



ST. CLAIR CATHOLIC
DISTRICT SCHOOL BOARD

Lighting the Way ~ Rejoicing in Our Journey

REQUEST FOR TENDER: 535-CP2010

Roof Top Unit & VVT System Replacement

Catholic Education Centre

420 Creek Street, Wallaceburg, ON N8A 4C4

Submission Deadline and Location:

Wednesday, April 8, 2020

3:00:00 PM Local Time

Catholic Education Centre, Reception Desk

420 Creek Street, Wallaceburg, ON N8A 4C4

ISSUED: March 13, 2020

Part 1: INTRODUCTION

1.1. **INTRODUCTION**

The St. Clair Catholic District School Board (hereafter referred to as the “SCCDSB” or the “Board”) invites interested parties to submit sealed submissions in response to this Request for Tender (“RFT”) document. The SCCDSB currently operates 25 elementary schools, 2 secondary schools, and an administrative office within the regions of Sarnia-Lambton and Chatham-Kent.

1.2. **PURPOSE**

The purpose of this RFT document is to provide interested parties with sufficient information to enable them to prepare and submit bids for consideration by the SCCDSB for the Scope of Work provided, subject to the terms and conditions described herein.

1.3. **INTERPRETATION AND DEFINITIONS**

The following words are used throughout the bid document and proponents should note these conditions when completing their RFT submission.

“ADDENDUM” means a written instruction and/or clarification issued to the RFT Document. The term addenda is to mean the same as Addendum.

“AGREEMENT” or “CONTRACT” means the final document including, but not limited to, the terms and conditions of this document.

“APPLICABLE LAW” and “APPLICABLE LAWS” means any common law requirement and all applicable and enforceable statutes, regulations, directives, policies, administrative interpretations, orders, by laws, rules, guidelines, approvals and other legal requirements of any government and/or regulatory authority in effect from time to time.

“BID IRREGULARITY” means a deviation between the requirements (terms, conditions, specifications, special instructions) of a bid response for the purposes of this bid; bid irregularities are further classified as major irregularities or minor irregularities. The classification of what is a major irregularity or a minor irregularity shall be the sole discretion of the SCCDSB.

“BID SUBMISSION” or “SUBMISSION” means all of the documentation and information submitted by a Proponent in response to this request.

“CONFLICT OF INTEREST” means any situation or circumstance where, in relation to performance of obligations under the RFT, the Proponent’s other commitments, relationships, or financial interests could result in a real, perceived, or potential unfair advantage to the Proponent.

“CONTRACTOR” means an entity that submits a bid in response to this tender document, as the context may suggest, refers to a potential Contractor.

“INFORMAL” shall mean bid submissions will be eliminated from further evaluation if the submission does not include the required information.

“MUST” shall mean proponents “must” include the required information in the bid submission. Failure to include the required information will deem the submission informal.

“PROPONENT” means an entity that submits a bid in response to this tender document, as the context may suggest, refers to a potential Proponent.

“SHOULD” shall mean proponents “should” include the required information in the bid submission.

“SUBCONTRACTOR” means the subcontractor and/or business who contracts to provide some service or material necessary for the performance of another’s contract.

[End of Part 1]

PART 2: RFT PROCESS, INSTRUCTIONS, TERMS & CONDITIONS

2.1. **RFT SCHEDULE**

For the purposes of this RFT, the Board has established the following timing deadlines for the completion of the RFT process.

Event	Date & Time
Issue Date:	Friday, March 13, 2020
Mandatory Site Visit:	Wednesday, March 18, 2020 @ 10:00 AM
Last Day to Submit Questions:	Tuesday, March 31, 2020 @ 12:00 PM
Responses to Questions Received:	Thursday, April 2, 2020
Closing Date and Time:	Wednesday, April 8, 2020 @ 3:00:00 PM

2.2. **RFT CONTACT**

Tony Prizio, Supervisor – Procurement
St. Clair Catholic District School Board
420 Creek Street, Wallaceburg, ON
P: (519) 627-6762 x10256
E: tony.prizio@st-clair.net

2.3. **ACCEPTANCE OF TERMS**

The submission of a bid by a Proponent represents that the Proponent has read and completely understands, and accepts all provisions contained within this RFT. Any bid that has alternative terms and conditions to those contained herewith may be considered a counteroffer to the Board’s request and may be rejected.

2.4. **AGREEMENT TO ABIDE BY ESTABLISHED PROCESS**

The following rules must be observed to protect the integrity of the competitive procurement process:

- All communications, including requests for information, must be between only the Representative of the Board and each Bidder who have been authorized and designated for that particular purpose.
- Apart from the communications between and among the designated representatives, there must be no communication between any other Board staff and any other representatives of the Bidder, and no giving of information with respect to the competitive procurement process and the final contract.
- Any attempt on the part of the Bidder, or any of its Employees, Agents, Vendors, or Representatives to contact any person(s) other than the designated SCCDSB representative(s) with respect to the competitive procurement process or any violation of the above requirements will be grounds for disqualification. The Board may, at its discretion, in addition to any other rights or remedies available at law, reject any potential or actual submission submitted by that Bidder.

Bidders accepts and agrees to observe the conditions listed herein, inform their staff thereof, and ensure their compliance by submitting an executed Bid Submission in response to this RFT.

2.5. SCOPE OF WORK

The St. Clair Catholic District School Board (Board) is seeking a Contractor to provide all of the necessary materials, equipment and labour to complete Roof Top Unit & VVT System Replacement at the Catholic Education Centre, in Wallaceburg, ON.

2.6. EXAMINATION OF SITE & SITE VISIT

Location: Catholic Education Centre, 420 Creek Street, Wallaceburg, ON N8A 4C4

Contact: Juan Galindo, Cell: 226-402-4824

Instructions: The site examination will be held at the date and time specified in Section 2.1 RFT Schedule. Attendees are required to report to the main office. A sign-in sheet will be available at the site examination. It is the attendee's responsibility to ensure they are signed-in at the meeting.

This is a MANDATORY SITE VISIT. Only contractors who attend the site visit will be permitted to submit a bid response. Attendance will be taken and will form part of the Bid Documents. Representatives of the Owner and Consultant will be in attendance.

In submitting a bid, it will be assumed that the bidders have carefully examined the drawings and have included in the bid price the complete cost of the work contemplated by the drawings and specifications and other bid documents.

2.7. TIMING OF PROJECT

The schedule for the completion of the project is:

- Commencement no earlier than Monday, July 6, 2020.
- Completion no later than August 21, 2020

Please refer to Specifications for details on project phasing.

Work is to be completed during regular business hours. Working outside of regular hours, including daytime access during weekends, holidays, etc. shall be at the sole discretion of the SCCDSB's Project Manager.

2.8. COORDINATION WITH OCCUPANTS

Full Owner Occupancy: Owner will occupy site during entire construction period except for weekends and Holidays. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

- Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
- Notify Owner not less than 48 hours in advance of activities that will affect Owner's operations.
- Restrict high noise operations (i.e. breaking and cutting concrete) to unoccupied periods. Include any overtime wages due to the condition stipulated.

- Power shutdowns will be scheduled during unoccupied periods. Include any overtime wages due to the condition stipulated.
- Mechanical specifications. Refer to sections 3.21 and 3.25 for maintenance of existing services and phasing of the work.
- Electrical specifications. Refer to sections 1.19 and 3.17 for cooperation with Owner's staff and maintenance of existing services.

2.9. **BID SUBMISSION**

Bids shall be submitted with the project clearly identified on the sealed envelope:

Bid Package RFT # 535-CP2010 Roof Top Unit & VVT System Replacement

Catholic Education Centre

Attention: Tony Prizio, Supervisor – Procurement

The sealed Bid Submission must be returned to:

Catholic Education Centre, Reception Desk

420 Creek Street, Wallaceburg, ON N8A 4C4

Bids MUST be received no later than the date and time specified in this tender document. Any bid submissions received after the deadline will be returned unopened to the bidder. It is the Bidder's responsibility to ensure their Bid Submission is received by a Board representative on or before the tender close. The Board will not take any responsibility for late submissions due to postal delay through Canada Post, third-party courier services, or for any other reason.

If a Bidder chooses to deliver their Bid Submission via post or courier, the envelope or package must reference the project number and project description on the outside.

Bids shall be filled out in ink or typed, signed in longhand by a duly authorized company official (having authority to bind) and sealed with a company corporate seal. One original of the fully completed Bid Form must be submitted. Failure to provide all of the requested information on the Bid Form may result in disqualification of the bid. Please refer to Appendix A: Bidder's Response Guide.

Bids by telephone, email, or fax will not be accepted.

After bid closing all submissions will be reviewed by the Board's evaluation team. Contractors submitting a bid are invited to stay for a public opening of Bids at the Catholic Education Centre following the submission deadline.

Supplier's Bid Submission, all Bid Documents and CCDC 2-2008 Stipulated Price Contract will form the agreement.

2.10. **CONTRACT PRICING**

Proponents must complete the Bid Form. Prices must include all travel, reimbursements, delivery (FOB Destination).

