types.

PART 3 - EXECUTION

3.1 CEILING LAYOUTS

.1 Lay out ceilings in accordance with reflected ceiling plans and symmetrical within each area to obtain uniform borders. Where layout is not shown match existing layout.

.2 Finished work shall be plumb, level and square with adjoining work.

3.2 SUSPENSION SYSTEM

.1 Suspend ceilings directly from structural members or from carrying channels supported from structural members. Do not fasten hangers to ducts, pipes, conduits.

.2 Erect suspension systems level with a maximum tolerance of 3 mm over 3 m length.

.3 Install main tees in accordance with module size. Suspend at maximum 1220 mm o.c.

.4 Install cross tees perpendicular to main tees in accordance with module size. Interlock with main tees.

.5 Hangers for suspended ceilings shall support grillage independently of walls, columns, pipes and ducts. Space hangers at maximum 1220 mm o.c. along supporting grillage and not more than 150 mm from ends. Do not place hangers in front of access panels.

.6 Make provisions for carrying fixtures occurring on and in suspended ceilings. Install additional hangers and reinforcing to ensure that loads being carried do not compromise integrity of system. Frame around fixtures and openings as required.

.7 Where ductwork, piping and other elements within ceiling spaces interfere with direct suspension of ceiling from structure, install additional framing securely fastened to main structure to accommodate proper hanging of ceiling.

.8 Exposed members shall be as long in length as practical to minimize joints. Distribute joints to prevent clustering in one area. Joints shall be made square, tight and flush so that exposed faces of intersecting members are on same plane.

.9 Joints in suspension system members shall be reinforced with splines or other suitable methods.

.10 Install perimeter moulding at abutting vertical surfaces.

.11 Where work of other Sections is fastened to acoustical ceilings, reinforce suspension system and/ or acoustical panels in manner acceptable to Consultant.

SECTION 09590 - FIRE RATED ACOUSTICAL CEILING - INSTALLATION AND REPLACEMENT

3.3 PANELS

.1 Install panels so that work is clean and unmarked.

.2 Neatly cut and fit panels as required to suit ceiling layout and to accommodate other work.

.3 Recessed items shall replace or be centred on panel unless otherwise indicated.

.4 Provide acoustic panel protection boxes at recessed light fixtures in accordance with applicable ULC Design.

3.4 CLEANING

.1 After installation, clean and touch up minor surface defects on panels.

.2 Remove damaged and badly marked units and replace with new unmarked material.

END

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements of Division 1.

1.2 RELATED WORK

.1	Pavement markings:	Section 02740
.2	Finishing of cabinetwork:	Section 06410
.3	Colour coding of concealed mechanical services:	Division 15

1.3 ACCEPTABLE MANUFACTURERS

.1 Unless otherwise specified, materials shall be manufactured and supplied by one of the following:

.1 Benjamin-Moore & Co. Ltd.
.2 Canadian Industries Ltd.
.3 Glidden Co. Ltd.
.4 Para Paints Ltd.
.5 Pittsburgh Paints
.6 Pratt & Lambert Inc.
.7 The Sherwin-Williams Co. Ltd.

1.4 LIST OF MATERIALS, SAMPLES

.1 List of Materials:

.1 Before ordering materials, submit written request in form acceptable to Consultant, for approval of paint materials. List each of the materials proposed and surfaces to be covered. State manufacturer's name and brand name of materials.

.2 List of materials shall be endorsed by manufacturer as being the best material for the applicable condition.

.3 Do not order material or commence work until list of materials is approved by Consultant.

.2 Samples:

.1 Submit two 200 mm x 200 mm colour draw downs of each paint colour coated with manufacturer's paint system to confirm colour match with colour chips supplied by Consultant.

.2 Submit sample of natural and stained finishes on each species and grade of wood to receive such finishes.

.3 Prepare full size samples showing each type of door finish.

.4 Prepare sample panels of wall and ceiling paint system as directed by Consultant.

.3 Maintenance Materials:

.1 Upon completion of work provide one sealed and properly identified 1 L can of each type and colour paint used on this project.

.2 Only top coating paints used in building interior are required.

.3 Submit complete colour schedule listing paint colours, name and product code numbers, prior to Substantial performance.

1.5 PRODUCT HANDLING

.1 Deliver paint materials to site in sealed original labelled containers bearing manufacturer's name, brand name, type of paint and colour designation.

.2 Store materials in strict accordance with manufacturer's recommendations.

.3 Do not store paints, stains, varnishes, rags, or equipment inside building. maintain separate workshop/storage shed for duration of work by this Section.

1.6 JOB CONDITIONS

.1 Environmental Conditions:

.1 Maintain temperature in interior areas to receive coatings between 15ºC and 25ºC for at least 24 hours before, during application and until coatings have cured after application. Apply exterior coatings only when temperature is above 10ºC.

.2 Do not apply exterior coatings during periods of precipitation nor when precipitation is imminent.

.3 Do not apply coatings under direct sunlight during hot weather.

.4 Adequately ventilate areas where coatings are being applied. Maintain a reasonably dust-free atmosphere for duration of work.

.2 Protection:

.1 Protect adjacent surfaces not scheduled to receive coatings from damage.

.2 Remove electrical plates, surface hardware, fittings and fastenings prior to painting operations. These items shall be carefully stored, cleaned and replaced on completion of work in each area. No solvent shall be used to clean hardware that will remove permanent lacquer finish on these items.

.3 Mask labels and specification plates occurring on equipment to be painted.

.4 Post "wet coating" signs and "no smoking" signs while work is in progress and while coatings are curing.

.5 Keep oily rags, wastes and other combustible materials in closed metal containers and remove at end of each work day. Take every precaution to avoid spontaneous combustion.

.3 Work Schedule:

.1 Unless otherwise permitted, apply coatings only after all other Sections have completed their work.

.2 Coordinate work of this Section with that of Section 07920 and review order of installation with Consultant where sealants are installed adjacent to painted surfaces.

.3 If it becomes necessary for the Owner to occupy areas of the building prior to their completion, schedule work of this Section to hours when students have vacated building.

SECTION 09900 - PAINTING

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Materials shall be "top line quality" products and shall be supplied by a single manufacturer except for specialty products not available from paint manufacturer.

.2 Paints shall be factory mixed unless otherwise specified, except any coating in paste or powder form, or to be field-catalyzed shall be field-mixed in accordance with manufacturer's directions.

.3 Primers shall be as specified by manufacturer and fully compatible with finish coats.

.4 Stains shall be of the rapid dry, alkyd base type or pigment oil type.

.5 Varnishes shall be synthetic type.

.6 Shellac shall be pure white gum in pure grain alcohol.

.7 Thinners, cleaners: as recommended by paint manufacturer.

2.2 FINISHES

.1 Paint colours and other finishes will be selected by Consultant. Do not start work until after receiving colour schedule.

.2 Colours selected by the Consultant will not necessarily be from manufacturer's standard colours.

.3 A variety of colours may be used. Consultant may select different colours for different elements such as ductwork, bulkheads, exposed decks, slabs and structural steel. Include for up to 10 colours, not including mechanical room colours listed below. Of these colours, up to 30% may be deep tones.

.4 Confirm gloss levels for all surfaces with Consultant before starting work. Unless otherwise indicated, allow for the following:

.1 Ceilings: flat
.2 Walls: eggshell
.3 Trim, doors, frames: semi-gloss

.5 Paint exposed piping, ductwork and conduits in mechanical and boiler rooms in colours directed by Consultant.

PART 3 - EXECUTION

3.1 CONDITIONS OF SUBSTRATES

.1 Sound, non-dusting, and free of grease, oil, dirt, and other matter detrimental to adhesion and appearance of coatings.

.2 Temperature: minimum 13ºC.

.3 Moisture content: maximum 12%. Test for moisture content using moisture meter.

.4 Alkalinity: test cementitious substrates for alkalinity. Use method recommended by coating manufacturer.

3.2 PREPARATION OF SUBSTRATES

.1 All substrates: clean as required to produce an acceptable surface. If wood, metal or any other surface to be finished cannot be put in proper condition for finishing by cleaning, sanding and filling

as specified, notify Consultant in writing or assume responsibility for an rectify any unsatisfactory finish resulting.

.2 Wood generally: clean soiled surfaces; sand smooth and dust off; putty nail holes, splits, scratches, after prime coat has been applied and dried; colour putty to match finish; putty stained wood after stain application.

.3 Wood for paint: clean knots, pitch streaks and sappy sections of residue and seal with sealer before applying prime coat.

.4 Wood for transparent finish: clean knots, pitch streaks and sappy sections of residue and seal with white shellac; seal after applying stain. Apply filler to open grained woods, prior to application of stain unless directed otherwise by Consultant. Do not apply satin varnish coat until Consultant has inspected and approved gloss varnish coat.

.5 Bare ferrous metal: remove rust and scale; wash with solvent; chemically clean; apply coat of metal primer.

.6 Previously primed metal: remove rust, oil, grease and loose shop paint by washing or wire brushing; make good shop coat; feather out edges of touch-up.

.7 Hot dip galvanized steel: Brush blast.

.8 Unit masonry and concrete: fill minor cracks, holes and fissures with Polyfilla and smooth to a flush surface. Texture filled areas to match surrounding surface.

.9 Plaster: fill minor cracks, holes and fissures with patching plaster, allow to dry, smooth to a flush surface and texture filled area to match surrounding surface.

.10 Gypsum board: fill minor cracks, holes and imperfections with patching plaster; allow to dry and sand smooth; sand taped joints and remove dust.

.11 Alkaline surfaces: wash and neutralize using proper type of solution compatible with paint to be used.

3.3 BACK PRIMING

.1 Back prime wood schedule for paint or enamel finish immediately on arrival at site with interior or exterior primer as applicable.

.2 Back prime wood scheduled for stain, varnish or natural finish immediately on arrival at site, with gloss varnish reduce 25% with mineral spirits.

3.4 APPLICATION OF COATINGS

.1 Apply paint by brush or roller, except on wood and metal surfaces where paint shall be applied by brush only.

.2 Spray painting may be permitted where deemed advantageous and shall be subject to Consultant's approval. When spray painting is permitted, use only airless spray guns. Consultant may prohibit use of spray painting at any time for such reasons as carelessness, poor masking or protective measures, drifting paint fog, disturbance to other trades or failure to obtain a uniform satisfactory finish.

.3 Applied and cured coatings shall be uniform in thickness, sheen, colour and texture and free of brush or roller marks, sags, crawls and other defects detrimental to appearance and performance.

.4 Regardless of the number of coats specified for any surface, apply sufficient paint to completely cover and hide substrate and to produce a solid uniform appearance.

.5 Thoroughly mix materials before application. Use same brand of paint for primer, intermediate and

finish coats.

.6 Where two or more coats of same paint are to be applied, undercoats shall be tinted in lighter shades of final coat to differentiate from final coat.

.7 Touch up suction spots after application of first coat. Sand lightly between coats with fine sandpaper.

.8 Each coat of finish shall be dry and hard before succeeding coats are applied with a minimum of 24 hours between coats, unless manufacturer's instructions state otherwise. Do not proceed with any coat until the last preceding coat is approved by the Consultant.

.9 Stained woodwork shall be covered with a uniform coat of stain and wiped off if required. Wood shall have uniform shade. Match stain so that dissimilar woods have uniform finished appearance.

3.5 PATCHING/TOUCH-UP

.1 Prior to takeover of project by Owner, inspect work of this Section and touch-up or refinish damaged finishes and finishes unsatisfactory to Consultant.

3.6 SCHEDULE OF FINISHES

.1 General Requirements:

.1 Paint or otherwise finish surfaces of building materials, building services and building accessories not otherwise protected or covered, as shown on Room Finish and Door Schedule, Drawings and as specified herein.

.2 In addition to finishing required by Room Finish and Door Schedules, Drawings and these Specifications, and unless otherwise specified, all work which is exposed to view and which is not prefinished shall be finished by this Section.

.3 In areas specifically designated as "unfinished" painting is not required except for bare, primed and zinc coated metal surfaces and insulated ductwork and pipes.

.4 Where exposed to view paint bare metals, previously primed metals and zinc coated metals unless specified otherwise.

.5 Paint behind surface mounted fixtures on walls and ceilings with full coats of paint.

.6 Paint walls behind wall mounted heating units with full coats of paint.

.7 Paint inside surfaces of light coves white.

.8 Finish tops of doors, trim, projections and other work as specified for surrounding work whether above site lines or not.

.9 Finish edges of doors to match face of door. Refinish edges of doors after fitting.

.10 Finish drawers on all sides, inside and outside. Unless otherwise indicated finish drawers with two coats of varnish.

.11 Paint tops, bottoms and edges of shelves with full specified coats, whether exposed to view or not.

.12 Paint interior of ducts at grilles and diffusers with two coats of flat black paint, so that duct interior is not visible when grilles and diffusers are installed.

.13 Paint piping, ducts and conduits in colours matching background wall or ceiling colours, unless otherwise directed by the Consultant. Ducts in mechanical rooms require only one

finish coat in addition to primer. Other exposed ductwork to receive two finish coats.

.14 Paint all gas piping whether exposed to view or not, with high-visibility yellow-orange paint.

.15 Unless specifically indicated to be painted, all finish carpentry work shall receive transparent finish.

.16 Unless specifically indicated otherwise paint all rooftop equipment and components, regardless of material and finish, including but not necessarily limited to mechanical rooftop equipment, vent stack flashings, sleeve flashings window washing anchors, but not including prefinished sheet steel flashings.

.17 Where finishing formula for surfaces requiring painting is not included hereunder, follow recommendations of Canadian Painting Contractor's Association Architectural Painting Specification Manual, latest issue.

.2 Interior Finishing:

.1 Concrete and concrete block:
1 coat block filler, latex or PVA based
1 coat primer
2 coats acrylic latex enamel

.2 Metal, prime painted:
spot prime with alkyd metal primer
2 coats acrylic latex

.3 Metal, zinc coated:
1 coat galvanized primer
2 coats acrylic latex

.4 Woodwork, painted:
1 coat alkyd enamel undercoat
2 coats acrylic latex

.5 Woodwork, stained and varnished (transparent finish):
1 coat stain
1 coat sanding sealer, sand lightly
1 coat alkyd or polyurethane varnish, gloss
1 coat alkyd or polyurethane varnish, satin

.6 Gypsum board:
1 coat drywall primer
2 coats acrylic latex

.7 Exposed piping and conduit, unwrapped:
1 coat alkyd metal primer
2 coats acrylic latex

.8 Exposed ductwork, insulated:
1 coat filler and primer
2 coats acrylic latex

END

APPENDIX

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements of Division 1.

1.2 RELATED WORK

.1 Pavement markings: Section 02740

.2 Finishing of cabinetwork: Section 06410

.3 Colour coding of concealed mechanical services: Division 15

1.3 ACCEPTABLE MANUFACTURERS

.1 Unless otherwise specified, materials shall be manufactured and supplied by one of the following:

.1 Benjamin-Moore & Co. Ltd.
.2 Canadian Industries Ltd.
.3 Glidden Co. Ltd.
.4 Para Paints Ltd.
.5 Pittsburgh Paints
.6 Pratt & Lambert Inc.
.7 The Sherwin-Williams Co. Ltd.

1.4 LIST OF MATERIALS, SAMPLES

.1 List of Materials:

.1 Before ordering materials, submit written request in form acceptable to Consultant, for approval of paint materials. List each of the materials proposed and surfaces to be covered. State manufacturer's name and brand name of materials.

.2 List of materials shall be endorsed by manufacturer as being the best material for the applicable condition.

.3 Do not order material or commence work until list of materials is approved by Consultant.

.2 Samples:

.1 Submit two 200 mm x 200 mm colour draw downs of each paint colour coated with manufacturer's paint system to confirm colour match with colour chips supplied by Consultant.

.2 Submit sample of natural and stained finishes on each species and grade of wood to receive such finishes.

.3 Prepare full size samples showing each type of door finish.

.4 Prepare sample panels of wall and ceiling paint system as directed by Consultant.

.3 Maintenance Materials:

.1 Upon completion of work provide one sealed and properly identified 1 L can of each type and colour paint used on this project.

.2 Only top coating paints used in building interior are required.

.3 Submit complete colour schedule listing paint colours, name and product code numbers, prior to Substantial performance.

1.5 PRODUCT HANDLING

.1 Deliver paint materials to site in sealed original labelled containers bearing manufacturer's name, brand name, type of paint and colour designation.

.2 Store materials in strict accordance with manufacturer's recommendations.

.3 Do not store paints, stains, varnishes, rags, or equipment inside building. maintain separate workshop/storage shed for duration of work by this Section.

1.6 JOB CONDITIONS

.1 Environmental Conditions:

.1 Maintain temperature in interior areas to receive coatings between 15ºC and 25ºC for at least 24 hours before, during application and until coatings have cured after application. Apply exterior coatings only when temperature is above 10ºC.

.2 Do not apply exterior coatings during periods of precipitation nor when precipitation is imminent.

.3 Do not apply coatings under direct sunlight during hot weather.

.4 Adequately ventilate areas where coatings are being applied. Maintain a reasonably dust-free atmosphere for duration of work.

.2 Protection:

.1 Protect adjacent surfaces not scheduled to receive coatings from damage.

.2 Remove electrical plates, surface hardware, fittings and fastenings prior to painting operations. These items shall be carefully stored, cleaned and replaced on completion of work in each area. No solvent shall be used to clean hardware that will remove permanent lacquer finish on these items.

.3 Mask labels and specification plates occurring on equipment to be painted.

.4 Post "wet coating" signs and "no smoking" signs while work is in progress and while coatings are curing.

.5 Keep oily rags, wastes and other combustible materials in closed metal containers and remove at end of each work day. Take every precaution to avoid spontaneous combustion.

.3 Work Schedule:

.1 Unless otherwise permitted, apply coatings only after all other Sections have completed their work.

.2 Coordinate work of this Section with that of Section 07920 and review order of installation with Consultant where sealants are installed adjacent to painted surfaces.

.3 If it becomes necessary for the Owner to occupy areas of the building prior to their completion, schedule work of this Section to hours when students have vacated building.

APPENDIX

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Materials shall be "top line quality" products and shall be supplied by a single manufacturer except for specialty products not available from paint manufacturer.

.2 Paints shall be factory mixed unless otherwise specified, except any coating in paste or powder form, or to be field-catalyzed shall be field-mixed in accordance with manufacturer's directions.

.3 Primers shall be as specified by manufacturer and fully compatible with finish coats.

.4 Stains shall be of the rapid dry, alkyd base type or pigment oil type.

.5 Varnishes shall be synthetic type.

.6 Shellac shall be pure white gum in pure grain alcohol.

.7 Thinners, cleaners: as recommended by paint manufacturer.

2.2 FINISHES

.1 Paint colours and other finishes will be selected by Consultant. Do not start work until after receiving colour schedule.

.2 Colours selected by the Consultant will not necessarily be from manufacturer's standard colours.

.3 A variety of colours may be used. Consultant may select different colours for different elements such as ductwork, bulkheads, exposed decks, slabs and structural steel. Include for up to 10 colours, not including mechanical room colours listed below. Of these colours, up to 30% may be deep tones.

.4 Confirm gloss levels for all surfaces with Consultant before starting work. Unless otherwise indicated, allow for the following:

.1 Ceilings: flat
.2 Walls: eggshell
.3 Trim, doors, frames: semi-gloss

.5 Paint exposed piping, ductwork and conduits in mechanical and boiler rooms in colours directed by Consultant.

PART 3 - EXECUTION

3.1 CONDITIONS OF SUBSTRATES

.1 Sound, non-dusting, and free of grease, oil, dirt, and other matter detrimental to adhesion and appearance of coatings.

.2 Temperature: minimum 13ºC.

.3 Moisture content: maximum 12%. Test for moisture content using moisture meter.

.4 Alkalinity: test cementitious substrates for alkalinity. Use method recommended by coating manufacturer.

3.2 PREPARATION OF SUBSTRATES

.1 All substrates: clean as required to produce an acceptable surface. If wood, metal or any other surface to be finished cannot be put in proper condition for finishing by cleaning, sanding and filling

as specified, notify Consultant in writing or assume responsibility for an rectify any unsatisfactory finish resulting.

.2 Wood generally: clean soiled surfaces; sand smooth and dust off; putty nail holes, splits, scratches, after prime coat has been applied and dried; colour putty to match finish; putty stained wood after stain application.

.3 Wood for paint: clean knots, pitch streaks and sappy sections of residue and seal with sealer before applying prime coat.

.4 Wood for transparent finish: clean knots, pitch streaks and sappy sections of residue and seal with white shellac; seal after applying stain. Apply filler to open grained woods, prior to application of stain unless directed otherwise by Consultant. Do not apply satin varnish coat until Consultant has inspected and approved gloss varnish coat.

.5 Bare ferrous metal: remove rust and scale; wash with solvent; chemically clean; apply coat of metal primer.

.6 Previously primed metal: remove rust, oil, grease and loose shop paint by washing or wire brushing; make good shop coat; feather out edges of touch-up.

.7 Hot dip galvanized steel: Brush blast.

.8 Unit masonry and concrete: fill minor cracks, holes and fissures with Polyfilla and smooth to a flush surface. Texture filled areas to match surrounding surface.

.9 Plaster: fill minor cracks, holes and fissures with patching plaster, allow to dry, smooth to a flush surface and texture filled area to match surrounding surface.

.10 Gypsum board: fill minor cracks, holes and imperfections with patching plaster; allow to dry and sand smooth; sand taped joints and remove dust.

.11 Alkaline surfaces: wash and neutralize using proper type of solution compatible with paint to be used.

3.3 BACK PRIMING

.1 Back prime wood schedule for paint or enamel finish immediately on arrival at site with interior or exterior primer as applicable.

.2 Back prime wood scheduled for stain, varnish or natural finish immediately on arrival at site, with gloss varnish reduce 25% with mineral spirits.

3.4 APPLICATION OF COATINGS

.1 Apply paint by brush or roller, except on wood and metal surfaces where paint shall be applied by brush only.

.2 Spray painting may be permitted where deemed advantageous and shall be subject to Consultant's approval. When spray painting is permitted, use only airless spray guns. Consultant may prohibit use of spray painting at any time for such reasons as carelessness, poor masking or protective measures, drifting paint fog, disturbance to other trades or failure to obtain a uniform satisfactory finish.

.3 Applied and cured coatings shall be uniform in thickness, sheen, colour and texture and free of brush or roller marks, sags, crawls and other defects detrimental to appearance and performance.

.4 Regardless of the number of coats specified for any surface, apply sufficient paint to completely cover and hide substrate and to produce a solid uniform appearance.

.5 Thoroughly mix materials before application. Use same brand of paint for primer, intermediate and

finish coats.

.6 Where two or more coats of same paint are to be applied, undercoats shall be tinted in lighter shades of final coat to differentiate from final coat.

.7 Touch up suction spots after application of first coat. Sand lightly between coats with fine sandpaper.

.8 Each coat of finish shall be dry and hard before succeeding coats are applied with a minimum of 24 hours between coats, unless manufacturer's instructions state otherwise. Do not proceed with any coat until the last preceding coat is approved by the Consultant.

.9 Stained woodwork shall be covered with a uniform coat of stain and wiped off if required. Wood shall have uniform shade. Match stain so that dissimilar woods have uniform finished appearance.

3.5 PATCHING/TOUCH-UP

.1 Prior to takeover of project by Owner, inspect work of this Section and touch-up or refinish damaged finishes and finishes unsatisfactory to Consultant.

3.6 SCHEDULE OF FINISHES

.1 General Requirements:

.1 Paint or otherwise finish surfaces of building materials, building services and building accessories not otherwise protected or covered, as shown on Room Finish and Door Schedule, Drawings and as specified herein.

.2 In addition to finishing required by Room Finish and Door Schedules, Drawings and these Specifications, and unless otherwise specified, all work which is exposed to view and which is not prefinished shall be finished by this Section.

.3 In areas specifically designated as "unfinished" painting is not required except for bare, primed and zinc coated metal surfaces and insulated ductwork and pipes.

.4 Where exposed to view paint bare metals, previously primed metals and zinc coated metals unless specified otherwise.

.5 Paint behind surface mounted fixtures on walls and ceilings with full coats of paint.

.6 Paint walls behind wall mounted heating units with full coats of paint.

.7 Paint inside surfaces of light coves white.

.8 Finish tops of doors, trim, projections and other work as specified for surrounding work whether above site lines or not.

.9 Finish edges of doors to match face of door. Refinish edges of doors after fitting.

.10 Finish drawers on all sides, inside and outside. Unless otherwise indicated finish drawers with two coats of varnish.

.11 Paint tops, bottoms and edges of shelves with full specified coats, whether exposed to view or not.

.12 Paint interior of ducts at grilles and diffusers with two coats of flat black paint, so that duct interior is not visible when grilles and diffusers are installed.

.13 Paint piping, ducts and conduits in colours matching background wall or ceiling colours, unless otherwise directed by the Consultant. Ducts in mechanical rooms require only one

finish coat in addition to primer. Other exposed ductwork to receive two finish coats.

.14 Paint all gas piping whether exposed to view or not, with high-visibility yellow-orange paint.

.15 Unless specifically indicated to be painted, all finish carpentry work shall receive transparent finish.

.16 Unless specifically indicated otherwise paint all rooftop equipment and components, regardless of material and finish, including but not necessarily limited to mechanical rooftop equipment, vent stack flashings, sleeve flashings window washing anchors, but not including prefinished sheet steel flashings.

.17 Where finishing formula for surfaces requiring painting is not included hereunder, follow recommendations of Canadian Painting Contractor's Association Architectural Painting Specification Manual, latest issue.

.2 Interior Finishing:

.1 Concrete and concrete block:
1 coat block filler, latex or PVA based
1 coat primer
2 coats acrylic latex enamel

.2 Metal, prime painted:
spot prime with alkyd metal primer
2 coats acrylic latex

.3 Metal, zinc coated:
1 coat galvanized primer
2 coats acrylic latex

.4 Woodwork, painted:
1 coat alkyd enamel undercoat
2 coats acrylic latex

.5 Woodwork, stained and varnished (transparent finish):
1 coat stain
1 coat sanding sealer, sand lightly
1 coat alkyd or polyurethane varnish, gloss
1 coat alkyd or polyurethane varnish, satin

.6 Gypsum board:
1 coat drywall primer
2 coats acrylic latex

.7 Exposed piping and conduit, unwrapped:
1 coat alkyd metal primer
2 coats acrylic latex

.8 Exposed ductwork, insulated:
1 coat filler and primer
2 coats acrylic latex

END

PROJECT MANUAL

VOLUME TWO

PROJECT: **EXHAUST FAN REPLACEMENT**
FATHER DANIEL ZANON CATHOLIC ELEMENTARY SCHOOL
ST. EDMUND CATHOLIC ELEMENTARY SCHOOL
ST. JUDE CATHIOLIC ELEMENTARY SCHOOL

OWNER: **DUFFERIN-PEEL CATHOLIC DISTRICT SCHOOL BOARD**

CONSULTANT:

ALLEN & SHERRIFF ARCHITECTS INC.
10350 YONGE STREET
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TEL: 905-884-1117
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CONSULTANT'S PROJECT No: 4235 -3

DATE: **Issued for Review: April 12, 2019**

Issued for Tender: May 16, 2019

SUBCONSULTANTS:

MECHANICAL / ELECTRICAL

WSP Canada Group Limited
600 Cochrane Drive, 5th Floor
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MECHANICAL SPECIFICATION

EXHAUST FAN REPLACEMENT FATHER DANIEL ZANON CES, ST. EDMUND CES, ST. JUDE CES

DUFFERIN-PEEL CATHOLIC DISTRICT SCHOOL BOARD

ALLEN & SHERRIFF NO.: 4235
WSP PROJECT NO.: 19M-00264-00

ISSUED FOR TENDER
May 16, 2019

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END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 Division 00 and Division 01 apply to and are a part of this Section.

1.02 APPLICATION

.1 This Section specifies requirements that are common to Mechanical Divisions work Sections and it is a supplement to each Section and is to be read accordingly. Where requirements of this Section contradict requirements of Divisions 00 or 01, conditions of Division 00 or 01 to take precedence.

.2 Be responsible for advising product vendors of requirements of this Section.

1.03 DEFINITIONS

.1 "concealed" – means hidden from normal sight in furred spaces, shafts, ceiling spaces, walls and partitions.

.2 "exposed" – means work normally visible, including work in equipment rooms, service tunnels, and similar spaces.

.3 "finished" - means when in description of any area or part of an area or a product which receives a finish such as paint, or in case of a product may be factory finished.

.4 “provision” or "provide" (and tenses of "provide") – means supply and install complete.

.5 "install" (and tenses of "install") – means secure in position, connect complete, test, adjust, verify and certify.

.6 "supply" – means to procure, arrange for delivery to site, inspect, accept delivery and administer supply of products; distribute to areas; and include manufacturer’s supply of any special materials, standard on site testing, initial start-up, programming, basic commissioning, warranties and manufacturers’ assistance to Contractor.

.7 "delete" or "remove" (and tenses of "delete" or “remove”) – means to disconnect, make safe, and remove obsolete materials; patch and repair/finish surfaces to match adjoining similar construction; include for associated re-programming of systems and/or change of documentation identifications to suit deletions, and properly dispose of deleted products off site unless otherwise instructed by Owner and reviewed with Consultant.

.8 "barrier-free" – means when applied to a building and its facilities, that building and its facilities can be approached, entered and used by persons with physical or sensory disabilities in accordance with requirements of local governing building code.

.9 "BAS" – means building automation system; "BMS" – means building management system; "FMS" – means facility management system; and “DDC” means direct digital controls; references to "BAS", "BMS", "FMS" and “DDC” generally mean same.

.10 "governing authority" and/or "authority having jurisdiction" and/or "regulatory authority" and/or "Municipal authority" – means government departments, agencies, standards, rules and regulations that apply to and govern work and to which work must adhere.

.11 "OSHA" and "OHSA" – stands for Occupational Safety and Health Administration and Occupational Health and Safety Act, and wherever either one is used, they are to be read to mean local governing occupational health and safety regulations that apply to and govern work and to which work must adhere, regardless if Project falls within either authority's jurisdiction.

.12 "Mechanical Divisions" – refers to Divisions 20, 21, 22, 23, 25 and other Divisions as specifically noted, and which work as defined in Specifications and/or on drawings is responsibility of Mechanical Contractor, unless otherwise noted.

.13 "Electrical Divisions" – refers to Divisions 26, 27, 28 and other Divisions as specifically noted, and which work as defined in Specifications and/or on drawings is responsibility of Electrical Contractor, unless otherwise noted.

.14 "Consultant" – means person, firm or corporation identified as such in Agreement or Documents, and is licensed to practice in Place of the Work, and has been appointed by Owner to act for Owner in a professional capacity in relation to the Work.

.15 Wherever words "indicated", "shown", "noted", "listed", or similar words or phrases are used in Contract Documents they are understood, unless otherwise defined, to mean product referred to is "indicated", "shown", "listed", or "noted" on Contract Documents.

.16 Wherever words "reviewed", "satisfactory", "as directed", "submit", or similar words or phrases are used in Contract Documents they are understood, unless otherwise defined, to mean that work or product referred to is "reviewed by", "to the satisfaction of", "submitted to", etc., Consultant.

1.04 DOCUMENTS

.1 Documents for bidding include but are not limited to issued Drawings, Specifications and Addenda.

.2 Specification is arranged in accordance with CSI/CSC 50 Division Sections MasterFormat.

.3 Drawings and Specifications are portions of Contract Documents and identify labour, products and services necessary for performance of work and form a basis for determining pricing. They are intended to be cooperative. Perform work that is shown, specified, or reasonably implied on the drawings but not mentioned in Specification, or vice-versa, as though fully covered by both.

.4 Review Drawings and Specifications in conjunction with documents of other Divisions and, where applicable, Code Consultant’s report.

.5 Unless otherwise specifically noted in Specifications and/or on Drawings, Sections of Mechanical Divisions are not intended to delegate functions nor to delegate work and supply of materials to any specific trade, but rather to generally designate a basic unit of work, and Sections are to be read as a whole.

.6 Drawings are performance drawings, diagrammatic, and show approximate locations of equipment and connecting services. Any information regarding accurate measurement of building is to be taken on site. Do not scale Drawings, and do not use Drawings for prefabrication work.

.7 Drawings are intended to convey the scope of work and do not show architectural and structural details. Provide, at your cost, offsets, fittings, transformations and similar products required as a result of obstructions and other architectural and/or structural details but not shown on Drawings.

.8 Locations of equipment and materials shown may be altered, when reviewed by Consultant, to meet requirements of equipment and/or materials, other equipment or systems being installed, and of building, all at no additional cost to Contract.

.9 Specification does not generally indicate specific number of items or amounts of material required. Specification is intended to provide product data and installation requirements. Refer to schedules, Drawings (layouts, riser diagrams, schematics, details) and Specification to provide correct quantities. Singular may be read as plural and vice versa.

.10 Starter/motor control centre (MCC)/variable frequency drive (VFD) schedule drawings are both mechanical and electrical, and apply to work of Mechanical Divisions and Electrical Divisions. Be responsible for reviewing starter, MCC, VFD, and motor specification requirements prior to Bid submission. Confirm and coordinate exact scope of work and responsibility of work between Mechanical Divisions and Electrical Divisions.

.11 Drawings and Specifications have been prepared solely for use by party with whom Consultant has entered into a contract and there are no representations of any kind made by Consultant to any other party.

.12 In the case of discrepancies between the drawings and specifications, documents will govern in order specified in “General Conditions”, however, when scale and date of drawings are same, or where discrepancy exists within specification, most costly arrangement will take precedence.

1.05 METRIC AND IMPERIAL MEASUREMENTS

.1 Generally, both metric and imperial units of measurement are given in Sections of Specification governed by this section. Measurement conversions may be generally "soft" and rounded off. Confirm exact measurements based on application. Where measurements are related to installation and onsite applications, confirm issued document measurements with applicable local code requirements, and/or as applicable, make accurate measurements onsite. Where significant discrepancies are found, immediately notify Consultant for direction.

1.06 EXAMINATION OF DOCUMENTS AND SITE

.1 Carefully examine Documents and visit site to determine and review existing site conditions that will or may affect work, and include for such conditions in Bid Price.

.2 Report to Consultant, prior to Bid Submittal, any existing site condition that will or may affect performance of work as per Documents. Failure to do so will not be grounds for additional costs.

.3 Upon finding discrepancies in, or omissions from Documents, or having doubt as to their meaning or intent, immediately notify Consultant, in writing.

1.07 WORK STANDARDS

.1 Where any code, regulation, bylaw, standard, contract form, manual, printed instruction, and installation and application instruction is quoted it means, unless otherwise specifically noted, latest published edition at time of submission of Bids adopted by and enforced by local governing authorities having jurisdiction. Include for compliance with revisions, bulletins, supplementary standards or amendments issued by local governing authorities.

.2 Where regulatory codes, standards and regulations are at variance with Drawings and Specification, more stringent requirement will apply unless otherwise directed by Owner and reviewed with Consultant.

.3 Supplementary mandatory specification and requirements to be used in conjunction with project include but are not limited to following:

.1 Air-Conditioning, Heating and Refrigeration Institute (AHRI);

.2 Air Movement and Control Association (AMCA);

.3 American Iron and Steel Institute (AISI);

.4 American National Standards Institute (ANSI);

.5 American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., (ASHRAE);

.6 American Society of Mechanical Engineers (ASME);

.7 American Society of Testing and Materials (ASTM);

.8 American Water Works Association (AWWA);

.9 Associated Air Balance Council (AABC);

.10 Building Industry Consulting Services, International (BICSI);

.11 Canadian Gas Association (CGA);

.12 Canadian General Standards Board (CGSB);

.13 Canadian Standards Association (CSA);

.14 Electrical and Electronic Manufacturers Association of Canada (EEMAC);

.15 Electrical Safety Authority (ESA);

.16 Electronic Industries Association (EIA);

.17 Factory Mutual Systems (FM);

.18 Illuminating Engineering Society (IES);

.19 Institute of Electrical and Electronic Engineers (IEEE);

.20 International Standards Organization (ISO);

.21 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS);

.22 National Building Code of Canada (NBC);

.23 National Electrical Manufacturers Association (NEMA);

.24 National Environmental Balancing Bureau (NEBB);

.25 National Fire Protection Association (NFPA);

.26 National Standards of Canada;

.27 NSF International;

.28 Occupational Health and Safety Act (OHSA);

.29 Ontario Building Code (OBC);

.30 Ontario Electrical Safety Code (OESC);

.31 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA);

.32 Technical Standards and Safety Authority (TSSA);

.33 Thermal Insulation Association of Canada (TIAC);

.34 Underwriters' Laboratories of Canada (ULC);

.35 Workplace Hazardous Materials Information System (WHMIS);

.36 Material Safety Data Sheets by product manufacturers;

.37 local utility inspection permits;

.38 Codes, standards, and regulations of local governing authorities having jurisdiction;

.39 additional codes and standards listed in Trade Sections;

.40 Owner's standards.

.4 Provide applicable requirements for barrier free access in accordance with latest edition of local governing building code.

.5 Where any governing Code, Regulation, or Standard requires preparation and submission of special details or drawings for review they are to be prepared and submitted to appropriate authorities. Be responsible for costs associated with these submittals.

.6 Unless otherwise specified, install equipment in accordance with equipment manufacturer's recommendations and instructions, and requirements of governing Codes, Standards, and Regulations. Governing Codes, Standards, and Regulations take precedence over manufacturer's instructions. Notify Consultant in writing of conflicts between Contract Documents and manufacturer's instructions.

.7 Work is to be performed by journeyperson tradesmen who perform only work that their certificates permit, or by apprentice tradesmen under direct on site supervision of experienced journeyperson tradesman. Journeyperson to apprentice ratio is not to exceed ratio determined by the Board as stated in Ontario College of Trades and Apprenticeship Act or local equivalent governing body in Place of the Work.

.8 Journeyperson tradesmen are to have a copy of valid trade certificates available at site for review with Consultant at any time.

.9 Experienced and qualified superintendent is to be on-site at times when work is being performed.