All charges must include the cost of the product or service. Prices quoted must be for products or services exactly as specified, unless otherwise noted or requested on the Bid Form.

Prices must remain in force for the initial term of the contract. Any price increases are subject to the approval of the SCCDSB and will be limited to proof of manufacturers' industry increases in written form from the successful proponent.

2.11. QUESTIONS AND REQUESTS FOR CLARIFICATION

Proponents finding discrepancies, ambiguities or omissions in the RFT documents or having doubt as to the meaning or intent thereof, shall immediately notify the Procurement Department. The board is not responsible for any misunderstanding of the RFT on the part of a Proponent. Questions must be received by the date and time specified in the RFT Document. Responses will be provided in writing to Proponents through the same platform that the original RFT documents were issued.

All questions to be addressed in writing to: [Tony Prizio](mailto:tony.prizio@st-clair.net), Supervisor - Procurement
St. Clair Catholic District School Board
E-mail: tony.prizio@st-clair.net
CC: victoria.iaccino@st-clair.net

For the purpose of this RFT, Proponents shall not contact anyone in the Board other than the designated contact listed in these bid documents. Any unauthorized communications may result in disqualification.

2.12. ADDENDA

Proponents may also, during the RFT Process, be advised by Addendum of any additions, deletions or alterations to RFT documents. All such Addenda shall become part of the RFT Documents.

If an addendum is issued, the document(s) will be made available to Proponents through the same platform that the original RFT documents were issued. Proponents are responsible for verifying before submitting its response that it has received all addenda that may have been issued.

Where a Bid Submission has been received by the Board prior to the publication of an Addendum or notice, the Board shall allow that Proponent to submit a revised Bid Submission prior to the closing date for the RFT or send written acknowledgement (which may be by email) to the RFT contact that the original Bid Submission still stands.

2.13. WITHDRAWAL OF SUBMISSION

A Proponent may alter, amend, or withdraw a submitted proposal if such request is received in writing by the contact person for this RFT prior to the closing date and time specified in this document. The last submission shall supersede and invalidate all previous submission by that Proponent as it applies to this bid. Such requests received after the closing date and time will not be permitted.

2.14. BID ACCEPTANCE

It shall be understood by all proponents, that the RFT submission shall be valid and subject to acceptance by the Board, and that no adjustments shall be made to the proposal for a period of up to and including sixty (60) days from the RFT Closing Date.

The Board reserves the right to determine the successful proponent at its sole discretion. The lowest cost may not be accepted. The Board reserves the right to decline any or all submissions, in whole or in part, at any time prior to making an award.

The successful proponent shall be required to enter into a formal contract with the Board, which will include the terms and conditions of the RFT documents, the Proponent's bid, and all other applicable documents.

2.15. CANCELLATION

The Board may cancel this RFT at its discretion at any time prior to an award. The Board may do so for budgetary reasons, for any other reason, or without providing reasons and issue a new request for tender, request for qualifications, or do nothing.

2.16. CLARIFICATION

The Board reserves the right to seek clarification from any Proponents without being obligated to all Proponents if it finds certain aspects of a bid unclear.

2.17. BOARD'S RIGHT TO WAIVE MINOR IRREGULARITY

The Board reserves the right to accept or waive a minor irregularity, or where practical to do so, the Board may as a condition of bid acceptance request a Proponent to correct a minor irregularity with no change in bid price. Items of non-compliance on any bid submissions which do not strictly comply with the provisions, procedures and requirements of this bid, or are incomplete, ambiguous, or which contain errors, alterations, misleading information, omissions, or irregularities of any kind, may be rejected and disqualified at the discretion of the Board. All proponents agree to provide all such additional information as, and when requested, at their own expense, provided no proponent in supplying any such information shall be allowed, in any way to change the pricing or other cost quotations originally given in its bid submission or in any way materially alter or add to the solution originally proposed.

2.18. ERRORS AND OMISSIONS

The Board will not be held liable for any errors or omissions in any part of the RFT. While the Board has used considerable effort to ensure an accurate representation in the RFT, the information contained in the RFT is supplied solely as a guideline for the Proponents. The information is not guaranteed or warranted to be accurate by the Board, nor is it necessarily comprehensive or exhaustive.

2.19. DOCUMENT AVAILABILITY

RFT documents are available on the Board's Website www.st-clair.net under Bid Opportunities or on Bidding www.bidding.com. Documents will also be provided to local construction associations: Sarnia Construction Association, Windsor Construction Association, Lambton Area Builders Exchange and the London & District Construction Association.

The Board assumes no responsibility for the proponent's failure to examine all of the RFT Documents.

2.20. PROPONENT EXPENSES

Any and all costs and expenses incurred by Proponents in the development, preparation, submission or presentation of their bids, or otherwise related to its participation in this RFT process will be borne by the Proponents. The selection of any bid, or the rejection of any or all bids, or the termination/cancellation of this RFT process, or initiation of a new RFT process shall not render the Board liable to pay or reimburse any such costs or damages incurred by any Proponent, or any partner or contractor of such Proponents.

2.21. VOLUNTARY ALTERNATE & SEPARATE PRICES

The bid amounts are to be based on the bid documents. Where there is any conflict within the bid documents, the bid amount shall include the higher cost alternative. Alternative proposals are encouraged and should be clearly identified in the bid. Submit complete information including any impact on schedule to allow a full evaluation of the proposal including, as applicable, any particulars in which the alternate proposal is at variance with or unable to meet the specifications. Note also any impact on other trades if

the alternative is accepted. Alternative proposals may be made without limitation, including for items specified as single sourced. The Board in its sole and unfettered discretion reserves the right to accept or reject alternatives.

2.22. BID INELIGIBILITY

Bids may, at the discretion of the Owner, be declared informal for any of the following reasons:

- the bid is incomplete, unsigned, improperly signed or sealed, conditional, illegible, obscure, contains arithmetical errors, erasures, alterations, or irregularities of any kind, or
- the bid does not include the required bonding/ consent of surety
- the Bid Forms and enclosures are improperly prepared, or
- the prices seem to be so unbalanced as to adversely affect the interests of the Owner, or
- the bid is based upon an unreasonable period of time for completion or delivery, or
- the bidder does not provide the required Proof of Insurance and/or WSIB coverage as specified in these Bid Documents

2.23. AWARD

The Board has the right to reject any or all bids. The lowest Bid will not necessarily be accepted. The invitation to bid does not constitute an offer by the Contractor to enter into a contract. In the event of a tie, a coin flip conducted by the Supervisor – Procurement (or designate) with a minimum of one other Board staff will determine the successful proponent.

Acceptance of the Bid and/or award is subject to the approval of the St. Clair Catholic District School Board.

The SCCDSB reserves the right to withdraw the award of the contract to a successful bidder(s) within 30 days of the award if, in the opinion of the SCCDSB, the successful bidder(s) is unable or unwilling to enter into a form of contract satisfactory to the SCCDSB. The SCCDSB shall be entitled to do so without any liability being incurred by the SCCDSB to the bidder.

2.24. ENTITLEMENT TO A DEBRIEFING

In accordance with the Broader Public Sector Procurement Directive unsuccessful Bidders are entitled to a debriefing, during which they will be provided with feedback regarding their Tender. In order to be debriefed, unsuccessful Bidders must contact the Owner representative identified in the Bid Documents in writing to request a debriefing within sixty (60) days from the date of the notification of award.

2.25. BID DISPUTE PROCEDURE

In the event that a Bidder wishes to review the decision of the Board in respect of any material aspect of the Request For Tender process, the Bidder shall submit a protest in writing to the Board to the attention of the Supervisor – Procurement within ten (10) days of the closing date of the Tender.

Any protest in writing shall include the following:

- a) a specific identification of the provision and/or procurement procedure that is alleged to have been breached;
- b) a specific description of each act alleged to have breached the procurement process;
- c) a precise statement of the relevant facts;

- d) an identification of the issues to be resolved;
- e) the Bidder's arguments and supporting documentation;
- f) the Bidder's requested remedy.

2.26. INVOICING & PAYMENT

The Board shall pay by electronic funds transfer (EFT), P-Card, or cheque within twenty eight (28) days after the receipt of a proper invoice. Invoices will be reviewed and certified by the Board's Consultant, if applicable, before the invoice is processed for payment. Invoices must include all back-up material for time and material charges, disbursements, and other fees.

Invoices should be sent digitally to the consultant and be based upon the consultant's approved format for invoicing with copies sent to victoria.iaccino@st-clair.net. Digital invoices will be processed as an original. Please do not send duplicate copies by mail.

Note: Invoices should reflect a 10% holdback (final construction cost) which will be retained by Board through substantial completion of the project in accordance with relevant legislation.

2.27. TAXES

Include in Bid all Taxes and all other Customs Duties and Excise Taxes which are in force at Bid date as detailed in General Conditions. Harmonized Sales Tax (H.S.T.) is **not** to be included in the bid. The H.S.T. amount and the Bidder's **H.S.T. Registration Number** are to be indicated on the Bid Form in the spaces provided.

2.28. CHANGE NOTICES, CHANGE ORDERS

The following fee percentage and overhead charges shall be applied to additional work ordered by the Board:

- For work carried out by the Contractor's own forces – 10% Overhead & Profit
- For work involving a subcontractor, the subcontractor may charge a maximum 10% fee. The General Contractor may charge a maximum of 5% in addition to subcontractor's fee.

2.29. PROJECT SPECIFIC REQUIREMENTS

Any and all damages to facilities while under the control of the contractor shall be repaired at the contractor's cost. Please be advised that the Owner has a No Smoking Requirement on the Owners' property. Contractors shall provide their own washroom facilities for their employees; board washrooms will be off limits to the contractor's employees. Contractors are requested to ensure that employees and suppliers are advised of these Requirements. Contractor shall remove rubbish and debris from the site on a daily basis or as directed by the Board. On completion of the work, all debris shall be removed; the floor shall be thoroughly cleaned and swept; the site shall be left in a tidy condition (construction clean). Do not use the Board's equipment or facilities for cleaning or for any reason.

2.30. SUBCONTRACTORS

The successful Proponent(s) may not, at any time, subcontract any portions of its contract with the Board nor shall it assign the contract without the written permission of the Board. The successful Proponent(s) must not, at any time, change subcontractors approved by the Board without the written permission of the Board.

2.31. GENERAL TERMS AND CONDITIONS

The issuance of this bid document shall not constitute an obligation on the part of the Board to any proponent who submits a bid.

The laws of the Province of Ontario shall govern any dispute occasioned as a result of the performance or non-performance and/or workmanship of a contract issued pursuant to the bid and any dispute arising out of the issuance of and response to this bid document.

All SCCDSB policies, procedures and regulations must be adhered to by the successful bidder(s).

Some of the Board sites are equipped with video surveillance cameras.

The successful proponent(s) is obliged to cooperate with all recycling and environmental procedures and initiatives established by government, the Board and each school.

The successful bidder(s)' employees and contracted staff shall not be considered SCCDSB employees and shall not represent themselves as an agent of the SCCDSB nor be eligible for any of the benefits provided to SCCDSB employees.

The SCCDSB reserves the right to demand the removal of any successful bidder's employees or contracted staff engaged in this contract if, in the SCCDSB's opinion, their conduct has been of an unacceptable nature.

The successful bidder(s) will be responsible for ensuring that regular supervision is maintained over all working personnel. It is the bidder's responsibility to ensure that all their activities are properly coordinated with the SCCDSB's operations and modify assignments as required.

This bid document is being issued pursuant to the SCCDSB's Purchasing Policies and Procedures.

The acceptance of the bid by the successful proponent(s) and the award of the contract contemplated by this bid document may be subject to approval of the Board of Trustees.

2.32. BONDING

On bids exceeding \$100,000.00 (inclusive of all taxes) the following tender security / bonding is required and must accompany the bid:

- Agreement to Bond: 50% Performance and 50% Labour and Material
- Bid Bond: 10% of the bid price, payable to the St. Clair Catholic District School Board

If the bid amount is greater than \$100,000 and less than \$500,000 (inclusive of all taxes) the Surety or Bid Bond may be provided in the form of an irrevocable letter of credit, a certified cheque, or money order payable to the Board in the value of 10% of the bid amount.

Only bond and agreements to bond issued by a licenced Canadian surety company authorized to do business in the Province of Ontario will be accepted. Upon request, the successful Bidder will be required to present the bonds to the Purchasing Department. Bonds must be issued as prescribed by the *Construction Act* regarding Broader Public Sector contracts. Failure to provide the proper surety to the Board upon award will result in rejection of that Bid. The cost of bonding shall be included in the Bid price, if applicable.

2.33. INSURANCE

The successful Proponent(s) must maintain, at the Proponent's expense for the entire term of the Contract or as otherwise required, all insurance as set out below. Proof of coverage must be provided as part of the bid submission:

- Comprehensive General Liability and Property Damage with a limit of not less than **\$5,000,000.00 (five million dollars)**.
- Motor Vehicle Public Liability and Property Insurance on all owned and rented equipment with a limit of not less than **\$2,000,000.00 (two million dollars)**.

The Proponent agrees to indemnify, hold harmless, and defend the Board, its Consultants, agents or employees from and against any and all liability for loss, damage and expense, which the Board may suffer or for which the Board may be held liable by reason of injury (including death) or damage to any property arising out of negligence on the part of the proponent or any of its representatives, employees, or subcontractors in the execution of the work performed or by way of ownership or operation of an automobile.

The successful Proponent shall provide the Board with a complete certified copy of all policies. Copies of renewed policies must be provided to the Board on or before the policy renewal date for projects that extend past the original policy term or for multi-year contracts. The successful Proponent must name the St. Clair Catholic District School Board as additional insured on their insurance policies.

2.34. WORKPLACE SAFETY INSURANCE BOARD (WSIB)

Successful Proponent(s) must ensure that all workers are covered by the Workplace Safety and Insurance Board coverage for the duration of this contract. Proof of coverage must be provided as part of the bid submission.

Proponents must furnish a Certificate of Clearance from the Workplace Safety and Insurance Board as evidence that all returns have been made and all necessary assessments have been paid as required, or levied, by the Workplace Safety and Insurance Board.

Alternatively, if the Proponent is an Independent Operator and is not classified under Class G: Construction, the proponent must provide a letter from the Work Place Safety & Insurance Board confirming independent operator status and identification number under the WSIB Act.

2.35. PERMITS

The Board will apply and pay for a building permit if applicable. The contractor is to obtain all other permits as required to complete the project, including but not limited to ESA, hot work permit etc.

2.36. MEETINGS

A Post Bid Meeting may be convened and chaired by the Board who will invite the Successful Proponent and his major Subcontractors to review the Contract Documents and Bid submitted. This meeting will be prior to the Board issuing a Letter of Intent or Contract. This meeting does not constitute or infer any contract award to the proposed contractor or any other contractor, nor that will the project proceed.

During the course of Work, scheduled progress meetings may be required at the call of the Project Leader.

2.37. WARRANTY

The vendor/contractor warrants that all goods/services, materials and equipment supplied under contract are free of all defects in manufacture and workmanship for a period of not less than 1 year from date of

delivery, installation or performance (whichever is the later) whether or not any portion or trade has been sublet.

The vendor/contractor shall promptly remedy any defect or deficiency in any goods/services, materials and equipment supplied under contract to the satisfaction of the Board within seven (7) calendar days following notice to do so from the Board at no additional cost to the Board, unless otherwise specified.

In the event that the vendor/contractor doesn't not promptly honour the above warranties to the satisfaction of the Board, the Board may, at the sole cost of the vendor/contractor do whatever it deems necessary and advisable to remedy, rectify or replace the defective, deficient or non-compliant goods, services, materials or equipment. The Board shall inform the vendor/contractor in advance of the approximate cost of such work to be done by the Board.

All goods/services and/or equipment furnished or supplied pursuant to the contract shall be installed or attached in such a manner as to preserve all manufacturer's and vendor/contractor's warranties, which shall, together with all parts and components, become the property of the Board after the successful and satisfactory installation or attachment.

2.38. GUARANTEE

The vendor/contractor guarantees that all goods/services, materials and equipment supplied under contract are new manufacture. The products must not contain re-manufactured parts and/or accessories and must not have been used under contract with any other customer(s) unless specified by the Board. The submissions will be of the latest design and technology at the time of submission by the vendor.

The vendor/contractor represents and warrants that the goods and/or services supplied pursuant to this bid will be manufactured and/or supplied under such conditions that do not contravene the Ontario Human Right Code or the minimum standards of Ontario workplace legislation and regulations or are otherwise unethical. In the event in the opinion of the Board, the bidder is in breach of the foregoing representation and warranty, the Board may cancel the award or any such subsequent contract entered into between the Board and bidder pursuant thereto.

2.39. SCHEDULE

The Contractor will be required to perform the work in accordance with the Schedule dates provided in 2.7. Timing of Project. Ordering of major and long delivery items shall begin immediately upon successful bidder's receipt of contract award. The Contractor will provide a construction schedule within five (5) days of being awarded the project.

Time is of the essence. Bidders are to include adequate manpower, overtime and shift work necessary to meet or improve the schedule, and to make up any time lost to weather or normal delays. Include travel, room and board costs for out of town workers, shop overtime and other premiums to expedite material and equipment, shipping premiums and any incentive costs required to meet the schedule.

2.40. CONTRACTED SERVICES PROGRAM

Contractors performing work on Board property must complete the Contracted Services Program. The Contracted Services Program is a joint program with Lambton Kent District School Board. This program has three basic components that **must** be met before the bid is awarded. Contractors who cannot meet the minimum requirements of this program will not be awarded this tender. Program information can be found on the Board's web site at www.st-clair.net or through the Board contact identified previously in this document. If the contractor has already been pre-qualified by LKDSB they must provide proof of

completion. Identification badges can be used on SCCDSB or LKDSB property. All Insurance and WSIB certificates must be up to date under the Contracted Services Program.