.10 Protect existing areas above, below and adjacent areas of Work from any debris, noise, or interruptions to existing services to satisfaction of Owner and reviewed with Consultant. Maintain in operation existing services to these areas to allow Owner to continue use of these areas. If services that are required to be maintained run through areas of renovations, provide necessary protection to services or reroute, in coordination with Owner and Consultant. Include for required premium time work to meet these requirements.

.11 Work being performed within occupied spaces and work affecting surfaces adjacent to occupied spaces may need to be performed after regular business hours. For areas where spaces are used by Owner on a 24 hours basis or over various hours, coordinate hours of work with Owner on a regular basis to suit Owner's schedule. Execute work at times confirmed with and agreed to by Owner and reviewed with Consultant, so as not to inconvenience Owner's occupation or in any way hinder Owner's use of building. Include for required premium time work to meet these requirements.

.12 Coordinate work inspection reviews and approvals with governing inspection department to ensure construction schedule is not delayed. Be responsible for prompt notification of deficiencies to Consultant and submission of reports and certificates to Consultant.

.13 Properly protect equipment and materials on site from damage and defacement due to elements and work of trades, to satisfaction of Owner and reviewed with Consultant. Equipment and materials are to be in new condition upon Substantial Performance of the Work.

.14 Mechanical piping system work, including equipment, must comply in all respects with requirements of local technical standards authorities and CSA B51, Boiler, Pressure Vessels and Pressure Piping Code. Where required, mechanical work products are to bear a CRN number.

.15 Electrical items associated with mechanical equipment are to be certified and bear stamp or seal of a recognized testing agency such as CSA, UL, ULC, ETL, etc., or bear a stamp to indicate special electrical utility approval.

1.08 PERMITS, CERTIFICATES, APPROVALS AND FEES

.1 Contact and confirm with local authorities having jurisdiction including utility providers, requirements for approvals from such authorities. Obtain and pay for permits, certificates, and approvals required to complete Work.

.2 Be responsible for ensuring that authorities having jurisdiction which require on-site inspection of work, have ample notification to perform inspection, with sufficient lead time to correct deficiencies in a manner that will not impede schedule of completion of Work. If any defect, deficiency or non-compliant is found in work by inspection, be responsible for costs of such inspection, including any related expenses, making good and return to site, until work is passed by governing authorities.

.3 Obtain and submit to Consultant, approval/inspection certificates issued by governing authorities to confirm that Work as installed is in accordance with rules and regulations of local governing authorities and are acceptable.

.4 Include in each copy of operating and maintenance instruction manuals, copies of approvals and inspection certificates issued by regulatory authorities.

1.09 REQUIREMENTS FOR CONTRACTOR RETAINED ENGINEERS

.1 Professional engineers retained to perform consulting services with regard to Project work, i.e. seismic engineer, fire protection engineer or structural engineer, are to be members in good standing with local Association of Professional Engineers, and are to carry and pay for errors and omissions professional liability insurance in compliance with requirements of governing authorities in Place of the Work.

.2 Retained engineer’s professional liability insurance is to protect Contractor's consultants and their respective servants, agents, and employees against any loss or damage resulting from professional services rendered by aforementioned consultants and their respective servants, agents, and employees in regards to the Work of this Contract.

.3 Unless otherwise specified in Division 00 or 01, liability insurance requirements are as follows:

.1 coverage is to be a minimum of $1,000,000.00 CDN inclusive of any one occurrence;

.2 insurance policy is not to be cancelled or changed in any way without insurer giving Owner minimum thirty days written notice;

.3 liability insurance is to be obtained from an insurer registered and licensed to underwrite such insurance in the Place of the Work;

.4 retained consultants are to ascertain that sub-consultants employed by them carry insurance in the form and limits specified above;

.5 evidence of the required liability insurance in such form as may be required is to be issued to Owner, Owner’s Consultant, and Municipal Authorities as required prior to commencement of aforementioned consultant’s services.

1.10 WORKPLACE SAFETY

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials. Submit WHMIS MSDS (Material Safety Data Sheets) for products where required, and maintain one copy at site in a visible and accessible location available to personnel.

.2 Comply with requirements of Occupational Health and Safety Act and other regulations pertaining to health and safety, including worker's compensation/insurance board and fall protection regulations. When working in confined spaces, comply with requirements of Occupational Health and Safety Act - Ontario Regulation 632, "Confined Spaces" and any other applicable Ministry of Labour requirements.

.3 If at any time during course of existing building work, hazardous materials other than those identified in Documents and pertaining to Project Scope of Work, are encountered or suspected that were not identified as being present and which specific instructions in handling of such materials were not given, cease work in area in question and immediately notify Consultant. Comply with local governing regulations with regards to working in areas suspected of containing hazardous materials. Do not resume work in affected area without approval from Owner and reviewed with Consultant.

1.11 PLANNING AND LAYOUT OF WORK

.1 Base installation layout, design, terminations, and supply of accessories, on Contract Documents with specific coordination with reviewed shop drawings.

.2 Plan, coordinate, and establish exact locations and routing of services with affected trades prior to installation such that services clear each other as well as other obstructions. Generally, order of right of way for services to be as follows:

.1 piping requiring uniform pitch;

.2 piping 100 mm (4") dia. and larger;

.3 large ducts (main runs);

.4 cable tray and bus duct;

.5 conduit 100 mm (4") dia. and larger;

.6 piping less than 100 mm (4") dia.;

.7 smaller branch ductwork;

.8 conduit less than 100 mm (4") dia..

.3 Unless otherwise shown or specified, conceal work in finished areas, and conceal work in partially finished and/or unfinished areas to extent made possible by the area construction. Install services as high as possible to conserve headroom and/or ceiling space. Notify Consultant where headroom or ceiling space appears to be inadequate prior to installation of work.

.4 Do not use Contract Drawing measurements for prefabrication and layout of piping, sheet metal work and such other work. Locations and routing are to generally be in accordance with Contract Drawings, however, prepare layout drawings for such work. Use established bench marks for both horizontal and vertical measurements. Confirm inverts, coordinate with and make allowances for work of other trades. Accurately layout work, and be entirely responsible for work installed in accordance with layout drawings. Where any invert, grade, or size is at variance with Contract Drawings, notify Consultant prior to proceeding with work.

.5 Prepare plan and interference drawings (at a minimum drawing scale of 1:50 or ¼"=1' 0") of work for coordination with each trade Contractor. Arrange for preparation of detailed section drawings of ceiling spaces of corridors and any other congested areas. Sections are to be cross referenced with plan drawings so that trades may make use of section drawings. Section drawings to indicate lateral and elevation dimensions of major services within ceiling space. Lateral dimensions are to be from grid lines and elevations from top of floor slab. Obtain from Consultant, engineering drawings for this use. Contractors' interference drawings are to be distributed among other Trade Contractors. Submit drawings to Consultant for review. Failure of General Contractor to prepare and coordinate overall interface drawings of trades does not relieve respective Division Contractor of responsibility to ensure that work is properly planned and coordinated.

.6 Carry out alterations in arrangement of work that has been installed without proper coordination, study, and review, even if in accordance with Contract Documents, in order to conceal work behind finishes, or to allow installation of other work, without additional cost. In addition, make necessary alterations in other work required by such alterations, without additional cost.

.7 Shut-off valves, balancing devices, air vents, equipment and similar products, particularly such products located above suspended ceilings must be located for easy access for servicing and/or removal. Products which do not meet this location requirement are to be relocated to an accessible location at no additional cost.

.8 Be responsible for making necessary changes, at no additional cost, to accommodate structural and building conditions that were missed due to lack of coordination.

1.12 COORDINATION OF WORK

.1 Review Contract Documents and coordinate work with work of each trade. Coordination requirements are to include but not be limited to following:

.1 requirements for openings, sleeves, inserts and other hardware necessary for installation of work;

.2 concrete work such as housekeeping pads, sumps, bases, etc., required for work, and including required dimensions, operating weight of equipment, location, etc.;

.3 depth and routing of excavation required for work, and requirements for bedding and backfill;

.4 wiring work required for equipment and systems but not specified to be done as part of mechanical work, including termination points, wiring type and size, and any other requirements.

.2 Ensure materials and equipment are delivered to site at proper time and in such assemblies and sizes so as to enter into building and be moved into spaces where they are to be located without difficulty.

.3 Wherever possible, coordinate equipment deliveries with manufacturers and/or suppliers so equipment is delivered to site when it is required, or so it can be stored within building, subject to available space as confirmed with Owner and reviewed with Owner, and protected from elements.

.4 Ensure proper access and service clearances are maintained around equipment, and, where applicable, access space for future equipment removal or replacement is not impeded. Comply with code requirements with regards to access space provision around equipment. Remove and replace any equipment which does not meet this requirement.

.5 Where work is to be integrated, or is to be installed in close proximity with work of other trades, coordinate work prior to and during installation.

1.13 PRODUCTS

.1 Be responsible for ordering of products (equipment and materials) in a timely manner in order to meet project-scheduling timelines. Failure to order products to allow manufacturers sufficient production/delivery time to meet project-scheduling timelines is an unacceptable reason to request for other suppliers or substitutions.

.2 Provide Canadian manufactured products wherever possible or required and when quality and performance is obtainable at a competitive price. Products are to be supplied from manufacturer's authorized Canadian representative, unless otherwise noted. Unless otherwise specified, products are to be new and are to comply with applicable respective Canadian standards. References to UL listings of products to include requirements that products are to be also Underwriters Laboratories of Canada (ULC) listed for use in Canada. Products are to meet or exceed latest ANSI/ASHRAE/IES 90.1 standards, as applicable. Do not supply any products containing asbestos materials or PCB materials.

.3 Systems and equipment of this Project are to be "State of the Art" and be most recent and up to date series/version of product that is available at time of shop drawing review process. Products that have been stored or "on shelf" for an extended period of time will not be accepted. Software is to be of latest version available and be provided with updates available at time of shop drawing review process. Systems are to be designed such that its software is backwards compatible. Future upgrades are not to require any hardware replacements or additions to utilize latest software.

.4 Products scheduled and/or specified have been selected to establish a performance and quality standard, and, in some instances, a dimensional standard. In most cases, base specified manufacturers are stated for any product specified by manufacturer's name and model number. Where acceptable manufacturers are listed, first name listed is base specified company. Bid Price may be based on products supplied by any of manufacturers' base specified or named as acceptable for particular product. If acceptable manufacturers are not stated for a particular product, base Bid Price on product supplied by base specified manufacturer.

.5 Documents have been prepared based on product available at time of Bidding. If, after award of Contract, and if successful manufacturer can no longer supply a product that meets base specifications, notify Consultant immediately. Be responsible for obtaining other manufacturers product that complies with base specified performance and criteria and meets project timelines. Proposed products are subject to review and consideration by Consultant and are considered as substitutions subject to a credit to Contract. In addition, if such products require modifications to room spaces, mechanical systems, electrical systems, etc., include required changes. Such changes are to be submitted in detail to Consultant for review and consideration for acceptance. There will be no increase in Contract Price for revisions. Above conditions supplement and are not to supersede any specification conditions with regards to substitutions or failure to supply product as per issued documents.

.6 Listing of a product as "acceptable" does not imply automatic acceptance by Consultant and/or Owner. It is responsibility of Contractor to ensure that any price quotations received and submittals made are for products that meet or exceed specifications included herein.

.7 If products supplied by a manufacturer named as acceptable are used in lieu of base specified manufacturer, be responsible for ensuring that they are equivalent in performance and operating characteristics (including energy consumption if applicable) to base specified products. It is understood that any additional costs (i.e. for larger starters, larger feeders, additional spaces, etc.), and changes to associated or adjacent work resulting from provision of product supplied by a manufacturer other than base specified manufacturer, is included in Bid Price. In addition, in equipment spaces where equipment named as acceptable is used in lieu of base specified equipment and dimensions of such equipment differs from base specified equipment, prepare and submit for review accurately dimensioned layouts of rooms affected, identifying architectural and structural elements, systems and equipment to prove that equipment in room will fit properly meeting design intent. There will be no increase in Contract Price for revisions.

.8 In addition to manufacturer’s products base specified or named as acceptable, other manufacturers of products may be proposed as substitutions to Consultant for review and consideration for acceptance, listing in each case a corresponding credit for each substitution proposed. However, base Bid Price on products base specified or named as acceptable. Certify in writing to Consultant that proposed substitution meets space, power, design, energy consumption, and other requirements of base specified or acceptable product. It is understood that there will be no increase in Contract Price by reason of any changes to associated equipment, mechanically, electrically, structurally or architecturally, required by acceptance of proposed substitution. Consultant has sole discretion in accepting any such proposed substitution of product. Indicate any proposed substitutions in areas provided on Bid Form. Do not order such products until they are accepted in writing by Consultant.

.9 Where products are listed as "or approved equal", certify in writing that product to be used in lieu of base specified product, at least meets space, power, design, energy consumption, and other requirements of base specified product and is equivalent or better than base specified product. When requested by Consultant, provide full design detail drawings and specifications of proposed products. Acceptance of these "or approved equal" products is at sole discretion of Consultant. It is understood that there will be no increase in Contract Price by reason of any changes to associated equipment, mechanically, electrically, structurally or architecturally, required by acceptance of approved equal product. There must be no increase in Contract price due to Consultant’s rejection of proposed equivalent product.

.10 Whenever use of product other than base specified product is being supplied, ensure corresponding certifications and product information (detailed catalogue and engineering data, fabrication information and performance characteristics) are submitted to Consultant for review. Failure of submission of these documents to Consultant in a timely manner to allow for review will result in base specified product to be supplied at Consultant’s discretion, at no additional cost to Contract.

.11 Products supplied by a manufacturer/supplier other than a manufacturer listed as acceptable may be considered for acceptance by Consultant if requested in writing with full product documentation submitted, a minimum of 10 working days prior to Bid closing date.

.12 Any proposed changes initiated by Contractor after award of Contract may be considered by Consultant at Consultant's discretion, with any additional costs for such changes if accepted by Owner and reviewed with Consultant, and costs for review, to be borne by Contractor.

.13 Whenever use of product other than based specified products or named as acceptable is being supplied, time for process of submission of other products and Consultant's review of products will not alter contract time or delay work schedule.

1.14 SHOP DRAWINGS

.1 At start-up meeting, review with Consultant products to be included in shop drawing submission. Prepare and submit list of products to Consultant for review.

.2 Submit electronic copies of shop drawings unless otherwise directed by Consultant. Coordinate exact requirements with Consultant.

.3 Submit for review, drawings showing detail design, construction, and performance of equipment and materials as requested in Specification. Submit shop drawings to Consultant for review prior to ordering and delivery of product to site. Include minimally for preparation and submission of following, as applicable:

.1 product literature cuts;

.2 equipment data sheets;

.3 equipment dimension drawings;

.4 system block diagrams;

.5 sequence of operation;

.6 connection wiring schematic diagrams;

.7 functionality with integrated systems.

.4 Each shop drawing or product data sheet is to be properly identified with project name and product drawing or specification reference. Shop drawing or product data sheet dimensions are to match dimension type on drawings.

.5 Where any item of equipment is required by Code or Standard or By-Law to meet a specific energy efficiency level, or any other specific requirement, ensure this requirement is clearly indicated on submission.

.6 Ensure proposed products meet each requirement of Project. Endorse each shop drawing copy "CERTIFIED TO BE IN ACCORDANCE WITH ALL REQUIREMENTS". Include company name, submittal date, and sign each copy. Shop drawings that are received and are not endorsed, dated and signed will be returned to be resubmitted.

.7 Consultant to review shop drawings and indicate review status by stamping shop drawing copies as follows:

.1 "REVIEWED" or "REVIEWED AS NOTED" (appropriately marked) – If Consultant's review of shop drawing is final, Consultant to stamp shop drawing;

.2 "REVISE AND RESUBMIT" – If Consultant's review of shop drawing is not final, Consultant to stamp shop drawing as stated above, mark submission with comments, and return submission. Revise shop drawing in accordance with Consultant's notations and resubmit.

.8 Following is to be read in conjunction with wording on Consultant's shop drawing review stamp applied to each and every shop drawing or product data sheet submitted:

"THIS REVIEW BY CONSULTANT IS FOR SOLE PURPOSE OF ASCERTAINING CONFORMANCE WITH GENERAL DESIGN CONCEPT. THIS REVIEW DOES NOT MEAN THAT CONSULTANT APPROVES DETAILED DESIGN INHERENT IN SHOP DRAWINGS, RESPONSIBILITY FOR WHICH REMAINS WITH CONTRACTOR. CONSULTANT'S REVIEW DOES NOT RELIEVE CONTRACTOR OF RESPONSIBILITY FOR ERRORS OR OMISSIONS IN SHOP DRAWINGS OR OF CONTRACTOR'S RESPONSIBILITY FOR MEETING REQUIREMENTS OF CONTRACT DOCUMENTS. BE RESPONSIBLE FOR DIMENSIONS TO BE CONFIRMED AND CORRELATED AT JOB SITE, FOR INFORMATION THAT PERTAINS SOLELY TO FABRICATION PROCESSES OR TO TECHNIQUES OF CONSTRUCTION AND INSTALLATION, AND FOR COORDINATION OF WORK OF SUB-TRADES."

.9 Submit each system and each major component as separate shop drawing submissions. Submit together, shop drawings for common devices such as devices of each system are to be submitted together.

.10 Obtain shop drawings for submission from product manufacturer's authorized representatives and supplemented with additional items specified herein.

.11 Do not order product until respective shop drawing review process has been properly reviewed with Consultant.

.12 Where extended warranties are specified for equipment items, submit specified extended warranty with shop drawing submittal.

1.15 ENGINEERED SUBMITTALS

.1 Submittals for items required to be sealed by a professional engineer (engineered) are to be duly prepared, sealed, and signed under direct control and supervision of a qualified professional engineer licensed in jurisdiction of the work. Professional engineer is to conform to requirements specified in this Section in article entitled Requirements for Contractor Retained Engineers.

.2 Engineered submittals are to include, but not be limited to, following:

.1 complete CAD layout drawings indicating equipment, piping schematic, pipe routing and sizing, zones, devices, wiring schematics, and any other pertinent data;

.2 listing of design data used to determine system layout and sizing;

.3 complete copies of design calculations and listing of design data used in preparing calculations;

.4 list detailing standards, codes, regulations, etc. adhered to when designing system;

.5 items as noted in other Sections of the Specification.

.3 Professional engineer responsible for engineered submittals is to perform periodic field reviews, including review of associated mock-ups where applicable, at locations wherever work as described by engineered submittal is in progress, during fabrication and installation of such work, and submit a field review report after each visit. Submit field review reports to Consultant and authorities having jurisdiction as required.

.4 Field reviews are to be at intervals as necessary and appropriate to progress of work described by engineered submittal to allow engineer to be familiar with progress and quality of such work and to determine if work is proceeding in general conformity with Contract Documents including reviewed shop drawings and design calculations.

.5 Upon completion of work as described by engineered submittal, professional engineer responsible for preparation of engineered submittal and for performing periodic field reviews is to prepare and submit to Consultant and, if applicable, authorities having jurisdiction, a letter certifying that work has been supplied and installed in accordance with requirements of Contract Documents, authorities having jurisdiction and engineered submittal.

1.16 EQUIPMENT LOADS

.1 Supply equipment loads (self-weight, operating weight, housekeeping pad, inertia pads, etc.) to Consultant, via shop drawing submissions, prior to construction.

.2 Where given choice of specific equipment, actual weight, location and method of support of equipment may differ from those assumed by Consultant for base design. Back-check equipment loads, location, and supports, and include necessary accommodations.

.3 Where supporting structure consists of structural steel framing, it is imperative that equipment loads, location, and method of support be confirmed prior to fabrication of structural steel. Review locations of equipment with Consultant prior to construction.

1.17 OPENINGS

.1 Supply opening sizes and locations to Consultant to allow verification of their effect on design, and for inclusion on structural drawings where appropriate.

.2 No openings are permitted through completed structure without written approval from Owner and reviewed with Consultant. Show required openings on a copy of structural drawings. Identify exact locations, elevations, and size of proposed openings and submit to Consultant for review, well in advance of doing work.

.3 Prior to leaving site at end of each day, walk through areas of work and check for any openings, penetrations, holes, and/or voids created under scope of work of project, and ensure that any openings created under scope of work have been closed off, fire-stopped and smoke-sealed. Unless otherwise directed by Owner and reviewed with Consultant, do not leave any openings unprotected and unfinished overnight.

1.18 SCAFFOLDING, HOISTING AND RIGGING

.1 Unless otherwise specified or directed, supply, erect and operate scaffolding, rigging, hoisting equipment and associated hardware required for work, and subject to approval from Owner and reviewed with Consultant.

.2 Use scaffolds in such a manner as to interfere as little as possible with work of other trades.

.3 Do not place major scaffolding/hoisting equipment loads on any portion of structure without approval from Owner and reviewed with Consultant. No supports, clips, brackets or similar devices are to be welded, bolted or otherwise affixed to any finished member or surface without approval from Owner and review with Consultant.

.4 Immediately remove from site scaffolding, rigging and hoisting equipment when no longer required.

1.19 CHANGES IN THE WORK

.1 Whenever Consultant proposes in writing to make a change or revision to design, arrangement, quantity or type of work from that required by Contract Documents, prepare and submit to Consultant for review, a quotation detailing proposed cost for executing change or revision.

.2 Quotation is to be a detailed and itemized estimate of product, labour, and equipment costs associated with change or revision, plus overhead and profit percentages and applicable taxes and duties.

.3 Unless otherwise specified in Divisions 00 or 01, following additional requirements apply to all quotations submitted:

.1 when change or revision involves deleted work as well as additional work, cost of deleted work (less overhead and profit percentages but including taxes and duties) is to be subtracted from cost of additional work before overhead and profit percentages are applied to additional work;

.2 material costs are not to exceed those published in local estimating price guides;

.3 mechanical material labour unit costs are to be in accordance with Mechanical Contractors Association of America Labor Estimating Manual, less 25%;

.4 electrical material labour unit costs are to be in accordance with National Electrical Contractors Association Manual of Labor Units at difficult level, less 25%;

.5 costs for journeyperson and apprentice labour must not exceed prevailing rates at time of execution of Contract and must reflect actual personnel performing work;

.6 cost for site superintendent must not exceed 10% of total hours of labour estimated for change or revision, and change or revision must be such that site superintendent’s involvement is necessary;

.7 costs for rental tools and/or equipment are not to exceed local rental costs;

.8 overhead percentage will be deemed to cover quotation costs other than actual site labour and materials, and rentals;

.9 quotations, including those for deleted work, to include a figure for any required change to Contract time.

.4 Quotations submitted that are not in accordance with requirements specified above will be rejected and returned for re-submittal. Failure to submit a proper quotation to enable Consultant to expeditiously process quotation and issue a Change Order will not be grounds for any additional change to Contract time.

.5 Make requests for changes or revisions to work in writing to Consultant and, if accepted by Owner, Notice of Change to be issued.

.6 Do not execute any change or revision until written authorization for the change or revision has been obtained from Consultant.

1.20 PROGRESS PAYMENT BREAKDOWN

.1 Prior to submittal of first progress payment draw, submit a detailed breakdown of work cost to assist Consultant in reviewing and approving progress payment claims.

.2 Payment breakdown is subject to Owner's approval and Consultant's review. Progress payments will not be processed until an approved breakdown is in place. Breakdown is to include one-time claim items such as mobilization and demobilization, insurance, bonds (if applicable), shop drawings and product data sheets, commissioning including testing, adjusting and balancing, system testing and verification, and project closeout submittals.

.3 Indicate equipment, material and labour costs for site services (if applicable) and indicate work of each trade in same manner as indicated on progress draw.

1.21 NOTICE FOR REQUIRED FIELD REVIEWS

.1 Whenever there is a requirement for Consultant to perform a field review prior to concealment of any work, to inspect/re-inspect work for deficiencies prior to Substantial Performance of the Work, for commissioning demonstrations, and any other such field review, give minimum 5 working days' notice in writing to Consultant.

.2 If Consultant is unable to attend a field review when requested, arrange an alternative date and time.

.3 Do not conceal work until Consultant advises that it may be concealed.

.4 When Consultant is requested to perform a field review and work is not ready to be reviewed, reimburse Consultant for time and travel expenses.

1.22 PRELIMINARY TESTING

.1 When directed by Consultant, promptly arrange, pay for, and perform site tests on any piece of equipment or any system for such reasonable lengths of time and at such times as may be required to prove compliance with Specification and governing Codes and Regulations, prior to Substantial Performance of the Work.

.2 When, in Consultant's opinion, tests are required to be performed by a certified testing laboratory, arrange and pay for such tests.

.3 These tests are not to be construed as evidence of acceptance of work, and it is agreed and understood that no claim for delays or damage will be made for injury or breakage to any part or parts of equipment or system due to test where such injuries or breakage were caused by faulty parts and/or workmanship of any kind.

.4 When, in Consultant's opinion, tests indicate that equipment, products, etc., are defective or deficient, immediately remove such equipment and/or products from site and replace them with acceptable equipment and/or products, at no additional cost.

1.23 PROVISIONS FOR SYSTEMS/EQUIPMENT USED DURING CONSTRUCTION

.1 Permanent mechanical systems in building may be used for temporary heating or cooling during construction subject to following conditions:

.1 each entire system is complete, pressure tested, cleaned, and flushed out;

.2 specified water treatment system has been commissioned, and treatment is being continuously monitored;

.3 building has been closed in and areas to be heated/ventilated are clean and will not thereafter be subjected to dust-producing processes;

.4 there is no possibility of damage from any cause;

.5 supply ventilation systems are protected by 60% filters, which are to be inspected daily, and changed every 2 weeks, or more frequently as required;

.6 return air systems have approved construction filters over openings, inlets, and outlets;

.7 systems are operated in accordance with manufacturer's recommendations or instructions, and are monitored on a regular and frequent basis;

.8 warranties are not affected in any way;

.9 regular preventive and other manufacturer's recommended maintenance routines are performed;

.10 before application for Certificate of Substantial Performance, each entire system is to be refurbished, cleaned internally and externally, restored to "as-new" condition, and filters in air systems replaced;

.11 energy costs are to be paid by Contractor.

.2 Confirm with Consultant what equipment can be used during construction.

.3 Any system or piece of equipment that is specified to be provided under requirements of Documents and is required to be used during construction stages of work prior to issuing of Certificate of Substantial Performance of the Work, are to be provided with special interim maintenance and service to cover systems/equipment during time of use during construction period of project until project has been certified as substantially performed and such systems/equipment are turned over to Owner.

.4 During this period of construction, such systems/equipment to not become property of Owner or be Owner’s responsibility for maintenance or service. Systems/equipment are to remain property of respective manufacturers/suppliers or Contractor, who are responsible for full maintenance and servicing of systems/equipment in order to maintain validity of warranties after turn over to Owner.

.5 Prior to application for a Certificate of Substantial Performance of the Work and turn over to Owner, such systems/equipment to be cleaned, restored to "new" condition, paint finishes "touched-up", filters cleaned or replaced, etc.

1.24 TEMPORARY SERVICES

.1 Coordinate with Prime Contractor, requirements for temporary services including but not limited to temporary heating, cooling and water. Unless otherwise noted, provide required services in compliance with requirements of local governing building code and local governing inspection authorities.

.2 Maintain fire protection of areas which may include fire watch during temporary shutdowns of existing systems, in accordance with requirements of local governing code and local governing authorities.

1.25 MAINTAINING EQUIPMENT PRIOR TO ACCEPTANCE

.1 Maintain equipment in accordance with manufacturer's instructions prior to start-up, testing and commissioning.

.2 Employ a qualified millwright to check and align shafts, drives, and couplings on all base mounted split coupled motor driven equipment.

.3 Where equipment lubrication fittings are not easily accessible, extend the fittings to accessible locations using copper or aluminium tubing.

.4 All filters are to be new upon Substantial Performance of the Work. This is in addition to any spare filters specified.

1.26 CLEANING

.1 During construction, keep site reasonably clear of rubbish and waste material resulting from work on a daily basis to the satisfaction of Owner and Consultant. Before applying for a Certificate of Substantial Performance of the Work, remove rubbish and debris, and be responsible for repair of any damage caused as a result of work.

.2 Clean equipment and devices installed as part of this project.

1.27 RECORD AS-BUILT DRAWINGS

.1 Drawings for this project have been prepared on a CAD system using AutoCAD software of release version reviewed with Consultant. For purpose of producing record "as built" drawings, copies of Contract Drawings can be obtained from Consultant.

.2 As work progresses at site, clearly mark in red in a neat and legible manner on a set of bound white prints of Contract Drawings, changes and deviations from routing of services and locations of equipment shown on Contract Drawings, on a daily basis. Changes and deviations include those made by addenda, change orders, and site instructions. Use notes marked in red as required. Maintain white print red line as-built set at site for exclusive use of recording as-built conditions, keep set up-to-date at all times, and ensure set is always available for periodic review. As-built set is also to include the following:

.1 dimensioned location of inaccessible concealed work;

.2 locations of control devices with identification for each;

.3 for underground piping and ducts, record dimensions, invert elevations, offsets, fittings, cathodic protection and accessories if applicable, and locate dimensions from benchmarks to be preserved after construction is complete;

.4 for fire protection systems, record actual locations of equipment, sprinkler heads, and valves, drains, and test locations, and deviations of pipe routing and sizing from that shown on the drawings;

.5 location of piping system air vents;

.6 location of concealed services terminated for future extension and work concealed within building in inaccessible locations.

.3 Before applying for a Certificate of Substantial Performance of the Work, update a clean copy of Contract Drawing set in accordance with marked up set of "as-built" white prints including deviations from original Contract Drawings, thus forming an "as-built" drawing set. Submit "as-built" site drawing prints to Consultant for review. Make necessary revisions to drawings as per Consultant's comments, to satisfaction of Consultant.

.4 Use final reviewed "as-built" drawing set to provide CAD files of drawings thus forming true "as-built" set of Contract Drawings. Identify set as "Project Record Copy". Load digital copies of final reviewed by Consultant as-built drawings onto USB type flash drive. Provide 2 complete sets of "as-built" drawings on separate USBs. Submit "as-built" sets of white prints and USBs to Consultant.

.5 Submitted drawings are to be of same quality as original Contract Drawings. CAD drawing files are to be compatible with AutoCAD software release version confirmed with Consultant.

.6 Unless otherwise noted in Divisions 00 or 01, failure to maintain accurate record drawings will incur additional 5% holdback on progress claims until drawings are brought up to date to satisfaction of Owner and reviewed with Consultant.

1.28 OPERATING AND MAINTENANCE MANUALS

.1 For each item of equipment for which a shop drawing is required (except for simple equipment), supply minimum 3, project specific, indexed copies of equipment manufacturers' operating and maintenance (O&M) instruction data manuals. Review exact quantity of manuals with Consultant. Consolidate each copy of data in an identified hard cover three "D" ring binder. Each binder to include:

.1 front cover: project name; wording – "Mechanical Systems Operating and Maintenance Manual"; and date;

.2 introduction sheet listing Consultant, Contractor, and Subcontractor names, street addresses, telephone and fax numbers, and e-mail addresses;

.3 equipment manufacturer's authorized contact person name, telephone number and company website;

.4 Table of Contents sheet, and corresponding index tab sheets;

.5 copy of each "REVIEWED" or clean, updated "REVIEWED AS NOTED" shop drawing or product data sheet, with manufacturer's/supplier's name, telephone and fax numbers, email address, company website address, and email address for local source of parts and service; when shop drawings are returned marked "Reviewed As Noted" with revisions marked on shop drawing copies, they are to be revised by equipment supplier to incorporate comments marked on "Reviewed" shop drawings and a clean updated copy is to be included in operating and maintenance manuals;

.6 operating data as follows:

.1 pressure test reports, and certificates issued by governing authorities;

.2 description of each system and its controls;

.3 control schematics for equipment/systems including building environmental controls;

.4 wiring and connection diagrams;

.5 if applicable, BAS architecture and all required operating data;

.6 description of operation of each system at various loads together with reset schedules and seasonal variances;

.7 operation instruction for each system and each component;

.8 description of actions to be taken in event of emergencies and/or equipment failure;

.9 valve tag schedule, and flow diagrams to indicate valve locations.

.7 maintenance data as follows:

.1 operation and trouble-shooting instructions for each item of equipment and each system;

.2 schedules of tasks, frequency, tools required, and estimated task time;

.3 recommended maintenance practices and precautions including warnings of any maintenance practice that will damage or disfigure equipment/systems;

.4 complete parts lists with numbers.

.8 performance data as follows:

.1 equipment and system start-up data sheets;

.2 equipment performance verification test results, and final commissioning report;

.3 final testing, adjusting and balancing reports.

.9 copies of warranties;

.10 items requested specifically in Section Articles.

.2 Generally, binders are not to exceed 75 mm (3") thick and not to be more than 2/3 full.

.3 Operating and maintenance instructions are to relate to job specific equipment supplied under this project and related to Owner’s building. Language used in manuals is to contain simple practical operating terms and language easy for in-house maintenance staff to understand how to operate and maintain each system.

.4 Before applying for a Certificate of Substantial Performance of the Work, assemble one copy of O & M Manual and submit to Consultant for review prior to assembling remaining copies. Incorporate Consultant's comments into final submission.

.5 Provide 2 digital copies of contents of operating and maintenance manuals and load onto separate USB type flash drives and submit to Consultant. Prepare digital copies using version of Adobe Acrobat Portable Document Format or equal as reviewed with Consultant and enhanced with bookmarks and internal document links.

1.29 COMMISSIONING

.1 After successful start-up and prior to Substantial Performance of the Work, commission the mechanical work. Commissioning work is the process of Contractor demonstrating to Owner and Consultant, for purpose of final acceptance, by means of successful and documented functional performance testing, that systems and/or subsystems are capable of being operated and maintained to perform in accordance with requirements of Contract Documents, as further described below.

.1 Retain services of a testing, adjusting, and balancing agency to perform testing and balancing of mechanical system air/fluid flows and capacities, prior to operational performance testing. Refer to Section entitled Testing, Adjusting and Balancing.

.2 Test, adjust and operate equipment and systems after start-up but before functional performance testing, to confirm operations are in accordance with requirements of Contract Documents. Verify modes and sequences of control and monitoring, interlocks, and responses to emergency conditions. Complete commissioning data sheets to document successful operational performance testing.

.3 Repeat successful operational performance testing with completed commissioning data sheet documentation in the presence of Consultant and Owner to validate and verify equipment and systems are complete in all respects, function correctly, and are ready for acceptance.

.4 Submit final commissioning data sheets, TAB reports as specified in Section entitled Testing, Adjusting and Balancing, project closeout documents, and other required submittals.

1.30 WARRANTY

.1 Unless otherwise specified in Divisions 00 and 01, warrant mechanical work to be in accordance with Contract Documents and free from defects for a period of 1 year from date of issue of a Certificate of Substantial Performance of the Work.

.2 Where equipment includes extended warranty period, e.g., 5 years, first year of warranty period is to be governed by terms and conditions of warranty in Contract Documents, and remaining years of warranty are to be direct from equipment manufacturer and/or supplier to Owner. Submit signed and dated copies of extended warranties to Consultant.

.3 Warranty to include parts, labour, travel costs and living expenses incurred by manufacturer’s authorized technician to provide factory authorized on-site service.

.4 Repair and/or replace any defects that appear in Work within warranty period without additional expense to Owner. Be responsible for costs incurred in making defective work good, including repair or replacement of building finishes, other materials, and damage to other equipment. Ordinary wear and tear and damage caused wilfully or due to carelessness of Owner's staff or agents is exempted.

.5 Do not include Owner deductible amounts in warranties.

.6 It is understood that warranties are to commence from time of Substantial Performance of the Work, regardless of what is noted within following Sections of Specification. Be responsible for providing whatever "bridging" or additional extended warranty period is required from time that material is purchased until this time.

.7 Visit building during warranty period with Owner representatives. Owner to organize these visits. At these meetings, Owner representatives are to review performance of systems. If performance is satisfactory, then no further action needs to be taken. If unsatisfactory, then correct deficiencies, as directed by Owner representatives, to satisfaction of Owner's representatives. These site visits to occur:

.1 once during 1st month of building operation;

.2 once during 3rd month of building operation;

.3 once between 4th and 10th month in a season opposite to 1st and 3rd month visits.

1.31 PROJECT CLOSEOUT SUBMITTALS

.1 Prior to application for Substantial Performance of the Work, submit required items and documentation specified, including following:

.1 Operating and Maintenance Manuals;

.2 as-built record drawings and associated data;

.3 extended warranties for equipment as specified;

.4 operating test certificates, i.e. Sprinkler Test Certificate;

.5 final commissioning report and TAB report;

.6 identified keys for equipment and/or panels for which keys are required, and other items required to be submitted;

.7 other data or products specified.

1.32 INSTRUCTIONS TO OWNER

.1 Refer to equipment and system operational and maintenance training requirements specified in Division 01.

.2 Train Owner's designated personnel in aspects of operation and maintenance of equipment and systems as specified. Demonstrations and training are to be performed by qualified technicians employed by equipment/system manufacturer/supplier. Supply hard copies of training materials to each attendee.

.3 Unless where specified otherwise in trade Sections, minimum requirements are for manufacturer/suppliers of each system and major equipment, to provide minimum two separate sessions each consisting of minimum 4 hours on site or in factory training (at Owner's choice), of Owner's designated personnel (for up to 6 people each session), on operation and maintenance procedures of system.

.4 For each item of equipment and for each system for which training is specified, prepare training modules as specified below. Use Operating and Maintenance Manuals during training sessions. Training modules include but are not limited to:

.1 Operational Requirements and Criteria – equipment function, stopping and starting, safeties, operating standards, operating characteristics, performance curves, and limitations;

.2 Troubleshooting – diagnostic instructions, test and inspection procedures;

.3 Documentation – equipment/system warranties, and manufacturer's/supplier's parts and service facilities, telephone numbers, email addresses, and the like;

.4 Maintenance – inspection instructions, types of cleaning agents to be used as well as cleaning methods, preventive maintenance procedures, and use of any special tools;

.5 Repairs – diagnostic instructions, disassembly, component removal and repair instructions, instructions for identifying parts and components, and review of any spare parts inventory.

.5 Before instructing Owner's designated personnel, submit to Consultant for review preliminary copy of training manual and proposed schedule of demonstration and training dates and times. Incorporate Consultant's comments in final copy.

.6 Obtain in writing from Consultant list of Owner's representatives to receive instructions. Submit to Consultant prior to application for Certificate of Substantial Performance of the Work, complete list of systems for which instructions were given, stating for each system:

.1 date instructions were given to Owner's staff;

.2 duration of instruction;

.3 names of persons instructed;

.4 other parties present (manufacturer's representative, consultants, etc.).

.7 Obtain signatures of Owner's staff to verify they properly understood system installation, operation and maintenance requirements, and have received operating and maintenance instruction manuals and "as-built" record drawings.

.8 Submit to Consultant, copy of electronic version of training materials loaded on USB flash drive. Include in operating and maintenance manuals submission.

1.33 FINAL INSPECTION

.1 Submit to Consultant, written request for final inspection of systems. Include written certification that:

.1 deficiencies noted during job inspections have been completed;

.2 field quality control procedures have been completed;

.3 systems have been tested and verified, balanced and adjusted, and are ready for operation;

.4 maintenance and operating data have been completed and submitted to, reviewed with Consultant and accepted by Owner;

.5 tags and nameplates are in place and equipment identifications have been completed;

.6 clean-up is complete;

.7 spare parts and replacement parts specified have been provided and acknowledged by Consultant;

.8 as-built and record drawings have been completed and submitted to and reviewed with Consultant and accepted by Owner;

.9 Owner's staff has been instructed in operation and maintenance of systems;

.10 commissioning procedures have been completed.

1.34 ALLOWANCES

.1 Include in Bid amount a prime cost allowance for the following schools:

.1 St. Jude CES - $3,100

.2 Allowance is for new exhaust fan(s). Refer to drawings for location and quantity of fans.

.3 Amount of allowance is to be net and is to include product and material costs (less applicable trade discounts), including delivery to site and applicable taxes.

.4 Other costs, including unloading and handling at site, installation, overhead and profit and other burdens are to be included in Bid amount, not in allowance.

.5 Whenever costs are more or less than amount of allowance, Contract amount will be adjusted accordingly by Change Order.

.6 Materials and products under allowance will be selected by Owner in sufficient time to avoid delays to work, and Owner reserves right to take entire or any part of allowance out of Contract amount at any time.

.7 Expenditure from above allowances may be made only upon receipt of order signed by Consultant. Relationship of Contractor and Subcontractors performing work to be paid out of allowances to be strictly between Contractor and Contractor's Subcontractors.

2 PRODUCTS

NOT USED

3 EXECUTION

NOT USED

END OF SECTION

1 GENERAL

1.01 APPLICATION

.1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Mechanical Divisions. It is intended as a supplement to each Section and is to be read accordingly.

1.02 SUBMITTALS

.1 Submit shop drawings/product data sheets for:

.1 pressure gauges and thermometers;

.2 electric motors (submit with equipment they are associated with).

.2 Submit weight loads for selected equipment (upon request).

.3 Submit copy of architectural reflected ceiling plan drawings and elevation drawings to indicate proposed access door locations.

.4 Submit samples of materials and any other items as specified in Sections of Mechanical Divisions.

.5 Submit a list of equipment identification nameplates indicating proposed wording and sizes.

.6 Submit a list of pipe and duct identification colour coding and wording.

.7 Submit a proposed valve tag chart and a list of proposed valve tag numbering and identification wording.

.8 Submit drawings indicating size and location of required sleeves, recesses and formed openings in poured or precast concrete work.

.9 As specified in Part 2 of this Section, submit a spare belt set, tagged and identified, for each belt driven piece of equipment.

.10 Submit any other submittals specified in this Section or other Sections of Mechanical Divisions.

2 PRODUCTS

2.01 FIRESTOPPING AND SMOKE SEAL MATERIALS

.1 Firestopping and smoke seal system materials for mechanical penetrations through fire rated construction are specified in Section entitled Firestopping and Smoke Seal Systems and work is to be included as part of mechanical work.

2.02 ACCESS DOORS

.1 Coordinate consistency of look and finish of access doors on project with each Division of Work. Coordinate exact requirements with General Trades Contractor.

.2 Access doors to be rust resistant steel door panels, with concealed hinges and positive locking and self-opening screwdriver operated lock. Wall type frame to be suitable for wall installation and have integral keys for plaster walls. Doors in tile wall to be stainless steel and in ceilings to be suitable for plaster covering with only frame joint showing. Other doors to be prime painted steel.

.3 Size access doors to suit the concealed work for which they are supplied, and wherever possible they are to be of standard size for all applications, but in any case they are to be minimum 300 mm x 300 mm (12" x 12") for hand entry and 600 mm x 600 mm (24" x 24") for body entry.

.4 Lay-in type tiles, properly marked, may serve as access panels. Coordinate marking of ceiling tiles with Consultant. Panels in glazed tile walls to be 12 gauge, 304 alloy stainless steel, No. 4 finish, with recessed frame secured with stainless steel counter-sunk flush head screws.

.5 Panels in plaster surfaces to have dish-shaped door and welded metal lath, ready to take plaster. Provide a plastic grommet for door key access.

.6 Other access doors to be welded 12 gauge steel, flush type with concealed hinges, lock and anchor straps, complete with factory prime coat. Submit to Consultant for review, details of non-standard door construction details.

.7 Access doors in fire rated ceilings, walls, partitions, structures, etc., to be ULC listed and labelled and of a rating to maintain fire separation integrity.

.8 Where access doors are located in surfaces where special finishes are required, they are to be of a recessed door type capable of accepting finish in which they are to be installed so as to maintain final building surface appearance throughout.

.9 Acceptable manufacturers include Le Hage, SMS, Pedlar and Acudor.

2.03 EQUIPMENT BELT DRIVES

.1 ANSI/RMA Standard V-belt type rated at minimum 1.5 times motor nameplate rating, and in accordance with following requirements:

.1 belts are to be reinforced cord and rubber, and multiple belts are to be matched sets;

.2 sheaves are to be cast iron or steel, secured to shafts with removable keys unless otherwise specified, standard adjustable pitch (± 10% range) for motors under 10 HP, fixed pitch type with split tapered bushing and keyway for motors 10 HP and larger, and, if required, replaced as part of mechanical work to suit system air/water quantity testing and balancing work;

.3 motor slide rail adjustment plates are to allow for centre line adjustment.

.2 Supply a spare belt set (tagged and identified) for each belt drive and hand to Owner upon Substantial Performance of the Work.

2.04 EQUIPMENT DRIVE GUARDS AND ACCESSORIES

.1 For V-belt drives – removable, 4-sided, fully enclosed, galvanized sheet steel guards to OHSA standards, cleaned, factory primed and painted with yellow equipment enamel, complete with a 2-piece full length hinged front panel to permit belt maintenance or replacement without removing guard, and 40 mm (1-½") diameter tachometer openings at each shaft location.

.2 For flexible couplings – removable "U" shaped galvanized steel guards to OHSA Standards with a 2.3 mm (3/32") thick frame and expanded mesh face.

.3 For unprotected fan inlets and outlets – unless otherwise specified, removable 20 mm (¾") galvanized steel wire mesh with galvanized steel frames, all to OHSA Standards.

2.05 ELECTRIC MOTORS

.1 Unless otherwise specified, motors are to conform to NEMA Standard MG1, applicable IEEE Standards, and applicable CSA C22.2 Standards, and are to meet NEMA standards for maximum sound level ratings under full load. Confirm motor voltages prior to ordering.

.2 Vertically mounted and submersible motors are to be purposely designed for mounting in this attitude.

.3 Efficiency of 1-phase motors to 1 HP is to be in accordance with CAN/CSA C747. Efficiency of 3-phase motors 1 HP and larger is to be in accordance with CAN/CSA C390 or IEEE 112B.

.4 Unless otherwise specified, 1-phase motors smaller than ½ HP are to be 115 volt, continuous duty capacitor start type with an NEMA 48 or 56 frame size, solid base, heavy-gauge steel shell with solid die-cast end shields, dynamically balanced die-cast rotor, integral automatic reset thermal overload protection, Class "B" insulation, and a 1.15 service factor at 40°C (105°F) ambient temperature.

.5 Explosion-proof 1-phase motors are to be totally enclosed, fan cooled, 115 volt continuous duty capacitor start type in accordance with CSA C22.2 No. 145, as specified for standard 1-phase motors but suitable for use in Class 1 Group D hazardous locations and complete with a rolled steel shell and a 1.0 service factor at 40°C (105°F) ambient temperature.

.6 Unless otherwise specified, motors ½ HP and larger are to be totally enclosed, fan cooled, 3-phase, T-frame, squirrel cage continuous duty induction motors suitable for voltages indicated on Drawings, NEMA Design "B" for normal starting torque or Design "C" for high starting torque as required by the application, each complete with Class "B" insulation, a 1.15 service factor at 40°C ambient temperature, grease lubricated open ball bearings with grease fittings to permit re-lubrication without dismantling motor, a cast iron frame with cast iron feet where required, cast iron end bracket and precision machined bearing fit, and balanced carbon steel shaft assembly with die-cast aluminum rotor windings.

.7 Explosion-proof 3-phase motors are to be totally enclosed fan cooled motors in accordance with CSA C22.2 No. 145, generally as specified above for standard 3-phase motors but suitable for use in Class 1 Group D hazardous locations and with a 1.0 service factor at 40°C (105°F) ambient temperature.

.8 Motor(s) for 2-speed fan(s) are to be as above but 2-speed double winding type.

.9 Unless otherwise indicated, motors 30 HP and larger are to be complete with a heat sensing PTC thermistor in the end turn of stator winding for each phase and connected in series inside motor with 2 marked leads brought out to motor conduit box.

.10 Motors for equipment with variable frequency drives are to be generally as specified above but inverter duty type to NEMA Standard MG-1 Part 31, quantified by CSA for operation from a variable frequency drive of type specified, and complete with Class "H" insulation. Motors are to be equipped with AEGIS, or approved equal, shaft grounding ring system to protect bearings from damage by diverting harmful shaft voltages and bearing currents to ground.

.11 Motors for equipment which is scheduled or specified with a corrosion resistant coating or constructed from corrosion resistant materials are to be factory coated with a primer and epoxy paint finish.

.12 Acceptable manufacturers are:

.1 TECO-Westinghouse Motors (Canada) Inc.;

.2 Canadian General Electric;

.3 Baldor Electric Co.;

.4 U.S. Electrical Motors;

.5 Weg Electric Corp.;

.6 Marathon Electric;

.7 Toshiba Corp.;

.8 Leeson Canada.

2.06 MOTOR STARTERS AND ACCESSORIES

.1 Motor starters must be capable of starting associated motors under the imposed loads. Confirm starter voltage matches motor prior to ordering.

.2 Unless otherwise specified, starters for 1-phase motors are to be 115 volt, thermal overload protected manual starting switches with a neon pilot light, a surface or recessed enclosure to suit the application, and, where automatic operation is required, a separate H-O-A switch in an enclosure to match starter enclosure.

.3 Unless otherwise specified, starters for 3-phase motors less than 50 HP are to be combination "quick-make" and "quick-break" fused disconnects and full voltage non-reversing across-the-line starters, each complete with and overload relay per phase, an enclosure to suit the application, and, a H-O-A switch, pilot lights, control transformer, auxiliary contacts, and other accessories as per motor starter schedule.

.4 Unless otherwise specified, starters for 3-phase motors 50 HP to 150 HP are to be reduced voltage, non-reversing, auto-transformer type starters complete with one overload relay per phase, an enclosure to suit the application, and, a H-O-A switch, pilot lights, control transformer, auxiliary contacts, and other accessories as per motor starter schedule.

.5 Unless otherwise specified, starters for 3-phase motors 150 HP and larger are to be reduced voltage, non-reversing, closed transition "wye-delta" starters complete with one overload relay per phase, an enclosure to suit the application, and, a H-O-A switch, pilot lights, control transformer, auxiliary contacts, and other accessories as per motor starter schedule.

.6 Starters for 2-speed double winding motors are to be generally as specified above but suitable for motor and equipped with a 45 second time delay to permit equipment to coast down to low speed before it is operated at low speed.

.7 Starters for 2-speed single winding motors are to be generally as specified above but suitable for motor and equipped with a 45 second time delay to permit equipment to coast down to low speed before it is operated at low speed.

.8 Starters for reversible motors for cooling towers are to be generally as specified above but suitable for motor and equipped with a 45 second time delay to allow fan(s) to coast down to a stop before being operated in reverse rotation.

.9 Unless otherwise specified, motor starter enclosures are to be in accordance with following NEMA ratings:

.1 enclosures located in sprinklered areas – Type 2;

.2 enclosures exposed to the elements – Type 3R, constructed of stainless steel;

.3 enclosures inside the building in wet areas – Type 3R, constructed of stainless steel;

.4 enclosures in explosion rated area – Type 7 with exact requirements to suit the area and application;

.5 enclosures except as noted above – Type 1;

.6 enclosures located in finished areas – as above but recess type with brushed stainless steel faceplate.

.10 Motor control centres are to be multi-unit, 2.28 m (9') high, NEMA Class 1, type "B", factory assembled, dead front, floor mounted, free-standing motor control centre with tin plated copper bus and an NEMA Type 1 or Type 2 enclosure as for loose starters specified above. Each motor control centre is to be complete with starters as specified above, load and control wiring terminal boards, and required facilities for line and load side power wiring connections.

.11 Disconnect switches for motor control centres are to be heavy-duty, CSA certified, front operated switches as per motor starter schedule, each complete with a handle suitable for padlocking in "off" position and arranged so that door cannot be opened with handle in "on" position and an NEMA enclosure as specified for loose starters. Fusible units are to be complete with fuse clips to suit fuse types specified below.

.12 Fuses are to be, unless otherwise scheduled or specified, English Electric Ltd. HRC fuses, Form I Class "J" for constant running equipment and Form II Class "C" for equipment that cycles on and off.

.13 Acceptable manufacturers are:

.1 Rockwell Automation Inc. - Allen-Bradley;

.2 Eaton Corp. – Cutler-Hammer;

.3 Eaton Corp. – Moeller Electric;

.4 Siemens Canada;

.5 Schneider Electric.

2.07 SPRINKLER PROOFING

.1 Provide drip shields for protection of surface mounted equipment enclosures from water spray and dripping of liquids. Features of shields include:

.1 factory constructed by respective equipment manufacturers;

.2 constructed from non-combustible materials (sheet steel);

.3 enamel painted to match equipment;

.4 surfaces and edges filled/sanded smooth prior to painting;

.5 supported from equipment with structural steel rods/metal framing or other method approved by Consultant;

.6 structural support finish painted to match shield.

.2 Include with equipment shop drawings, detailed dimensions of drip shields and methods of supporting.

.3 Equipment with top cable/conduit entries to include additional sealing of entries with gasketting and/or waterproof sealant to prevent water from entering enclosure.

.4 Design ventilation louvers such that live components are not exposed to water spray and dripping liquids.

.5 Above requirements are additional minimum "sprinkler proof" standards for equipment specified as NEMA 1, 2 or 12.

.6 Obtain CSA approval where required by local governing authorities.

2.08 MECHANICAL WORK IDENTIFICATION MATERIALS

.1 Equipment nameplates are to be minimum 1.6 mm (1/16") thick 2-ply laminated coloured plastic plates, minimum 12 mm x 50 mm (½" x 2") for smaller items such as damper motors and control valves, minimum 25 mm x 65 mm (1" x 2-½") for equipment, and minimum 50 mm x 100 mm (2" x 4") for control panels and similar items. Additional requirements are as follows:

.1 unless otherwise specified or required, each nameplate is to be white, complete with bevelled edges and black engraved wording to completely identify equipment and its use with no abbreviations;

.2 wording is generally to be as per drawings, i.e. Fan EF-1, and is to include equipment service and building area/zone served, but must be reviewed prior to engraving;

.3 supply stainless steel screws for securing nameplates in place;

.4 nameplates for equipment suspended above floor level or generally not within easy viewing from floor level are to be increased in size so as to be easily readable from floor level.

.2 Duct identification is to be custom made Mylar stencils with 50 mm (2") high lettering to accurately describe duct service, i.e. "AHU-1 SUPPLY", complete with a directional arrow, and coloured ink with ink pads and roller applicators. Ink colour is generally to be black but must contrast with lettering background.

3 EXECUTION

3.01 GENERAL PIPING AND DUCTWORK INSTALLATION REQUIREMENTS

.1 Unless otherwise specified, locate and arrange horizontal pipes and ducts above or at ceiling on floors, arranged so that under consideration of all other work in area, maximum ceiling height and/or usable space is maintained. If required to maintain ceiling heights, reroute and/or resize ductwork, with Consultant’s approval.

.2 Unless otherwise specified, install work concealed in finished spaces, and concealed to degree possible in partially finished and unfinished spaces. Refer to and examine Architectural drawings and room finish schedules to determine finished, partially finished, and unfinished areas. Walls which are painted are considered finished.

.3 Install pipes and ducts parallel to building lines and to each other.

.4 Neatly group and arrange exposed work.

.5 Locate work to permit easy access for service or maintenance as required and/or applicable. Locate valves, dampers and any other equipment which will or may need maintenance or repairs and which are to be installed in accessible construction so as to be easily accessible from access doors. Where valves, dampers and similar piping or ductwork accessories occur in vertical services in shafts, pipe spaces or partitions, locate accessories at floor level.

.6 Make connections between pipes of different materials using adapters suitable for application. Provide cast brass dielectric type adapters/unions at connections between ferrous and copper pipe.

.7 Comply with equipment and material manufacturer's installation instructions unless otherwise specified herein or on drawings, and unless such instructions contradict governing codes and regulations.

.8 Carefully clean ducts, pipe and fittings prior to installation. Temporarily cap or plug ends of pipe, ducts and equipment which are open and exposed during construction.

.9 Install piping and ductwork which are to be insulated so that they have sufficient clearance to permit insulation and finish to be applied continuously and unbroken around pipe or duct, except for ductwork at fire barriers, in which case insulation will be terminated at each side of the duct fire damper.

.10 Inspect surfaces and structure prepared by other trades before performing work. Verify surfaces or structure to receive work has no defects or discrepancies which could result in poor application or cause latent defects in installation and workmanship. Report defects in writing. Installation of work will constitute acceptance of such surfaces as being satisfactory.

.11 Any ferrous piping that exhibits in excess of 5% surface rust, either inside or outside or both, is to be wire brush cleaned to bare metal and coated with suitable primer. Steel pipe, fittings and accessories are to be free of corrosion and dirt when work is complete or prior to being concealed from view. Where dirt is evident, clean piping prior to being concealed.

.12 For factory applied finishes, repaint or refinish surfaces damaged during shipment and installation. Quality of repair work is to match original finish. This requirement also applies to galvanized finishes.

.13 Where mechanical work is located in high humidity areas where ferrous metal products will be subject to corrosion and protection for such products is not specified, provide finishes on products to protect against corrosion or provide products which will not corrode in the environment, i.e. aluminium ductwork, copper or stainless steel pipe, etc.

.14 Provide screwed unions or flanges in piping connections to equipment and in regular intervals in long (in excess of 12 m [40']) piping runs to permit removal of sections of piping.

.15 Unless otherwise specified and except where space limitations do not permit, piping elbows are to be long radius. Eccentric reducers are to be installed with straight side at top of piping.

3.02 DUCT OPENINGS

.1 Duct openings, air inlet and outlet openings, fire damper and similar openings will be provided in new poured concrete work, masonry, drywall and other building surfaces by trade responsible for particular construction in which opening is required.

.2 Size openings for fire dampers to 600 mm (24") high to suit damper arrangement with folding blade out of air stream.

.3 For duct openings except where fire dampers are required, pack and seal space between duct or duct insulation and duct opening as specified above for pipe openings in non-fire rated construction.

3.03 INSTALLATION OF FASTENING AND SECURING HARDWARE

.1 Provide fastening and securing hardware required for mechanical work to maintain installations attached to structure or to finished floors, walls and ceilings in a secure and rigid manner capable of withstanding dead loads, live loads, superimposed dead loads, and any vibration of installed products.

.2 Use fasteners compatible with structural requirements, finishes and types of products to be connected. Do not use materials subject to electrolytic action or corrosion where conditions are liable to cause such action.

.3 Where floor, wall or ceiling construction is not suitable to support loads, provide additional framing or special fasteners to ensure proper securement to structure that is to support the products. Provide reinforcing or connecting supports where required to distribute loading to structural components.

.4 Obtain written consent before using explosive actuated fastening devices. If consent is obtained, comply with requirements of CAN/CSA Z166.1 and CAN/CSA Z166.2.

.5 Do not attach fasteners to steel deck without written consent from Consultant.

3.04 SUPPLY OF ACCESS DOORS

.1 Supply access doors to give access to mechanical work which may need maintenance or repair but which is concealed in inaccessible construction, except as otherwise specified herein or on drawings.

.2 Before commencing installation of mechanical work, coordinate with other trades and prepare on a set of reflected ceiling plans and wall elevations, complete layouts of access doors. Submit these layouts for Consultant's review and show exact sizes and locations of such access doors. Locate and arrange mechanical work to suit.

.3 Access doors will be installed by trade responsible for particular type of construction in which doors are required. Supply access doors to trade installing same at proper time.

.4 Wherever possible, access doors to be of a standard size for each application. Confirm exact dimensions and minimum size restrictions with Consultant prior to ordering.

.5 Group piping and ductwork to ensure minimum number of access doors is required.

.6 Submit a sample of each proposed access door for review prior to ordering.

.7 Coordinate with Electrical Contractor and General Trades Contractor to ensure access doors on project are provided by a single manufacturer, installed as part of work of General Trades Contractor and work involving both mechanical and electrical services should, where possible, be accessible from common access door. Coordinate work to ensure common location access doors are not supplied by both Mechanical Divisions and Electrical Divisions.

3.05 INSTALLATION OF EQUIPMENT DRIVE GUARDS AND ACCESSORIES

.1 Provide OHSA guards for exposed accessible rotating parts such as belt drives, couplings, fan wheels, and shaft ends on mechanical equipment.

.2 Install belt guards to allow movement of motors for adjusting belt tension.

.3 Provide a means to permit lubrication and use of test instruments with guards in place.

.4 Secure guards to equipment or equipment base but do not bridge sound or vibration isolation.

.5 Where equipment oil level gauges, oil reservoirs, grease cups, or grease gun fittings are integral with equipment but are not easily accessible for service, extend to an accessible location using aluminium or copper tubing.

3.06 MECHANICAL WORK IDENTIFICATION

.1 Identify new exposed piping and ductwork as per Part 2 of this Section in locations as follows:

.1 at every end of every piping or duct run;

.2 adjacent to each valve, strainer, damper and similar accessory;

.3 at each piece of connecting equipment;

.4 on both sides of every pipe and duct passing through a floor, wall or partition, unless otherwise specified;

.5 at 6 m (20') intervals on pipe and duct runs exceeding 6 m (20') in length;

.6 at least once in each room, and at least once on pipe and duct runs less than 6 m (20') in length.

.2 Unless otherwise specified identify new concealed piping and ductwork as per Part 2 of this Section in locations as follows:

.1 at points where pipes or ducts enter and leave rooms, shafts, pipe chases, furred spaces, and similar areas;

.2 at maximum 6 m (20') intervals on piping and ductwork above suspended accessible ceilings, and at least once in each room;

.3 at each access door location;

.4 at each piece of connected equipment, automatic valve, etc..

.3 Provide an identification nameplate for equipment provided as part of this project, including items such as control valves, motorized dampers, instruments, and similar products. Secure nameplates in place, approximately at eye level if possible, with stainless steel screws unless such a practice is prohibitive, in which case use epoxy cement applied to cleaned surfaces. Locate nameplates in the most conspicuous and readable location.

.4 Paint new natural and/or propane gas piping with primer and 2 coats of yellow paint in accordance with Code requirements and requirements of Painting Section in Division 09. Identify piping at intervals as specified above.

.5 Provide an identification nameplate for each motor starter or disconnect switch located in a motor control centre or on a motor starter panel, and on each individually mounted starter provided as part of mechanical work, and on each disconnect switch provided as part of the electrical work for motorized equipment provided as part of mechanical work.

.6 Where shut-off valves, control dampers, sensors, and similar items which will or may need maintenance and/or repair are located above accessible suspended ceilings, provide round coloured ceiling tacks in ceiling panel material, or stickers equal to Brady "Quick Dot" on ceiling grid material to indicate locations of items. Unless otherwise specified, ceiling tack or sticker colours are to be as follows:

.1 HVAC piping valves and equipment: yellow

.2 fire protection valves and equipment: red

.3 plumbing valves and equipment: green

.4 HVAC ductwork dampers and equipment: blue

.5 control system hardware and equipment: orange

3.07 FINISH PAINTING OF MECHANICAL WORK

.1 Finish paint exposed mechanical work as specified and/or scheduled in accordance with requirements of painting Section in Division 09.

.2 Touch-up paint damaged factory applied finishes on mechanical work products.

3.08 SUPPLY OF MOTOR STARTERS AND ACCESSORIES

.1 Unless otherwise shown or specified, supply a starter for each item of motorized equipment. Refer to Motor Starter Schedule.

.2 Where 3-phase starters are indicated in motor control centres, supply motor control centres with starters and bolt to a concrete housekeeping pad.

.3 Where package type equipment with integral starters, or equipment with starters integral in loose power and control panels supplied with equipment is fed from a motor control centre, provide a disconnect switch in motor control centre in lieu of a motor starter.

.4 Where 3-phase starters are indicated and/or scheduled to be mounted on a motor starter panel, starters will be mounted and connected, complete with panels and splitter trough, as part of electrical work. Hand starters to electrical trade at site when they are required.

.5 Where package type equipment with integral starters, or equipment with starters integral in loose power and control panels supplied with equipment is fed from a motor starter panel, a disconnect switch will be provided on motor starter panel as part of electrical work.

.6 Unless otherwise specified or shown on drawings, 1-phase motor starters will be mounted adjacent to equipment they serve and connected complete as part of electrical work. Hand starters to electrical trade at site at the proper time.

3.09 ELECTRICAL WIRING WORK FOR MECHANICAL WORK

.1 Unless otherwise specified or indicated, following electrical wiring work for mechanical equipment will be done as part of the electrical work:

.1 "line" side power wiring to motor starters or disconnect switches in motor control centres and starters or disconnects on motor starter panels, and "load" side wiring from starters or disconnects to equipment;

.2 "line" side power wiring to individual wall mounted starters, and "load" side wiring from starters to equipment;

.3 "line" side power wiring to pre-wired power and control panels and variable frequency drives (VFD), and "load" side power wiring from the panels and VFD's to equipment;

.4 provision of receptacles for plug-in equipment;

.5 provision of disconnect switches for motors in excess of 10 m (30') from starter location, or cannot be seen from starter location, and associated power wiring;

.6 motor starter interlocking in excess of 24 volts;

.7 wiring from motor winding thermistors in motors 30 HP and larger to motor starter contacts;

.8 120 volt power connections to electrical receptacles integral with small ceiling exhaust fans, including wiring through light switches or speed controllers;

.9 120 volt wiring connections to lighting fixture/switch combinations integral with air handling units;

.10 120 volt wiring connections to duplex receptacles integral with air handling unit control panels.

.2 Mechanical wiring work not listed above or specified herein or on drawings to be done as part of electrical work is to be installed in conduit and is to be done as part of mechanical work in accordance with wiring requirements specified for electrical work.

3.10 EQUIPMENT BASES AND SUPPORTS

.1 Unless otherwise specified or required, set floor mounted equipment on minimum 100 mm (4") high reinforced concrete housekeeping pads 200 mm (8") clear of equipment on each side and end, or a minimum of 200 mm (8") from centreline of equipment anchor bolts to edge of the base, whichever is larger. Conform to following requirements:

.1 supply dimensioned drawings and equipment base templates, and provide anchor bolts for proper setting and securing of equipment on pads;

.2 place anchor bolts during concrete pour and be responsible for required levelling, alignment, and grouting of equipment;

.3 as a minimum, use wire mesh reinforcement, however, for pads for large heavy equipment, use reinforcement as per structural drawing details.

.2 For equipment not designed for base mounting, where required, provide welded, cleaned and prime coat painted structural steel stands or supports conforming to following requirements:

.1 provide stands and supports, except those for small equipment, designed by a structural engineer registered in jurisdiction of the work, and submit stamped and signed design drawings with calculations as shop drawings for review;

.2 flange bolt steel stands to concrete housekeeping pads;

.3 seismically restrained stands and supports in accordance with applicable requirements.

3.11 CUTTING, PATCHING AND CORE DRILLING

.1 Unless otherwise provided by General Trades, perform cutting, patching, and core drilling of existing building required for installation of mechanical work. Perform cutting in a neat and true fashion, with proper tools and equipment to Consultant's approval. Patching is to exactly match existing finishes and be performed by tradesmen skilled in particular trade or application. Work is subject to review and acceptance by Consultant.

.2 Criteria for cutting holes for additional services:

.1 cut holes through slabs only; no holes to be cut through beams;

.2 cut holes 150 mm (6") diameter or smaller only; obtain approval from Structural Consultant for larger holes;

.3 keep at least 100 mm (4") clear from beam faces;

.4 space at least 3 hole diameters on centre;

.5 for holes that are required closer than 25% of slab span from supporting beam face, use cover meter above slab to clear slab top bars;

.6 for holes that are required within 50% of slab span, use cover meter underside of slab to clear slab bottom bars;

.7 submit sleeving drawings indicating holes and their locations for Structural Consultant's review.

.3 Do not cut or drill any existing work without approval from Owner and Consultant. Be responsible for damage done to building and services caused by cutting or drilling.

.4 Where pipes pass through existing construction, core drill an opening. Size openings to leave 12 mm (½") clearance around pipes or pipe insulation.

.5 Prior to drilling or cutting an opening, determine, in consultation with Consultant and Owner, and by use of non-destructive radar scan (magnetic scan) of slab or wall, presence of any existing services and reinforcement bars concealed behind building surface to be cut and locate openings to suit. Coring is not permitted through concrete beams or girders.

.6 Where drilling is required in waterproof slabs, size opening to permit snug and tight installation of a pipe sleeve sized to leave 12 mm (½") clearance around pipe or pipe insulation. Provide a pipe sleeve, constructed of Schedule 40 galvanized steel pipe with a flange at one end and of a length to extend 100 mm (4") above slab, in opening. Secure flange to the underside of slab and caulk void between sleeve and slab opening with proper non-hardening silicone base caulking compound to produce a water-tight installation.

.7 Firestop and seal openings in fire rated construction in accordance with requirements of article entitled Firestopping and Smoke Seal Materials in this Section. Do not leave openings open overnight unless approved by Owner and Consultant.

3.12 PACKING AND SEALING CORE DRILLED PIPE OPENINGS

.1 Pack and seal void between pipe opening and pipe or pipe insulation for length of opening as follows:

.1 non-fire rated interior construction – pack with mineral wool and seal both ends of opening with non-hardening silicone base caulking compound to produce a water-tight seal;

.2 exterior walls above grade – pack with mineral wool and seal both ends of sleeves water-tight with non-hardening silicone base caulking compound unless mechanical type seals have been specified;

.3 exterior walls below grade (and any other wall where water leakage may be a problem) – seal with link type mechanical seals as specified.

3.13 FLASHING FOR MECHANICAL WORK PENETRATING ROOF

.1 Perform required flashing work, including counter-flashing, for mechanical work penetrating and/or set in roof.

.2 Perform flashing work in accordance with requirements of drawing details, and requirements specified in Division 07.

3.14 CLEANING MECHANICAL WORK

.1 Refer to cleaning requirements specified in Division 01.

.2 Clean mechanical work prior to application for Substantial Performance of the Work.

.3 Include for vacuum cleaning interior of air handling units and ductwork systems.

3.15 CONNECTIONS TO OTHER EQUIPMENT

.1 Carefully examine Contract Documents during bidding period and include for mechanical work piping and/or ductwork connections to equipment requiring such connections.

3.16 FAN NOISE LEVELS

.1 Submit sound power levels with fan shop drawings/product data, with levels measured to AMCA 300 and calculated to AMCA 301.

3.17 EQUIPMENT AND SYSTEM MANUFACTURER'S CERTIFICATION

.1 When equipment/system installation is complete, but prior to start-up procedures, arrange and pay for equipment/system manufacturer's authorized representative to visit site to examine installation, and after any required corrective measures have been made, to certify in writing to Consultant that equipment/system installation is complete and in accordance with equipment/system manufacturer's instructions.

3.18 EQUIPMENT AND SYSTEM START-UP

.1 When installation of equipment/systems is complete but prior to commissioning, perform start-up for equipment/systems as specified in mechanical work Sections in accordance with following requirements:

.1 submit a copy of each equipment/system manufacturer's start-up report sheet to Consultant for review, and incorporate any comments made by Consultant;

.2 under direct on-site supervision and involvement of equipment/system manufacturer's representative, start-up equipment/systems, make any required adjustments, document procedures, leave equipment/systems in proper operating condition, and submit to Consultant complete set of start-up documentation sheets signed by manufacturer/supplier and Contractor.

END OF SECTION

1 GENERAL

1.01 APPLICATION

.1 This Section specifies vibration isolation product requirements that are common to mechanical work Sections of the Specification and it is a supplement to each Section and is to be read accordingly.

1.02 SUBMITTALS

.1 Submit copies of manufacturer's product data sheets for products specified in this Section. Product data sheets are to include product characteristics, limitations, dimensions, finishes, and installation recommendations.

.2 Submit a letter from vibration isolation manufacturer to certify correct installation of products, as specified in Part 3 of this Section.

2 PRODUCTS

2.01 GENERAL

.1 Vibration isolation products are to be in accordance with drawing schedule and details, and as specified below.

.2 Springs are to be stable, colour coded, selected to operate at no greater than ⅔ solid load, designed in accordance with Society of Automotive Engineers Handbook Supplement 9 entitled Manual on Design and Application of Helical and Spiral Springs, and with spring diameters in accordance with manufacturer's recommendations to suit static deflection and maximum equipment load.

.3 Steel components of isolation products not exposed to the weather or moisture are to be zinc plated. Steel components of isolation products exposed to the weather or in a damp, moist environment are to be factory painted with rust inhibiting primer and 2 coats of neoprene.

.4 Where weight of isolated equipment may change significantly due to draining or filling with a liquid, vibration isolators are to be equipped with limit stops to limit spring extensions.

.5 Flexible piping connections to vibration isolated equipment are specified in the appropriate piping sections of the Specification.

2.02 ISOLATION PADS

.1 Sandwich type pads, 20 mm (¾") nominal thickness, selected for 3.2 mm (1/8") static deflection unless otherwise specified, consisting of 2 waffle type or ribbed 50 durometer neoprene pads permanently bonded to a minimum #10 gauge steel plate, and complete with rubber bushed bolt holes and equipment anchor bolts with neoprene isolation grommets.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type NSN;

.2 The VMC Group Vibration Mounting & Controls Inc. (Korfund-Dynamics) "SHEAR-FLEX PLATES";

.3 Kinetics Noise Control Vibron Products Group Type NGS/NGD;

.4 Mason Industries Inc. Type SW/S/SW with HG Bolt Insertion Washers;

.5 J. P. America Inc. Type JSJ.

2.03 RUBBER FLOOR ISOLATORS

.1 Captive, bridge bearing quality neoprene mount selected for a minimum 4 mm (0.15") static deflection unless otherwise specified, with an integral ductile iron housing and integral equipment anchor bolt.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type R;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) Type RSM;

.3 Kinetics Noise Control Vibron Products Group Type RQ;

.4 Mason Industries Inc. Type BR;

.5 J. P. America Inc. Type TRM.

2.04 SPRING FLOOR ISOLATORS

.1 Seismically rated captive spring mount isolator complete with levelling bolts, upper and lower neoprene spring cups, neoprene cushion, ductile iron housing, neoprene sound pads, and neoprene isolation grommets for securing bolts.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type SFS;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) Type AMSR;

.3 Kinetics Noise Control Vibron Products Group Type FLSS;

.4 Mason Industries Inc. Type SSLFH;

.5 J. P. America Inc. Type TSO-C-SC.

2.05 OPEN SPRING MOUNTS

.1 Base mount free-standing assemblies, each complete with a stable colour coded steel spring welded in place, drilled mild steel mounting plate bonded to a ribbed rubber or neoprene acoustical pad, and an external 16 mm (5/8") diameter level adjustment bolt.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type FS;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) "Spring-Flex" Type A;

.3 Kinetics Noise Control Vibron Products Group Type FDS;

.4 Mason Industries Inc. Type SLFH;

.5 J. P. America Inc. Type TSO.

2.06 CLOSED SPRING MOUNTS

.1 Base mount free-standing enclosed assemblies, each complete with stable colour coded spring(s), 2 piece cast housing, non-binding rubber horizontal stabilizers, a ribbed rubber or neoprene acoustical pad bonded to base of the closed housing, and an external level adjustment bolt.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type CM;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) "Spring-Flex" Types B and C;

.3 Kinetics Noise Control Vibron Products Group Type FLS;

.4 Mason Industries Inc. Type C;

.5 J. P. America Inc. Type TSC.

2.07 TOTALLY RETAINED SPRING MOUNTS

.1 Base mount free-standing enclosed and retained assemblies to limit both vertical and lateral movement of mounted equipment, each complete with stable colour coded spring(s), drilled welded steel housing and top plate, ribbed rubber or neoprene acoustical pad bonded to bottom of housing, vertical limit adjusting hardware, and a level adjustment bolt.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type CSR;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) "Spring-Flex" Type MS;

.3 Kinetics Noise Control Vibron Products Group Type SM;

.4 Mason Industries Inc. Type SLRSO;

.5 J. P. America Inc. Type TSR.