2.41. HEALTH and SAFETY

The Occupational Health and Safety Act describes the responsibilities of an employer. The Board requires Contractors to maintain procedures, training, and enforcement so that the responsibilities are carried out in the workplace. The Contractor shall abide by and strictly adhere to the regulations and conditions set out and laid down by the most current versions of the Occupational Health and Safety Act. All staff employed or hired by the Contractor and working on the Board's premise MUST be trained in WHMIS in accordance with Occupational Health and Safety Act and Regulations. They MUST adhere to all of the Board's Health and Safety Procedures and Guidelines and to Municipal By-Laws.

Contractor will submit proof of its health and safety program, procedures and training as detailed above upon request by the Board.

The Contractor shall appoint a Competent Person as the Supervisor of this project. The Competent Person shall be as defined in Section 1 of the Occupational Health and Safety Act.

The successful Contractor shall conform to the Ontario "Occupational Health and Safety Act" and all regulations made under said act and assume full responsibility for contraventions of same.

All workplace injuries or accidents on Board property MUST be reported by the Contractor to the Board's representative within 24 hours.

Any workplace injury that is defined under the Occupational Health and Safety Act as a "Critical Injury" must be reported to the Board's representative IMMEDIATELY.

2.42. ELECTRICAL AND SAFETY APPROVALS

All electrical/electronic components supplied by the vendor/contractor must be CSA, ULC and/or Ontario Hydro/Ontario Electrical Safety Authority approved. Appropriate labels must be affixed to the equipment prior to delivery. The vendor/ contractor is responsible for ensuring goods or services supplied to the Board must comply with the Occupational Health and Safety Act and Regulations of Industrial Establishments.

2.43. DESIGNATED SUBSTANCES

The contractor shall conduct work in recognition of the most current regulations related to Designated Substances. The contractor is required to review the site specific designated substances report to ascertain potential for exposure to designated materials and notify the board of instances where the scope of work under this contract will require remediation. If the report does not schedule designated materials in the attached report and should the contractor uncover material which is believed to be asbestos, work is to cease immediately and the Board staff are to be contacted immediately.

2.44. SAFE SCHOOL PROCEDURES

Contractor's staff is required to report to the main office of the site where work will be carried out during regular school hours and notify the school office staff of the purpose of the visit. The Contractor is required to adhere to all school specific procedures if applicable.

It is the responsibility of the Contractor's staff to sign in and sign out of the Log Book, which is located in the main office area, while performing their duties.

The following information must be recorded in a legible manner:

Date
Company Name
Employee Name
Employee Signature
Reason for Visit
Time Entering Building
Time Leaving Building

2.45. HOISTING, SCAFFOLDS, ELEVATED WORK PLATFORMS

The Contractor is responsible for all hoisting and other equipment necessary to facilitate their work if required.

2.46. TEMPORARY POWER

A source of electric power will be designated by the Board. The Board will allow a tie-in connection with fuse or breaker protection for the Contractor's estimated load requirements. The Contractor must provide the power connections and all extensions from the point to the job site. All electrical connections and extensions must meet ESA requirements and must be approved by the Board. The Contractor's estimated load requirements must not be exceeded without the Owner's permission.

2.47. NOISE AND TRAFFIC CONTROL

Bidders shall comply with all applicable **noise by-laws** (or local requirements governing same) and traffic routing that may be in effect during the life of the Project.

This **may** limit some activities to restricted time periods. Where the schedule requires for after hour work, the Contractor shall include all costs associated with obtaining the necessary permits to work such time periods.

The Contractor shall be responsible for all costs associated with providing a traffic officer as necessary to facilitate construction.

2.48. SITE ACCESS AND EGRESS

Contractors will be required to sign out a master key and will be assigned an access code for the alarm system. Successful Contractor will be responsible for building security during working hours and locking up the facility at night, which includes setting the alarm.

Any false alarms generated by the Contractor's workforce will result in a back charge for the costs incurred to the Board.

The Contractor shall make good any damage to roads, curbs, sidewalks, fencing, or grass damaged by vehicles or equipment during the course of construction.

2.49. PARKING

Contractors must park within the designated areas and allow for provisions to and from the designated parking area onto the job site.

2.50. CONTRACTOR'S PERSONNEL

The Contractor shall, at its own expense, provide all the personnel required to take a proactive role in managing the project as it relates to their work and its coordination with other trades. This will include but is not limited to the following:

- Competent supervision of the work of the Contract and coordination with the work of other Subcontractors. This includes being responsible for and properly supervising any subcontractors of this subcontractor.
- All layout work required to complete the work of the trade contract.
- Competent supervision of the work of the trade contract to ensure work is done in accordance with the OHSA and any other applicable regulations.
- Expediting the procurement of material and equipment to ensure delivery by their required dates.
- Submission of Requests for Information where required in a timely manner and wherever possible providing the Board with information to assist in the answering of these requests.
- Submission in a timely manner of all required shop drawings and samples and assistance to the Board required to obtain approvals to suit the schedule. All shop drawings are to be reviewed by the Contractor prior to submitting for approval.
- Attendance at all construction coordination meetings when requested by the Board.
- Provision of all necessary information requested by the Board for cost control and billing purposes.
- Inspection of the work of the Trade Contract for defects and deficiencies and cooperation with the Board and other inspection authorities to allow their inspections to take place.
- Submission of pricing for all changes to the work within five (5) working days after receipt of change documentation including the breakdown and backup necessary to allow checking and approval.

2.51. ACCESSIBILITY FOR ONTARIANS WITH DISABILITIES ACT

The Purchaser is committed to the highest possible standards for accessibility. Proponent(s) must be capable to recommend and deliver, as appropriate for each Deliverable, accessible and inclusive Services consistent with the Ontario Human Rights Code (OHRC), the Ontarians with Disabilities Act, 2001 (ODA) and Accessibility for Ontarians with Disabilities Act, 2005 (AODA) and its regulations in order to achieve accessibility for Ontarians with disabilities.

In accordance with Ontario Regulation 429-07 made under the Accessibility for Ontarians with Disabilities Act, 2005 (Accessibility Standards for Customer Service), the Purchaser has established policies, practices and procedures governing the provision of its services to persons with disabilities.

Proponents are required to comply with the Purchaser's accessibility standards, policies, practices, and procedures, which may be in effect during the Term of the Agreement and which apply to the Deliverables to be provided by the Proponent.

2.52. CANADA'S ANTI-SPAM LEGISLATION

Please note that vendors are required to comply with all applicable laws, including CASL, in providing goods or services to the Board. This also extends to communications sent on the Boards behalf. The successful proponent(s) will be required to indemnify the Board for any failure by the successful proponent(s) to comply with CASL, to the extent that the successful proponent(s) action, or inaction, could expose the Board to liability.

2.53. CONFIDENTIAL INFORMATION

All correspondence, documentation, and information of any kind provided to any Proponent in connection with or arising out of this Request for Tender or the acceptance of any Bid:

- Remains the property of the Purchaser and shall be removed from the Purchaser's premises only with the prior written consent of the Purchaser.
- Must be treated as confidential and shall not be disclosed except with the prior written consent of the Purchaser.
- Must not be used for any purpose other than for replying to this RFT and for the fulfilment of any related subsequent agreement.
- Must be returned to the Purchaser upon request.

Except as provided otherwise in this request, or as may be required by Applicable Laws, the Purchaser shall treat the Proponents' Proposals and any information gathered in any related process as confidential, provided that such obligation shall not include any information that is or becomes generally available to the public other than as a result of disclosure by the Purchaser.

During any part of this Request for Tender process, the Purchaser or any of its representatives or agents shall be under no obligation to execute a confidentiality agreement.

All correspondence, documentation, and information provided in response to or because of this RFT may be reproduced for the purposes of evaluating the Proponent's Bid Submission.

If a portion of a Proponent's Bid Submission is to be held confidential, such provisions must be clearly identified in the Bid.

The Purchaser reserves the right to require any Proponent to enter into a non-disclosure and/or confidentiality agreement satisfactory to the Purchaser.

2.54. CONFLICT OF INTEREST

Proponents must declare all conflicts of interest or any situation that may reasonably be perceived as a conflict of interest in relation to the Project that exists now or may exist in the future. The Board, at its sole discretion, waives any and all actual, potential, or perceived conflicts of interest, on such terms and conditions and the Board, at its sole discretion, considers to be appropriately managed, mitigated, and minimized. In this regard the Board may require the Proponent to implement measures or take steps to manage or mitigate the impact of any actual, potential, or perceived conflict of interest.

2.55. MUNICIPAL FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY ACT

The *Municipal Freedom of Information and Protection of Privacy Act* (Ontario) applies to information provided by Proponents. A Proponent should identify any information in its Quotation or any accompanying documentation supplied in confidence for which confidentiality is to be maintained by the Purchaser. The confidentiality of such information will be maintained by the Purchaser, except as otherwise required by law or by order of a court, tribunal, or the Ontario Privacy Commissioner.

By submitting a Bid, including any Personal Information requested in this RFT, Proponents agree to the use of such information for the evaluation process, for any audit of this procurement process, and for contract management purposes.

2.56. PERSONAL INFORMATION PROTECTION AND ELECTRONIC DOCUMENTS ACT

The Proponent represents and warrants that if the Proponent becomes subject to any private sector privacy legislation in responding hereto, or in carrying out its obligations under any subsequent agreement, the

bidder will be solely responsible with such legislation. Without limitation, the Proponent represents and warrants that if the Proponent is subject to the *Personal Information Protection and Electronic Documents Act* (PIPEDA) the Proponent shall ensure compliance of all PIPEDA Protected Information that the Bidder:

- Collects directly from the individuals or indirectly from the Board or others;
- Uses or discloses in the course of responding hereto or in performing its obligations under and subsequent agreement; or
- Transfers or discloses to the Board

2.57. TRADE AGREEMENTS

Proponents should note that procurements within the scope of either Chapter 5 of the Canadian Free Trade Agreement, Chapter 19 of the Comprehensive Economic and Trade Agreement, within the scope of the Trade and Cooperation Agreement between Quebec and Ontario or any other applicable agreement not listed herein are subject to such agreements, although the rights and obligations of the parties shall be governed by the specific terms of this RFT.

2.58. WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM

The Proponent should provide Workplace Hazardous Materials Information System (WHMIS) material safety data sheets (MSDS) for all Services. Additionally, the Proponent should provide the Purchaser's personnel WHMIS training, as it relates to the Services, in accordance with the Ontario Occupational Health and Safety Act.

2.59. VENDOR PERFORMANCE

Where the Contractor fails to comply with any of its obligations under the Contract, the Board may issue a notice setting out the manner and time-frame for rectification. Within seven (7) Business Days of receipt of that notice or in a timeframe as otherwise agreed to, the Contractor shall either: (a) comply with that rectification notice; or (b) provide a rectification plan satisfactory to the Board. If the Contractor fails to either comply with that rectification notice or provide a satisfactory rectification plan, the Board may immediately terminate the Contract. Where the Contractor has been given a prior rectification notice, the same subsequent type of non-compliance by the Contractor may allow the Board to immediately terminate the Contract and result in the suspension of bidding privileges to the Board for up to two years at the sole unfettered discretion of the Board.

2.60. TERMINATION OF CONTRACT

Either party may terminate the Agreement on written notice to the other where such other party neglects or fails to perform or observe any material term or obligation of the Agreement and such failure has not been cured within 30 Days of written notice being provided.

If the Proponent fails to execute the work properly or otherwise fails to comply with the requirements of the contract to a substantial degree, the Board may correct such default and deduct the cost thereof from any payment then or thereafter due to the contractor.

The Board shall be entitled to terminate the Agreement immediately, without liability, cost, or penalty on written notice to the Proponent:

- if any proceeding in bankruptcy, receivership, liquidation, or insolvency is commenced against the Proponent or its property;
- if the Proponent makes an assignment for the benefit of its creditors, becomes insolvent, commits an act of bankruptcy, ceases to carry on its business or affairs as a going concern, files a notice of

intention or a proposal, or seeks any arrangement or compromise with its creditors under any statute or otherwise;

- following the occurrence of any material change in the Board's requirements which results from a regulatory or funding changes, or recommendations issued by a Governmental Authority;
- in the event of a breach of the representation regarding conflict of interest;
- in the event of a misrepresentation or material breach;
- if the proponent uses, destroys, exploits, or discloses any Board Confidential Information to any Personal Information contrary to this Agreement; and
- in accordance with any provision of the Agreement that provides for early termination;

The Board reserves the right to terminate the Agreement, without cause, upon sixty (60) days' prior written notice to the Proponent.

The Board shall be liable to the Vendor only for the payment of Deliverable(s) supplied and accepted up to the date of termination.

The Board, at its sole and unfettered discretion, may extend the timelines for termination if it is deemed to be in the Board's best interest to do so.

Any termination of the Agreement shall not in any respect limit any of either party's rights or remedies either in law or in equity or relieve either party of any obligation incurred prior to the effective date of such termination.

[End of Part 2]

APPENDIX A: Bidder's Response Guide

Each bid submission should be structured using only the criteria identified in this bid document.

1. A completed copy of APPENDIX B: Bid Form **must** be included in your bid submission.
2. Proof of WSIB Coverage and Proof of Insurance **must** be included in your bid submission.
3. Required Bonding **must** be included in your bid submission.
4. Supplemental material will not qualify as substitutes for direct responses to the bid's requirements, except for specifically requested material.
5. The successful contractor must be prequalified under the contracted services program before an award is made.

APPENDIX B: Bid Form

Submitted By: _____

To:

St. Clair Catholic District School Board
535-CP2010 Roof Top Unit and VVT System Replacement
Catholic Education Centre

B1. Base Bid Price

The Drawings, Specifications and other Contract Documents for this Project have been examined, as well as the premises and job site conditions affecting the work. The undersigned hereby offers to complete the work in accordance with the Contract Documents for the following bid price, except as defined below for HST:

_____ Dollars (\$ _____)

in Canadian funds EXCLUDING HST. HST will be added to the bid price.

In submitting this Bid, the undersigned recognizes and accepts the right of the Owner to accept any Bid, which is deemed the most advantageous to the Owner, (or any part thereof), at the price submitted, or to reject any or all Bids. Acceptance of the Bid and/or award of the contract is subject to the approval of the Board. In the event that a discrepancy arises between the written bid price and the associated numerical price, the written bid price will be deemed to be correct.

B2. Harmonized Sales Tax (HST)

The bidder shall not include the applicable HST in the bid price. The successful contractor will indicate on each application for payment as a separate amount the appropriate HST the Owner is obliged to pay.

HST Registration # _____

B3. Cash Allowances

1. Include a Stipulated Sum of Forty Eight Thousand Dollars (\$48,000.00) to cover over the following items from which the Consultant shall direct payment for services, labour, and material.
 - a. Provisional Cash Allowance \$20,000
 - b. Controls \$20,000
 - c. Replacement of Existing Controls \$ 5,000
 - d. Building Controls System Commissioning \$ 3,000

Time and Materials rates to be applied against Cash Allowance work. Final reconciliation will adjust the cash allowance as credit to the SCCDSB for unexpended amounts and extra to the contractor for over

expenditure. The contractor shall mark-up sub-trade time and materials billing for this portion of work at 10% only.

B4. Itemized Prices

The following prices have been included in the Base Bid amount. The following prices, if accepted by the owner, shall include all labour, material, tools, equipment, overhead and profit, but exclude H.S.T. No other cost consideration shall be added to the contract for the scope of this work if accepted by the owner. The owner retains the right to cancel any or all of the sites for any reason.

Itemized Price #1: None at this time.

B5. Alternate Prices

It is accepted that the intent of alternate prices is to allow the Owner to select an alternative scope of work at a price which is declared below, and solely at the owner’s discretion. All prices submitted take into consideration and allow for changes and adjustments in other work as may be necessary to provide a finished functional result, unless specifically indicated otherwise.

The following alternate prices are for work which is not included in the stipulated bid price listed on the bid form but which may be substituted by the Owner for work which is included (no price listed shall mean no change in cost) and the Owner has the right to accept or reject any or all of the prices quoted. The following prices, if accepted by the owner, shall include all labour, material, tools, equipment, overhead and profit, but exclude H.S.T. No other cost consideration shall be added to the contract for the scope of this work if accepted by the owner.

Alternate Price #1: None at this time.

B6. Separate Prices

It is accepted that the intent of separate prices is to allow the Owner to select a separate scope of work at a price which is declared below, and solely at the owner’s discretion.

The following price has not been included in the Base Bid amount. The following prices, if accepted by the owner, shall include all labour, material, tools, equipment, overhead and profit, but exclude H.S.T. No other cost consideration shall be added to the contract for the scope of this work if accepted by the owner.

Separate Price #1: None at this time.

B7. List of Subcontractors

Trade: Insulation Contractor: _____

Trade: Sheet Metal Contractor: _____

Trade: Testing and Balancing Contractor: _____

B8. Project Superintendent / Supervisor

The Owner requires the General Contractor provide a full time site supervisor for the duration of the project. A minimum of 5 years supervisory experience is required. List proposed personnel and their experience in the table below. Supervisory experience with firms other than the Bidder is acceptable to include on the list. The General Contractor shall indicate the person chosen in writing to the Owner within 5 days of contract award.

Name	Firm/Position	Qualifications/ Experience

B9. Conflict of Interest

I /We confirm that: (please check one)

_____ There is not nor was there any actual or perceived Conflict of Interest or any other type of unfair advantage in our submitting this Proposal or performing or observing the contractual obligations of the Contractor in the Agreement.

OR

_____ Complete with this bid submission is a declaration on company letterhead of situations which may be a Conflict of Interest or an instance of unfair advantage or appears as potentially a Conflict of Interest or unfair advantage in our company submitting this Proposal or the contractual obligations of the Contractor under the Agreement.

Please note that the Board has the right to waive an actual or perceived conflict of interest as described in section 2.54 CONFLICT OF INTEREST.

B10. Agreement of Terms

I/We hereby acknowledge and agree that I/we have read, accepted, and completed all Contract Terms and Conditions and Appendices.