2.08 SPRING HANGERS

.1 Welded steel plate housing with top and bottom rod mounting holes and spring retainer, neoprene double deflection isolation element, stable colour coded spring, and heavy-duty rubber washers.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type SHR-SN;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) "Spring-Flex" Series HRSA;

.3 Kinetics Noise Control Vibron Products Group. Type SRH;

.4 Mason Industries Inc. Type 30N;

.5 J. P. America Inc. Type TSH.

2.09 NEOPRENE HANGER ISOLATORS

.1 Neoprene double deflection rod isolators with steel housing and hanger rod bushing, selected for a minimum 4 mm (0.15") static deflection unless otherwise specified.

.2 Acceptable products are:

.1 Vibro-Acoustics Ltd. Type NH;

.2 The VMC Group Vibration Mounting & Controls (Korfund-Dynamics) Type HR;

.3 Kinetics Noise Control Vibron Products Group Type RH;

.4 Mason Industries Inc. Type HD or WHD;

.5 J. P. America Inc. Type TRH.

3 EXECUTION

3.01 INSTALLATION OF VIBRATION ISOLATION MATERIALS

.1 Provide vibration isolation products for mechanical work in accordance with drawing schedule and details, and requirements specified herein and/or on drawings.

.2 Supply to vibration isolation product manufacturer or supplier a copy of a "reviewed" shop drawing or product data sheet for each piece of equipment to be isolated and dimensioned pipe layouts of associated piping to be isolated.

.3 Unless otherwise specified, vibration isolation products are to be product of one manufacturer.

.4 Ensure vibration isolation manufacturer coordinates material selections with equipment provided in order to ensure adherence to performance criteria. Allow for expansion and contraction when material is selected and installed.

.5 Unless otherwise indicated, install isolation materials for base mounted equipment on concrete housekeeping pad bases which extend at least over the full base and isolated area of the isolated equipment. Additional requirements are as follows:

.1 block and shim bases level so ductwork and piping connections can be made to a rigid system at proper operating level, before isolated adjustment is made, and ensure there is no physical contact between isolated equipment and building structure;

.2 steel bases are to clear the sub-base by 25 mm (1");

.3 concrete bases are to clear the sub-base by 50 mm (2").

.6 Isolate piping larger than 25 mm (1") dia. directly connected to motorized and/or vibration isolated equipment with 25 mm (1") static deflection spring hangers at spacing intervals in accordance with following:

.1 for pipe less than or equal to 100 mm (4") dia. – first 3 points of support;

.2 for pipe 125 mm (5") to 200 mm (8") dia. – first 4 points of support;

.3 for pipe equal to or greater than 250 mm (10") dia. – first 6 points of support;

.7 First point of isolated piping support is to have a static deflection of twice the deflection of the isolated equipment but maximum 50 mm (2").

.8 Secure top of spring hanger frame rigidly to structure, and do not install spring hangers in concealed locations.

.9 Where it is impossible to use at least 2 spring hangers, provide Senior Flexonics Ltd. Style 102 (or 102-U as required) or equal, twin sphere, moulded rubber flexible connection assemblies, selected by manufacturer and suitable in all respects for intended application, and complete with required nipples and connections to provide proper vibration isolation.

.10 Erect roof curb vibration isolation in accordance with instructions shipped with assembly. Match vibration isolation with associated roof top unit and orient isolation as identified by manufacturer to ensure proper loading and optimum performance. Caulk top of roof curb with 2 beads of caulking provided and centre isolation assembly onto roof curb and, unless otherwise noted, screw in place with 50 mm (2") lag screws at 900 mm (36") O.C. Position gasket on top rail or alternatively, caulk with 2 beads of caulking provided and orient and lower roof top unit onto isolation rails and, unless otherwise noted, screw unit into top rail with 25 mm (1") lag screws at 900 mm (36") O.C. After roof top unit is secured in place, but before damageable work is installed, spray each isolated equipment assembly with water and correct any water leaks.

.11 For control wiring connections to vibration isolated equipment ensure flexible metallic conduit with 90° bend is used for conduit 25 mm (1") dia. and smaller, and for conduit larger than 25 mm (1") dia., use Crouse Hinds EC couplings. Connections are to be long enough so that conduit will remain intact if equipment moves 300 mm (12") laterally from its installed position, and flexible enough to transmit less vibration to structure than is transmitted through vibration isolation. Coordinate these requirements with mechanical trades involved. If electrical power connections are not made in a similar manner as part of the electrical work, report this fact to Consultant.

.12 Arrange and pay for vibration isolation product manufacturer to visit site to inspect installation of his equipment. Perform revision work required as a result of improper installation. When vibration isolation equipment manufacturer is satisfied with the installation, obtain and submit a letter stating manufacturer has inspected the installation and equipment is properly installed.

END OF SECTION

1 GENERAL

1.01 APPLICATION

.1 This Section specifies insulation requirements common to Mechanical Divisions work Sections and it is a supplement to each Section and is to be read accordingly.

1.02 DEFINITIONS

.1 "concealed" – means mechanical services and equipment above suspended ceilings, in non-accessible chases, in accessible pipe spaces, and furred-in spaces.

.2 "exposed" – means exposed to normal view during normal conditions and operations.

.3 "mineral fibre" – includes glass fibre.

.4 "mineral wool" – includes rock wool and slag wool.

.5 "domestic water" or "potable water" – means piping extended from building Municipal supply main.

1.03 SUBMITTALS

.1 Submit a product data sheet for each insulation system product.

1.04 QUALITY ASSURANCE

.1 Mechanical insulation is to be applied by a licensed journeyman insulation mechanic, or by an apprentice under direct, daily, on-site supervision of a journeyman mechanic.

.2 Do not apply insulation unless leakage tests have been satisfactorily completed.

.3 Ensure surfaces to be insulated are clean and dry.

.4 Ensure ambient temperature is minimum 13°C (55°F) for at least 1 day prior to application of insulation, and for duration of insulation work, and relative humidity is and will be at a level such that mildew will not form on insulation materials.

.5 Insulation materials must be stored on site in a proper, dry storage area. Any wet insulation material is to be removed from site.

2 PRODUCTS

2.01 FIRE HAZARD RATINGS

.1 Unless otherwise specified, insulation system materials inside building must have a fire hazard rating of not more than 25 for flame spread and 50 for smoke developed when tested in accordance with ULC S102, Surface Burning Characteristics of Building Materials and Assemblies.

2.02 THERMAL PERFORMANCE

.1 Unless otherwise specified, thermal performance of insulation is to meet or exceed values given in Tables entitled Minimum Piping Insulation Thickness Heating and Hot Water Systems and Minimum Piping Insulation Thickness Cooling Systems, as stated in ANSI/ASHRAE/IES Standard 90.1 version referenced in Ontario Building Code.

2.03 DUCTWORK SYSTEM INSULATION MATERIALS

.1 Rigid Mineral Fibre Board

.1 Pre-formed board type insulation to ASTM C612, 48 kg/m^3 (3 lb/ft^3) density, with a factory applied reinforced aluminum foil and kraft paper facing.

.2 Acceptable products are:

.1 Knauf Fiber Glass Insulation Board with FSK facing;

.2 Manson Insulation Inc. "AK BOARD FSK";

.3 Johns Manville Inc. Type 814 "Spin-Glas";

.4 Owens Corning 703.

.2 Semi-Rigid Mineral Fibre Board

.1 Roll form insulation to ASTM C1393, consisting of cut strips of rigid mineral board insulation glued to an aluminium foil and kraft paper facing.

.2 Acceptable products are:

.1 Multi-Glass Insulation Ltd. "Multi-Flex MKF";

.2 Owens Corning Pipe and Tank Insulation;

.3 Johns Manville Inc. Pipe and Tank Insulation "Micro-Flex".

.3 Blanket Mineral Fibre

.1 Blanket type roll form insulation to ASTM C553, 24 kg/m^3 (1-½ lb/ft^3) density, 40 mm (1-½") thick, with a factory applied vapour barrier facing.

.2 Acceptable products are:

.1 Johns Manville Inc. Microlite FSK Duct Wrap Type 150;

.2 Knauf Fiber Glass Blanket Insulation FSK Duct Wrap Type III;

.3 Manson Insulation Inc. ALLEY WRAP FSK Duct Wrap Type III;

.4 Certainteed Corporation Softtouch FSK Duct Wrap Type 150.

.4 Flexible Foam Elastomeric

.1 Sheet form, CFC free, closed cell, self-adhering elastomeric nitrile rubber insulation with a water vapour permeability rating of 0.08 in accordance with ASTM E96 Procedure A.

.2 Acceptable products are:

.1 Armacell "AP Armaflex";

.2 IK Insulation Group "K-Flex Duct Wrap", S2S.

2.04 INSULATING COATINGS

.1 Equal to Robson Thermal Manufacturing Ltd. insulating coatings as follows:

.1 anti-condensation coating, "No Sweat-FX";

.2 thermal insulating coating, "ThermaLite".

2.05 INSULATION FASTENINGS

.1 Wire

.1 Minimum #15 gauge galvanized annealed wire.

.2 Duct Insulation Fasteners

.1 Weld-on 2 mm (3/32") diameter zinc coated steel spindles of suitable length, complete with minimum 40 mm (1-½") square plastic or zinc plated steel self-locking washers.

.3 Tape Sealant

.1 Equal to 3M 1520-CW self-adhesive insulation tapes, types PAF, FSK, ASJ, or SWV as required to match surface being sealed.

.4 Mineral Fibre Insulation Adhesive

.1 Clear, pressure sensitive, brush consistency adhesive, suitable for a temperature range of -20°C to 82°C (-4°F to 180°F), compatible with type of material to be secured, and WHMIS classified as non-hazardous.

.5 Flexible Elastomeric Insulation Adhesive

.1 Armacell "Armaflex" #520 air-drying contact adhesive.

.6 Screws

.1 No. 10 stainless steel sheet metal screws.

2.06 INSULATION JACKETS AND FINISHES

.1 Flexible Insulation Jacketing

.1 Equal to 3M VentureClad 1577CW Series, flexible, laminated, self-adhering, protective jacketing, vapour barrier with 0.00 permeability rating and weatherproofing membrane, having a high performance acrylic adhesive capable of installation with no additional mechanical attachment and with a maximum flame spread/smoke developed rating of 25/50 when tested in accordance with ULC S102. Review finish colour requirements with Consultant before ordering.

.2 Coating for Flexible Foam Elastomeric Insulation

.1 Flexible foam elastomeric insulation protective coating equal to Armacell "WB Armaflex" weatherproof, water-based latex enamel finish.

3 EXECUTION

3.01 GENERAL INSULATION APPLICATION REQUIREMENTS

.1 Unless otherwise specified, do not insulate following:

.1 factory insulated equipment and piping;

.2 heating piping within radiation unit enclosures, including blank filler sections of enclosures;

.3 heating piping in soffits and/or overhang spaces and connected to bare element radiation in spaces;

.4 branch potable water piping located under counters to serve counter mounted plumbing fixtures and fittings, except barrier-free lavatories;

.5 exposed chrome plated potable water angle supplies from concealed piping to plumbing fixtures and fittings, except barrier-free lavatories;

.6 heated liquid system pump casings, valves, strainers and similar accessories;

.7 heating system expansion tanks;

.8 fire protection pump casings;

.9 manufactured expansion joints and flexible connections;

.10 acoustically lined ductwork and/or equipment;

.11 factory insulated flexible branch ductwork;

.12 fire protection system water storage tanks;

.13 piping unions, except for unions in "cold" category piping.

.2 Install work generally in accordance with TIAC National Insulation Standards Manual except conform to manufacturer's instructions and recommendations, and requirements specified in this Section.

.3 Install insulation directly over pipes and ducts, not over hangers and supports.

.4 Install piping insulation and jacket continuous through pipe openings and sleeves.

.5 Install duct insulation continuous through walls, partitions, and similar surfaces except at fire dampers.

.6 For insulation thicknesses greater than or equal to 75 mm (3"), provide double layer of insulation to achieve required insulation thickness and stagger joint locations.

.7 When insulating "cold" piping and equipment, extend insulation up valve bodies and other such projections as far as possible, and protect insulation jacketing from condensation at its junction with metal.

.8 When insulating vertical piping risers 75 mm (3") diameter and larger, use insulation support rings welded directly above lowest pipe fitting, and thereafter at 4.5 m (14.7') centres and at each valve and flange. Insulate in accordance with Thermal Insulation Association of Canada National Insulation Standards, Figure No. 9.

.9 Where existing insulation work is damaged as a result of mechanical work, repair damaged insulation work to Project work standards.

.10 Where mineral fibre rigid sleeve type insulation is terminated at valves, equipment, unions, etc., neatly cover exposed end of insulation with a purpose made PVC cover on "cold" piping, and with canvas jacket material on "hot" piping.

.11 Carefully and neatly gouge out insulation for proper fit where there is interference between weld bead, mechanical joints, etc., and insulation. Bevel away from studs and nuts to permit their removal without damage to insulation, and closely and neatly trim around extending parts of pipe saddles.

.12 Where thermometers, gauges, and similar instruments occur in insulated piping, and where access to heat transfer piping balancing valve ports and similar items are required, create a neat, properly sized hole in insulation and provide a suitable grommet in the opening.

3.02 DUCTWORK INSULATION REQUIREMENTS – MINERAL FIBRE

.1 Insulate following ductwork systems inside building and above ground with mineral fibre insulation of thickness indicated:

.1 outside air intake ductwork, casings and plenums from fresh air intakes to and including mixing plenums or sections, or, if mixing plenums or sections are not provided, to first heating coil, or if both mixing plenums or sections and heating coil sections are not provided, and fresh air is not tempered, then the fresh air ductwork system complete – minimum 40 mm (1-½") thick as required;

.2 mixed supply air or preheated supply air casings, plenums and sections to and including the fan section where not factory insulated – minimum 25 mm (1") thick rigid board or minimum 40 mm (1-½") thick flexible blanket as required;

.3 supply air ductwork outward from fans, except for supply ductwork exposed in area it serves – minimum 25 mm (1") thick rigid board or minimum 40 mm (1-½") thick flexible blanket as required;

.4 exhaust discharge ductwork for a distance of 3 m (10') downstream (back) from exhaust openings to atmosphere, including any exhaust plenums within the 3 m (10') distance – minimum 25 mm (1") thick rigid board or minimum 40 mm (1-½") thick flexible blanket as required;

.5 any other ductwork, casings, plenums or sections specified or detailed on drawings to be insulated – thickness as specified.

.2 Provide rigid board type insulation for casings, plenums, and exposed rectangular ductwork. Provide blanket type insulation for concealed round, oval or rectangular ductwork. Provide semi-rigid mineral fibre board type insulation for exposed round or oval ducts.

.3 Liberally apply adhesive to surfaces of exposed rectangular ducts and/or casings. Accurately and neatly press insulation into adhesive with tightly fitted butt joints. Provide pin and washer insulation fasteners at 300 mm (12") centres on bottom and side surfaces. Secure and seal joints with 75 mm (3") wide tape sealant. Additional installation requirements as follows:

.1 at trapeze hanger locations, install insulation between duct and hanger;

.2 provide drywall type metal corner beads on edges of ductwork, casings and plenums in equipment rooms, service corridors, and any other area where insulation is subject to accidental damage, and secure in place with tape sealant.

.4 Liberally apply adhesive to surfaces of concealed rectangular or oval ductwork, and wrap insulation around duct with a top butt joint and tight section to section butt joints. Provide pin and washer insulation fasteners at 300 mm (12") centres on bottom surfaces. Secure and seal joints with 75 mm (3") tape sealant. At each trapeze type duct hanger, provide a 100 mm (4") wide full length piece of rigid mineral fibre board insulation between duct and hanger.

.5 Accurately cut sections of insulation to fit tightly and completely around exposed and concealed round or oval ductwork. Liberally apply adhesive to surfaces of duct, and wrap insulation around duct with a top butt joint and tight section to section butt joints. Seal joints with tape sealant. At duct hanger locations install insulation between duct and hanger. At each hanger location for concealed ductwork where flexible blanket type insulation is used, provide a 100 mm (4") wide full circumference strip of semi-rigid board type duct insulation between duct and hanger.

.6 Insulation application requirements common to all types of rigid ductwork are as follows:

.1 at duct connection flanges, insulate flanges with neatly cut strips of rigid insulation material secured with adhesive to side surfaces of flange with a top strip to cover exposed edges of the side strips, then butt the flat surface duct insulation up tight to flange insulation, or, alternatively, increase insulation thickness to depth of flange and cover top of flanges with tape sealant;

.2 installation of fastener pins and washers is to be concurrent with duct insulation application;

.3 cut insulation fastener pins almost flush to washer and cover with neatly cut pieces of tape sealant;

.4 accurately and neatly cut and fit insulation at duct accessories such as damper operators (with standoff mounting) and pitot tube access covers;

.5 prior to concealment of insulation by either construction finishes or canvas jacket material, patch vapour barrier damage by means of tape sealant.

3.03 DUCTWORK INSULATION REQUIREMENTS – FLEXIBLE ELASTOMERIC

.1 Insulate exposed exterior ductwork (except fresh air intake ductwork) and associated plenums and/or casings outside building with minimum 50 mm (2") thick flexible elastomeric sheet insulation as required, applied in two minimum 25 mm (1") thick layers with staggered tightly butted joints.

.2 Install with adhesive in strict accordance with manufacturer’s instructions to produce a weather-proof installation. Ensure sheet metal work joints are sealed watertight prior to applying insulation.

3.04 APPLICATION OF INSULATING COATINGS

.1 Apply, in accordance with manufacturer’s instruction, insulating coatings to following bare metal surfaces:

.1 paint bare metal surfaces clear of "cold" piping and/or equipment insulation for a distance of from 300 mm (12") to 600 mm (24") clear of pipe or equipment insulation, with "No Sweat-FX" anti-condensation coating;

.2 paint bare metal surfaces associated with mechanical systems with an operating temperature 60°C (140°F) with "ThermaLite" insulating coating.

.2 Apply coatings with a brush. Remove any splatter or excess coating from adjacent surfaces.

3.05 INSULATION FINISH REQUIREMENTS

.1 Flexible Insulation Jacketing

.1 Submit list with shop drawing submittal indicating which services are to be provided with flexible insulation jacketing. For services inside building, ensure product utilized has been tested to CAN/ULC S102 and meets local governing flame spread/smoke developed requirements.

.2 Confirm finish/colour with Consultant before ordering.

.3 Install in accordance with manufacturer's instructions and recommendations.

END OF SECTION

1 GENERAL

1.01 APPLICATION

.1 This Section specifies requirements, criteria, methods and execution for mechanical demolition work that are common to one or more mechanical work Sections, and it is intended as a supplement to each Section and is to be read accordingly.

2 PRODUCTS

Not Used

3 EXECUTION

3.01 DISCONNECTION AND REMOVAL OF EXISTING MECHANICAL WORK

.1 Where indicated on drawings, disconnect and remove existing mechanical work, including hangers, supports, insulation, etc. Disconnect at point of supply, remove obsolete connecting services and make system safe. Cut back obsolete piping behind finishes and cap water-tight unless otherwise specified.

.2 Scope and extent of demolition or revision work is only generally indicated on drawings. Estimate scope, extent and cost of work at site during bidding period site visit(s). Claims for extra costs for demolition work not shown or specified but clearly visible or ascertainable at site during bidding period site visits will not be allowed.

.3 If any re-design is required due to discrepancies between mechanical drawings and site conditions, notify Consultant who will issue a Site Instruction. If, in the opinion of Consultant, discrepancies between mechanical drawings and actual site conditions are of a minor nature, required modifications are to be done at no additional cost.

.4 Where existing mechanical services extend through, or are in an area to serve items which are to remain, maintain services in operation. Include for rerouting existing services concealed behind existing finishes and which become exposed during renovation work, so as to be concealed behind new or existing finishes.

.5 Unless otherwise specified, remove from site and dispose of existing materials which have been removed and are not to be relocated or reused, except for following which are to be handed over to Owner at site.

3.01 INTERRUPTION TO AND SHUT-DOWN OF MECHANICAL SERVICES AND SYSTEMS

.1 Coordinate shut-down and interruption to existing mechanical systems with Owner. Include for costs of premium time to perform work during nights, weekends or other times outside of normal working hours, which may be necessary to comply with stipulations specified herein this Article. Services for operation of existing non-renovated areas of building are to be maintained.

.2 Upon award of a Contract, submit a list of anticipated shut-down times and their maximum duration.

.3 Prior to each shut-down or interruption, inform Owner and Consultant in writing 5 working days in advance of proposed shut-down or interruption and obtain written consent to proceed. Do not shut-down or interrupt any system or service without such written consent. Shutdowns of some essential services may require additional advance notification time.

.4 Perform work associated with shut-downs and interruptions as continuous operations to minimize shut-down time and to reinstate systems as soon as possible, and, prior to any shut-down, ensure materials and labour required to complete the work for which shut-down is required are available at site.

.5 Pipe freezing may be used to connect new piping to existing piping without draining existing piping. Pipe freeze equipment is to be equal to "NORDIC FREEZE" equipment supplied by Mag Tool Inc. (1-800-661-9983) or Rigid Tool Co. RIGID "SuperFreeze".

END OF SECTION

1 GENERAL

1.01 APPLICATION

.1 This Section specifies mechanical system testing, adjusting, and balancing requirements that are common to mechanical work Sections of the Specification and it is a supplement to each Section and is to be read accordingly.

1.02 DEFINITIONS

.1 "Agency" – means agency to perform testing, adjusting and balancing work.

.2 "TAB" – means testing, adjusting and balancing to determine and confirm quantitative performance of equipment and systems and to regulate specified fluid flow rate and air patterns at terminal equipment, e.g., reduce fan speed, throttling, etc.

.3 "hydronic systems" – includes heating water, chilled water, glycol-water solution, condenser water, and any similar system.

.4 "air systems" – includes outside air, supply air, return air, exhaust air, and relief air systems.

.5 "flow rate tolerance" – means allowable percentage variation, minus to plus, of actual flow rate values in Contract Documents.

.6 "report forms" – means test data sheets arranged for collecting test data in logical order for submission and review, and these forms, when reviewed and accepted, should also form permanent record to be used as basis for required future testing, adjusting and balancing.

.7 "terminal" – means point where controlled fluid enters or leaves the distribution system, and these are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.

.8 "main" – means duct or pipe containing system's major or entire fluid flow.

.9 "submain" – means duct or pipe containing part of the systems' capacity and serving 2 or more branch mains.

.10 "branch main" – means duct or pipe servicing 2 or more terminals.

.11 **"**branch" – means duct or pipe serving a single terminal.

1.03 SUBMITTALS

.1 Within 30 days of work commencing at site, submit name and qualifications of proposed testing and balancing agency in accordance with requirements of article entitled Quality Assurance below.

.2 Submit sample test forms, if other than those standard forms prepared by Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB), are proposed for use.

.3 Submit a report by Agency to indicate Agency's evaluation of mechanical drawings with respect to service routing and location or lack of balancing devices. Include set of drawings used and marked-up by Agency to prepare report.

.4 Submit a report by Agency after each site visit made by Agency during construction phase of this Project.

.5 Submit a draft report, as specified in Part 3 of this Section.

.6 Submit a final report, as specified in Part 3 of this Section.

.7 Submit a testing and balancing warranty as specified in Part 3 of this Section.

.8 Submit reports listing observations and results of post construction site visits as specified in Part 3 of this Section.

1.04 QUALITY ASSURANCE

.1 Employ services of an independent testing, adjusting, and balancing agency meeting qualifications specified below, to be single source of responsibility to test, adjust, and balance building mechanical systems to produce design objectives. Agency is to have successfully completed testing, adjusting and balancing of mechanical systems for a minimum of 5 projects similar to this Project within past 3 years, and is to be certified as an independent agency in required categories by one of following:

.1 AABC - Associated Air Balance Council;

.2 NEBB - National Environmental Balancing Bureau.

.2 Testing, adjusting and balancing of complete mechanical systems is to be performed over entire operating range of each system in accordance with 1 of following publications:

.1 National Standards for a Total System Balance published by Associated Air Balance Council;

.2 Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems published by National Environmental Balancing Bureau;

.3 Chapter 37, Testing, Adjusting, and Balancing of ASHRAE Handbook HVAC Applications.

2 PRODUCTS

Not Used

3 EXECUTION

3.01 SCOPE OF WORK

.1 Perform total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of fluid quantities of mechanical systems as required to meet design specifications and comfort conditions, and recording and reporting results.

.2 Mechanical systems to be tested, adjusted and balanced include:

.1 TAB of air handling systems is to include equipment and ductwork air temperatures, capacities and flows.

3.02 TESTING, ADJUSTING AND BALANCING

.1 Conform to following requirements:

.1 as soon as possible after award of Contract, Agency is to carefully examine a white print set of mechanical drawings with respect to routing of services and location of balancing devices, and is to issue a report listing results of the evaluation;

.2 set of drawings examined by Agency is to be returned with evaluation report, with red line mark-ups to indicate locations for duct system test plugs, and required revision work such as relocation of balancing devices and locations for additional devices;

.3 after review of mechanical work drawings and specification, Agency is to visit site at frequent, regular intervals during construction of mechanical systems, to observe routing of services, locations of testing and balancing devices, workmanship, and anything else that will affect testing, adjusting and balancing;

.4 after each site visit, Agency is to report results of site visit indicating date and time of visit, and detailed recommendations for any corrective work required to ensure proper adjusting and balancing;

.5 testing, adjusting and balancing is not to begin until:

.1 building construction work is substantially complete and doors have been installed;

.2 mechanical systems are complete in all respects, and have been checked, started, adjusted, and then successfully performance tested.

.6 mechanical systems to be tested, adjusted and balanced are to be maintained in full, normal operation during each day of testing, adjusting and balancing;

.7 obtain copies of reviewed shop drawings of applicable mechanical plant equipment and terminals, and temperature control diagrams and sequences;

.8 Agency is to walk each system from system "head end" equipment to terminal units to determine variations of installation from design, and system installation trades will accompany Agency;

.9 Agency is to check valves and dampers for correct and locked position, and temperature control systems for completeness of installation before starting equipment;

.10 wherever possible, Agency is to lock balancing devices in place at proper setting, and permanently mark settings on devices;

.11 Agency is to leak test ductwork as specified in Section entitled HVAC Air Distribution in accordance with requirements of SMACNA "HVAC Air Duct Leak Test Manual", coordinate work with work of aforementioned Sections, provide detailed sketch(es) to Sheet Metal Contractor and Consultant identifying ductwork not in accordance with acceptable leakage values specified in aforementioned Sections, and retest corrected ductwork;

.12 Agency is to balance systems with due regard to objectionable noise which is to be a factor when adjusting fan speeds and performing terminal work such as adjusting air quantities, and should objectionable noise occur at design conditions, Agency is to immediately report problem and submit data, including sound readings, to permit an accurate assessment of noise problem to be made;

.13 Agency is to check supply air handling system mixing plenums for stratification, and where variation of mixed air temperature across coils is found to be in excess of ±5% of design requirements, Agency is to report problem and issue a detail sketch of plenum baffle(s) required to eliminate stratification;

.14 Agency is to perform testing, adjusting and balancing to within ±5% of design values, and make and record measurements which are within ±2% of actual values;

.15 for air handling systems equipped with air filters, test and balance systems with simulated 50% loaded (dirty) filters by providing a false pressure drop;

.16 test, adjust and balance air conditioning systems during summer season and heating systems during winter season, including at least a period of operation at outside conditions within 2.8°C (5°F) wet bulb temperature of maximum summer design condition, and within 5.5°C (10°C) dry bulb temperature of minimum winter design condition, and take final temperature readings during seasonal operation.

.2 Prepare reports as indicated below.

.1 Upon completion of testing, adjusting, and balancing procedures, prepare draft reports on AABC or NEBB forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in same manner specified for final reports. Submit 2 complete sets of draft reports. Only 1 complete set of draft reports will be returned.

.2 Upon verification and approval of draft reports, prepare final reports, type written, and organized and formatted as specified below. Submit 2 complete sets of final reports. Use units of measurement (SI or Imperial) as used on Project Documents.

.3 Report forms are to be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, 3-ring binders. Provide binding edge labels with project identification and a title descriptive of contents. Divide contents of binder into divisions listed below, separated by divider tabs:

.1 General Information and Summary;

.2 Air Systems;

.3 Temperature Control Systems;

.4 Special Systems.

.4 Agency is to provide following minimum information, forms and data in report:

.1 inside cover sheet to identify Agency, Contractor, and Project, including addresses, and contact names and telephone numbers and a listing of instrumentation used for procedures along with proof of calibration;

.2 remainder of report is to contain appropriate forms containing as a minimum, information indicated on standard AABC or NEBB report forms prepared for each respective item and system;

.3 Agency is to include for each system to be tested, adjusted and balanced, a neatly drawn, identified (system designation, plant equipment location, and area served) schematic "as-built" diagram indicating and identifying equipment, terminals, and accessories;

.4 Agency is to include report sheets indicating building comfort test readings for all rooms.

.3 After final testing and balancing report has been submitted, Agency is to visit site with Contractor and Consultant to spot check results indicated on balancing report. Agency is to supply labour, ladders, and instruments to complete spot checks. If results of spot checks do not, on a consistent basis, agree with final report, spot check procedures will stop and Agency is to then rebalance systems involved, resubmit final report, and again perform spot checks with Contractor and Consultant.

.4 When final report has been accepted, Contractor is to submit to Owner, in name of Owner, a certificate equal to AABC National Guaranty Certification or a NEBB Quality Assurance Program Bond, and in addition, Contractor is to submit a written extended warranty from Agency covering one full heating season and one full cooling season, during which time any balancing problems which occur, with exception of minor revision work done during scheduled site visits, will, at no cost, be investigated by Agency and reported on to Owner, and if it is determined that problems are a result of improper testing, adjusting and balancing, they are to be immediately corrected without additional cost to Owner.

.5 After acceptance of final report, Agency is to perform post testing and balancing site visits in accordance with following requirements:

.1 post testing and balancing site visits are to be made:

.1 once during first month of building operation;

.2 once during third month of building operation;

.3 once between fourth and tenth months in a season opposite to first and third month visit.

.2 during each return visit and accompanied by Owner’s representative, Agency is to spot rebalance terminal units as required to suit building occupants and eliminate complaints;

.3 Agency is to schedule each visit with Contractor and Owner, and inform Consultant;

.4 after each follow-up site visit, Agency is to issue to Contractor and Consultant a report indicating any corrective work performed during visit, abnormal conditions and complaints encountered, and recommended corrective action.

END OF SECTION

1 GENERAL

1.01 APPLICATION

.1 This Section specifies material requirements for firestopping and smoke seal systems that are common to mechanical work Sections and it is a supplement to each Section and is to be read accordingly.

1.02 SUBMITTALS

.1 Submit a product data sheet and WHIMIS sheet for each firestopping and smoke seal product.

.2 Submit for review, full company name and experience of proposed firestopping and smoke seal system applicator.

.3 Submit letter of proper firestopping and smoke seal certification as specified in Part 3 of this Section.

1.03 QUALITY ASSURANCE

.1 Applicator is to have a minimum of 3 years of successful experience on projects of similar size and complexity, and applicator's qualifications are to be submitted to Consultant for review.

.2 Comply with firestopping and smoke seal product manufacturer’s recommendations regarding suitable environment conditions for product installation.

2 PRODUCTS

2.01 FIRESTOPPING AND SMOKE SEAL SYSTEM MATERIALS

.1 Asbestos-free, elastomeric materials and intumescent materials, tested, listed and labelled by ULC in accordance with CAN/ULC S115, and CAN/ULC S101 for installation in ULC designated firestopping, and smoke seal systems to provide a positive fire, water and smoke seal and a fire resistance rating (flame, hose stream and temperature) no less than fire rating for surrounding construction.

.2 Firestopping and smoke seal material system to be specifically ULC certified with designated reference number for its specific installation. As part of shop drawing submission, submit copies of firestopping drawings with ULC certificate and system number for each specific installation.

.3 Materials are to be compatible with abutting dissimilar materials and finishes and complete with primers, damming and back-up materials, supports, and anchoring devices in accordance with firestopping manufacturer’s recommendations and ULC tested assembly. Coordinate material requirements with trades supplying abutting areas of materials.

.4 Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance ratings.

.5 Typically, for openings of up to 250 mm (10") in diameter, provide putty pad type firestop materials equivalent to Specified Technologies Inc. "SpecSeal" intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibres or silicone compounds.

.6 Typically, for openings of greater than 250 mm (10") in diameter, and for rectangular openings, provide pillow type firestop materials equivalent to Specified Technologies Inc. "SpecSeal" re-enterable, non-curing, mineral fibre core encapsulated on six sides with intumescent coating contained in a flame retardant poly bag.

.7 Pipe insulation forming part of a fire and smoke seal assembly is specified in Section entitled Mechanical Insulation.

.8 Supply products of a single manufacturer for use on work of this Division.

.9 Installer to be manufacturer trained and certified on specific product. Submit copy of certificate with shop drawings.

.10 Include for manufacturer’s authorized representative to inspect and verify each installation and application. Submit test report signed and verified by system installer’s authorized representative and manufacturer’s representative.

.11 Acceptable certification to also include certification by Underwriters Laboratories of Northbrook IL, using tests conforming to ULC-S115 and given cUL listing published by UL in their "Products Certified for Canada (cUL) Directory".

.12 Acceptable manufacturers are:

.1 Specified Technologies Inc.;

.2 3M Canada Inc.;

.3 Tremco;

.4 A/D Fire Protection Systems;

.5 Nelson;

.6 Hilti Canada.

3 EXECUTION

3.01 INSTALLATION OF FIRESTOPPING AND SMOKE SEAL MATERIALS

.1 Where work penetrates or punctures fire rated construction, provide ULC certified, listed and labelled firestopping and smoke sealing packing material systems to seal openings and voids around and within raceway and to ensure that continuity and integrity of fire separation is maintained. Openings not in immediate vicinity of working areas are to be firestopped and sealed same day as being opened.

.2 Install firestopping and smoke seal materials for each installation in strict accordance with specific ULC certification number and manufacturer's instructions. Comply with local governing building code requirements and obtain approvals from local building inspection department. Ensure that openings through fire separations do not exceed maximum size wall opening, and maximum and minimum dimensions indicated in ULC Guide No. 40 U19 for Service Penetration Assemblies and firestopping materials.

.3 Ensure that continuity and integrity of fire separation is maintained and conform to requirements of latest edition of ULC publication "List of Equipment and Materials, Volume II, Building Construction".

.4 Comply with following requirements:

.1 Examine substrates, openings, voids, adjoining construction and conditions under which firestop and smoke seal system is to be installed. Confirm compatibility of surfaces.

.2 Verify penetrating items are securely fixed and properly located with proper space allowance between penetrations and surfaces of openings.

.3 Report any unsuitable or unsatisfactory conditions to Consultant in writing, prior to commencement of work. Commencement of work will mean acceptance of conditions and surfaces.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces. Remove stains on adjacent surfaces.

.5 Prime substrates in accordance with product manufacturer’s written instructions.

.6 Provide temporary forming as required and remove only after materials have gained sufficient strength and after initial curing.

.7 Tool or trowel exposed surfaces to a neat, smooth, and consistent finish.

.8 Remove excess compound promptly as work progresses and upon completion.

.9 At fusible link damper locations, seal perimeter of angle iron framing on both sides of wall or slab with ULC listed and labelled sealant materials to provide a positive smoke seal.

.5 Notify Consultant when work is complete and ready for inspection, and prior to concealing or enclosing firestopping and smoke seal materials and service penetration assemblies. Arrange for final inspection of work by local governing authority inspector prior to concealing or enclosing work. Make any corrections required.

.6 On completion of firestopping and smoke sealing installation, submit a Letter of Assurance to Consultant certifying the firestopping and smoke sealing installation has been carried out throughout the building to service penetrations and that installation has been performed in strict accordance with requirements of local governing building code, any applicable local municipal codes, ULC requirements, and manufacturer’s instructions.

.7 Manufacturer's authorized representative to inspect and verify each installation and provide a test report signed by installing trade and manufacturer's representative. Test report to list each installation and respective ULC certification and number.

.8 Where work requires removal of existing firestopping materials and replacement of firestopping materials after changes have been made, ensure that replacement material is same material and manufacturer of existing if any remains in place, or ensure that all existing material is removed before installation of replacement material.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Submit shop drawings/product data sheets for all products specified in this Section except shop fabricated ductwork and fittings.

.2 Submit duct leakage test data prior to ductwork being covered from view.

.3 Submit manufacturer's colour chart(s) for all items for which a finish colour is to be selected.

2 PRODUCTS

2.01 GALVANIZED STEEL DUCTWORK

.1 Galvanized steel sheet is to be hot dipped in accordance with requirements of ASTM A653. G60 galvanizing for bare uncovered duct to be finish painted. G90 for all other galvanizing.

.2 Rectangular

.1 Lock forming grade hot dip galvanized steel, ASTM A653, shop fabricated, minimum #26 gauge.

.3 Round

.1 Factory machine fabricated, spiral, mechanically locked flat seam, single wall duct, fittings and couplings.

.4 Flat Oval

.1 Factory machine fabricated, single wall, 4-ply spiral lock seam duct, fittings and couplings.

2.02 FLEXIBLE METALLIC DUCTWORK

.1 Bare

.1 Spirally wound, semi-rigid, self-supporting corrugated aluminum duct with continuous triple lock seams, SMACNA Form "M-UN", ULC S110 listed and labelled as a Class 1 Air Duct, constructed of dead soft aluminum strip, and supplied in 3 m (10') lengths.

.2 Insulated

.1 Spirally wound, semi-rigid, self-supporting corrugated aluminum duct with continuous triple lock seams, SMACNA Form "M-I", ULC S110 listed and labelled as a Class 1 Air Duct, constructed of dead soft aluminum strip, supplied in 3 m (10') lengths and factory covered with 40 mm (1-½") thick, 12 kg/m^3 (0.75 lb/ft^3) density fibreglass insulation with a vinyl jacket meeting 25/50 flame spread and smoke developed requirements tested in accordance with CAN/ULC S102.