I/We understand it is the SCCDSB's intention that this RFT and the successful proponent(s)'s returned RFT submission will form the basis of the proposed contract. All of the terms and conditions of this RFT must be accepted by the proponent(s) and incorporated into the proponent(s) RFT submission. It is the SCCDSB's intention to use a CCDC 2-2008 Stipulated Price Contract when establishing an Agreement with the successful proponent(s).

The undersigned acknowledges receipt of Addenda Numbers _____ through _____ inclusive, and that the price, or adjustment thereof, for all work required therein is included in this submission.

This page must be signed below and returned with your submission for your bid to be accepted.

I/We the undersigned are duly authorized to execute this Bid Submission on behalf of:

Company: _____

Address: _____

Name: _____

Title: _____

Signature: _____ Date: _____

Phone: _____ Fax: _____

Email: _____

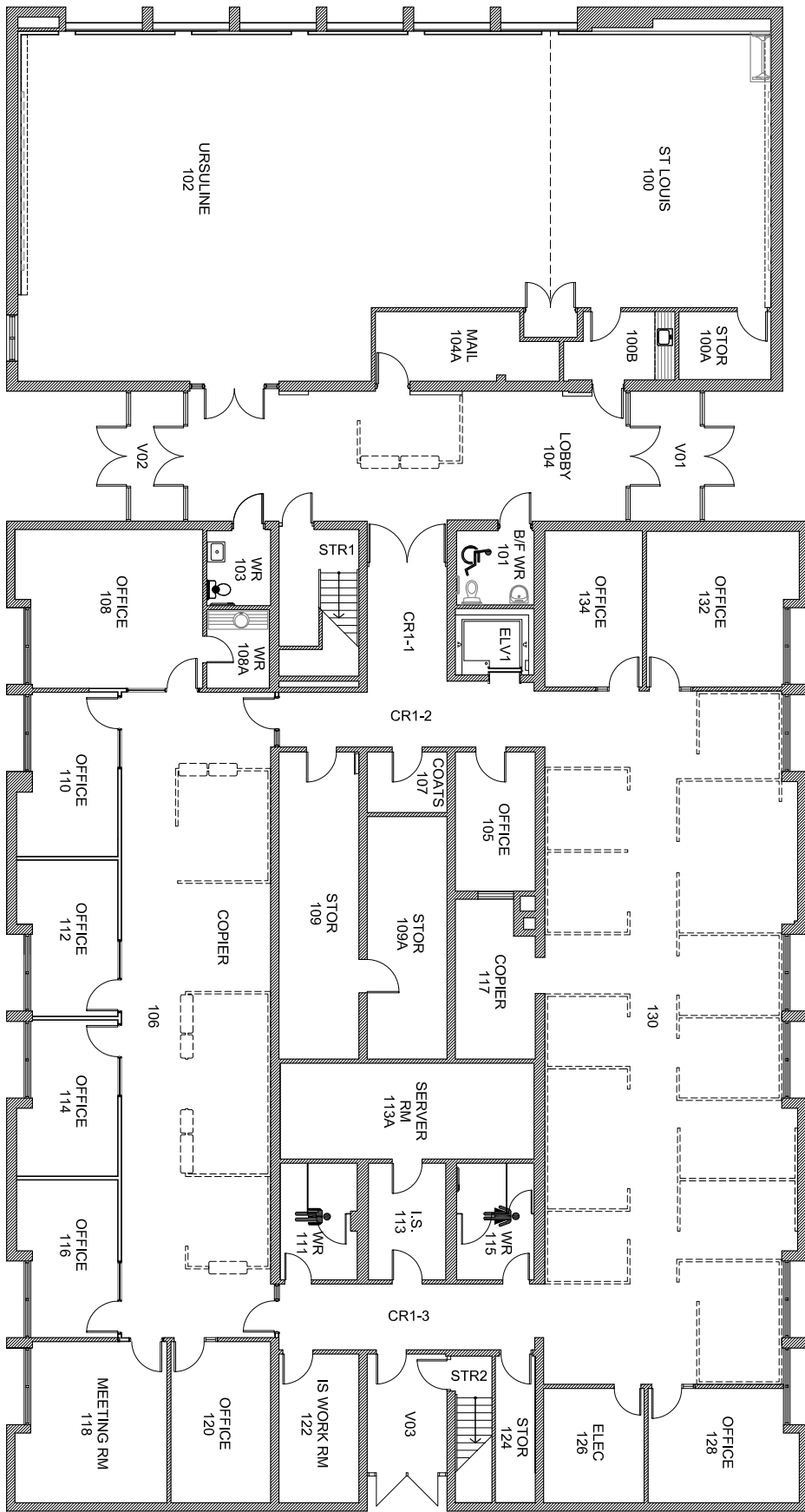
Please refer to Appendix A: Bidder's Response Guide to ensure you include all necessary documentation with your bid submission

APPENDIX C: Scope of Work and Specifications

Insert detailed scope of work, specifications, supplementary conditions & drawings

Table of Contents

Ground and Second Floor Plans	2
Mechanical & Electrical Specifications	96
Designated Substances Survey	14
Mechanical Drawings (including cover)	8
M1.1 Mechanical Legend, Abbreviations and Schedules	
M2.1 Ground and Second Floor Plans Heating	
M3.1 Ground and Second Floor Plans Air Distribution	
M4.1 Roof Plan Mechanical	
M5.1 Ground and Second Floor Plans Heating Demolition	
M5.2 Ground and Second Floor Plans Air Distribution Demolition	
M5.3 Roof Plan Mechanical Demolition	
Electrical Drawings	2
E1.1 Electrical Legend, Drawing List, Schedules and Details	
E2.1 Ground and Second Floor Plans and Roof Plans Electrical	



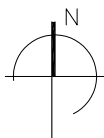
Legend:

----- Movable Partition Walls

----- Bi-fold Partition Walls

**Catholic Education Centre
CEC**

420 Creek Street, Wallaceburg, ON, N8A 4C4



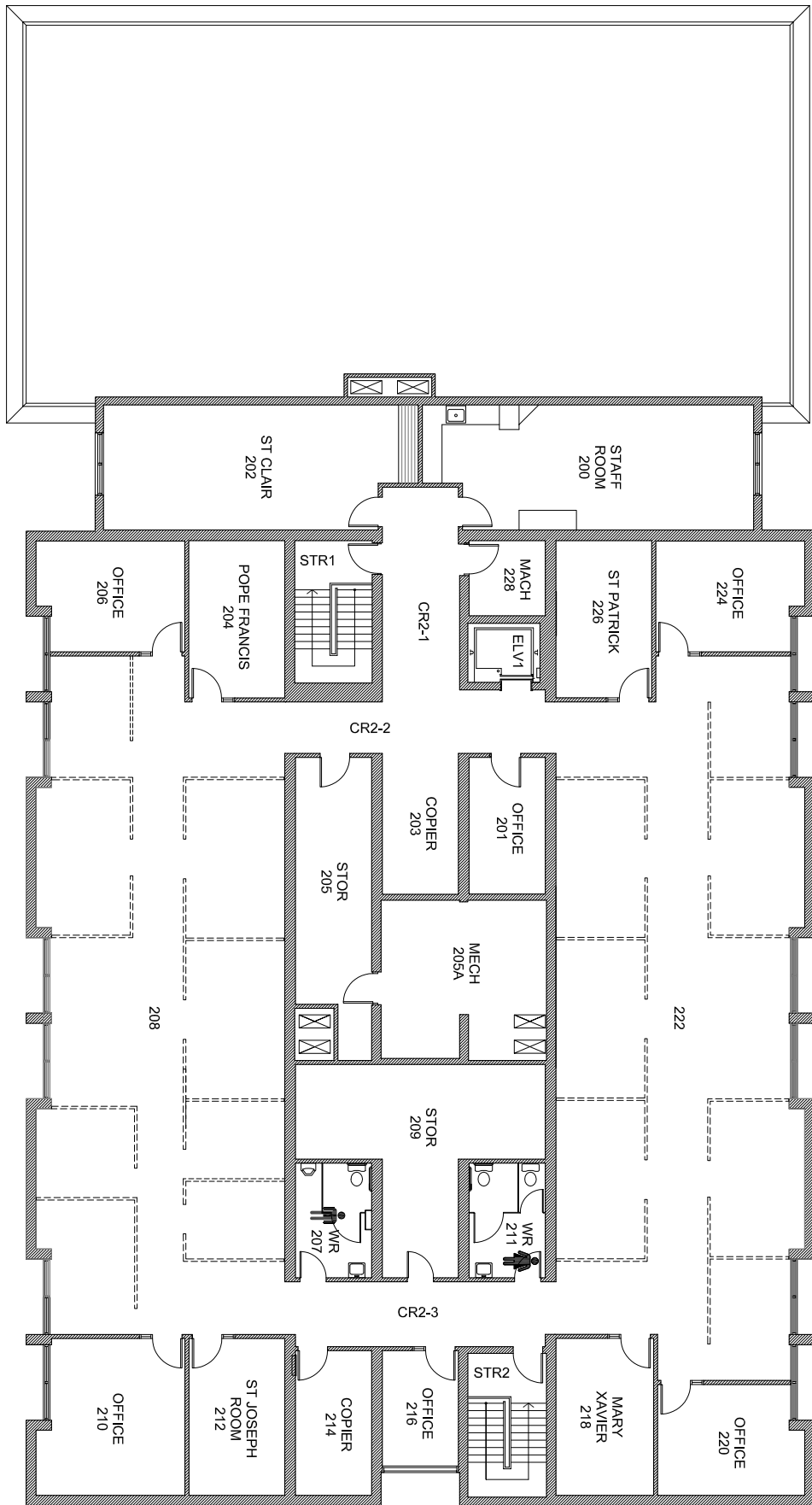
GROUND FLOOR PLAN

02/14/2019



**ST. CLAIR CATHOLIC
DISTRICT SCHOOL BOARD**

Lighting the Way ~ Rejoicing in Our Journey

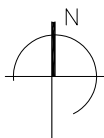


Legend:

- Movable Partition Walls
- Bi-fold Partition Walls

**Catholic Education Centre
CEC**

420 Creek Street, Wallaceburg, ON, N8A 4C4



SECOND FLOOR PLAN

02/14/2019



**ST. CLAIR CATHOLIC
DISTRICT SCHOOL BOARD**
Lighting the Way ~ Rejoicing in Our Journey

ROOFTOP UNIT AND VVT SYSTEM REPLACEMENT

CATHOLIC EDUCATION CENTRE

WALLACEBURG

ONTARIO

ST. CLAIR CATHOLIC DISTRICT SCHOOL BOARD

GENERAL INDEX

	<u>No. of Pages</u>
MECHANICAL SPECIFICATIONS	
SECTION 15001 - MECHANICAL GENERAL PROVISIONS.....	22
SECTION 15900 - APPENDIX 'A' Phasing Plan.	2
SECTION 15200 - TESTING AND BALANCING.....	4
SECTION 15600 - LIQUID HEAT TRANSFER.	6
SECTION 15800 - AIR DISTRIBUTION.....	13
SECTION 15900 - CONTROLS.	12
ELECTRICAL SPECIFICATIONS	
SECTION 16001 - ELECTRICAL GENERAL PROVISIONS.....	20
SECTION 16100 - BASIC MATERIALS AND METHODS.....	6
SECTION 16400 - SERVICE AND DISTRIBUTION.....	2
Panel Schedule	1
APPENDIX 'A' - Designated Substances Survey/Asbestos Products Re-Assessment.	12

-
- 1 General
- 1.1 **GENERAL REQUIREMENTS**
- 1.1.1 This Section and Division 1 - General Requirements applies to and governs the work of all Sections of Division 15.
- 1.2 **MECHANICAL SYSTEMS COMMISSIONING**
- 1.2.1 The mechanical systems of this project will be thoroughly commissioned by a Third Party Commissioning Agent engaged by the Owner. Assist and cooperate with the commissioning agent as required. Include all related costs in the Base Bid.
- 1.3 **VISITING SITE**
- 1.3.1 Visit the site and be familiar with working conditions and work involved before submitting Bids. No extras will be granted due to lack of a thorough preliminary investigation of the site.
- 1.3.2 Remove and replace existing ceiling tile to inspect ceiling space for existing Mechanical, Electrical and Structural obstructions. Include cost of all necessary changes in Bid Price. No extras will be granted due to lack of a thorough preliminary investigation of accessible ceiling spaces.
- 1.3.3 Contractors visiting for site investigation must sign in at the main office. Upon arrival, review and sign the on-site Designated Substances Report prior to site investigation.
- 1.4 **CONTRACT DRAWINGS**
- 1.4.1 Mechanical Drawings show Mechanical work only and are not intended to show Structural details, Electrical details or Architectural features. Take building dimensions and details from Architectural or Structural Drawings or from job measurements.
- 1.4.2 Only the general location and route of piping and ductwork is shown. Install all piping and ductwork neatly to conserve headroom. All piping and ductwork to be installed parallel to building lines unless shown otherwise.
- 1.4.3 The Consultant reserves the right to revise the locations of equipment and outlets within any given room without altering the Contract Price provided notice of change is given prior to roughing-in.
- 1.4.4 In case of conflict between work of other trades and work of this Division, clarify the location of these items with the Consultant before roughing-in.
- 1.4.5 In the event of any discrepancies or ambiguity of any symbol, note, abbreviation, etc., used in this Specification or on the Contract Drawings, obtain clarification, in writing, from the Consultant prior to submitting Bid. No allowance will be made for additional costs arising from failure to obtain proper clarification of conflicting information before Bid.

-
- 1.4.6 Quantities or lengths indicated in any of the Contract Documents are approximate only and will not be held to gauge or limit the work. No adjustment to the Contract Price will be allowed to complete the work.
- 1.4.7 Verify equipment access and coordinate with equipment supplier to ensure equipment can be physically transported to installation location. Under no circumstances will any claim be allowed for extra cost to disassemble and/or assemble equipment at the final location which will be considered as part of equipment installation.
- 1.4.8 Provide labour, products and services specified, but not shown on Drawings and vice versa, and all other labour, products and services necessary for completion of the work.
- 1.4.9 All dimensions and sizes are in SI units. Generally, units are in millimetres. All exceptions to this are noted. Pipe sizes are in accordance with ANSI Standards. See Detail Sheet at end of this Section.
- 1.5 **SHOP DRAWINGS**
- 1.5.1 Submit Manufacturers' Shop Drawings, Electrical Wiring Diagrams and Control System Drawings to the Consultant. Provide title sheet for Shop Drawing submitted. Include project name, Shop Drawing item (including Specification paragraph reference) and approval stamps. The Consultant reserves the right to have samples submitted of any specified products.
- 1.5.2 Before submitting shop drawings, provide a complete list of shop drawings to be submitted in Microsoft Excel format. List all shop drawings and approximate date of submission.
- 1.5.3 Submit all shop drawings electronically in Adobe Acrobat PDF format. File attachments to an email must total no more than 5 MB and must be submitted unzipped. If multiple items are submitted in single PDF file, each individual piece of equipment must be "book marked" using equipment labels as per Design Drawings. All shop drawings submitted electronically must be checked and stamped by Contractor as specified below.
- 1.5.4 Catalogues, manuals or price lists will not be accepted as Shop Drawings. Before submission, check Shop Drawings, make necessary corrections, apply stamp "Checked and Certified Correct", sign and date.
- 1.5.5 Submit one reviewed set of Shop Drawings with each set of Maintenance and Operating Instructions.
- 1.5.6 The review of Shop Drawings by Chorley + Bisset Ltd. is for the sole purpose of ascertaining conformance with the general design concept. This review does not mean that Chorley + Bisset Ltd. approves the detail design inherent in the Shop Drawings, responsibility for which remains with the Contractor. Such review does not relieve the Contractor of his responsibility for errors or omissions in the Shop Drawings or of his responsibility for meeting all requirements of the Construction and Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation, and for coordination of the work of all subtrades.

-
- 1.5.7 The Contractor is to review each shop drawing and document the differences between the shop drawing submission and the description listed in the specification. If there are no differences listed, the Contractor implicitly declares the shop drawing meets all requirements of the Specification.
- 1.5.8 Ensure at least one copy of the reviewed Shop Drawings is kept on site at all times for reference.
- 1.5.9 Prepare all Drawings in SI units.
- 1.6 **FIELD DRAWINGS**
- 1.6.1 Submit, to the General Contractor, Drawings accurately showing all openings for ducts, pipes, etc. Drawings must include the size of openings and their locations by dimensions, including the location of the structural members framing these openings. Each trade will be responsible for detail layout of their own work.
- 1.6.2 Assume full responsibility for the detailed coordination of all Division 15 work. Prepare Field Drawings to determine the exact location of each service. On these Drawings, include all mechanical and electrical services, architectural features, and structural details. If a conflict becomes apparent after the installation of services, pay all costs associated with removing and reinstalling these services.
- 1.7 **AS-BUILT DRAWINGS**
- 1.7.1 The Contractor will be provided with Mechanical and Electrical Files used to produce the contract documents. The following digital formats were used and are to be maintained: AutoCAD and PDF. The Contractor is to print Drawings from the PDF files provided.
- 1.7.2 Revise and maintain the prints as work progresses. Show all revisions, relocations and changes, to scale. Use colour markings.
- 1.7.3 Transfer information from the marked prints to AutoCAD files on a monthly basis to match the software that version the original files were created in.. Have the marked prints and updated CAD prints on site for review by the Consultant at all times. Monthly draws will not be approved unless all changes have been shown.
- 1.7.4 Prior to testing, balancing and final commissioning, complete the transfer of marked prints to the AutoCAD files. Fill in the Owner's equipment numbering system in the Schedules on the Drawings and on the plans where blank placeholder tags have been shown.
- 1.7.4.1 AutoCAD format files are to match exactly the layering system and symbology of the Consultant. Bind all external references.
- 1.7.5 Mark Drawings "As-Built Drawings" and insert name and logo of Contractor. Submit one set of printed "As-Built Drawings" for review by the Consultant. Remove Engineers Stamp. Include Contractors name and Logo.
- 1.7.6 Submit completed As Built Drawings on disks in same digital data software program, and version as original contract documents. Also provide one set of Drawings with the Operating and Maintenance Manuals.