2.03 FLEXIBLE FABRIC DUCTWORK

.1 Bare

.1 Equal to Flexmaster Canada Ltd. "Fabriflex" Type 4 ULC listed and labelled Class 1 flexible fabric duct consisting of vinyl coated fibreglass cloth mechanically bonded to a corrosion resistant galvanized steel helix.

.2 Insulated

.1 Equal to Flexmaster Canada Ltd. "Fabriflex" Type 4T ULC listed and labelled Class 1 flexible fabric duct consisting of vinyl coated fibreglass cloth mechanically bonded to a corrosion resistant galvanized steel helix and factory insulated with 25 mm (1") thick glass fibre insulation with a polyethylene vapour barrier jacket.

2.04 FLEXIBLE CONNECTION MATERIAL

.1 Waterproof, indoor-outdoor type flexible connection material meeting requirements of NFPA 90A, consisting of woven glass fibre fabric coated on both sides with synthetic rubber. Acceptable products are:

.1 Duro Dyne Canada Inc. "DUROLON";

.2 Dyn Air Inc. "HYPALON".

2.05 METAL DUCT SYSTEM JOINT SEALANT

.1 ULC listed and labelled, premium grade, grey colour, water base, non-flammable duct sealer, brush, or gun applied, with a CAN/ULC S102 tested maximum flame spread rating of 5 and smoke developed rating of 0.

.2 Acceptable manufacturers are:

.1 Johns Manville;

.2 Manson Insulation;

.3 Knauf Insulation.

2.06 ACOUSTIC LINING

.1 Minimum 25 mm (1") thick acoustic lining material meeting 25/50 flame spread and smoke developed ratings tested in accordance with CAN/ULC S102, meeting NFPA 90A, ASTM C1071, and ASTM G21 requirements, not supporting microbial growth, flexible for round ducts, board type for rectangular ducts, consisting of a bonded fiberglass mat coated on inside (airside) face with a black fire-resistant coating.

.2 Acceptable manufacturers are:

.1 Johns Manville;

.2 Manson Insulation;

.3 Knauf Insulation.

2.07 CASING AND PLENUM MATERIAL AND ACCESSORIES

.1 Unless otherwise specified, casing and plenum material is to be same as connecting duct material.

.2 Accessories such as access doors and drain pans are to be constructed of same material as casing and plenum and are to be in accordance with Chapter 6 of SMACNA HVAC Duct Construction Standards Metal and Flexible.

2.08 PLENUM ACCESS DOORS

.1 Factory fabricated, double wall insulated access doors, sized as indicated on drawings, and constructed of same material as connecting ductwork in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible to suit operating pressure of the system.

2.09 ROUND TO RECTANGULAR DUCT CONNECTIONS

.1 Equal to Flexmaster Canada Ltd. galvanized steel, flared, flanged or notched "Spin-On" round duct take-off collars with locking dampers in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

2.10 AIR TURNING VANES

.1 For square elbows, multiple-radius turning vanes interconnected with bars, adequately reinforced to suit pressure and velocity of system, constructed of same material as duct they are associated with, and in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

.2 For short branch ducts at grille and diffuser connections, air extractor type each equipped with a matching bottom operated 90° opposed blade volume control damper, constructed of same material as duct it is associated with and in accordance with requirements and details in ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

2.11 MANUAL BALANCING (VOLUME) DAMPERS

.1 Flanged and drilled, single or parallel blade (depending on damper size) manual balancing dampers, each constructed of same material as connecting ductwork unless otherwise specified, each designed to maintain internal free area of connecting duct, and each complete with:

.1 hexagonal or square shaft extension through frame;

.2 non-stick, non-corrosive synthetic bearings for rectangular dampers, flange stainless steel bearings for round dampers;

.3 blade stops for single blade dampers, designed to prevent blade from moving more than 90°;

.4 linkage for multiple blade dampers;

.5 locking hand quadrant damper operator with, for insulated ducts 50 mm (2") standoff mounting.

.2 Rectangular Dampers: Nailor Industries Inc. 1800 Series, maximum size 1.2 m x 1.2 m (4' x 4') for a single damper.

.3 Round Dampers: Nailor Industries Inc. Model 1890, maximum 600 mm (24") diameter, equipped with a minimum 200 mm (8") deep frame, and blade stiffeners where required.

.4 Multiple Rectangular Damper Section Assembly: Rectangular assembly supplied with the dampers or site constructed, of same material as damper and designed for tight and secure mounting of individual dampers.

.5 Acceptable manufacturers are:

.1 Nailor Industries Inc.;

.2 T.A. Morrison & Co. Inc. "TAMCO";

.3 NCA Manufacturing Ltd.;

.4 Greenheck Fan Corp.;

.5 Ruskin Co.

2.12 BACKDRAFT DAMPERS

.1 Nailor Industries Model 1370CB counterbalanced backdraft dampers, vertical or horizontal mounting, 50 mm (2") wide, sized as shown and complete with:

.1 extruded 6063-T5 aluminum frame, 2.3 mm (0.090") nominal wall thickness, with mitred corners;

.2 extruded 6063-T5 aluminum blades, 1.3 mm (0.050") nominal wall thickness on 92 mm (3-5/8") centres, and with extruded PVC blade seals;

.3 corrosion-resistant synthetic bearings;

.4 adjustable plated steel counterweights mounted internally in the airstream;

.5 concealed blade linkage located out of the airstream.

.2 Acceptable manufacturers are:

.1 Nailor Industries Inc.;

.2 T.A. Morrison & Co. Inc. "TAMCO";

.3 NCA Manufacturing Ltd.;

.4 Greenheck Fan Corp.;

.5 Ruskin Co.

2.13 FUSIBLE LINK DAMPERS

.1 Curtain blade type, dynamic, galvanized steel (unless otherwise specified) fusible link dampers, ULC classified to CAN/ULC S112 and in accordance with NFPA 90A requirements, factory tested for closure under airflow, 1-1/2 hour or 3 hour rated as required, and complete with a constant force type 301 stainless steel closure spring, a blade lock assembly, a steel sleeve, retaining angles, and, unless otherwise specified, a 74°C (165°F) rated standard fusible link.

.2 Fusible link dampers are to be Type "B" or Type "C" (as required) with folded curtain blade out of air stream except where damper size or location requires use of type "A" dampers with curtain blade in air stream.

.3 Acceptable manufacturers are:

.1 Nailor Industries Inc.;

.2 Greenheck Fan Corp.;

.3 NCA Manufacturing Ltd.;

.4 Ruskin Co.;

.5 Price Industries (E.H. Price).

2.14 ROOF DUCT SUPPORTS

.1 Equal to PHP Systems Design Model PHP-D adjustable duct support assemblies sized to suit duct size, each assembly complete with injection moulded recycled plastic and carbon black bases and tubular hot dip galvanized steel framing.

2.15 PRESSURE RELIEF DOORS

.1 Greenheck model PRAD (positive) or VRAD (negative) pressure relief doors constructed of same material as duct or plenum they are associated with, each complete with a sealing gasket, special latches, cable assembly with spring to limit door opening to maximum 80° and factory set, field adjustable pressure relief magnet assembly.

.2 Size access doors to match requirements of system so pressure drop through open blow-out door at required flow rate will not exceed rated pressure of duct system.

.3 Acceptable manufacturers are:

.1 Greenheck Fan Corp.;

.2 United Enertech.

2.16 DUCT ACCESS DOORS

.1 In accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, with sizes suitable in all respects for purpose for which they are provided, and, unless otherwise specified, constructed of same material as duct they are associated with.

2.17 DUCTWORK DRAIN POINTS

.1 Equal to Ductmate Canada Ltd. "Moisture Drain", 20 mm (¾") diameter moisture drains with galvanized sheet metal funnel, and chrome plated brass threaded drain, nut and cap.

3 EXECUTION

3.01 CLEANLINESS REQUIREMENTS FOR HANDLING AND INSTALLATION OF DUCTWORK

.1 Handle and install ductwork in accordance with SMACNA's Duct Cleanliness for New Construction Guidelines at the Advanced Level.

3.02 FABRICATION AND INSTALLATION OF GALVANIZED STEEL DUCTWORK

.1 Provide required ductwork, rectangular, round and/or flat oval. Where rectangular ductwork is shown, round or flat oval ductwork of equivalent cross-sectional area is acceptable.

.2 It is to be understood that all duct dimensions shown on drawings are clear internal dimensions.

.3 Unless otherwise specified, construct and install ductwork in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible to suit duct pressure class designation of minimum 500 Pa (2" w.c.) positive or negative as applicable, a minimum velocity of 10 m/s (2000 fpm), and so ductwork does not "drum". Flat surfaces of rectangular ductwork are to be cross-broken. Duct system sealing is to meet ANSI/SMACNA Seal Class A requirements.

.4 Variable air volume ductwork from supply fans to boxes is as above but rectangular duct take-offs are double side straight taper type with a take-off length equal to 0.5 times the branch duct width but minimum 150 mm (6") length, and double taper side is to have an included angle of minimum 60°.

.5 Confirm routing of all ductwork at site and site measure ductwork prior to fabrication. Duct dimensions may be revised to suit site routing and building element requirements, if dimension revisions are reviewed with and approved by Consultant. Duct routing and/or dimension revisions to suit conditions at site are not grounds for a claim for an extra cost.

.6 Refer to structural drawings. Where ductwork is to be run within or through open web steel joists, ductwork shown on mechanical drawings is schematic only and is to be altered as required to suit steel joist configuration, spacing, panel points, and cross-bridging at no additional cost.

.7 Wherever ductwork is required at locations where sprayed fireproofing is applied to building construction, install ductwork only after fireproofing work is complete and do not compromise fire rating of sprayed fireproofing.

.8 Install (but do not connect) duct system mounted automatic control components supplied as part of the automatic control work.

.9 Where indicated, provide duct connections to fan powered heat transfer equipment with integral coils.

.10 Flange connect ductwork to hot water reheat coils in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible. Coils will be suspended independent of connecting ductwork as part of the heat transfer work.

.11 Support horizontal rectangular ducts inside building in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, but use trapeze hangers with, unless otherwise specified, galvanized steel channels, and galvanized steel hanger rods for exposed ducts and concealed ducts wider than 500 mm (20"). Support hardware constructed of same material as duct for metal duct, and, unless otherwise specified, type 316 stainless steel for non-metal duct. Supports for "heavy" duct such as cementitious core duct is to be suitable in all respects for the application and approved by Consultant.

.12 Support round and flat oval ducts inside building in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, but, unless otherwise specified, for both uninsulated and insulated ducts exposed in finished areas, use bands and secure at top of duct to a hanger rod, all similar to Ductmate Canada Ltd. type "BA". If duct is insulated, size strap to suit diameter of insulated duct. Unless otherwise specified, duct support hardware for metal duct is constructed of same material as duct, and for non-metal duct, type 316 stainless steel.

.13 Where flanged duct joints are used, do not locate joints in wall or slab openings, or immediately at wall or slab openings. Do not use flanged joints for exposed uninsulated ducts in finished areas.

.14 Where watertight horizontal ductwork is required, construct ducts without bottom longitudinal seams. Solder or weld joints of bottom and side sheets. Seal all other joints with duct sealer. Slope horizontal duct to hoods, risers, or drain points. Provide drain points. Provide watertight ductwork for:

.1 ductwork outside building or otherwise exposed to the elements;

.2 dishwasher exhaust;

.3 shower exhaust ducts from grilles to duct main or riser;

.4 minimum of 3 m (10') upstream and downstream of duct mounted humidifiers or humidifier manifolds;

.5 fresh air intakes;

.6 wherever else shown.

.15 Leakage Testing:

.1 Ductwork leakage is not to exceed following:

.1 ductwork to 2" W.C. Class, 1% of total air quantity handled by respective fans;

.2 ductwork exceeding 2" W.C. Class, 2% of total air quantity handled by respective fans.

.2 Leakage testing is to be performed by the Testing, Adjusting and Balancing (TAB) agency in accordance with SMACNA HVAC Air Duct Leakage Test Manual and is to be witnessed by Consultant.

.3 Leakage test following ductwork:

.1 All new and reworked ductwork.

.4 Be responsible for following:

.1 preparing duct systems for leakage testing prior to installation of external insulation including capping duct runouts and provision of final tap-in for test equipment;

.2 schedule testing with TAB agency in advance, be present for all testing and ensure notice is given to Consultant so they may witness testing;

.3 resealing and/or replacement of defective ductwork;

.4 bearing all costs associated with retesting ductwork which has failed to pass leakage testing.

.16 Seal all ductwork in accordance with SMACNA Seal Class "A", except for round duct with self-sealing gasketed fittings and couplings which does not require site applied sealant. Apply sealants by brush or gun to cleaned metal surfaces. Where bare ductwork is exposed apply neat uniform lines of sealant. Randomly brushed, sloppy looking sealant applications will be rejected and must be repaired or replaced with a neat application of sealant.

.17 Apply sealants by brush or gun to cleaned metal surfaces. Where bare ductwork is exposed apply neat uniform lines of sealant. Randomly brushed, sloppy looking sealant applications will be rejected and must be repaired or replaced with a neat application of sealant.

.18 Clean exterior exposed (uninsulated) ducts and coat with a heavy full coverage of Bakor #410-02 black metal paint.

.19 Where dissimilar metal ducts are to be connected, isolate ducts by means of flexible duct connection material.

.20 Round exposed ductwork in Gymnasium is to be 2 metal gauges heavier than standard metal gauge for same size duct, and duct hangers are to be pairs of 9.5 mm (⅜") diameter hanger rods secured to 40 mm (1-½") wide #12 gauge galvanized steel split clamps around full circumference of duct at maximum 1.8 m (72") centres. Provide double nuts and lock washers on each hanger rod above and below each clamp.

3.03 INSTALLATION OF FABRIC DUCTWORK

.1 Provide fabric ductwork.

.2 Secure duct from structure by means of tension cable and suspension components supplied with ductwork.

.3 Install tension cable and suspension components in accordance with duct manufacturer’s instructions.

.4 Provide metal duct connection collars as required.

.5 Start-up fabric duct system in accordance with manufacturer’s instructions.

.6 Do not penetrate fire barriers with fabric duct.

3.04 INSTALLATION OF FLEXIBLE DUCTWORK

.1 Provide maximum 3 m (10') long lengths of flexible ductwork for connections between galvanized steel duct mains and branches, and necks of ceiling grilles and diffusers. Do not install flexible ductwork through walls, even if shown on drawings.

.2 At rectangular galvanized steel duct, accurately cut holes and provide flanged or "Spin-in" round flexible duct connection collars. Seal joints with duct sealer.

.3 Install flexible ducts as straight as possible and support in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, and secure at each end with nylon or stainless steel gear type clamps, and seal joints. Provide long radius duct bends where they are required.

.4 Do not penetrate fire barriers with flexible duct.

3.05 INSTALLATION OF ACOUSTIC LINING

.1 Provide acoustic lining in ductwork in locations as follows:

.1 wherever shown and/or specified on drawings;

.2 supply ductwork downstream of air terminal boxes for a distance of 2.4 m (8') measured along duct and outward from box in all directions;

.3 all transfer air ducts.

.2 Install lining in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, however, for all installations regardless of velocity, at leading and trailing edges of duct liner sections, provide galvanized steel nosing channel in accordance with detail entitled Flexible Duct Liner Installation found in the ANSI/SMACNA manual referred to above.

3.06 INSTALLATION OF CASINGS AND PLENUMS

.1 Provide required shop or site fabricated casings and plenums. Unless otherwise specified or shown, construct casings and plenums of same material as connecting duct system.

.2 Construct and install casings and plenums in accordance with Chapter 6 of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible to suit systems' pressure classification. Ensure plenums and casings secured to building structure are gasketed air-tight and equipped with angle reinforcing.

.3 Provide drain pans with accessible trapped drains for fresh air intake plenums, and wherever else shown.

3.07 INSTALLATION OF CASING AND PLENUM ACCESS DOORS

.1 Provide access doors into all site or shop fabricated casings and plenums requiring access, and wherever shown.

.2 Construct access doors to open in or out to suit positive and negative pressures of system.

.3 Provide pitot tube openings in access doors where required for system air quantity balancing purposes.

.4 Provide suitably sized, engraved, red-white laminated Lamacoid warning nameplates on access doors into casings and plenums where equipment is located, i.e. fans.

3.08 INSTALLATION OF ROUND TO RECTANGULAR DUCT CONNECTIONS

.1 Cut round holes in rectangular ducts and provide round to rectangular lock-in fittings with dampers for connection of flexible round ductwork.

3.09 INSTALLATION OF TURNING VANES

.1 Provide turning vanes in ductwork elbows where shown on drawings and wherever else required where, due to site installation routing and duct elbow radius, turning vanes are recommended in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

.2 Provide volume extractor type turning vanes in short branch supply duct connections off mains to grilles and diffusers where shown and/or specified.

3.10 INSTALLATION OF MANUAL BALANCING (VOLUME) DAMPERS

.1 Provide manual balancing dampers as required to provide a fully balanced system, including but not limited to in all open end ductwork, in all duct mains, and wherever else shown and/or specified.

.2 Install dampers so operating mechanism is accessible and positioned for easy operation, and so dampers cannot move or rattle. Ensure operating mechanisms for dampers in insulated ducts are complete with stand-off mounting brackets.

.3 Where a duct for which a balancing damper is required has dimensions larger than dimensions of maximum size volume damper available, provide multiple dampers bolted together in a properly sized assembly, or bolted to a heavy-gauge black structural steel angle or channel framework which is properly sized. Seal to prevent air by-pass, and provide connecting linkage.

.4 Confirm exact damper locations with personnel doing air quantity balancing testing work and install dampers to suit. Include for providing 5 additional dampers at no additional cost.

3.11 INSTALLATION OF BACKDRAFT DAMPERS

.1 Provide backdraft dampers.

.2 Install and secure dampers so they cannot move or rattle.

3.12 INSTALLATION OF FUSIBLE LINK DAMPERS

.1 Provide fusible link dampers. Ensure damper rating (1-½ or 3 hr.) is suitable for fire barrier it is associated with.

.2 Install dampers with retaining angles on all 4 sides of sleeve on both sides of damper and connect with ductwork in accordance with damper manufacturer’s instructions and details, and Code requirements.

.3 Provide expansion clearance between damper or damper sleeve and opening in which damper is required. Ensure openings are properly sized and located, and all voids between damper sleeve and opening are properly sealed to maintain rating of fire barrier.

.4 Where size of fire barrier opening requires use of a sectionalized fire damper assembly, provide multiple fusible link dampers (sized to CAN/ULC S112) bolted together in a properly sized assembly or bolted to a heavy-gauge black structural steel angle or channel framework.

3.13 INSTALLATION OF FLEXIBLE CONNECTION MATERIAL

.1 Provide a minimum of 100 mm (4") of flexible connection material where ducts, plenums, and/or easings connect to fans, and wherever else shown or specified.

.2 Rigidly secure a minimum of 75 mm (3") of duct material (minimum #24 gauge) to each edge of flexible fabric and to fan, duct, plenum, etc., in accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible. Ensure connections to flexible fabric material are arranged and supported so as to not impose any external forces on the fabric.

3.14 INSTALLATION OF ROOF MOUNTED DUCT SUPPORTS

.1 Supply supports for roof mounted ductwork.

.2 Accurately mark location and spacing of roof support assemblies. At each plastic base location, carefully scrape away loose roof ballast (gravel) and all other debris and dirt. Prime existing membrane with a primer which is compatible with existing roofing components. Set bases in adhesive in accordance with manufacturer's installation instructions. Scrape loose ballast back around and on bases. Install framing, and install ductwork on the cross-members. Secure ductwork to cross-members with galvanized steel banding.

3.15 INSTALLATION OF PRESSURE RELIEF DOORS

.1 Provide pressure release access doors to prevent duct system explosion or implosion as a result of a duct obstruction, i.e. closed fire damper, which prevents normal air flow through the system. Size access doors in accordance with requirements of Part 2 of this Section.

.2 Where pressure release doors are shown in suction ducts or plenums, mount access door assembly so door swings in and latch mechanism is on the inside of duct or plenum. If latch mechanism is not accessible, provide a standard access door at latch side of the pressure release access door for maintenance purposes.

.3 Adjust each latch mechanism by means of the adjusting pin to suit static pressure of the particular system in accordance with latch mechanism manufacturer's instructions.

3.16 INSTALLATION OF DUCT ACCESS DOORS

.1 Provide access doors in ductwork for access to all components which will or may need maintenance and/or repair, including reheat coils. Install in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.

.2 Identify access doors provided for fusible link damper maintenance with "FLD" stencil painted or marker type red lettering and ensure doors are properly located for damper maintenance.

.3 When requested, submit a sample of proposed duct access doors for review.

.4 Where sectionalized fusible link dampers and/or balancing dampers are provided in large ducts, provide a plenum type access door to suit, and adequately reinforce ductwork to suit access door installed.

3.17 DUCT SYSTEM PROTECTION, CLEANING AND START-UP

.1 Temporarily cover all open ends of ducts during construction.

.2 Remove all dirt and foreign matter from entire duct systems and clean duct system terminals and interior of air handling units prior to operating fans.

.3 Prior to starting any supply air handling system provide 50 mm (2") thick glass fibre construction filters at fan equipment in place of permanent filters.

.4 Provide cheesecloth over duct system inlets and outlets and run system for 24 hours, after which remove cheesecloth and construction filters, and install new permanent filters.

.5 Include all labour for a complete site walk-through with testing and balancing personnel following route of all duct systems to be tested, adjusted and balanced for the purpose of confirming proper position and attitude of dampers, location of pitot tube openings, and any other work affecting testing and balancing procedures. Perform corrective work required as a result of this walk-through.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

.1 Submit shop drawings/product data sheets for fans and accessories. Include following:

.1 certified fan performance curves at specified operating point with flow, static pressure and HP clearly plotted;

.2 certified sound power data that conforms to specified levels;

.3 product data sheets for all accessories;

.4 product data sheets for fan motors.

.2 Submit with delivery of each unit a copy of the factory inspection report, and include a copy of each report with O & M Manual project close-out data.

.3 Submit a site inspection and start-up report from manufacturer's representative as specified in Part 3 of this Section.

.4 Supply reviewed copies of fan/curb assembly shop drawings or product data to trade who will cut roof openings for fans, and ensure openings are properly located.

.5 Supply reviewed copies of fan assembly shop drawings or product data to trade who will form/prepare wall openings for fans, and ensure openings are properly located.

1.02 QUALITY ASSURANCE

.1 Fan manufacturers, as applicable, are to be current members of the Air Movement and Control Association International Inc. (AMCA), and fans are to be rated (capacity and sound performance) and certified in accordance with requirements of following standards:

.1 ANSI/AMCA Standard 210, Laboratory Method of Testing Fans for Certified Aerodynamic Performance Rating;

.2 AMCA Standard 211, Product Rating Manual for Fan Air Performance;

.3 ANSI/AMCA Standard 300, Reverberant Room Method for Sound Testing of Fans;

.4 AMCA Standard 311, Product Rating Manual for Fan Sound Performance;

.5 AMCA Standard 99-2408, Operating Limits for Centrifugal Fans.

2 PRODUCTS

2.01 CENTRIFUGAL FANS

.1 Centrifugal fans in accordance with drawing schedule, each capable of operating over the complete pressure class limits as specified in AMCA Standard 99-2408.

.2 Continuously welded heavy-gauge steel housing, braced and reinforced as required to prevent vibration or pulsation, equipped with a discharge flange, spun, aerodynamically designed inlet cones or venturies with wire grid guards, drain plug, and epoxy enamel coated both inside and outside to a 3 mm dry film thickness.

.3 Continuously welded, stable, non-overloading wheel with die-formed steel blades and, unless otherwise required, a cast iron hub, statically and dynamically balanced prior to assembly, then balanced as an assembly and braced and secured to base prior to shipment.

.4 AISI C1040 or C1050 hot rolled steel fan shaft, accurately turned, ground, polished, and ring gauged for accuracy, and sized for a first critical speed of at least 1.25 times the maximum rated speed for fan, and heavy-duty, grease lubricated, ball or roller, self-aligning pillow block type bearings selected for an AFBMA L-10 minimum average bearing life in excess of 200,000 hours, and equipped with extended copper lubrication lines terminated in lubrication fittings immediately inside fan section access door.

.5 NEMA Premium TEFC motor, adjustable V-belt drive selected for 40% service factor based on motor nameplate data, and OHSA guard, all in accordance with requirements of Section entitled Basic Mechanical Materials and Methods.

.6 Fan and motor support base is to be rigid, welded structural steel, vibration isolated base with steel cross members, factory cleaned, deburred, and finished with epoxy enamel, and complete with a slide type motor base and stable, colour coded spring mounts with sound pads selected to suit static deflection and maximum equipment load and to operate at not greater than 2/3 solid load, and shipping restraints.

.7 Unless otherwise specified, finish is to consist of rust inhibiting primer applied to cleaned and deburred metal surfaces prior to assembly, then a second coat of primer after assembly and an air dried epoxy enamel finished coat both inside and outside to a 3 mm dry film thickness.

.8 Acceptable manufacturers are:

.1 Twin City Fan and Blower;

.2 Loren Cook Co.;

.3 Greenheck Fan Corp.;

.4 CML Northern Blower;

.5 PennBarry.

2.02 EXPLOSION-PROOF CENTRIFUGAL FANS

.1 Explosion-proof centrifugal fans in accordance with drawing schedule, each capable of operating over complete pressure class limits as specified in AMCA Standard 99-2408 and rated Spark B in accordance with AMCA Standard 99-0401, Classification for Spark Resistant Construction.

.2 Housing constructed as per ASTM Standard 99-0401 to suit "Spark" classification, with a wheel direct connected to an explosion-proof TEFC motor conforming to requirements specified in Section entitled Basic Mechanical Materials and Methods, statically and dynamically balanced prior to assembly, then balanced as an assembly and secured to base prior to shipment.

.3 Rigid, welded structural steel, vibration isolated fan support base with steel cross members, factory cleaned, deburred, and finished with epoxy enamel, and complete with stable, colour coded spring mounts with sound pads selected to suit static deflection and maximum equipment load and to operate at not greater than 2/3 solid load, and shipping restraints.

.4 Acceptable manufacturers are:

.1 Twin City Fan and Blower;

.2 Loren Cook Co.;

.3 Greenheck Fan Corp.;

.4 CML Northern Blower;

.5 PennBarry.

2.03 UTILITY FANS

.1 Centrifugal, single width and inlet, factory run tested utility fans in accordance with drawing schedule, and capable of operating over complete pressure class limits as specified in AMCA Standard 2408.

.2 Rotatable, continuously welded heavy-gauge steel housing, braced and reinforced as required to prevent vibration or pulsation, equipped with a spun, aerodynamically designed inlet cone, and an attached welded steel bearing and motor support platform.

.3 Riveted aluminum or welded steel wheel, statically and dynamically balanced.

.4 For belt driven fans only, AISI C1040 or C1045 hot rolled steel shaft, accurately turned, ground, polished, and ring gauged for accuracy, and sized for a first critical speed of at least 1.43 times maximum rated speed for fan, equipped with heavy-duty, grease lubricated, ball, pillow block type bearings, selected for a minimum average AFBMA L-50 bearing life of 200,00 hours at the maximum fan RPM, and secured to bearing support platform, and an adjustable V-belt drive with OHSA guard (weather cover) in accordance with requirements of Section entitled Basic Mechanical Materials and Methods.

.5 NEMA Premium TEFC motor conforming to requirements of Section entitled Basic Mechanical Materials and Methods.

.6 Unless otherwise specified, the finish is to consist of rust inhibiting primer applied to cleaned and deburred metal surfaces prior to assembly, then a second coat of primer after assembly and an air dried epoxy enamel finished coat both inside and outside to a 3 mm dry film thickness.

.7 Acceptable manufacturers are:

.1 Twin City Fan and Blower;

.2 Loren Cook Co.;

.3 Greenheck Fan Corp.;

.4 CML Northern Blower;

.5 PennBarry.

2.04 CENTRIFUGAL INLINE FANS

.1 Centrifugal, ULC listed, factory run tested rectangular inline fans in accordance with drawing schedule.

.2 Heavy-gauge galvanized steel housing with removable side panels to permit removal of power assembly without disturbing duct connections, universal mounting brackets and hardware including spring vibration isolators to accommodate horizontal or vertical mounting as required, a flanged inlet panel with inlet venturi, a flanged outlet panel, both with duct connection collars, and galvanized steel wire grid fan inlet/outlet guard(s).

.3 Non-overloading aluminium wheel with backward inclined blades with matching inlet venturi, statically and dynamically balanced as an assembly.

.4 For belt-drive fans only, hot rolled steel shaft, accurately turned, ground, and polished, and sized for a first critical speed of at least 1.25 times maximum rated speed for fan, and heavy-duty, self-aligning pillow block type bearings selected for an AFBMA L-50 minimum average life in excess of 500,000 hours and equipped with lubrication line and fitting, and an adjustable V-belt drive with guard conforming to requirements of Section entitled Basic Mechanical Materials and Methods.

.5 TEFC motor conforming to requirements specified in Section entitled Basic Mechanical Materials and Methods, mounted out of the airstream, complete with a cover, and factory pre-wired to a NEMA 4 disconnect switch.

.6 Acceptable manufacturers are:

.1 Twin City Fan and Blower;

.2 Loren Cook Co.;

.3 Greenheck Fan Corp.;

.4 JencoFan;

.5 Carnes Company Inc.

2.05 ROOF MOUNTED EXHAUST FANS

.1 Centrifugal, ULC listed, factory run tested roof mounted exhaust fans in accordance with drawing schedule.

.2 Spun aluminium housing with deep venturi inlet, aluminium curb cap with continuously welded corners, pre-punched mounting holes, galvanized steel or aluminium birdscreen, and EMT conduit chase to the motor compartment.

.3 Centrifugal, non-overloading aluminum wheel with backward inclined blades matched to inlet venturi, statically and dynamically balanced as an assembly.

.4 For belt-drive fans only, hot rolled steel shaft, accurately turned, ground, and polished, and sized for a first critical speed of at least 1.25 times maximum rated speed for fan, and one-piece grease lubricated pillow block type bearings selected for an AFBMA L-50 minimum average life in excess of 500,000 hours at maximum catalogue operating speed and equipped with a lubrication fitting, and a heavy-gauge galvanized steel adjustable V-belt drive with guard conforming to requirements of Section entitled Basic Mechanical Materials and Methods.

.5 Motors are to conform to requirements specified in Section entitled Basic Mechanical Materials and Methods, mounted on vibration isolation in a compartment outside of the airstream, and factory pre-wired to a NEMA 4 disconnect switch.

.6 Prefabricated, minimum 600 mm (12") high heavy-duty aluminum roof mounting curb with factory installed wood nailer, 40 mm (1-½") thick insulation, continuously welded seams, and damper tray.

.7 For fans as scheduled, factory supplied accessories as follows:

.1 gravity backdraft damper with #20 gauge galvanized steel frame and #26 gauge aluminum blades with felt edge blade seals;

.2 non-corrosive motorized damper with linkage, end switch, and motor with voltage to match fan motor;

.3 continuous non-corrosive piano type curb hinge to permit access to fan, damper and connecting duct, complete with retaining chain and a security hasp to prevent removal of unit from curb cap and prevent building entry through connecting ductwork;

.4 2-speed switch and 2-speed double winding 1-phase motor in accordance with Section entitled Basic Mechanical Materials and Methods.

.8 Acceptable manufacturers are:

.1 Twin City Fan and Blower;

.2 Loren Cook Co.;

.3 Greenheck Fan Corp.;

.4 JencoFan;

.5 Carnes Company Inc.

2.06 SIDEWALL PROPELLER FANS

.1 Axial flow type, ULC listed, factory run tested propeller fans in accordance with drawing schedule.

.2 Heavy-gauge galvanized steel drive component frame bolted or welded to formed galvanized steel fan panel equipped with formed flanged edges, pre-punched mounting holes, and a deep formed inlet venturi.

.3 Fabricated steel blades unless otherwise specified, welded to a heavy-gauge steel hub, and dynamically balanced.

.4 For belt-drive fans only, AISI 1045 cold rolled steel shaft, accurately turned, ground, and polished, and sized for a first critical speed of at least 1.25 times maximum rated speed for fan, and grease lubricated or permanently lubricated, sealed, ball type pillow block bearings selected for an AFBMA L-50 minimum average life in excess of 200,000 hours at maximum fan RPM, with a variable pitch adjustable V-belt drive with guard conforming to requirements of Section entitled Basic Mechanical Materials and Methods.

.5 Motor in accordance with requirements specified in Section entitled Basic Mechanical Materials and Methods.

.6 Unless otherwise specified, all bare steel surfaces are to be cleaned, primed, and factory finished with epoxy equipment enamel.

.7 Factory supplied accessories as follows:

.1 #16 gauge G90 galvanized steel wall box with removable screen guard, equipped with mounting flanges with pre-punched holes;

.2 back draft damper with galvanized steel frame, aluminum blades with felt edge seals, stainless steel shaft, and OHSA damper guard;

.3 galvanized steel weather hood with removable galvanized steel wire mesh bird screen, with mounting flanges equipped with pre-punched mounting holes;

.4 OHSA motor side guard with galvanized steel side panels and removable galvanized steel wire mesh screen.

.8 Acceptable manufacturers are:

.1 Twin City Fan and Blower;

.2 Loren Cook Co.;

.3 Greenheck Fan Corp.;

.4 JencoFan;

.5 Carnes Company Inc.;

.6 PennBarry.

2.07 CEILING MOUNTED FANS

.1 ULC listed and labelled ceiling mounted centrifugal, AMCA rated and certified (capacity and sound to AMCA Standards 211 and 311), exhaust fans in accordance with drawing schedule, complete with:

.1 minimum #20 gauge galvanized steel housing equipped with duct connection collar(s), integral spring loaded aluminum backdraft damper, 12 mm (½") thick acoustic insulation meeting 25/50 flame spread/smoke developed ratings when tested in accordance with CAN/ULC S102, multi-position mounting brackets, and an integral CSA certified electrical receptacle in an outlet box for plug-in connection of fan motor;

.2 low RPM, resiliently mounted, direct connected fan wheel and motor assembly with a forward curved, statically and dynamically balanced galvanized steel or calcium carbonate filled polypropylene centrifugal wheel direct connected to a 1-phase motor conforming to requirements specified in Section entitled Basic Mechanical Materials and Methods and equipped with a length of power cord and plug;

.3 for fans as indicated and/or scheduled, a white calcium carbonate exhaust grille;

.4 factory supplied accessories in accordance with drawing schedule, as follows:

.1 rectangular to round duct transitions;

.2 roof cap with backdraft damper and birdscreen;

.3 wall cap with backdraft damper and birdscreen.

.2 Acceptable manufacturers are:

.1 Twin City Fan and Blower;

.2 Loren Cook Co.;

.3 Greenheck Fan Corp.;

.4 CML Northern Blower;

.5 PennBarry.

3 EXECUTION

3.01 INSTALLATION OF CENTRIFUGAL FANS

.1 Provide centrifugal fans.

.2 Secure each base mounted fan in place, level and plumb, on vibration isolation on a concrete housekeeping pad.

.3 Secure suspended units in place from structure, level, and plumb, by means of vibration isolation spring hangers, properly sized galvanized steel hanger rods and galvanized structural steel angle or channel trapeze supports.

.4 Install explosion-proof units in accordance with classification requirements.

.5 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system manufacturer certification requirements.

.6 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system start-up requirements.

.7 Include for a 1/2 day on-site operation demonstration and training session. Training is to be a full review of all components including but not limited to a full operation and maintenance demonstration, with abnormal events.

3.02 INSTALLATION OF UTILITY FANS

.1 Provide utility fans.

.2 Secure each fan in place, level, and plumb, on vibration isolation on a concrete housekeeping pad or base as indicated.

.3 Secure suspended units in place from structure, level, and plumb, by means of vibration isolation spring hangers, properly sized galvanized steel hanger rods, and galvanized structural steel angle or channel trapeze supports.

.4 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system manufacturer certification requirements.

.5 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system start-up requirements.

.6 Include for a 4 hour on-site operation demonstration and training session. Training is to be a full review of all components including but not limited to a full operation and maintenance demonstration, with abnormal events.

3.03 INSTALLATION OF CENTRIFUGAL INLINE FANS

.1 Provide inline centrifugal fans.

.2 Secure each fan in place from structure with vibration isolation, independent of connecting ductwork and in accordance with fan manufacturer’s instructions.

.3 Ensure duct connections are made using flexible connection material.

.4 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system manufacturer certification requirements.

.5 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system start-up requirements.

.6 Include for a 4 hour on-site operation demonstration and training session. Training is to be a full review of all components including but not limited to a full operation and maintenance demonstration, with abnormal events.

3.04 INSTALLATION OF ROOF MOUNTED EXHAUST FANS

.1 Provide roof mounted exhaust fans.

.2 Supply a roof mounting curb with each fan and hand curbs to roofing trade on roof for mounting and flashing into roof construction as part of roofing work. Secure fans in place on curbs.

.3 Install dampers in curb damper tray and secure in place.

.4 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system manufacturer certification requirements.

.5 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system start-up requirements.

.6 Include for a 4 hour on-site operation demonstration and training session. Training is to be a full review of all components including but not limited to a full operation and maintenance demonstration, with abnormal events.

3.05 INSTALLATION OF SIDEWALL PROPELLER FANS

.1 Provide sidewall propeller fans. Coordinate location(s) and size(s) of wall opening(s) with trade preparing the opening(s).

.2 Rigidly secure each fan and accessories in place to structure in accordance with fan manufacturer's instructions.

.3 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system manufacturer certification requirements.

.4 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system start-up requirements.

3.06 INSTALLATION OF CEILING FANS

.1 Provide ceiling exhaust fans.

.2 Secure each ceiling mounted fan housing in place in ceiling space, flush with suspended ceiling.

.3 Secure suspended units in place from structure, level, and plumb, by means of vibration isolation spring hangers and galvanized steel hanger rods.

.4 Plug fan motors into housing receptacles.

.5 Supply exterior wall/roof discharge caps as indicated.

.6 Hand roof caps to roof trade for installation and flashing into roof construction as part of roofing work.

.7 Install wall caps and secure in place. Caulk perimeter of each wall cap in accordance with caulking requirements specified in Division 07.

.8 Connect fan housings and discharges with ductwork.

.9 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system start-up requirements.

END OF SECTION

1 GENERAL

1.01 REFERENCE

.1 Refer to Appendix A entitled DPCDSB BAS Standard Guideline attached at the end of this Section. Any work to the existing building automation system shall be in accordance with this Standard.

1.02 SUBMITTALS

.1 Submit shop drawings/product data sheets for following:

.1 all control system components;

.2 identified schematic control diagrams with component identification, catalogue numbers, and sequence of operation for all systems;

.3 certified wiring diagrams for all systems.

.2 Submit following samples for review:

.1 control damper section with linkage, operator, and certified flow and leakage data;

.2 wall mounting control system flow diagram as specified in Part 2 of this Section;

.3 each type of thermostat to be used, each identified as to intended use.

.3 Submit a site inspection and start-up report from manufacturer's representative as specified in Part 3 of this Section.

.4 Submit written confirmation from control component manufacturer that site installation personnel are qualified and experienced in installation of components, and have parts and service availability on a 24/7 basis.

1.03 QUALITY ASSURANCE

.1 Control systems are to be installed by control component manufacturer or by licensed personnel authorized by control component manufacturer. Submit written confirmation from control component manufacturer.

.2 Control system installation company is to have local parts and service availability on a 24/7 basis.

.3 Control wiring work is to be performed by licensed journeyman electricians, or under direct daily supervision of journeyman electricians.

2 PRODUCTS

2.01 CONTROL DAMPERS AND OPERATORS

.1 T. A. Morrison & Co. Inc. "TAMCO" 100 mm (4') deep, flanged, AMCA low leakage certified aluminium dampers. Dampers for modulating and mixing applications are to be parallel blade type. Dampers for open-shut service are to be opposed blade type. Maximum blade length is to be 1 m (4'). Dampers greater than 2 sections wide are to be complete with a jackshaft. Each damper is to be complete with:

.1 extruded 6063T5 aluminum frame and airfoil blades, each with an integral slot to receive a gasket;

.2 extruded TPE frame gaskets and extruded EPDM blade gaskets;

.3 slip-proof aluminium and corrosion resistant plated steel linkage of a metal thickness to prevent warping or bending during damper operation, concealed in frame, equipped with seal-sealing and self-lubricating bearings consisting of a Celcon inner bearing fixed on hexagonal blade pin and rotating in a polycarbonate outer bearing inserted in frame.

.2 For standard damper(s), Series 1000 as above.

.3 For insulated damper(s), Series 9000 as above but with all 4 sides of frame insulated with polystyrene, and blades thermally broken and insulated with expanded polyurethane foam.

.4 For stainless steel dampers, as above but constructed of type 316 stainless steel and equipped with Teflon blade bearings.

.5 Each damper motor is to be shaft mounted, spring return, fail safe in the normally open or normally closed position, sized to control damper against maximum pressure or dynamic closing pressure, whichever is greater, to suit sizes of dampers involved, and to provide sufficient force to maintain damper rated leakage characteristics. Each operator is to be complete with a damper position indicator, and external adjustable stops to limit length of stroke in either direction, and is to be mounted on a corrosion resistant adjustable bracket. Operating arms are to have double yoke linkages and double set screws for fastening to damper shaft. Operators for dampers to be connected to building fire alarm system or to freeze protection devices are to be equipped with additional relays to permit dampers to respond and go to required position in less than 15 seconds upon receipt of a signal. Operator enclosures are to be suitable in all respects for environment in which they are located.

.6 Electric damper operators are to be equal to Belimo EF Series 24 volt or 120 volt AC spring return, direct coupled electric motor operators for either modulating or 2-position control as required. Each operator is to be overload protected and complete with an enclosure to suit the mounting location.

2.02 SYSTEM WIRING MATERIALS

.1 System wiring, conduit, boxes, and similar materials are to be in accordance with requirements specified in appropriate Section(s) of Electrical Work specification.

3 EXECUTION

3.01 DEMOLITION

.1 Perform required control system demolition work.

.2 Refer to demolition requirements specified in Section entitled Demolition and Revision Work.

3.02 GENERAL RE: INSTALLATION OF CONTROLS

.1 Provide complete systems of control and instrumentation to control and supervise building equipment and systems in accordance with this Section and drawings.

.2 Control systems are to generally be as indicated on drawing control diagrams and are to have all the elements therein indicated or implied.

.3 Control diagrams show only the principal components controlling the equipment and systems. Supplement each control system with all relays, transformers, sensors, etc., required to enable each system to perform as specified and to permit proper operation and supervision.

3.03 SUPPLY OF CONTROL AIR DAMPERS AND OPERATORS

.1 Unless otherwise specified, supply required control dampers. Hand dampers to sheet metal trade at site in location where they are required for installation as part of sheet metal work. Ensure each damper is correctly located and mounted.

.2 Provide linkage and operators for dampers. Wherever possible locate damper operators so they are accessible from outside duct, plenum, and equipment casings. Bracket mount operators on ducts or plenums clear of insulation where applicable.

.3 Where sequence operation is indicated, or where multiple operators drive a series of dampers, provide pilot positioners to couple their action.

.4 Ensure dampers located in ductwork other than galvanized steel are constructed of type 316 stainless steel.

3.04 INSTALLATION OF CONTROL SYSTEM COMPONENTS

.1 Provide required control system components and related hardware. Refer to drawing control diagrams and sequences.

.2 Where components are pipe, duct, or equipment mounted supply components at proper time, coordinate installation with appropriate trade, and ensure components are properly located and mounted.

3.05 CONTROL WIRING

.1 Perform required control wiring work for control systems except:

.1 power wiring connections to equipment and panels, except as noted below;

.2 control wiring associated with mechanical plant equipment and systems whose control is not part of work specified in this Section;

.3 starter interlock wiring.

.2 Except as specified below, install wiring in conduit. Unless otherwise specified, final 600 mm (2') connections to sensors and transmitters, and wherever conduit extends across flexible duct connections is to be liquid-tight flexible conduit.

.3 Control wiring in ceiling spaces and wall cavities may be plenum rated cable installed without conduit but neatly harnessed, secured, and identified.

.4 Wiring work is to be in accordance with certified wiring schematics and instructions, and wiring standards specified in appropriate Sections of Electrical Work Specification.

3.06 IDENTIFICATION AND LABELLING OF EQUIPMENT AND CIRCUITS

.1 Refer to identification requirements specified in Section entitled Basic Mechanical Materials and Methods.

.2 Identify equipment as follows:

.1 enclosures and components: engraved laminated nameplates with wording listed and approved prior to manufacture of nameplates;

.2 wiring: numbered sleeves or plastic rings at both ends of conductor, with numbering corresponding to conductor identification on shop drawings and "as-built" record drawings.

3.07 TESTING, ADJUSTING, CERTIFICATION, START-UP, AND TRAINING

.1 When control work is complete, check installation of components and wiring connections, make any required adjustments, and coordinate adjustments with personnel doing HVAC testing, adjusting and balancing work.

.2 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system manufacturer certification requirements.

.3 Refer to Section entitled Basic Mechanical Materials and Methods for equipment/system start-up requirements.

END OF SECTION

APPENDIX A

DPCDSB BAS STANDARD GUIDELINE

Dufferin-Peel Catholic District School Board

STANDARD TEXT GUIDELINE FOR

Building Management System

for

ELEMENTARY AND SECONDARY SCHOOLS

Prepared by the Plant Department

Formatted by the Design Department

ORIGINAL PREPARED:	SEPTEMBER 1999	RE-EDITED:	APRIL 27,2002
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REVISION 1:	FEBRUARY 22, 2000	REVISION :	MAY 2012
REVISION 2:	JANUARY 19 2001		

1 INSTRUCTIONS TO CONSULTANTS

1.1 BUILDING MANAGEMENT SYSTEM

1.1.1 The BMS (Building Management System) is required to develop a balanced function between economics, operating costs, safety and comfort with human considerations being most important.

1.1.2 The BMS shall effectively and automatically manage and optimize the systems and equipment to minimize energy consumption and extend equipment life with variations in loads, occupancies, schedules and weather conditions.

1.1.3 The BMS shall operate on a management by exception concept and essentially be able to operate by itself on the basis of programmable schedules, events, etc., and requiring only a small degree of manual intervention and supervision.

1.1.4 The Building Management System shall enhance building efficiency while providing an easy to use interface for monitoring and managing the building.

1.1.5 The Building Management System shall provide all necessary hardware, software and network communication abilities to provide scheduling, monitoring, trending, historical storage, alarm functions, and for the building equipment and systems.

1.1.6 Control capabilities shall include: time of day scheduling, direct digital control, custom control, Boolean logic, optimum start/stop, duty cycling, electrical demand control, temperature control, after hours override, reports and logs, trend prints, remote communications, alarm logging, run time and maintenance, and expanded informational messages.

1.1.7 The Building Management System shall allow full user operation with a minimum of training. It shall have an English language display, with both user prompts and a "help" user tutorial.

1.1.8 The Consultant shall provide a damper schedule clearly showing sizes and pressure drop for outside air, mixed air and exhaust air dampers. A separate damper, on/off operation shall be provided for minimum outside air volume. Dampers shall be sized to ensure that a negative pressure is maintained in the mixed air plenum for all modes of operation.

1.1.9 Damper schedule shall be included on drawing or in specification at time of tender. (Dampers need not necessarily be duct size).

1.1.10 The Consultant shall provide a schedule of automatic control valves. Automatic control valves shall be sized by the Consultant, sized to suit the application served, clearly indicating valve size, CV, and pressure drop only after a thorough hydraulic analysis of the system(s) has been carried out. Valve schedule shall be included in drawing or in specification at time of tender. Valves shall be sized to have a valve authority of 0.5 or greater.

1.1.11 Install necessary relays and transformers to interconnect with BMS equipment where required.

1.1.12 The Consultant shall clearly define the responsibility for interlocking fans and other equipment to H & V Units, etc. Normally and preferably, this work is the responsibility of the control section.

1.1.13 Starter schedule shall include details of wiring, starter types and interlocks.

1.1.14 Equipment interlocks shall be done by use of interfacing relay controllers provided and wired as part of Building Management System (BMS).

1.1.15 Point identification names shall be in accordance with the Boards standard practices:

1.1.16 All sequence of operation for each system shall be written using the point Descriptor for all modes of operation and for alarm conditions.

1.1.17 All equipment and instrumentation shall be graduated in System International (SI).

1.1.18 High limit and low limit alarms shall be provided for all suitable points with lockouts, and time delays to preclude nuisance alarms. Standard messages shall be provided showing point in alarm and current valve.

1.1.19 Where multiple pumps, fans or other equipment is started by a single BMS control point provide:

1.1.19.1 Multiple contact control relays to isolate each piece of equipment,

1.1.19.2 Local time delay relays for each controlled piece of equipment and adjust to prevent simultaneous starting of the equipment,

1.1.19.3 Minimum 30 second time delay between starts.

1.1.20 The Consultant shall ensure correct, trouble-free operation of the DDC system and its conformance with the contract drawings and specifications.

1.1.21 BMS Contractor shall hard-wire boiler safeties, chiller flow switches, humidifier safeties, sump pump control wiring, etc. to ensure the integrity of the control sequences. Consultant shall co-ordinate with other sections, ensuring that the controls wiring is not duplicated in other sections.

1.1.22 For most boiler manufacturers, status and alarm points are additional cost options. The Consultant shall write and enforce a boiler specification with sufficient dry contacts for status and alarm to support the functionality specified in the BMS section. Similarly, if a boiler is intended to have multiple stage or burner modulation, the boiler specification shall support that and shall be enforced.

1.1.23 The use of stand alone control systems promoted by equipment vendors is discouraged, except for the usual gas burner, humidifier and chiller safety controls. Should any such devices be specified, the Consultant shall co-ordinate the specification with the BMS section.

1.1.24 Rooftop packaged units should be specified with OEM economizer packages, without the enthalpy feature. A decision regarding global economizer shall be made by BMS, using high quality, central temperature and humidity sensors for outside air condition.

1.1.25 Custom-built air handlers should be specified to have dampers and actuators factory installed. Similarly, schedules and/or specifications for fans may include motorized

dampers. In this case, the dampers and actuators must conform to the same standards as specified in the BMS section, i.e. Tamco and Belimo/Siemens respectively.

1.1.26 If sections other than BMS contractor intend to carry dampers or dampers and actuators in their Work, this shall be very clearly specified in the equipment specifications, so that the BMS bidders do not also carry the cost in their estimates.

1.1.27 Exterior Lighting shall be controlled by the BMS, as a function of light level and time of day.

1.1.28 Where communications between the BMS and a third party intelligent building system is desired, it shall be accomplished by means BACnet MSTP or BACnet IP.

1.1.29 Enclosed is a Guideline for the BMS section which reflects the preferences of the Board. The operating sequences reflect sequences that have been useful in the past. Consultants shall review and modify sequences, or write additional sequences as required to fulfill the intent of their systems design for the project at hand.

1.1.30 The Consultant shall provide a points list in tabular form, bound with the specification. The Board has developed a list of points required for particular types of systems attached to the end of this Guideline. This list represents a minimum requirement and Consultant shall add to it, as required, in order to confirm the sequence of operation and design intent.

1.1.31 The main electrical feed and the subfeed shall be equipped with smart electric meter that will have output signals supporting BACnet® MS/TP or BACnet/IP communication protocol.

1.1.32 The main water feed into the school shall have a water meter that has output signals supporting BACnet® MS/TP or BACnet/IP communication protocol.

1.1.33 The main natural gas feed into the school shall have a gas meter that has output signals supporting BACnet® MS/TP or BACnet/IP communication protocol.

END OF INSTRUCTIONS TO CONSULTANTS

2 GENERAL

2.1 WORK INCLUDED

2.1.1 Install a Building Management System (BMS), also known as Building Automation System, incorporating Direct Digital Control (DDC), equipment monitoring; microcomputer based Standalone Direct Digital Controllers (DDCs) shall be interfaced directly with sensors, actuators and environmental delivery systems (i.e., HVAC units, boilers, chillers, lighting systems, etc.); controls and mechanical devices for all items indicated on drawings described herein including dampers, valves, panels, and a primary communication network to allow data exchange.

2.1.2 Install control wiring for field mounted boiler, chiller, duct heater and humidifier safety controls, sump pump level controls, excess pressure pump, line voltage thermostats,

motorized dampers, DX split systems, and cooling tower/fluid cooler remote panels to the extent that such devices are specified in Division 15.

2.1.3 Install any necessary power wiring for control components over and above whatever power drops are specifically shown on the electrical drawings, from 120/1/60 circuits provided by Division 16.

2.1.4 Submittals, data entry, electrical installation, programming, start up, test and validation acceptance documentation, and system warranty.

2.2 WORK BY OTHERS

2.2.1 Access doors and setting in place of valves, flow meters, water pressure and differential taps, flow switches, thermal wells, dampers, airflow stations, and current transformers.

2.2.2 Installation of flow switches, low water cutoffs and high temperature limit controls for boilers and flow switches for chillers.

2.2.3 Installation of air proving switches and high humidity limit controls for humidifiers.

2.2.4 Installation of level controllers for sump pumps.

2.2.5 Other sections of Division 15 shall install the following devices, which are to be supplied by this section:

2.2.5.1 Control dampers and actuators, other than integral to packaged equipment, which are to be provided by equipment manufacturers

2.2.5.2 Control valves and actuators

2.2.5.3 Flow switches

2.2.5.4 Thermowells

2.3 INTENT

2.3.1 BMS contractor shall provide articles, materials, equipment, labour and incidentals shown, noted, specified or required to complete work of this Section whether specifically detailed, noted or referenced.

2.3.2 High limit and low limit alarms shall be provided for all suitable points with lockouts, and time delays to preclude nuisance alarms. Standard messages shall be provided showing point in alarm and current valve. Alarms for heating functions shall be automatically disabled during warm weather to prevent nuisance alarms.

2.3.3 Where multiple pumps, fans or other equipment is started by a single BMS control point provide:

2.3.3.1 Multiple contact control relays to isolate each piece of equipment,

2.3.3.2 Local time delay relays for each controlled piece of equipment and adjust to prevent simultaneous starting of the equipment,

2.3.3.3 Minimum 30 second time delay between starts.

2.4 SUBMITTALS

2.4.1 BMS Contractor shall submit the following:

2.4.1.1 A points list identifying the following for each DDC shall be submitted:

• PHYSICAL POINT IDENTIFIER ON THE DDC • POINT TYPE (AI, AO, BI, BO) • POINT NAME • POINT DESCRIPTOR • PERIPHERAL DEVICE PART NUMBER • WIRE NUMBER • COMMENT	• SIGNAL TYPE • TREND / TANTALIZATION • ALARM • CALIBRATED • COMMISSIONED

2.4.1.2 Controller schedule incorporating the BACnet addressing practices followed by DPCDSB.

2.4.1.3 Submittal sheet or catalogue cut for all field devices.

2.4.1.4 A plain English language Sequence of Operations for each system, explaining in detail, how each function will be programmed and the points used to satisfy the Sequence of Operation.

2.4.1.5 Testing and commissioning plan.

2.4.1.6 A general arrangement of each control panel clearly showing construction and dimensions, location of internal and external components and wiring shall be provided. Identify all components in accordance with specifications and sequence of operation.

2.4.1.7 Schematic of each control system showing electrical/electronic connections including terminal numbers, component locations and operations together with system description, component names and numbers shall be provided.

2.4.1.8 An electrical connection wiring diagrams of control panels showing internal wiring connections between all components with terminal numbers and outgoing terminal blocks including necessary field interlocks to give system operations specified.

2.4.2 All data, plans, specifications, drawings, sketches, correspondence and documents of any kind, originals or copies, respecting the work or the project, whether produced by Dufferin-Peel Catholic District School Board (hereinafter called the Board), or the BMS Contractor, or any subcontractors, shall be deemed to be the property of the Board, and the BMS Contractor shall not be entitled to make use of any such data, plans specifications, drawings, sketches, correspondence or documents of any kind for any purpose whatsoever, without the Board's written consent.

2.5 AS BUILT DRAWINGS AND INFORMATION

2.5.1 Upon completion of the work, the BMS Contractor shall submit three (3) copies of all Operating and Maintenance Manuals for equipment and materials supplied, and one set of "As- Built" plans showing reasonably exact routes of all cabling, specifications marked "As-Built", plans and specifications marked "As-Built".

2.5.2 A description of all maintenance procedures for each system's components, including inspection, periodic preventive maintenance, fault diagnosis and repair or replacement of defective module shall be provided. This shall include calibration, maintenance and repair of sensors, transmitters, transducers and panels plus diagnostics and repair or replacement of all system hardware.

2.5.3 Control damper schedules with construction details and dimensions. Identify dampers in accordance with specification and drawings. Dampers shall be identified as parallel or opposed blade, c/w frame style and actuator position.

2.5.4 Specifications and data sheets for all control system components including relays, switches, thermostats, controllers, dampers, indicators, flow switches, sensors and similar components.

2.5.5 Valve schedules with construction details, calculated CVs, selected valve CV, pressure drops and flows.

2.5.6 Two (2) copies of all software programs for controlled systems on disk

2.5.7 Provide a manual divided into 3 sections describing the following functions:

2.5.7.1 System Hardware Specification Manual, which provides a functional description of all hardware component installation/configuration with detailed instructions.

2.5.7.2 System Operator's Manual, which provides concise instructions for operation of each system an explanation recovery route for all system alarms.

2.5.7.3 System Data Manual, which provides the applications data, programmed into the system including a list of virtual points and a print out of the programs and point labels.

2.5.7.4 A complete English language description of each control program for each system shall be provided. Clearly identify the function of each point reference used in the program for each system and/or equipment.

2.5.7.5 Calibrate these points and establish units, limits and alarms;

2.5.7.6 Incorporate these points in screen displays and reports;

2.5.7.7 Incorporate these points in software sequences and control loops.

2.5.7.8 Incorporate these points dynamically in graphic displays.

2.5.7.9 Modify designation of control and virtual points.

2.5.8 Revised points list, panel schedule and sequences of operations and all other information submitted with the original shop drawings, reflecting the "as built" condition.

2.5.8.1 The point list shall consist of the following information

• PHYSICAL POINT IDENTIFIER ON THE DDC • POINT TYPE (AI, AO, BI, BO) • POINT NAME • POINT DESCRIPTOR • PERIPHERAL DEVICE PART NUMBER • WIRE NUMBER • COMMENT	• SIGNAL TYPE • TREND / TANTALIZATION • ALARM • CALIBRATED • COMMISSIONED

2.5.8.2 The as-built drawings shall consist of a single page showing the system architecture with BACnet (MSTP & I/P)network numbers, instance and MAC address.

2.6 UNITS

2.6.1 All equipment and instrumentation shall be graduated in System International (SI) Units.

2.7 TRAINING

2.7.1 Training shall be provided after successful system demonstration and before system acceptance.

2.7.2 The Contractor shall provide two level of training: Operator level and advanced level.

2.7.2.1 Operator training program shall include the following:

- DDC Operation Concept,
- System Data Reading,
- Equipment Operation and Software Commands,
- Operator Monitoring and Control Intervention,
- Calibration of Data Acquisition Devices,
- Troubleshooting and repair of the Automation System.

2.7.2.2 Advanced Level Training Program , 2 days for 6 persons (16 hours classroom instruction) shall include the following:

- System Architecture and design considerations. System configurations ,
- Software installation details, configuration details,

- DDC Operation and Programming techniques,
- Graphics development,
- Scheduling and trending,
- Maintaining server software,
- Preventive maintenance of the building automation hardware and software,
- Troubleshooting and repair of the Automation System,

2.7.3 Board personnel will participate in the workshops and the Board reserves the right to videotape the sessions for use in future operator training and review programs.

3 BUILDING MANAGEMENT SYSTEM

3.1.1 All applications programs shall be pre-engineered and pre-tested.

3.1.1.1 All the controllers used on the project must use the same programming language, and programs developed for one model of controller must be cross platform transferable to any other model of controller that has sufficient RAM and suitable input/output points.

3.1.2 Temperature control system shall be completely microprocessor based Direct Digital Control (DDC) electrically and /or electronically operated except where otherwise stated. System shall be installed by competent mechanics and electricians regularly employed by the BMS Company. Energy management system shall be an integral part of BMS.

3.1.3 In event of power or system failure, equipment shall fail safe, and heating valves open, dampers closed, humidifiers off, cooling off. Provide spring return feature on all valves to ensure this condition. (Exception: valve and damper actuators on radiation, reheat valves, and unit heaters. VAV terminals and cabinet heaters shall be fully modulating type.) Floating point valves shall not be accepted. Wax valves shall not be acceptable

3.1.4 All system hardware and associated equipment shall be standard OEM items regularly manufactured for this and/or other systems and not custom designed especially for this project. All components shall have been thoroughly tested and proven in actual use. All electronic circuits shall be self-diagnostic.

3.1.5 Design scope documents establish minimum acceptable system and component capability. They are not all inclusive. All additional construction, equipment, interfaces and software required for a complete and operating systems providing the specified functions are required.

3.1.6 The fire/life safety system (F/LS) shall have priority with respect to control of equipment that is subject to control by both the F/LS and BMS. The BMS Contractor shall coordinate installation of the BMS to ensure that interfacing and connection of BMS to such equipment and H-O-A switches shall not pass or interfere with F/LS operation under either normal mode or failure mode operation of the BMS.

3.1.7 Freeze stats and other safety controls shall have priority with respect to control of equipment that is also controlled by the BMS. Consultant shall co-ordinate installation of the BMS to ensure that interfacing and connections of the BMS and H-O-A switches to such equipment shall not by-pass or interfere with freeze stats or other safety controls.

3.1.8 System shall be fully modular, permitting point expansion by adding computer memory, remote terminal units, or applications software without obsolescence of existing communication or processing equipment.

3.1.8.1 Provide licences for the software packages normally used by the BMS contractor to create, modify and add programming and graphics to the system. The software shall enable Board to add points to system and to program complex routines. Board shall be able to add and modify all point information. Board accessible software shall include:

- Direct Digital Control Library
- Report Generation Library
- Energy Management Library
- Graphics Library
- Programming Tool
- Engineering Graphics Tool

3.1.8.2 Once programmed, the results may be used to start/stop points, and readjust set points, sequence equipment, report abnormal conditions, etc.

3.1.8.3 Provide three (3) copies of all programs, any required hardware, three (3) hardware/software keys, licenses, manuals and instruction to permit use by the Board and full functionality.

3.1.9 Set points and values given are for initial set-up only. All points shall be adjustable from the host station.

3.1.10 All electrical and electronic components shall be CSA; ULC, UL or Ontario Hydro approved where such approvals are required by the regulatory authorities.

3.1.11 Failure of any Direct Digital Controller Unit (DDC) or its communication link in the system shall not affect the proper operation of the Host computer or any other Direct Digital Controllers.

3.1.12 If the Host Computer (CPU) or transmission network fails but power to the DDC does not, the DDC shall continue to monitor all changes of state and/or values and shall retain the most recent values. The DDC shall also maintain all analog set points and command positions.

3.2 ACCEPTABLE SUPPLIERS

3.2.1 Unless otherwise noted, acceptable manufacturers/installers of BMS components and systems shall be:

3.2.1.1 Reliable Controls/ Energy Concepts

3.2.1.2 Johnson FX/ Empire Controls BACnet IP Import/ Export

3.2.1.3 Delta Controls/ESC automation

3.2.2 Mechanical Contractor shall verify that selected BMS supplier fully complies with requirements of the Contract.

4 MATERIALS

4.1.1 Building Management System (BMS) shall be fully integrated and installed as complete package of controls and instrumentation. System shall be stand-alone energy management using direct digital control (DDC) solid state technology of modular construction with high reliability and simple user friendly operation. Intelligent heat pump controllers shall be fully integrated with BMS so that heat pumps and all other controls are integrated as one intelligent system.

4.1.1.1 DDC Systems installed under this specification shall strictly adhere to the following characteristics:

- Building Automation System (BAS) Direct Digital Controls (DDC) shall consist of **native BACnet**, microprocessor-based, peer-to-peer, networked, distributed devices utilizing the BACnet communication protocol in an open, interoperable system. The BAS also includes operator interface devices, programming and configuration software applications, DDC input/output devices, non-DDC automatic temperature controls, enclosures and interconnecting conduit and wire.

- The BACnet operating stack must be embedded directly in every Device at the board level, and in all operator interface software packages.

- No Gateways, Communication Bridges, Protocol Translators or any other device that translates any proprietary or other communication protocol to the BACnet communication protocol shall be permitted as a part of the BAS installation pursuant with this specification section. Gateways may only be used as required for communication to existing systems or systems installed pursuant with other specification sections.

- DDC controllers that are not BACnet compliant shall not be acceptable under this specification and are strictly prohibited.

- The BAS shall be modular in nature and comprised of a network of stand-alone DDC devices. The System shall be designed and implemented in such a way that it may be expanded in both capacity and functionality through the addition of DDC Devices, sensors, actuators, etc,

- All BAS controllers shall be tested, certified, clearly stamped and listed by the BACnet Testing Laboratories (BTL)[i]

- Program database, data acquisition, and all control sequence logic shall reside in each DDC Device. The Building Level Communication Network (BLCN) shall

not be dependent upon connection to a Server or Master Controller for performance of the Sequence of Control as outlined in this specification. Each individual Device shall, to the greatest possible extent, perform its programmed sequence without reliance on the BLCN.

- BAS shall be provided with a complete Web enabled operator interface. The Web enabled application shall operate on industry standard PC hardware. Proprietary server hardware or "Black Boxes" will not be acceptable. Third party Web enabled applications are acceptable if they are configured to be indistinguishable from the OWS applications.

- The Owner at the Owner's expense shall provide connection to the Internet for the BAS. The LAN connection type and configuration (TCP/IP addressing scheme, etc.) will be information provided to the System Contractor from the Owner, or Owner's representative.

- All BAS DDC Devices at all levels shall be fully custom-programmable in the field using the standard Operators Workstation Software. No configurable, canned program application specific controllers will be permitted.

- All BAS DDC Devices shall be capable of updating firmware using software via internetowrk without replacing any hardware, microprocessors or chips.

- The BAS shall be capable of sending system alarms and Event Notifications to pagers, and email services.

- Actuation of control devices shall be [electronic] [pneumatic]. Spring return fail-safe actuation shall be provided when loss of property and/or property damage is possible and where specified.
- DDC Automatic Temperature Control (ATC) System shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started; along with the time delay between starts shall be user-selectable.
- All binary output points shall be protected from short cycling via output configuration and/or programming. This feature shall allow minimum on time and off-time to be configurable

4.1.2 Components shall not require any customizing other than setting of jumpers and switches, adding of firmware modules or software modules or any software programming to perform required functions. System shall be a true distributed processing system without any form of network management device used. All software control functions shall be performed by intelligent field panels and by intelligent unit controllers as appropriate.

4.1.3 All equipment, unless specified to contrary, shall be fully proportioning, modulating in operation.

4.1.4 Local equipment cabinets shall be provided for each controller or group of controllers, of free standing or wall mounted type. Respective controllers, transducers, shall be mounted within cabinet. Relays, transformers and any other devices using a voltage above 24 VAC must be housed in a separate enclosure from the controllers. Transformers may be enclosed type, mounted outside of the enclosures. Panel instruments shall be designated as to type and function of black Lamicoid tags 6.4 mm white engraved, secured with drive screws. Cabinets shall be located where shown or as later directed and may be grouped per Mechanical Room.

4.1.5 Enclosures for DDC components must be metal, NEMA 1, or a higher NEMA rating if required to resist conditions in the area where the enclosure is being installed. If the DDC controllers come with plastic enclosures, the plastic enclosures must be themselves enclosed in a metal enclosure. Enclosures for modems and controllers with more than 30 points capacity shall have hinged covers with cylinder locks.

4.1.6 Local field panels shall perform all of the functions described in these specifications, including all of the options described even if the options are not required in the initial work. Local field panel shall have an allowance of a minimum of 10% in spare points for each type of point. If a certain type of point is not associated with a specific panel, the required minimum spare points shall be two (2).

4.1.7 Provide integral or supplementary power conditioning equipment for all hardware so as to ensure that power line noise or electrical spikes, noise, bursts, sags or surges shall not damage equipment or software or cause erroneous computations.

4.1.8 The CPU and peripheral equipment shall operate in the following conditions:

- Temperature 15 C to 27 C
- Humidity 20% to 80% (non condensing)
- Power 120 VAC +/-10%
- Frequency 60HZ +/-3HZ
- Power factor 0.6 to 1.0

4.1.9 Local field panels and peripheral equipment shall be rated to operate in following conditions:

- Temperature 0º C to 50º C
- Humidity 10% to 90% RH (non condensing)
- Power 120 VAC + 10% on primary side of control transformers and plus or minus 25% of nominal voltage on the secondary side.
- Frequency 60 Hz + 3 Hz
- Power Factor 0.6 to 1

4.1.10 Install all DDC controllers in heated space. Keep all electronic equipment away from temperature extremes and wild fluctuations, and shielded from electromagnetic interference.

4.1.11 Proposed panel locations shall approved by Engineer/Board. Panels containing controllers shall be installed only in heated areas not subject to extremes of temperature or rapid temperature variations.

4.1.12 Panels shall use only following signal types to interface with field data points:

4.1.13 Binary Input (BI) also known as Digital Input (DI) contacts. Internal voltage source shall be dry contact or 0-5 V.D.C.

4.1.14 Analogue Input (AI) is to be standard 4 - 20 ma transmitter, 0 – 5 VDC, 2-10 VDC or 0-10 VDC.

4.1.15 Binary Output (BO) also known as Digital Output contacts rated at 24 V.D.C., 20 mA.

4.1.16 Each output on major controllers shall have an ON, OFF, AUTO select with status indication lamp and internal voltage source. Triacs may also be used.

4.1.17 Analogue Output (AO) to be standard 4 to 20 mA or 0-10 V.D.C. @ 20 mA maximum.

4.1.18 Provide engraved black and white Lamicoid plastic nameplates, 25 x 65 mm minimum at all duct mounted instruments, reset controls, thermometers and panels so as to clearly indicate service of particular device. All manual switches unless they come with standard nameplate shall be similarly labeled.

4.1.19 Controls shall be D.D.C. solid state type as noted elsewhere, and with exception of actuators, contain no moving parts.

4.1.20 Sensor accuracy shall be within 0.6% of maximum range, maximum ± 0.25 C. Mixed air sensors must give a true average across duct cross section.

4.1.21 Enclosures shall be large enough to accommodate the components without crowding, after allowing sufficient space for good wiring management. In all cases, the local field panel must have a minimum of 25% free mounting area within the enclosure

4.1.22 All din rail or screw mounted transmitters, shall be mounted in steel box of suitable size with removable cover and secured in place.

5 FIELD DEVICES

5.1 GENERAL

5.1.1 Space and duct sensors shall be electronic suitably located for specific application. Space sensing units shall be mounted 1500 mm from floor to centre unless otherwise noted or agreed to by Architect/Engineer.

5.1.2 Sensors shall meet or exceed following standards:

5.2 ROOM TEMPERATURE SENSORS (SUPERVISED AREAS)

5.2.1 Classrooms, Offices, Staff Rooms, Workrooms and other supervised areas:

- Element — 10Kthermistor complete with sensor, temperature setpoint slide and override switch.
- Output — Resistive
- Range — 0 C to 40 C
- Accuracy — 5% max. range, maximum ± 0.50
- Features — Set-point adjustment and mode override button with LED acknowledgement of mode override

5.3 ROOM TEMPERATURE SENSORS (UNSUPERVISED AREAS)

5.3.1 Gymnasiums, Stage, Cafeterias, Hallways, Washrooms, Change Rooms and other unsupervised areas:

- Element — 10K wire, bonded to reverse side of stainless steel blank switch plate
- Output — Resistive
- Range — 0° C to 40° C
- Accuracy — 0.05% max. range, maximum ± 0.1°C
- Features — No setpoint adjustment or mode override.

5.3.2 STANDARD OF ACCEPTANCE:

5.3.2.1 Enercorp TS-PL-R-1000

5.4 OUTSIDE TEMPERATURE SENSOR

5.4.1 The sensor is to be mounted in box on north exterior wall, including sun visor capable of protecting it from hockey sticks, balls, etc. It must be thermally isolated from indoor conditions.

- Element — PT - l00 platinum 3 wire RTD with hockey puck transmitter
- Output — 4 to 20 mA or resistive
- Range — -40° C to 40° C
- Accuracy — 0.05% of max. range, max. ± 0.10 C
- Thermistors — Are not acceptable for OAT applications.

5.4.2 STANDARD OF ACCEPTANCE:

Enercorp TS-O-R-1000.

5.5 SUPPLY AIR TEMPERATURE SENSOR

5.5.1 Mounted in ductwork

- Element 10K thermistor averaging element
- Output Resistive
- Range 5° C to 120° C
- Accuracy 0.05% of max. range, max. ± 0.10° C

5.5.2 STANDARD OF ACCEPTANCE:

5.5.2.1 Enercorp TS-D-12-R-1000

5.6 LIQUID TEMPERATURE SENSOR

5.6.1 Mounted in pipework

- Element 10K thermistor
- Output 4 to 20mA or resistive
- Range Appropriate
- Stem Minimum length of l50 mm with brass well
- Accuracy 0.05% of maximum range, max. 0.1° C

5.6.2 STANDARD OF ACCEPTANCE:

5.6.2.1 Greystone TE-300 or Enercorp TS-P-12-R-1000.

5.7 SEPARABLE BRASS THERMOWELLS

5.7.1 These shall be provided with immersion type bulbs for installation by plumbing section. (Stainless steel shall be used for immersion in glycol solutions.) Wells shall be packed with thermal conductive grease to increase speed of response. Thermowells shall have ½" IPS threads to receive sensor, and be of suitable length for the pipe diameter.

5.7.2 STANDARD OF ACCEPTANCE:

5.7.2.1 Enercorp TW - B - (length in inches)

5.7.2.2 (Stainless Steel): Enercorp TW - S - (length in inches)

5.8 STRAP-ON SENSORS

5.8.1 Are acceptable only on retrofits of existing systems, where copper pipe is used, and for copper pipe of diameters too small to accommodate thermowells.

5.8.2 STANDARD OF ACCEPTANCE for strap on sensors:

5.8.2.1 Enercorp TS-SO-R-100 with TT-HP-R-100 Transmitter

5.9 MIXED AIR SENSOR

5.9.1 Mixed air temperature reading must be averaged across duct cross-section using sensor with same specifications as supply air sensor. Probe to be at least 24 feet long with 9 encapsulated sensor elements and shall indicate the average value of the 9 sensors. Probe to be neatly mounted on tubular copper supports.

5.9.2 STANDARD OF ACCEPTANCE:

5.9.2.1 Enercorp TS-A-20- 9 – R-1000

5.10 HUMIDITY SENSOR

5.10.1 Range from 0% to 100% RH ± 2% between 10% and 90% RH.

5.10.2 Use Humicap or equal.

5.10.3 STANDARD OF ACCEPTANCE:

5.10.3.1 Enercorp HTC-D-420.

5.10.3.2 (Outdoor Humidity Sensor): General Eastern

5.11 AIR QUALITY SENSOR

5.11.1 Q.E.L. Model QTS 2000 non-dispersive infrared carbon dioxide transmitter sensor capable of monitoring return air concentration of CO2.

- Method: N.D.I.R.
- Gas: Carbon Dioxide
- Range: 0-5000 PPM
- Accuracy: ± 3% of full VDC
- Power Source: 12 VDC
- Output Signal: 4-20 mA DC Linear
- Zero drift at ambient Less than 0.02% CO2 per degree centigrade.
- Operating Temp.: 10º to 60º C

5.12 CONTROL INTERFACE

5.12.1 Shall meet or exceed following standards:

5.12.2 Watt Transducer

- Current input: 0 to 5 amps
- Voltage input: 0 to 120 VAC, 60 Hz
- Power requirement: 120 VAC, 60 Hz
- Output: 4 to 20 mA or pulsed
- Accuracy: 1.3% of reading
- Measurement type: 3 phases, 4 wires

5.12.3 Interface Relay

- Input 10 VDC
- Contact rating 10 A at 120 VAC, 60 Hz & 10 A at 28 VDC
- Contact action DPDT

5.12.4 Power Relay

- Input 120 VAC, 60 Hz
- Contact rating 30 A at 250 VAC, 60 Hz
- Contact action DPDT

5.12.5 Contactors

- Input 120 VAC, 60 Hz
- Contact rating As per application
- Contact 3 poles, N.O. contact, 1 aux. contact, N.C. arrangement
- Control 347 v. /120 VAC, 60 Hz with protection transformer Metal cabinet (enclosing contactor, transformer, protection, etc.), NEMA rating appropriate to environment.

5.12.6 STANDARD OF ACCEPTANCE:

5.12.6.1 Contactors shall be Allen-Bradley or approved equal.

5.13 MOTORIZED DAMPERS

5.13.1 All dampers shall be heavy duty, low leakage, aluminum opposed blade, designed to withstand static pressure specified. Damper shall have nylon bushings, edge and end seals, and thrust washers.

5.13.2 The damper linkages shall be installed on the blades within the air stream for ease of access, maintenance and adjustment. The damper blade hardware shall be provided with corrosive resistant material. The damper assemblies, linkages and motors shall be properly mounted and fitted for airtight and trouble free operation.

5.13.3 Dampers on O.A. and Exhaust shall be T.A. Morrison Series 9000 insulated. Return air dampers and other internal dampers shall be un-insulated TAMCO Series 1000. Alternatives shall not be considered.

5.14 DAMPER OPERATORS

5.14.1 Install electric damper operators to suit the control dampers, operators shall be adequately sized to provide smooth and full travel in both directions. Under no circumstances shall pneumatic actuators be installed.

5.14.2 Damper operators shall be maintenance free 24 volt direct coupled actuators with 95 degree rotation, position indicator, non overloading. Direction of rotation shall be reversible without wiring change.

5.14.3 A separate damper operator shall be provided where individual dampers are installed. On multi-section dampers, install separate damper operators for each section except where a jack shaft drive arrangement is indicated.

5.14.4 Install damper linkage where direct coupling of motor to damper shaft is not possible. Where multiple damper actuators are driven from a single DDC point, provide a positioner for each. Similarly, if a major air handler does not have a separate minimum fresh air damper, provide a positioner for each of the outdoor, recirculating and exhaust air dampers.

5.14.5 Ensure failure position of damper actuator meets safety requirements of item controlled. Provide spring return upon power failure feature for all damper actuators. The 24VAC power for the dampers shall be wired through through the safety circuits (freeze stat) to ensure the dampers will fail safe when the safety circuits trip.

5.14.6 STANDARD OF ACCEPTANCE:

5.14.6.1 BELIMO/Siemens positioner. Smaller actuators may be used provided the torque rating is 150% of the calculated torque necessary to close the dampers against the maximum static pressure for which it was designed. Where feedback of damper position is required by either the sequence of operations, drawing or points list, use a model with the feedback potentiometer/auxiliary contact feature. No alternatives shall be considered.

5.14.7 Damper actuators for VAV applications to be with a minimum rating of 32 inch-pounds of force, and clutch release mechanism.

5.15 CONTROL VALVES

5.15.1 Shall have the following minimum specifications:

5.15.1.1 Consultant shall select valves for the operating pressures and temperature conditions of the system and shall ensure that valves shall close against system operating differential pressures. Consultant shall select modulating valves from CVs., and shall select valves for full shut off applications (i.e. two position valves) on the basis of full line size.

5.15.1.2 Consultant shall select valves with characteristics to suit the application. Straight through two port water valves shall be single seated with equal percentage flow characteristics.

5.15.1.3 Three port valves shall be linear for each port to give constant total flow. Butterfly valves are not acceptable, except for “full shutoff“ applications and heat pump loop heat injection valves greater than 65mm. “Shoe” valves shall not be used and shall not be confused with the use of ball valves

5.15.1.4 All valves shall be equipped with stainless steel stems.

5.15.1.5 Valves 50 mm and smaller shall be Belimo or Siemens characterized ball valves with stainless steel stems, stainless steel balls, and screwed bronze bodies suitable for a maximum working pressure of 1200 pa. No alternatives. Do not select models without characterizing disks for modulating applications. Models with chrome plated brass balls shall not be used.

5.15.1.6 Valves 65mm and larger shall have flanged cast iron bodies suitable for a maximum

working pressure of 1400 pa., Belimo G series with suitable Belimo electronic actuators or Siemens equivalent.

5.15.1.7 Use positive positioning relays on valves that are sequenced with other actuators.

5.15.1.8 Valves shall be equipped with fully modulating Belimo/Siemens electronic actuators with sufficient torque for the application. All actuators for valves 2-1/2" and smaller shall be spring return type, except for reheat valves not exposed to outside air radiation and differential pressure valves. Control signal shall be 2 – 10 VDC. Where feedback is specified in the points list or implied by the sequence of operations, provide Belimo actuators with feedback potentiometers. All the spring return actuator 24VAC power shall be wired through the safety circuits (freeze stat) to ensure the valves will fail safe when the safety circuits trip.

5.15.1.9 Valves for radiator and reheat applications to have manual opener and position indicator for use in the event of actuator failure and during maintenance operations.

5.15.2 STANDARD OF ACCEPTANCE for radiation, reheat and other control valves up to 50 mm:

- Belimo/Siemens characterized ball valves with brass balls and Belimo/Siemens electronic actuators. No alternatives. Do not select models without characterizing disks for modulating applications.
- For globe valve applications, use Belimo G series with suitable Belimo electronic actuators or Siemens equivalent.

5.15.3 Under no circumstances shall pneumatic or wax type actuators be considered for new valves.

5.16 HIGH LIMIT THERMOSTATS

5.16.1 Thermostats shall have liquid filled insertion probe.

5.16.2 Range shall be -3.9 to 101.7 C

5.16.3 Switch shall be snap acting and rated for 16 amperes at 120 VAC or 8 amperes at 575 VAC as required.

5.16.4 Thermostat shall have manual reset feature.

5.16.5 Provide one thermostat for each 1 sq. m of duct area.

5.16.6 Thermostats shall be CSA approved and enclosure dust tight.

5.16.7 Thermostats shall be SPDT or DPDT to facilitate monitoring by BMS.

5.16.8 STANDARD OF ACCEPTANCE:

5.16.8.1 Johnson Controls A25CN-1

5.17 LOW LIMIT THERMOSTATS

5.17.1 Thermostats shall have 6000 mm vapour tension sensing element sensitive to a temperature below its setpoint over 300 mm of its length.

5.17.2 Range shall be 1.7 to 7.2 degrees C.

5.17.3 Switch shall be snap acting and rated for 16 amperes at 120 VAC or 8 amperes at 575 VAC as required.

5.17.4 Thermostat shall have manual reset feature.

5.17.5 Provide one thermostat for each 1 sq. m of coil face area or part thereof.

5.17.6 Thermostats shall be DPDT to facilitate monitoring by BMS.

5.17.7 STANDARD OF ACCEPTANCE:

5.17.7.1 Johnson Controls AH70HA-1.

5.17.8 Mount sensing element rigidly and as close as possible to the downstream face of the coil being protected or where shown on schematic diagrams. Freeze controls shall have 6 m capillary arranged in ducts for best possible protection.

5.17.9 Provide freeze stat for each 5.5 square meters of duct area where necessary, wired in series. Sensing element shall extend at least to two diagonally opposite corners of the coil.

5.18 DIFFERENTIAL PRESSURE TRANSMITTERS

5.18.1 The transmitter shall have an operating range to suit the application such that the controlled value is mid range.

5.18.2 The transmitter output shall be a linear proportional signal over the full operating range, for 0 to 5 volts or 4 to 20 mA.

5.18.3 STANDARD OF ACCEPTANCE:

5.18.3.1 Enercorp WGT-420

5.19 CURRENT SENSORS A.K.A. CURRENT TRANSFORMERS

5.19.1 Status inputs for motors (pumps and fans) shall use inductive coils to monitor current draw from one phase of power.

5.19.2 Current transformers shall be selected and configured for appropriate amperage range, and shall have 0 to 5 Volt output.

5.19.3 BMS shall use AI points to monitor current transformers.

5.19.4 STANDARD OF ACCEPTANCE:

5.19.4.1 Enercorp A100 series

5.20 FILTER BANK STATUS DIFFERENTIAL PRESSURE SWITCHES (DI)

5.20.1 Select the differential pressure range of the switch to suit the application.

5.20.2 Provide switches with adjustable setpoint.

5.20.3 Provide switches with SPDT contacts rated at 9 amperes at 120 VAC and be CSA approved.

5.20.4 Mounted switches with diaphragm in a vertical plane.

5.20.5 STANDARD OF ACCEPTANCE: Enercorp AFS-22

5.21 POSITIVE POSITIONING RELAYS

5.21.1 Positive positioning relays shall be used on valves and dampers to maintain control accuracy and sensitivity, proper sequencing, constant driving force at all positions and shall have the following minimum specifications:

5.21.1.1 Belimo type SGA-24/SGF-24.

5.21.1.2 Input 0 to 10 volts. Output 2 to 10 volts.

5.22 FLOW SWITCHES (DI)

5.22.1 Select flow switches for the pipe size and flow rate.

5.22.2 The flow switch shall have a paddle with 3 segments for selecting optimum size suited for pipe sizes from 25 mm to 150 mm.

- Temperature rating 121° C
- Pressure rating 1030 pa
- Contact rating 8 amps at 120 VAC

5.22.3 Switch shall be CSA approved.

5.22.4 Flow switch to be DPDT, if possible to facilitate monitoring by BMS.

5.22.5 STANDARD OF ACCEPTANCE:

5.22.5.1 McDonnell-Miller

5.23 ELECTRONIC TO PNEUMATIC TRANSDUCER

5.23.1 In retrofit projects, where the specification clearly indicates that existing pneumatic actuators are to be reused, and controlled by DDC, provide transducers to convert the DDC output signals to pressure. Protect each transducer with a 0.2 micron coalescing filter.

- I/P or V/P
- Input signal 4.20 mA or 2.10 VDC.
- Input Impedance 500 ohms
- Output Signal 0 – 15 pig

5.23.2 STANDARD OF ACCEPTANCE:

5.23.2.1 Enercorp VIP-9000 Transducer with VIP-F02 coalescing filter.

5.24 PHOTO SENSOR (DI)

5.24.1 Weathertight

5.24.2 Operating Temperature –30 to +70 C

5.24.3 Resistance at 0 Lux 15 Kohms minimum

5.24.4 Resistance at 10 Lux 3 Kohms typical

5.24.5 STANDARD OF ACCEPTANCE:

5.24.5.1 Enercorp LC-O

5.25 DC POWER SUPPLY

5.25.1 Output: 1 amp at 24V at 20º C in free air

5.25.2 Input: 24 VAC

5.25.3 STANDARD OF ACCEPTANCE:

5.25.3.1 Enercorp PS24DCF

5.26 VAV AIR FLOW SENSOR

5.26.1 STANDARD OF ACCEPTANCE:

5.26.1.1 Kalvico or Honeywell MicroBridge

Hot wire technology is not acceptable.

6 SOFTWARE DESCRIPTION

6.1.1 The software characteristics specified shall establish minimum requirements. The Contractor is responsible for the software used and its applications in reference to the automation system. The Contractor shall deliver a complete an operational system in compliance with contract drawings and specifications.

6.1.2 The BMS Contractor shall provide all software required for efficient operation of all functions required by contract documents. Software shall be modular in design for flexibility all software expansion or revisions shall be included.

6.1.3 The interface between the local field panels shall allow the operator to use the command centre in a conversational alphanumeric mode (by means of questions/answers). The programming of points, event related alarms any other related software functions should be programmable using clear conversational statements. The operating system shall have the following characteristics:

- Multi Tasking
- Real-time clock Routines,
- Memory Map Support with Memory Protect,
- Input/Output Control,
- User Programmable,
- Error Detection, Recovery,
- System Self Testing,
- User Friendly,
- Menu Driven,
- On-Line Help Screens,
- Minimum of Five Level Security Password Access.

6.1.4 Programming with the use of codes shall not be acceptable.

7 SYSTEM

7.1 DDC SYSTEM

7.1.1 DDC system shall be modular in design and of standard microprocessor architecture shall strictly adhere to the following characteristics:

- Building Automation System (BAS) Direct Digital Controls (DDC) shall consist of native BACnet, microprocessor-based, peer-to-peer, networked, distributed devices utilizing the BACnet communication protocol in an open, interoperable system. The BAS also includes operator interface devices, programming and configuration software applications, DDC input/output devices, non-DDC automatic temperature controls, enclosures and interconnecting conduit and wire.

- The BACnet operating stack must be embedded directly in every Device at the board level, and in all operator interface software packages.

- No Gateways, Communication Bridges, Protocol Translators or any other device that translates any proprietary or other communication protocol to the BACnet communication protocol shall be permitted as a part of the BAS installation pursuant with this specification section. Gateways may only be used as required for communication to existing systems or systems installed pursuant with other specification sections.

- DDC controllers that are not BACnet compliant shall not be acceptable under this specification and are strictly prohibited.

- All DDC controllers shall be tested, certified, clearly stamped and listed by the BACnet Testing Laboratories (BTL)ii

- Program database, data acquisition, and all control sequence logic shall reside in each DDC Device. The Building Level Communication Network (BLCN) shall not be dependent upon connection to a Server or Master Controller for performance of the Sequence of Control as outlined in this specification. Each individual Device shall, to the greatest possible extent, perform its programmed sequence without reliance on the BLCN.

7.1.2 Major controllers must have real time clocks. Time keeping methods that depend on the clock speed of the processor chip are not accurate enough, and are not acceptable. One designated controller shall keep the time for the entire system.

7.1.3 The network shall permit the automatic transferring of all point values from one controller to the other on a planned, prioritized basis. The transfer of point values shall be performed directly between controllers. Systems that relay on a control, network, master or gateway controllers to perform these functions are not acceptable.

7.1.4 Firmware must be flash upgradeable over the network.

7.1.5 Digital system controller shall perform its assigned control and energy management functions as "stand alone" unit, in event of loss of communications with CPU.

7.1.6 Control algorithms shall be available and resident in digital system controller to permit proportional, integral derivative, incremental, floating and two position control modes in any combination to meet requirements of application.

7.1.7 Canned packages shall not be permitted in controllers. Controllers must be flexible enough to accommodate custom programs and additional points. Easy down and upload of database over the Board's WAN shall be incorporated to allow for changes and control storage of database. "Applications Controllers" shall not be used.

7.1.8 All control shall be performed in digital manner using digital signal from microprocessor based controller converted through electronic circuitry for operation of electric actuators.

7.1.9 Digital system controller shall be expandable by adding additional field interface units that operate through processor of digital controller to expand its control loop and energy management point capacity, without making any of the original equipment redundant.

7.1.10 To maintain long term analog accuracy in controller sensing circuits, digital controller shall sense voltage being supplied to resistance sensing element and through firmware compensate for power supply.

7.1.11 The non-volatile EPROM memory shall, as a minimum, support the operating system. Tape or disk media is not acceptable. All control languages, application functions and operating data or software shall reside in SuperCap or battery backed RAM. Data or control software (such as I/0 point characteristics, schedules, set points and alarm limits) must remain in RAM and, hence, modifiable on-line through an operators terminal connected to any panel on the system or from a remote location via modem without the use of specialized software not provided in this contract. Controllers using batteries that require periodic replacement shall not be used. Standard off the shelf communications software packages are acceptable but in no case shall a hardware key or any other protection method be permitted that restricts the Board from connection to the system from multiple remote locations to display system command language and graphics displays. Digital system controller shall be supplied with minimum of 250 hours of backup for RAM with automatic battery charger.

7.1.12 All BMS components must be internally protected from loss of memory or operation due to power surges and brown outs. Controllers must be capable of operating without overheating or other damage at as little as 75% of nominal voltage, and as much as 125% of nominal voltage on the secondary side of the control transformers.

7.2 COLOUR GRAPHICS SOFTWARE

7.2.1 Install all software necessary to permit the operator to create, modify, delete, file and recall all graphics. The package shall encompass all graphics, control, control schematics and wiring details for all points and systems contained in the Input/output Point Summary. Provide a separate, valid license, complete with manuals, disks, and documentation for the graphics engineering software for each school project. Provide a separate valid license for of the software necessary to view the graphics with each Operator Work Station

7.2.2 Provide facility to import photographic images, and industry standard graphics drawn by third party graphics software developers, including Paint Shop Pro and AutoCAD, and use them as backdrops to dynamic displays.

7.2.3 Graphics Symbols Software: Shall maintain a library of the symbols provided. Additionally, the feature shall be implemented to allow the operator to define a minimum of 10 unique symbols. In the development of a graphic picture, the graphics software shall support all operator actions necessary to:

- Define the background;
- Establish colours;
- Locate, orient and size the symbols;
- Position and edit alphanumeric descriptors;
- Establish connecting lines;
- Establish sources of real time data and location of their readouts.

7.2.4 The graphic file shall follow the naming convention of the board. All graphics to be submitted for preapproval.

7.2.5 The Graphics Library: Shall contain Contractor prepared displays for each system included in the point schedule and library of standard symbols with the following as a minimum:

- Chiller
- Boiler
- 3-Way Control Valve
- Damper
- Motor
- Coil
- Damper Motor
- Duct
- Sensor
- Air Quality Sensor
- Bulb Temperature Sensor
- Pump
- Convector
- 2-Way Valve
- Check Valve
- Fan
- Filter
- Pipe
- Switch
- Air Measuring Device
- Average Duct Temperature

7.3 DYNAMIC UPDATING

7.3.1 On-line data, displayed as an integral part of a schematic, shall be updated not less than every 5 seconds with the exception of alarm/change of state information, which shall be updated upon its receipt at the operator's terminal.

7.4 INFORMATION SCREEN DISPLAY

7.4.1 Individual schematics shall include, where applicable:

- Status of monitored and controlled on/off points;

- Current value of analog input;
- Identification for each point;
- Current value of the setpoint & DDC output for each control loop;
- Current state of each control loop (computer auto/computer manual);
- Schematic and systems identification;
- Point alarm lock-out status;
- Equipment symbolic information (pump, fan, etc);
- Alarm/normal indication;

7.4.2 All points pertinent to one system shall be on one screen.

7.4.3 Symbols shall have the ability to change colour, depending on the status.

7.4.4 Animations are to indicate point status. Animations are to include pumps, fans and boilers. The BMS contractor shall obtain from the Board the final numbering and name convention to be used for all spaces in the school for incorporation in the "As Built" drawings and manuals.

7.5 EXTERNAL COMMUNICATION

7.5.1 BMS supplier shall supply and install a bridge from the main LAN of the Building Management System to the Board's Wide Area Net. The BMS shall be accessible with full functionality via TCP/IP protocol at any workstation on the WAN that has the necessary front-end software, even if the local front end is turned off.

7.5.2 Dial up connections that require use of telephone lines shall not be considered as an alternative.

7.5.3 Install software, set-up and program Board's central monitoring station to provide complete and total remote control.

7.5.4 This access over the WAN is fundamental to the Board's operation. The capability shall be fully developed, field proven and released by the DDC manufacturer for general use at time of tender. Prototypes shall not be used.

7.5.5 In addition to the WAN connection, the contractor shall provide wiring in conduit to Bell Canada telephone backboard in Telephone Room and provide a telephone modem for remote two-way external communications. The contractor shall use this modem access for his own purposes.

7.5.6 The BMS system shall have the capability of communicating with third party computerized building systems using BACnet protocol.

8 OPERATORS' CONSOLES

8.1 OPERATOR WORKSTATION (OWS)

8.1.1 The Board shall provide, at no cost to the BMS contractor, the OWS consisting of CPU, monitor, keyboard, mouse and all necessary hardware for connecting to the Board's WAN. The BMS contractor shall confirm that the BMS software is compatible with 64bit Windows 7.

8.1.2 The OWS shall be located in the Mechanical Room, and shall be permanently connected to WAN via an Ethernet card and cable drops provided by the communications cabling contractor. The BMS contractor shall not use any other cables to connect to the Board's WAN

8.2 GRAPHICS

8.2.1 Provide linked graphic pictures as follows:

- Building Identification front plate with menu.
- Photo of front elevation of building.
- Floor Plan of each building level.
- Photographic images of typical building interior areas.
- Schematic for each system.
- Tables summarizing temperatures in each zone.
- Tables summarizing the monitored functions off all air handling units.
- Table summarizing weekly schedules.
- Outside Lighting Schematic.
- Time of Day schedules.
- Up to five additional graphics as defined by the Board.
- Global Setpoints, summarizing items such as Min/Max Setpoints, Override Period, etc.
- Global Statistics, summarizing lowest temp, highest temp, number of heat pumps heating/cooling, number of zones occupied, number of zones in override, etc**.**

8.3 OPERATION FUNCTIONS

8.3.1 Digital system controller shall be furnished with software features and capable of performing following energy management functions:

- Menu driven prompting.
- English language based input/output format.
- Direct digital control.
- Alarm reporting and summaries.
- Trend logging.
- Time of day programming with a minimum of 30 days type and 30 week type. TOD function shall be capable of 60 ON/OFF commands in each hour. Advance programming up to (1) one-year minimum. Automatic daylight saving time reset.
- Change of state reporting.
- Password controlled access.
- Hardware self-supervision and fault report.
- On-line programming of start/stop times, setpoints, loop constants, etc.
- Energy totalization for gas, electricity demand and consumption and water Hourly, daily, monthly, quarterly and annual total shall be provided.
- Night setback temperature control and morning warm up in conjunction with O.S.S. program.
- Fully programmable from local terminal and user friendly.
- Economizer control of free cooling cycle.

- Intermediate season or zero energy band control above system break even temperature.
- Automatic re-boot and restart following power interruption.
- Calculation of minimum outside air quantity from outside, return and mixed air temperature.
- Colour Graphics.
- Energy from ground loop using flow rates, supply and return liquid temperatures.

8.4 PROMPTING FORMAT

8.4.1 This shall be menu driven requiring a combination of integer and text inputs. Main system prompt shall present minimum of four choices to Operator typically consisting of Password, Device Configuration, Edit and Command.

8.4.2 Password:

8.4.2.1 Feature shall allow customer programming of minimum of 15 unique operator passwords to provide access only to functions assigned to Operator.

8.4.2.2 Operation function shall be menu driven for level of command, operation and monitoring functions with facilities for individual point or function lock-out within a permitted group. For example, Operator may be permitted to adjust room temperature but banned from adjusting supply air temperature.

8.4.2.3 System shall record log on and log off operations.

8.4.2.4 Password feature shall provide for user defined password time-out interval.

8.4.3 Device Configuration:

8.4.3.1 Feature shall allow operator to direct system data information to output to printer or formatted CRT with slave printer or be auto-dialled to board's Central Computer and or Monitoring Station. A single command selection shall be labelled for these configurations. System shall be capable of being accessed from any remote station or via modem link without use of any front-end software.

8.4.4 Edit:

8.4.4.1 Feature shall enable operator to select various options associated with accessing information or initiating manual commands including Summary, Override, Adjust, Alarm Data Change of State Reporting and Global Advisories as hereafter stated.

8.4.5 Command:

8.4.5.1 Feature shall enable operator to select various options associated with accessing information or initiating manual commands including Summary, Override, Adjust, Alarm Date Change of State Reporting and Global Advisories as hereafter stated.

8.4.6 Summary:

8.4.6.1 Feature shall enable point information to be displayed as single point, or point group or total system point basis. Point data shall be automatically refreshed on CRT every 10 seconds. Summaries shall also be capable of being trended with update intervals between 1 second and 999 minutes. A program start/stop summary shall be provided listing start/stop times

for each controlled load. In graphics mode system shall display all control loop, with dynamic point information.

8.4.7 Override:

8.4.7.1 Feature shall allow manual override, analog or binary point manual override such as start/stop of a motor, set position of a damper or valve, etc.

8.4.8 Adjust:

8.4.8.1 Feature shall allow manual adjustment of an analog or binary point such as a control loop setpoint, control loop tuning constants, start or stop times, etc.

8.4.9 Alarm Data:

8.4.9.1 Feature shall allow display of all alarms (including diagnostic) in system. Alarm display shall be automatically refreshed on CRT every 10 seconds. Equipment or systems switched locally on through system to manual (hand) shall initiate alarm signal with auto log device. Alarms shall be grouped and repeated on daily basis after initial alarm, until acknowledgement. Alarms generated by manual operation shall be repeated every 24 hours irrespective of acknowledgement until point is returned to automatic operation.

8.4.10 Change of State Reporting:

8.4.10.1 Feature shall enable binary points to be displayed on change of status.

8.4.11 Global Advisories:

8.4.11.1 Feature shall give continuous display of information on CRT about general operation of digital system controller, Information shall include:

- Alarm status
- Communication status
- Existence of manual overrides

8.4.12 Storage:

8.4.12.1 Install capabilities for continuous storage of all status data to a minimum of 9000 readings per point. By selection, Operator shall be able to select frequency of readings over a period of up to one year; using individually programmed frequency intervals on any or all points at same time. Selective printout of historical data shall be provided with capabilities of overlaying several points for selected period. Program shall have capability of auto-dialling Board's Central Computer and down loading pre-selected historical logs.

9 TESTING, COMMISSIONING AND OPERATION

9.1.1 Adjust and set sensors, valves, damper operators and relays to proper settings to give required performance. Co-operate with other trades and Sections during testing and balancing of each mechanical system to ensure each total system operates to approval.

9.1.2 Testing shall include pre-delivery testing, field testing, and adjustment of all major components and of the complete BMS and an on-site final operational acceptance test of the complete system.

9.1.3 All tests to be witnessed and approved by Consultant and a Performance Certificate issued by the Contractor.

9.1.4 When installation of the BMS is complete, calibrate all sensors and other equipment, and verify transmission operation.

9.1.5 Final operational test shall be a minimum of 30 days, 24hrs/day, for complete installed and operational BMS to demonstrate that it functions in accordance with the contract drawings and specification. Correct any defects in hardware or software as it occurs before resumption of tests.

9.1.6 Include for carrying out the following tests by Contractor and verification by Consultant:

9.1.6.1 Automatic restart after power outage

9.1.6.2 BMS software program downloading and uploading to and DDC controllers and floppy disks

9.1.6.3 System by system point displays

9.1.6.4 System by system graphic displays

9.1.6.5 Change of output status

9.1.6.6 Response of system to field alarm conditions

9.1.6.7 Response of system to field communication failure

9.1.6.8 Display of and alterations to, time schedules

9.1.6.9 Presence and proper functioning of On-screen Help menu

9.1.6.10 Correct operation of safety circuits, in both “Hand” and “Auto” modes.

9.1.7 Demonstrate the ability of each DDC panel to maintain proper control strategies during a communications failure with the central control facility and the field interface with a DDC panel using a portable terminal provided by the Contractor.

9.1.8 Provision for remote access to complete direct access to BMS to monitor, or change, setpoints, sequence of operation etc.

10 SERVICE & WARRANTY

10.1.1 Temperature control system shown and specified herein shall be warranted free from defects in materials and workmanship and shall be serviced without charge (except for damage from lack of maintenance or other causes) for **three years** after date of start of acceptance. If, within this period, any equipment is proved to be defective in workmanship or materials, it shall be replaced or repaired without charge.

10.1.2 Any component replaced during warranty shall be guaranteed for general system warranty or for one year from date of replacement whichever is the greater length of time.

10.1.3 Provide, at a minimum, one of each manufacturer’s hardware and/or software tools required to service the system, including all manuals and licenses. In the case of multiple types of service tools, one of each type shall be provided.

10.1.3.1 During the first 12 months from the date of acceptance the BMS Contractor shall respond

and be totally responsible for making all adjustments, modifications, upgrades any other necessary changes to maintain the system to operate in accordance with the Consultant's design intent, contract documents maintenance of comfort conditions.

10.1.3.2 Services will be provided by factory trained local area service representatives, regularly employed by the BMS Contractor.

10.1.3.3 All software/firmware updates for the system.

10.1.3.4 Quarterly inspections to verify proper, operation and to perform preventive maintenance as required.

10.1.3.5 Provide during first year of warranty a 24 hour monitoring of critical alarms from control contractor's office.

10.1.3.6 Maintain a local office within an 80 km radius of this installation, staffed with trained software engineers and technicians fully capable of providing instructions, routing maintenance and emergency service within four hours notice on a 24 hour/day basis.

10.1.3.7 Provide new to the owner at time of acceptance. Do not use these Service Tools for commissioning of the system. Provide all service tools preconfigured for system use and tested as required to:

- **Perform hardware configuration (hardware addressing, communication configuration, &c.) of installed equipment, devices, sensors, etc.**
- **Perform network administration, configuration maintenance and changes**
- **Perform Graphical modification and program changes**

11 EXECUTION - ELECTRICAL

11.1 RULES AND REGULATIONS

11.1.1 All of the installation requirements, be they temporary or permanent, shall comply with the Canadian Electrical Code and all local and Provincial codes.

11.1.2 The Contractor shall supply, install and connect all conduits, boxes and wires between all the different components related to the centralized control system including all required line voltage to the equipment. All power shall be provided from appropriately sized new circuits at the nearest electrical panel with space provided by the Contractor.

11.2 CONDUITS

11.2.1 All line voltage power wiring shall be in conduit.

11.2.2 All exposed wiring shall be in conduit.

11.2.3 Wiring in finished areas shall be concealed in structure.

11.2.4 All conduits shall be installed in a concealed manner where possible and shall be installed parallel to the lines of the building.

11.2.5 All flexible conduits shall not exceed 2 m in length and shall be used only in areas where vibrations and/or expansion joints are present.

11.2.6 All conduits and other wiring shall be supported at least every 2 m, supports shall also be located at the connector's end of the conduit.

11.2.7 When flexible conduits are used for connecting an element to its rigid conduit or EMT then the length of this flexible conduit shall not exceed 500mm.

11.2.8 In damp areas, the conduit and related equipment shall be suitable for the application.

11.2.9 All wiring shall be properly identified.

11.3 WIRING AND IDENTIFICATION

11.3.1 All conductors shall be in one continuous length from a point to its source.

11.3.2 The two- (2) extremities shall be identified using the same code.

11.3.3 The terminal strips shall also be identified with this same code.

11.3.4 The identification shall be done using a self-adhesive yellow band marker, Model WBC from Thomas & Betts or approved equivalent.

11.3.5 All power wiring to be copper stranded RW 90 type, with appropriate gauge in accordance with the Canadian Electrical Code.

11.3.6 All control wiring to be copper stranded TEW-105, with appropriate gauge in accordance with the Canadian Electrical Code. The minimum gauge used to be 18 AWG.

11.3.7 All the conductors used for signals from the local field panel (BI, AI, AO, BO) and the communications network shall be a 2-wire, or 4 wire twisted pair with grounded shield around each pair, No. 18 AWG, plenum rated. Multi-conductor cables are acceptable providing that each conductor pair is shielded. Conductor Model 8760 from Belden or approved equivalent shall be used.

11.3.8 All the equipment and panels shall have a Lamicoid nameplate indicating its name, number and all pertinent information. "DYMO" tape will not be accepted.

11.3.9 Surge transient protection shall be provided in each digital system controller unit for the purpose of suppressing induced voltage transients.

11.4 POWER CONDITIONING

11.4.1 If the power conditioning built into the DDC components is insufficient to protect them from damage under the conditions specified, provide external power conditioning for all the DDC components.

11.4.2 Power conditioning filters shall when possible utilize silicon avalanche diode technology rather than metal oxide varisters. (M.O.V.) Life expectancy 10 years or better.

11.5 GROUNDING

11.5.1 All low voltage grounds (shields) must be connected to ONE COMMON GROUND at ONE SPECIFIC POINT in the building at one end of the wire run. No low voltage wire ground may be connected to this common specific point ground in more than one point. This specific point ground must be approved by Dufferin-Peel in writing. Building construction materials or plumbing that are ground loops or have a thermocouple effect may not be considered an acceptable ground connection point. Once the ground has been established the contractor must ensure no in or out of phase potential exists within the ground.

11.5.2 Contractor shall comply with manufacturer's recommendations for network wiring and grounding.

11.6 CONTROL POWER FOR HEAT PUMP CONTROLLERS

11.6.1 Control power for DDC heat pump controllers shall be completely independent from the power provided to the heat pump. The controller shall NOT be powered from the heat pump's integral control transformer.

11.6.2 Wiring for all inputs and outputs from heat pump controllers shall be twisted pair, shielded.

12 GENERAL NOTES

12.1.1 The points listed in any "points list" that shall be provided in the specification and/or drawing, and shall represent the minimum requirement for the control sequences specified. A copy of the Board's Minimum Points List for different types of systems is included at the end of the Guideline

12.1.2 The Consultant shall be responsible for specifying any additional points, as required, to provide and confirm the specified control sequences.

12.1.3 High limit and low limit alarms shall be provided for all suitable points with lockouts, and time delays to preclude nuisance alarms. Standard messages shall be provided showing point in alarm and current valve.

12.1.4 Where multiple pumps, fans or other equipment is started by a single BMS control point provide:

12.1.4.1 Multiple contact control relays to isolate each piece of equipment,

12.1.4.2 Local time delay relays for each controlled piece of equipment and adjust to prevent simultaneous starting of the equipment,

12.1.4.3 Minimum 30 second time delay between starts.

13 OPERATION FUNCTIONS

13.1 OCCUPIED/UNOCCUPIED MODE OF OPERATION

13.1.1 Provide all controls and application programs for time of day scheduling, optimum start/stop, night setback, duty cycling, load shedding etc.

13.1.2 Provide mode override for all zones. Mode override is to be accomplished by pushbuttons on all adjustable DDC thermostats. For areas controlled by non-adjustable DDC temperature sensors, mode override shall be accomplished through the Operator Console.

13.1.3 During unoccupied mode, all fans serving the zone shall be off, and temperature setpoint will revert to heating setback/cooling set up settings.

13.1.4 If the mode is overridden in a heating zone, the temperature setpoint reverts to the occupied setpoint for a period of two hours (adjustable at Operator Console within the 1 to 8 hour ranges.) If half the zones in an area served by an air-handling unit are overridden, the operation of the air-handling unit resumes until the override period has ended.

13.2 TIME SCHEDULING (T/S)

13.2.1 Time scheduling (T/S) can be assigned on all the start/stop points.

13.2.2 The time scheduling table shall have unlimited OCCUPIED, UNOCCUPIED, START and STOP assignments per day for any selected equipment at 1 minute intervals, 24 hours per day and shall be suitable for daily, weekly and annual scheduling for any piece of equipment on an individual basis.

13.2.3 Install an override control so that a period of override may be scheduled at least 30 days in advance. The program shall then automatically reset to normal schedule. The outside dampers shall open to their minimum position within an operator adjustable time period after commencement of the warm up cycle.

13.2.4 During a cool down cycle, the fan system shall operate with the outside damper in the minimum position, except for those systems which also have the enthalpy economizer program specified in the control strategies. For systems with the economizer program, an enthalpy comparison between outside and return air shall be made. If the economizer program determines that outside air can be used for free cooling, then the maximum outside air dampers shall be opened during the cool down cycle. In any event, the outside dampers shall be opened no later than an operator adjustable time period after commencement of the cycle.

13.2.5 Provide summaries at the CRT for each system, as applicable, the following:

13.2.5.1 Programmed occupancy and unoccupied times and desired occupant comfort levels.

13.2.5.2 Times at which system was actually started and stopped.

13.2.5.3 Outside and inside temperatures at the time a system was started.

13.2.5.4 Outside and inside temperature at the time of occupancy.

13.3 DUTY CYCLE (DC)

13.3.1 All the equipment associated with a start/stop program shall be suitable for duty cycling. The following items are requirements of duty cycling:

13.3.1.1 Be applicable with the peak demand limiting program or work as a stand-alone program.

13.3.1.2 A minimum and maximum onetime setting and a minimum and maximum OFF-time setting.

13.3.1.3 Duty cycling shall be automatically deferred if maximum or minimum space temperatures are exceeded.

13.4 TREND GRAPHING

13.4.1 System shall have ability to display points on a trend graph, individually or in groups, of up to 6 points. Graph limits shall be auto set and also manual programmable.

13.4.2 Trends must be easily exportable from within the graphics program to Microsoft Excel, for future graphing, custom report formatting, manipulation, and printing.

13.5 RUNTIME TOTALIZATION

13.5.1 The system shall keep track of equipment "on" time for all binary status points. A program shall totalize runtime for each individual point based on open or closed contact conditions.

13.5.2 Runtime points shall be assigned individual runtime limits. The system shall output a 60 character maintenance message when the runtime for a point has exceeded its limit.

13.5.3 The runtime program shall be capable of storing totalized values to 9999 hours in increments of 5 minutes.

13.5.4 A runtime totalization summary shall be provided which contains a listing of all runtime points; their current totals and operator set runtime limits.

13.5.5 The system shall automatically output a runtime totalization summary based upon a pre-selected time as detiled under the program function description.

13.5.6 An operator command shall be made available to reset or pre-set the accumulated runtime for any point.

14 TRENDS AND REPORTS

14.1.1 Provide point trending capabilities for any system information of operating point. Generate reports based on specific point or group of points; e.g. - status, room temperatures, etc. Write the trend-logged data to a file for screen review by the operator.

14.1.2 Implement trends on all physical points, and for all “mode” variables for all systems. System shall have sufficient RAM to accommodate a minimum of 50 samples per trend in the panel before scrolling to OWS hard drive.

14.1.3 Digital points on major equipment shall be trended using Change of State trending**.**

14.1.4 Analogue points on major equipment shall be trended using Change of Value trending.

14.1.5 Conventional trending shall be used for other types of points.

14.2 ALARM

14.2.1 Install alarming capabilities on all points by assigning a max or min values, incorrect state or error state status. Generate an alarm message from a standard library or a 25 character alphanumeric text.

14.2.2 Install interlock and time delay functions so that alarms shall be locked out.

14.2.3 No alarm shall be reset until acknowledged unless status of point returns to normal condition. In such event a record of the alarm shall be made in an alarm history file for storage of a minimum of 3 months.

14.2.4 Provide for automatic call out to remote terminal for alarms.

14.2.5 Implement alarms and dial outs for all logical conditions. Examples include HWST out of range, Flame Failure Space Too Cold, Pump Failed to Start, Fan Failed to Start, Bad Thermostat, etc.

14.2.6 Program all Critical Alarms to be dialed out in Real Time

14.2.7 Program all other alarms to be dialed out during normal business hours.

14.2.8 Dial outs shall be directed to the BMS contractor's central monitoring station. As part of the tender price, the BMS contractor shall provide 24/7 monitoring of the installation until one year after Substantial Completion.

14.3 ADVISORIES

14.3.1 The system shall continuously interrogate its hardware for failure and/or tampering and report to the operator, in English language, all changes in hardware status. Advisories shall include at least the following:

14.3.1.1 System can/cannot communicate with point.

14.3.1.2 System can/cannot communicate with field processing unit/DDC system controller.

14.3.1.3 Field processing unit is operational/not operational.

14.3.1.4 System can/cannot communicate with operator device(s).

14.3.1.5 A power failure has been detected at (time) (date).

14.4 MAINTENANCE TIME REMINDERS

14.4.1 Maintenance time reminders shall be generated based on run time or calendar date.

15 CONTROL STRATEGIES AND SEQUENCES OF OPERATIONS

15.1 TEMPERATURE BASED LOAD CONTROL PROGRAM

15.1.1 The system shall provide an interlocking capability between any energy control load and an analog temperature point. A comfort or safe range zone shall be defined by high/low alarm limits. If load under control is presently within comfort or safe range, load will operate normally as either an operator specified programmed start/stop point, demand limit point, or cycling point. If load is outside its limits, interlock sequence shall take effect until load control point returns to comfort or safe zone at which time it will resume operation as either programmed start/stop load, demand limit load, or cycling load.

15.1.2 This program in conjunction with programmed start/stop, shall permit load cycling for reduced night temperature setback during unoccupied periods in conjunction with space temperature analog points.

15.2 ENTHALPY ECONOMIZER

15.2.1 Provide control of fresh air, and relief air dampers during the cooling season based on inside and outside enthalpy comparisons. Provide all sensors and controllers required for the proper operation of this feature whether or not they are identified in the point schedule. These points shall include OAT, OAH and RAH.

15.2.2 The program shall monitor outside and inside temperatures and humidifies and fan cooling coil discharge temperature. Based on these inputs, the outside/return air dampers shall be controlled as follows:

15.2.2.1 Minimum outside air damper fully open. When the supply air discharge temperature setpoint is less than the mixed air temperature, obtained when operating on minimum outside air only, the maximum outside air, return air and exhaust air dampers shall modulate to satisfy the supply air discharge temperature setpoint.

15.2.2.2 Minimum outside air damper fully open. When the supply air discharge temperature setpoint is greater than mixed air temperature, obtained when operating a minimum outside air only, calculations shall be made to determine if the use of 100% outside air or minimum outside air provides the smallest enthalpy change across the cooling coil.

15.2.3 The calculations shall take into consideration the total enthalpy in the outside and return airstrips.

16 AIR SYSTEMS

16.1 CONSTANT VOLUME SINGLE ZONE (MULTI SPACES) SINGLE HEATING COIL

16.1.1 Provide a program that automatically adjusts fan discharge setpoint temperature as high as possible (cooling) or as low as possible (heating) to satisfy the space with the greatest cooling or heating load. Provide all sensors required for the proper operation and clearly identify in the point schedule.

16.1.2 Zone heating/cooling requirements shall be determined by monitoring space temperature. Supply air discharge temperature shall be adjusted up or down as appropriate until at least one of the measured inputs is at its comfort limit, indicating additional reset would cause zone discomfort.

16.1.3 A comparison shall be made with the mixed air temperature, obtained with minimum outside air only, and supply air discharge temperature setpoint. If the outside air temperature is suitable the maximum outside air, mixed air, and exhaust air damper shall modulate to satisfy the supply air discharge temperature setpoint without energizing the main heating coil. Heating coil shall only energized if the supply air discharge temperature setpoint cannot be attained when the system is operating on minimum outside air.

16.1.4 An operator adjustable time delay shall be provided to establish a stabilization period between consecutive setpoint adjustments.

16.1.5 Provide a summary to the CRT for each fan system:

16.1.5.1 Space temperatures or thermostat signals and comfort range limits.

16.1.5.2 Current discharge temperature setpoints.

16.1.5.3 Status of freezestats and firestats.

16.1.5.4 Position of each AHU outside air, return air, and exhaust damper as sensed by the feedback potentiometer in the damper actuator.

16.2 CONSTANT VOLUME, SINGLE ZONE (MULTI SPACES) HEATING COIL AND SPACE TERMINAL HEATING COILS

16.2.1 BMS adjusts the supply air discharge temperature setpoint, as required to satisfy the warmest space and make up the difference by operating the reheat coils. Provide all sensors required for the proper operation and clearly identify in the point schedule.

16.2.2 Zone heating/cooling requirements shall be determined by monitoring space temperature. Supply air discharge temperature shall be adjusted up or down as appropriate until at least one of the measured inputs is at its comfort limit, indicating additional reset would cause zone discomfort.

16.2.3 In conjunction with the economizer controls, a comparison shall be made with the mixed air temperature, obtained with minimum outside air only, and the supply air discharge temperature setpoint. If the outside air temperature is suitable the maximum outside air, mixed air, and exhaust air dampers shall modulate to satisfy the supply air discharge temperature setpoint without energizing the main heating coil or any space terminal reheat coil.

16.2.4 In the event that the outside air temperature is not suitable to maintain a minimum fixed mixed air temperature of 12.7□C (55 □F) with minimum outside air only, the main heating coil shall be energized to maintain a minimum fixed supply air discharge temperature setpoint of 12.7ºC. Required zone heating shall be supplied by the space terminal reheat coil. In the event that the outside air temperature is suitable to maintain a mixed air temperature ranging from 12.7º C (55ºF) to 18.3º C (65º F), using more that minimum outside air volume, without energizing the main heating coil, but is below the supply air discharge temperature setpoint, any further heating required shall be supplied via the space terminal reheat coil.

16.2.5 Whenever possible only one source of reheat, i.e. main heating coil or space terminal reheat coil, shall be used to satisfy the space temperature requirements.

16.2.6 An operator adjustable time delay shall be provided to establish a stabilization period between consecutive setpoint adjustments.

16.2.7 Provide a summary to the CRT for each fan system:

16.2.7.1 Space temperatures or thermostat signals and comfort range limits.

16.2.7.2 Current discharge temperature setpoints.

16.2.7.3 Status of freezestats and firestats.

16.2.7.4 Position of each AHU outside air, return air and exhaust damper as sensed by the feedback potentiometer in the damper actuator.

16.3 CONSTANT VOLUME, SINGLE ZONE (MULTIPLE SPACES) HEATING AND COOLING COILS

16.3.1 Provide a program that automatically adjusts the supply air discharge temperature setpoint as high as possible (cooling) or as low as possible (heating to satisfy the space with the greatest cooling or heating load. Provide all sensors required for the proper operation and are clearly identified tin the point schedule.

16.3.2 Zone heating/cooling requirements shall be determined by monitoring space temperature. Supply air discharge temperature shall be adjusted up or down as appropriate until at least one of the measured inputs is at its comfort limit, indicating additional reset would cause zone discomfort.

16.3.3 In conjunction with the economizer controls, a comparison shall be made with the mixed air temperature, obtained with minimum outside air only, and supply air discharge temperature setpoint. If the outside air temperature is suitable the maximum outside air, mixed air, and exhaust air damper shall modulate to satisfy the supply air discharge temperature setpoint without energizing the main heating or cooling coil. The heating or cooling coil shall only be energized if the supply air discharge temperature setpoint cannot be attained, but simultaneously.

16.3.4 In conjunction with the economizer control, when mechanical cooling is required to satisfy the supply air discharge temperature setpoint, the return air humidity shall be used to determine the supply air discharge temperature setpoint. If the supply air discharge temperature setpoint has been determined in accordance with the preceding, and the return air humidity level exceeds an operator adjustable setpoint level, indicating insufficient dehumidification is occurring, the supply air discharge temperature setpoint shall be decreased until the return air humidity level is below the setpoint limit.

16.4 CONSTANT VOLUME, SINGLE ZONE (MULTI SPACES) MAIN HEATING AND COOLING COILS, SPACE TERMINAL REHEAT COILS

16.4.1 This shall be the same as describe in item 3 above except that the space terminal reheat coil shall not be allowed to be energized until the space temperature falls 5.5 C below the lower limit of the operator adjustable comfort range

17 HYDRONIC SYSTEMS

17.1 SINGLE HEATING DISTRIBUTION SYSTEM

17.1.1 Where a single heating distribution system is used to serve air-handling units and/or any other terminal heating device, the supply water temperature shall be scheduled in accordance with outdoor temperature.

17.2 PRIMARY/SECONDARY HEATING DISTRIBUTION SYSTEM

17.2.1 Primary distribution system shall be constant temperature.

17.2.2 Secondary distribution system shall be scheduled in accordance with outside temperature. In addition, where the output of a terminal device is controlled via two-way valve, these

control valves shall be monitored and if 4 or more control valves are not fully open the supply water temperature shall be decreased at a rate of 0.5 C - 1 C, at 2 minute intervals, until valves are fully open.

17.3 COIL CONTROL USING THREE WAY MIXING VALVE

17.3.1 The supply air discharge temperature controller, in sequence with the economizer controls, shall mix supply water with return water via 3-way to satisfy the supply air discharge temperature setpoint.

17.4 GLYCOL HEAT RECOVERY LOOP

17.4.1 Control leaving air temperature from coil in fresh air duct via 3-way valve. Use immersion sensor to override 3-way valve control to raise glycol return temperature to prevent frost forming on exhaust air coil.

17.5 CO_2 CONTROL

17.5.1 Provide CO_2 controls to override economizer controls to allow more outside air to enter. Limit excess outside air in order to prevent mixed air temperature falling below 7ºC unless a glycol heating coil is installed.

17.6 CO CONTROL

17.6.1 Provide CO sensor in outside air duct to shut down fans if ambient CO level exceeds setpoint and report alarm. Fans are to restart automatically after 30 minutes.

17.7 HUMIDIFICATION

17.7.1 Modulate humidifier output under DDC control to satisfy return air humidity.

17.7.2 Hard wired safety controls shall include a high limit humidistat and air flow switch, supplied by the humidifier manufacturer, and installed and wired by the Controls Contractor, and a hard wired interlock with the supply fan starter.

17.7.3 DDC points shall include RAH, SAH, humidifier enable/disable, humidifier output modulation, and humidifier alarm.

17.7.4 Interlock the humidifier in software with the associated fan system, so that the humidifier is enabled only when the fans are commanded to run, and status points indicate that they are, in fact, running.

18 CONTROLS

18.1 EXTERIOR LIGHTING CONTROL

18.1.1 The exterior lighting system has been zoned and is provided with relays for control (relays by Division 16).

18.1.2 Morality lighting (including building flood lighting, and Parking Lot Lighting shall have separate schedules).

18.1.3 The above zones shall be on time of day schedules. Provide a schedule for each zone. Lighting shall be off from 09:00 hours to 17:00 hours, regardless of photosensor signal.

18.1.4 Morality Lighting shall be enabled, subject to photosensor status, every evening from 17:00 hours until 09:00 hours the following day. (Operator adjustable)

18.1.5 Parking Lot Lighting shall be enabled, subject to photosensor status every week night from 17:00 hours until 24:00 hours. (Operator adjustable

18.1.6 An exterior photometric sensor shall be monitored as an digital input point.

18.1.7 The BMS shall report an alarm if the photosensor senses light between 23:00 hours and 04:00 hours, or darkness between the 10:00 hours and 15:00 hours. This shall be an indication that either the photosensor is not working, or the BMS system clock is incorrectly set.

18.1.8 Install “Hand-Off-Auto” switches so that exterior lighting can be conveniently tested and re-lamped during daylight hours by staff not conversant with BMS operation.

18.1.9 The BMS shall monitor the status of the fire alarm system. If the fire alarm is active, subject to photo-sensor status, the BMS shall turn on all exterior lighting under its control, and leave it on four hours after the alarm is cleared.

18.1.10 The corridor lighting shall be controlled by the BMS. The BMS shall monitor the security system. When the security system is armed and is free of any alarm the volt free contact shall close and the BMS shall turn off the corridor lights 15 min after it senses the closure of the contact. When the security system in unarmed or there is an alarm in the security system the volt free contact shall open and the BMS shall turn on all the corridor lights

18.1.11 Install “Hand-Off-Auto” switches so that corridor lighting can be operated when required.

18.2 BOILER, CIRCULATING PUMP AND HEATING PUMP CONTROL (GENERAL)

18.2.1 The DDC control system shall monitor the status, flame failure and alarm condition of each modular unit or large boiler, using the dry contacts provided by the boiler manufacturer.

18.2.2 Install DDC lead and lag control and sequential operation for modular units and large boilers and associated circulating pumps on a rotational basis. Where boilers are fitted with modulating or low/high firing burners, monitor the status of boiler firing. Standalone boiler/pump sequencing panels shall not be acceptable.

18.2.3 Status of boilers and boiler stages and boiler alarms shall be indicated by LEDs mounted on the front cover of the BMS boiler controller cover.

18.2.4 Emergency operation of boilers shall be achieved by putting the Boiler “Hand-Off-Auto” switch in the “Hand” position. When in “Hand”, the boiler shall be controlled by its own operating aquastat. The high temperature limit aquastat and other safety devices shall remain in the circuit regardless of switch position

18.2.5 Emergency operation of pumps shall be achieved by putting the “Hand-Off-Auto” switch on the starter in the “Hand” position

18.2.6 Where a primary/secondary loop system is designed the primary loop shall be constant temperature. Implement outside air temperature reset of secondary loop clearly showing design parameters.,

18.2.7 Where there is only a primary loop serving all heating equipment, implement outside air temperature reset of the primary loop and monitor return water temperature to ensure that the return hot water temperature is above the minimum necessary to prevent condensation inside the boiler.

18.2.8 This section shall take precedence over the burners and controls paragraphs of the boilers, pumps and starters specifications.

18.2.9 New boilers shall be complete with modulating burners.

18.2.10 New boilers shall be complete with factory wired safety controls, including flow proving switch, low water cutoff, high temperature limit aquastat, operating aquastat and “Hand-Off-Auto” switch. The equipment specification shall clearly indicate that if a device is to be field wired, the wiring shall be the responsibility of the Controls Contractor**.** Otherwise, the cost of field wiring boiler components shall be the responsibility of the boiler vendor.

18.2.11 New boilers shall also be complete with alarm package and clearly labeled terminal strip. The terminal strip shall have connections for the following:

18.2.11.1 “Enable/Disable” or “Start/Stop”

18.2.11.2 “Modulation” (Company’s choice of 0 – 10 VDC or 4 – 20 mAmps)

18.2.11.3 “Flame Status” (Dry Contacts)

18.2.11.4 “Flame Failure” (Dry Contacts)

18.2.12 The Consultant shall forward a copy of the shop drawings for boiler, circulating pumps and pump starters for review by the BMS contractor. BMS contractor shall certify these drawings as complying with these interface requirements, and being free of superfluous controllers. Shop drawings shall not be certified by the BMS contractor unless they are complete with legible internal and external wiring diagram.

18.2.13 The Consultant shall be responsible for ensuring that the installed equipment is complete with specified terminal strips and without standalone controllers to enable BMS to have direct control of the equipment

18.3 AIR HANDLING UNITS AND FANS

18.3.1 The DDC system shall control, adjust setpoints and monitor the status of air handling unit and components, control status of supply, return, and exhaust fans larger than .1 kW. Status of fans shall be determined by a current transformer. Actual amp draw in real time and calculated status shall be available at the Operator Console. Connection to an auxiliary starter contact is not an acceptable alternative method. Alarm setpoints are to be set in software high enough that the current drawn by a free wheeling motor with a broken fan belt or coupling shall not be high enough to confirm “ON” status. Fan status shall be presented on the graphical display as an animation

18.3.2 If the drawings or fan schedule stipulate that a specific fan is to be complete with Back Draft Damper, the BMS contractor shall not include for a Motorized Damper for that fan.

18.3.3 The Consultant shall ensure that any fan, heat recovery unit and air handling unit shown on the drawings or in the specification to be complete with motorized dampers, these comply with the Section 15900 Specification i.e. TAMCO dampers and Belimo actuators.

18.4 STATUS OF PUMPS

18.4.1 The DDC system shall control and monitor the status of all HVAC and Domestic Hot Water pumps. Status of pumps shall be determined by a current transformer, in conjunction with an AI point. Actual current draw in real time, expressed in amperes as well as calculated status shall be available at the OWS. Connection to an auxiliary starter contact is not an acceptable alternative. Pump status shall be presented on the graphical display as an animation.

18.5 CABINET HEATERS, FORCE FLOWS AND UNIT HEATERS

18.5.1 The DDC control system shall control all cabinet and unit heaters. Install plate type room temperature sensor and stop/start for each heater. Status points are not required. Implement night setback. Mode may be overridden only at the OWS.

18.5.2 For unit heaters, cycle supply fan on/off to maintain set point.

18.5.3 For cabinet heaters, cycle supply fan on/off and modulate control valve to maintain setpoint.

18.5.4 The control system shall maintain the following temperatures:

18.5.4.1 Occupied mode 18º C

18.5.4.2 Unoccupied mode 13º C

18.6 ELEVATOR MACHINE ROOM, ELECTRICAL ROOM, STORAGE ROOMS, NODE ROOMS

18.6.1 The DDC control system shall cycle the exhaust fan motorized dampers and heating device, where applicable to maintain a setpoint of 27º C. Status point is not required.

18.7 DIFFERENTIAL PRESSURE CONTROL

18.7.1 Install pressure sensors on the discharge and suction side of the pumps. When the pressure differential increases beyond a pressure differential set point, the BMS shall modulate the bypass valve to maintain the setpoint.

18.8 PERIMETER RADIATION

18.8.1 Radiation valve shall modulate to maintain setpoint of local space temperature sensor.

18.8.2 During unoccupied mode, radiator valve modulates to maintain “unoccupied” set point.

18.8.3 Where adjustable setpoint thermostats are provided, the setpoint wheel shall adjust the Occupied Mode setpoint only. Setpoint adjustment available at the thermostat shall be limited in software to a reasonable range of 20º to 22º C.

18.9 DOMESTIC HOT WATER (GAS FIRED SYSTEM)

18.9.1 The Building Automation System shall control the domestic hot water pump(s) on Time of Day. The BMS shall monitor the status of the DHW pump(s) by means of current transformers, and monitor the supply temperature.

18.10 HEAT PUMPS, WATER TO AIR

18.10.1 Each heat pump shall be controlled through a standalone intelligent DDC controller mounted on the heat pump cabinet, and a wall mounted intelligent electronic sensor with programmable setpoint and mode override button, and no other features that will permit building occupants to interfere with the operation of the heat pump. Each stat shall have jack in underside into which a palmtop computer can be plugged to access the entire system in text mode.

18.10.2 The BMS controller shall operate through the heat pump manufacturer's terminal strip to control fan, compressor and reversing valve to maintain space temperature. The fan shall run continuously when in "Occupied" mode, and intermittently when in "Unoccupied" mode.

18.10.3 The BMS controller will report any unit failure alarms generated by the heat pump's integral control system.

18.10.4 Temperature setpoints will be limited to a reasonable range. The "reasonable range" of temperatures can be set at the Operator Workstation by a building operator with adequate password authorization.

18.10.5 Upon receipt of an alarm from the heat pump, the DDC system shall generate a system alarm (and disable the heat pump, if this safety feature is not already built into the heat pump circuitry.)

18.10.6 The BMS controller shall continuously monitor the supply air temperature.

18.10.7 If the heat pump has been heating mode for at least 2 minutes, the BMS shall generate an alarm if the SAT is cooler than 30^{o}C.

18.10.8 If the heat pump has been cooling mode for at least 2 minutes, the BMS shall generate an alarm if the SAT is warmer than 18^{o}C.

18.10.9 The BMS Room Stat for the heat pump shall annunciate alarms generated by the local heat pump by flashing an LED continuously.

18.10.10 The BMS shall calculate, on the basis of information updated at least once a minute, and present on a "Global Information" display:

- Total number of heat pumps in occupied mode
- Total number of heat pumps in override mode
- Total number of heat pumps cooling
- Total number of heat pumps heating
- Total number of heat pumps in "alarm"
- Average space temperature
- Lowest space temperature

- Average heating offset
- Greatest heating offset
- Average cooling offset
- Greatest cooling offset

18.10.11 Upon resumption of power after a power outage, restore operation of the heat pumps in sequence to minimize the heavy current draw that would otherwise take place. (See also the sequence for Resumption of Power.) If heat pumps have “Random Start” built into their integral controls, the BMS need not duplicate that feature.

18.10.12 If the Heat Pump has a “Reset” terminal, it shall be possible to reset the integral heat pump alarms manually from the Operator Work Station.

18.11 BOILER AND MECHANICAL ROOM SUPPLY AIR SYSTEMS

18.11.1 The DDC control system shall cycle the exhaust fan, dampers and unit heater or other heating device, and modulate the outside air, return air and exhaust air dampers as required to maintain the temperature between a heating setpoint of 18ºC and a cooling setpoint of 24ºC. Fan status point is required.

18.12 HEAT PUMP LOOP

18.12.1 The heat pump system shall be controlled by the BMS.

18.12.2 The sequence of operations shall be as follows:

18.12.3 HEAT REJECTION:

18.12.3.1 On a loop temperature rise to 29.4 degrees C (85 °F), the BMS shall energize the damper relay to open a positive closure damper mounted on the discharge of the evaporative fluid cooler.

18.12.3.2 When the discharge damper opens fully, an end switch makes, which in turn energizes an actuator to open the inlet damper.

18.12.3.3 On a rise to 31.3 degrees C (88 °F), the BMS shall start the recirculating spray pump motor on the evaporative fluid cooler. On further temperature rise, turn on the fluid cooler fan.

18.12.4 HEAT INJECTION:

18.12.4.1 On a fall in loop temperature leaving the cooler, the sequence shall take place in reverse order at not more than 1.7 degrees C (3 °F) differential below the above specified operating points.

18.12.4.2 The BMS shall control the three-way heat injection valve to maintain heat pump loop supply temperature. The setpoint shall be operator adjustable within a range of 15.5º & 21.1º C (60º F & 70º F), with and throttling range adjustable between 1.7º & 4.4º C (3º & 8ºF)

18.12.4.3 On a loop temperature fall to the selected "add heat" setpoint, the BMS shall start the lead heat injection pump, and allow the hot water diverting valve to modulate to maintain its heat injection setpoint.

18.12.5 Heat Pump Loop Pumps shall operate in a lead/lag sequence with weekly rotation.

18.12.6 When flow is required in the heat pump loop, the BMS will activate the magnetic starter for the lead pump. Should pump motor not startup and develop normal run amperage as detected by current transformer, or if flow is not proven by means of the flow switch within 20 seconds, the BMS shall disable the lead pump and activate the lag pump, and register an alarm. Should the flow not be proven within twenty seconds, the BMS shall register a "Critical Alarm".

(Refer to sequence for "Alarm Handling".)

18.12.6.1 On loss of flow, start standby pump, deactivate all stages of control, and report an alarm. The evaporator spray pump and fans shall shut down, and the heat injection valve shall close, until standby pump has started, and the flow is proved.

18.12.6.2 When flow is proven or restored, or in the event of restoration of power after a power interruption, the equipment shall be staged on to prevent a large current inrush.

(Refer to Sequence for "Resumption of Power")

18.13 HEAT PUMP LOOP ALARMS

18.13.1 In the event that flow is not proven within 20 seconds of starting up the lag pump, the BMS shall report a "Critical Alarm", which includes activating the alarm strobe light in the administration area.

18.13.2 On a loop temperature fall to 13.4 degrees C (56 °F), the BMS shall report a Critical Alarm.

18.13.3 On a loop temperature rise to 40.6 degrees C (105 °F), the BMS shall report a Critical Alarm.

18.14 ROOFTOP AND INDOOR PACKAGED HVAC UNITS

18.14.1 Mechanical contractor shall provide units complete with safety controls, dampers and Belimo MFT actuators, and terminal strips only. The terminal strip shall be the interface between the BMS and the unit, and shall be the means for the BMS to:

18.14.1.1 Directly modulate the damper actuator(s)

18.14.1.2 Directly control the stages of cooling

18.14.1.3 Directly control the heating modulation or stages of heating

18.14.1.4 Directly control any valves which may be provided by unit manufacturer

(Unless otherwise specified, this section is responsible for valves)

18.14.1.5 Monitor signals from unit's integral safety controls for flame status, flame failure and cooling alarm.

18.14.1.6 Monitor status of filter clogged sensors, if so equipped.

18.14.2 All valves or damper actuators provided by equipment manufacturers shall be suitable Belimo Multifunction Technology, configured to accept a 2 – 10 VDC control signal, but

field configurable to other standard control signals, including 0 – 10 VDC and 4 – 20 mAmps.

18.14.3 The BMS shall monitor space temperature, space setpoint, return air temperature, supply air temperature, and mixed air temperature and fan(s) status, and modulate the dampers and cycle the heating and cooling as required to maintain space temperature at setpoint.

18.14.4 The BMS shall coordinate the operations of this unit with any radiation zones that serve the same area. The BMS shall implement heating setback and cooling setup with manual override during unoccupied hours.

18.14.5 The BMS shall register alarms if:

18.14.5.1 Space temperature is out of range

18.14.5.2 Fan status does not match commanded state

18.14.5.3 Unit not heating when commanded, as indicated by SAT

18.14.5.4 Unit not cooling when commanded, as indicated by SAT

18.14.5.5 Flame status as indicated by dry contacts

18.14.5.6 Flame failure or cooling alarm as indicated by dry contacts

18.14.6 Consultant shall submit shop drawings for the above equipment to the BMS contractor for review by the BMS contractor to ensure that they comply with these requirements, and being free of superfluous controllers. Consultant shall then review to ensure they comply with the specified Sequence of Operation.

18.15 HEAT RECOVERY UNIT

18.15.1 Mechanical Contractor shall provide units complete with safety controls, dampers and Belimo MFT actuators, and terminal strips only. The terminal strip shall be the interface between the BMS and the unit, and shall be the means for the BMS to:

18.15.1.1 Directly modulate the damper actuator(s)

18.15.1.2 Directly control the stages of cooling

18.15.1.3 Directly control the heating modulation or stages of heating

18.15.1.4 Directly control any valves which may be provided by unit manufacturer (Unless otherwise specified, this section is responsible for valves)

18.15.1.5 Directly control heat wheels or heat coil tilt mechanisms

18.15.1.6 Directly control the inputs from any Variable Speed Drives

18.15.1.7 Monitor output signals from any Variable Speed Drives

18.15.1.8 Monitor signals from unit's integral safety controls for flame status, flame failure and cooling alarm.

18.15.1.9 Monitor status of filter clogged sensors, if so equipped

18.15.2 All valves or damper actuators provided by equipment manufacturers shall be suitable Belimo Multifunction Technology, configured to accept a 2 – 10 VDC control signal, but field configurable to other standard control signals, including 0 – 10 VDC and 4 – 20 mAmps.

18.15.3 The BMS shall monitor, SAT reset adjustment, exhaust air temperature, supply air temperature, OAT entering heat wheel , SAT leaving heat wheel, EXH air temperature entering heat wheel, EXH air temperature leaving heat wheel, fan(s) status, and any other points as noted in points list

18.15.4 The BMS shall register alarms if:

18.15.4.1 SAT is out of range

18.15.4.2 Fan status does not match commanded state

18.15.4.3 Unit not heating when commanded, as indicated by SAT

18.15.4.4 Unit not cooling when commanded, as indicated by SAT

18.15.4.5 Flame status as indicated by dry contacts

18.15.4.6 Flame failure or cooling alarm as indicated by dry contacts

18.16 RESUMPTION OF POWER

18.16.1 BMS controllers and front end will restart on resumption of power without human intervention.

18.16.2 In the event of a power outage, upon restoration of power, the BMS shall stage on controlled equipment to prevent avoidable power surges

18.16.3 Equipment and systems must be restored in a logical order. For example, in the case of a heat pump system, the pumps should be restored first, followed by the boiler or fluid cooler, and finally the heat pumps.

18.16.4 The time between stages shall be sufficient to permit the first piece of equipment to startup, come up to speed, and settle down to drawing normal “run” amperage before starting up the next piece of equipment.

18.16.5 Specify in the shop drawing submittals the order in which controlled equipment shall be restored to normal operation after resumption of power.

19 ALARM HANDLING

19.1.1 Alarm handling shall be a function of the DDC controllers, rather than the operator interface software, and the following functionality will be available in text mode without sound, even if the Operator Interface Software is running.

19.1.2 Alarms will be designated “Critical” or “Non Critical”.

19.1.3 “Critical” alarms shall be registered for conditions that are serious enough to compromise the ability of the building systems to support normal business activities. Alarms should not be designated “Critical” unless they would justify having the building operator attend the site, or at least dial in to the site after hours.

19.1.4 "Non Critical" alarms shall be registered for conditions that lack that urgency.

19.1.5 "Critical" alarms are designated on the points list as "CR", while "Non Critical" alarms are shown as digits.

19.1.6 In the event of a "Critical" alarm, the BMS shall:

19.1.6.1 Indicate an alarm at the Operator Workstation (assuming that the OWS is turned on) both on the monitor and by voice message to the speakers.

19.1.6.2 Print out an alarm at the Operator Workstation (assuming that both OWS and printer are both turned on)(provided printer is specified to be provided).

19.1.6.3 Dial out an alarm to the building operator's pager.

19.1.6.4 Dial out an alarm to the contractor's monitoring station, which in turn notifies contractor's duty technician.

19.1.7 In the event of a "Non Critical" alarm, the BMS shall:

19.1.7.1 Indicate an alarm at the Operator Workstation (assuming that the OWS is turned on) both on the monitor and by voice message to the speakers.

19.1.7.2 Dial out an alarm to the control monitoring station.

19.1.8 If the OWS is not turned on at the time of the alarm, the alarm condition will be reported on the OWS monitor when the OWS is next activated.

20 ASSIGNMENT OF ACCESS LEVELS

20.1.1 Divide operator access to system into 3 basic levels of operation, programming and configuration of system. Each level requires unique access code and operator's initials to sign on.

20.1.2 **Level 1** permits review of status and statistical data in panel being accessed. This includes status and value of points, totalized run time and trend data. Level 1 also allows operator to manually start and stop points and acknowledge alarms.

20.1.3 **Level 2** provides operator with ability to perform level 1 function, and display or modify application program data. Normally issued to senior board staff only, who have responsibility for energy costs.

20.1.4 **Level 3** provides access to programming and safety logic, including limits on adjustment ranges, and will require high level access. This level normally issued only to customer or contractor technicians certified by the manufacturer.

20.1.5 **Interface** shall permit setpoint adjustment through graphics display using pull-down menus, mouse in conjunction with keyboard. Setpoint adjustments shall be password protected as follows:

20.1.6 Adjustment within limited range of nominal setpoint, low level password adjustment outside of limited range above, medium level password alarm setpoints, high level password.

20.1.7 Review of logs/status/system graphics shall be unprotected or low-level password protected.

20.1.8 Programming, graphics display modifications shall be accessible only through medium/high level passwords as directed at system commissioning.

List of points

Typical Plant Boiler

Point Description	DI	DO	AI	AO	
Individual Boiler Status	1				
Individual Boiler Flame Failure	1				
Supply header Pressure Sensor			1		
Return Header Pressure Sensor			1		
Individual Boiler Discharge temperature			1		
Hot Water Supply header temperature			1		
Hot Water Return header temperature			1		
Outside air temperature			1		
Individual Boiler Enable		1			
Individual Boiler Modulation/Staging		1		1	
Strobe Alarm		2			Blue, 24vAC strobe
Refer to pump I/O list for all heating pumps					

Heat Recovery Unit

Point Description	DI	DO	AI	AO	
Supply air temperature			1		
Return air temperature			1		
Exhaust air temperature			1		
Temp after heat wheel			1		
Supply fan status			1		Current sensor

Return fan status			1		Current sensor
Heat wheel alarm	1				
HRU alarm	1				
Temp Reset				1	
Supply Fan Control		1			
Return Fan Control		1			
HRU to be connected using BACnet MSTP					

Roof Top Unit

Point Description	DI	DO	AI	AO	
Supply air temperature			1		
Return air temperature			1		
Mixed air temperature			1		
Supply fan status			1		Current sensor
Return fan status			1		Current sensor
Supply Fan Control		1			
Return Fan Control		1			
Damper control		1		1	
Heating control		1		1	O/P based on number of stages
DX cooling control		1			O/P based on number of stages

Air Handling Unit

Point Description	DI	DO	AI	AO	
Supply air temperature			1		
Return air temperature			1		
Mixed air temperature			1		
Supply fan status			1		
Space Air temperature			1		
Return fan status			1		Current sensor
Freeze stat	1				Current sensor
Heating enable		1			
Heating Control		1		1	
Cooling Control		1		1	O/P based on number of stages

Damper Control				1	
Supply Fan Control		1			
Return Fan Control		1			
Gum AHU CO2 sensor			1		

Heat Pump

Point Description	DI	DO	AI	AO	
Supply Air temperature			1		
Alarm Status	1				Volt free contact from Heat Pump
Fan Control		1			
Compressor Control		1			
Reversing Valve Control		1			
Refer to room temperature sensor for space temp sensor details					

Typical Room sensor

Point Description	DI	DO	AI	AO	
Room temperature sensor			1		
Set point slider			1		
Occupancy override	1				Switch

Typical Room sensor for Storage rooms / Change room / Washrooms & Corridor

Point Description	DI	DO	AI	AO	
Temperature sensor for Storage rooms/Change room /Washrooms & corridor			1		Plate sensors

Pump

Point Description	DI	DO	AI	AO	
Pump status			1		Current sensor
Pump start/Stop		1			

Unit Heater with fan control only

Point Description	DI	DO	AI	AO	
Space Air Temp			1		
Heater enable		1			

Unit Heater with fan and water control

Point Description	DI	DO	AI	AO	
Space Air Temp			1		
Heater enable		1			
Heater valve control		1		1	

Exhaust Fan

Point Description	DI	DO	AI	AO	
Exhaust Fan Status			1		Current sensor
Exhaust Fan Start/Stop		1			Auto/Manual switch to be provided

Radiation Valve Control

Point Description	DI	DO	AI	AO	
Space Air Temp			1		
Radiation Valve Control				1	

Cooling Tower

Point Description	DI	DO	AI	AO	
Building Supply water temp			1		
Building Return water temp			1		
Building Supply water pressure			1		
Tower entering water temp			1		
Tower leaving water temp			1		
Tower Damper open status	1				
Spray pump status			1		Current sensor
Fan status			1		Current sensor
Tower bypass valve status	1				
Damper Open command		1			

Spray pump Stat/Stop		1			
Tower fan low speed		1			If VFD then BACnet command
Tower fan high speed		1			
Tower bypass valve				1	
If equipped with VFD refer to the VFD point list					

Typical VFD Control

Point Description	DI	DO	AI	AO	
VFD alarm status	1				
VFD enable disable		1			
VFD Speed control				1	
All VFD's shall be with BACnet MST communication					

Valve control

Point Description	DI	DO	AI	AO	
Valve control		1		1	
All spring return valve should have the 24VAC wired through safety circuit to activate fail safe mode.					

Heat Exchanger

Point Description	DI	DO	AI	AO	
Heat exchanger primary entering water temp			1		
Heat exchanger primary leaving water temp			1		
Heat exchanger secondary entering water temp			1		
Heat exchanger secondary leaving water temp			1		
Valve control				1	

Corridor lighting Control

Point Description	DI	DO	AI	AO	
Security system input	1				
Corridor floor 1 light override	1				
Corridor floor 2 light override	1				
Corridor floor 1 light ON		1			Auto/Manual switch to be provided
Corridor floor 2 light ON		1			Auto/Manual switch to be provided

Outside lighting

Point Description	DI	DO	AI	AO	
Photo Cell input	1				Photo cell to have volt free contact
Pole light start/stop		1			

Morality lighting

Point Description	DI	DO	AI	AO	
Morality light start/stop		1			Auto/Manual switch to be provided

GYM Ceiling Fan / lighting control

Point Description	DI	DO	AI	AO	
Motion sensor input in each Gym sections	1				
Gym light start/stop for each section		1			Auto/Manual switch to be provided
GYM Ceiling fan Enable	1				

Chillier Enable

Point Description	DI	DO	AI	AO	
Chilled Water supply temp			1		
Chilled Water return temp			1		
Chilled water supply header pressure			1		
Condenser water header pressure.			1		
GYM ceiling fan Enable		1			
Chillier shall be with BACnet MST communication					
For condenser water control refer to cooling tower I/O list.					
For pump control refer to pump and VFD I/O list.					
Chillier to be connected through BACnet mstp					

Miscellaneous

Point Description	DI	DO	AI	AO	
Outside air temperature			**1**		
Gym space temperature			1		Plate sensor
GAS meter (BACnet / modbus interface preferred)	1				DI shall be rated for 10 pulse per sec
Electric meter (BACnet / modbus interface preferred)	1				DI shall be rated for 10 pulse per sec

Metering

Point Description	DI	DO	AI	AO	
Gas meter (Main feed to the school)	**1**				DI shall be rated for Pulse input with controller capable of storing the value in non volatile memory.
Water meter (Main feed to the school)	1				
Electrical meter shall be connected over BACnet MSTP network. KW, KWH, KVA, KVAH, PF, Voltage and Current shall be the minimum parameters that shall be logged over BACnet					

END OF BUILDING MANAGEMENT GUIDELINE