1.7.7 For the purposes of Contract payments, As Built Drawings will be assumed to have a value of \$1,000.00. This will not be released until As Built Drawings have been accepted as complete and acceptable by the Consultant. This amount is in addition to the normal 10% holdback required by the Construction Lien Act, 2018.

1.8 SIMULTANEOUS PROJECTS

1.8.1 Other projects may be under construction simultaneously on this site during the course of this construction project. The Owner will not be the "constructor" as defined by The Ontario Health & Safety Act & Regulations. This Contractor is to maintain a separation between this project and all other Contractors, by time or space, as defined by The Ontario Health & Safety Act & Regulations.

1.9 CONFLICTS AND PRECEDENCE

1.9.1 Immediately upon discovery of any conflict, ambiguity, error or omission in the Contract Documents, request clarification in writing from Consultant prior to starting the work in questions.

1.9.2 Failure to give such written notice will constitute an irrevocable waiver and release of any claim for additional compensation or delays incurred.

1.9.3 Where work fails to conform to Contract Documents, as clarified by Consultant, promptly remove and replace such work as directed, without adjustment to Contract price.

1.10 FIRESTOPPING

1.10.1 Before starting any work on site, submit detailed Shop Drawings to the Consultant for review and comments. Include:

1.10.1.1 Manufacturer's technical product data and installation instructions for each specific type and location of penetration.

1.10.1.2 Certification that proposed firestopping materials and assemblies comply with CAN-ULC S115 "Standard Method of Fire Test for Firestop Systems".

1.10.1.3 For each specific type and location of penetration, provide installation instructions from a recognized independent testing agency.

1.10.2 Mark penetration types and locations on set of white prints. At completion of project, transfer this information to "Record" Drawings.

1.10.3 Comply with all requirements of Ontario Building Code, Clause "Building Services in Fire Separations and Fire Rated Assemblies".

1.11 MAINTENANCE AND OPERATING INSTRUCTIONS

1.11.1 Assemble one set of equipment literature (cuts), operating instructions, maintenance instructions, pressure test results, certificate, other pertinent data and Letter of Warranty. Place in three ring binders, complete with index pages, indexing tabs and cover identification at front and side. Submit to Consultant for approval.

-
- 1.11.2 Make changes or submit additional information as required to obtain approval. Final Certificate of Completion will not be issued until the Consultant possesses three approved sets. Include copies of approved Shop Drawings and name and address of Spare Parts' Suppliers with manuals.
- 1.11.3 Provide one electronic copy of the maintenance and operating manual in Adobe Acrobat PDF format on a USB Drive and submit with the final version of manuals. Electronic copy of manual to be provided as one folder per section or piece equipment. Files are to be formatted with bookmarks in accordance with the sections of the manuals listed in clauses above. Divide the maintenance manuals into sections which correspond with Specification Sections.
- 1.11.4 The following information is to be contained within the Sections:
- 1.11.4.1 A list of names, addresses and telephone numbers of the Consultants, General Contractor and Mechanical Contractor. Written warranty of the Mechanical systems. A copy of the valve directory, giving number, valve location, normal valve position and purpose of valve. Copy of all natural gas fitter tags.
- 1.11.4.2 A copy of all pressure tests and operational tests for pumping systems. A list of names, addresses and telephone numbers of all suppliers. A copy of all approved Shop Drawings.
- 1.11.4.3 A complete and comprehensive lubrication, maintenance and operating instructions details D (daily), W (weekly), M (monthly), SA (semi-annually), A (annually) schedule for maintenance and lubrication.
- 1.11.4.4 A complete list of all air filter sizes, quantities and types, corresponding with unit designations.
- 1.11.4.5 Copies of warranties.
- 1.11.4.6 Complete control diagrams, wiring diagrams and description of control system and the functioning of the system.
- 1.11.4.7 Copy of the project Testing and Balancing Report.
- 1.12 **REGULATIONS AND PERMITS**
- 1.12.1 Carry out all work in accordance with the latest editions of applicable municipal and provincial codes, regulations, bylaws, and requirements of local Authority Having Jurisdiction. In no instance, however, is the standard established by the Drawings and Specifications to be reduced by the codes referred to above. Apply for and obtain any necessary permits. Pay any necessary fees.
- 1.12.2 Enforce all prevailing Provincial and local safety regulations at all times. Abide by all Owner's safety and security policies and procedures and conform to all regulations of the current Occupational Health and Safety Act.
- 1.12.3 Submit copies of CRN Certificates for all boilers and registered pressure vessels. Arrange and pay for TSSA certification of all boilers with a heating surface area greater than 2.78 m² (30 ft²).

-
- 1.12.4 Fill out TSSA forms and pay all costs associated with removal of existing boilers and other equipment, wherever equipment is currently registered with TSSA
- 1.12.5 Arrange and pay for TSSA inspection and certification for all piping systems and equipment regulated by TSSA.
- 1.12.6 TSSA will forward certificates and invoice for certificates to Owner. Owner will forward certificates and invoice to certificates to this contractor. Pay TSSA invoice for the certificates. Insert a copy of each certificate in to the Operating and Maintenance Manual. Frame and hang the original certificates in the Utility Room near the equipment.

1.13 **MATERIAL AND EQUIPMENT**

- 1.13.1 Where an item of material or any equipment is specifically identified by a manufacturer's trade name and/or catalogue number, make no substitution except as provided for in paragraphs 3, 4 and 5 below.
- 1.13.2 In the case of some items of equipment, one or more additional names of acceptable equal manufacturers are listed in the Clause describing an item or a group of items. The design, layout, space allocation, connection details, etc., are based on the products named first in the description of each item. The products named first in the description of each item establish the quality of manufacture and design standards for all other manufacturers of that item. The general approval indicated by listing the names of other manufacturers is subject to final review of Shop Drawings, performance data, test reports, production samples (if required) by Consultant, and equipment shipped to site. Ensure that the products used meet the requirements specified and as shown on the Contract Drawings.
- 1.13.3 Suppliers wishing to submit other items of equipment for approval as an equal to those specified must apply to the Consultant at least 10 working days before Bid closing date. Requests must be accompanied by complete description and technical data on the items proposed. Approval for substitution of equipment will only be given on the understanding that all details, accessories, features and performance meet the Specifications unless otherwise stated. Deviations from the Specifications must be stated in writing at time of application for approval.
- 1.13.4 Include in the Bid, the equipment named in the Specifications or approved as an equal as in paragraph 3 above. This will form the Base Bid. Any number of alternative bids, as defined below, may be included in addition to the Base Bid.
- 1.13.5 Items of equipment by Manufacturers not named in the Specifications may be offered as alternatives to the manufacturers named in the Specifications. The alternative proposals must be accompanied by full descriptive and technical data, together with the statement of amount of addition or deduction from the Base Bid, if the alternative is accepted. Prior approval by the Consultant is **not** required on items submitted as alternative bids.

-
- 1.13.6 After execution of the Contract, substitution of equipment will be considered only if equipment accepted cannot be delivered in time to complete the work in proper sequence, or if the manufacturer has stopped production of the accepted item. In such cases, requests for substitution must be accompanied by proof of equality and difference in price and delivery, in the form of Certified Quotations from Suppliers of both specified and proposed equipment. Credit any decrease in price involved in substitution to the Owner by reduction of the Contract Price. The Contractor will **not** be reimbursed for any such increase in price.
- 1.13.7 Where equipment other than the equipment used as a basis for design, layout and space allocation is used, produce and submit revised layouts of equipment, pipes, ducts, etc., in the areas affected. Submit these Drawings with the Shop Drawings. Failure to produce these Drawings is indication by the Contractor that they are not required and the original space allocations are adequate for the substituted equipment.
- 1.13.8 Name the Subcontractors and Manufacturers in the Bid as indicated in Clause "List of Mechanical Subcontractors and Manufacturers".
- 1.14 **INTERPRETATION OF CONTRACT DOCUMENTS**
- 1.14.1 The decision as to which trade provides required labour or materials rests solely with the Contractor. Extra payments will not be considered based on a difference in interpretation of the Contract Documents as to which trade involved provides materials or labour for specific items of work. The Consultant will not enter into such discussions.
- 1.15 **SITE VISITS**
- 1.15.1 The Mechanical Contractor shall have an office representative (not site personnel) at each site meeting and deficiency review. Attendance at these meetings is mandatory.
- 1.16 **PROGRESS DRAWS**
- 1.16.1 Mechanical Contractor shall review all supplier and subcontractor draws submitted to their office to ensure they are fair and reasonable for the amount of work completed on site to date prior to submitting to the General Contractor. Mechanical Contractor will be responsible for the validity of supplier and subcontractor draw claims.
- 1.17 **WARRANTY**
- 1.17.1 Warranty all workmanship and make good any defects for one year after Owner's takeover except where specifically specified otherwise. Warranty material and equipment supplied by the manufacturers for one year after Owner's takeover. Make good damage caused due to defects and workmanship.
- 1.17.2 Where equipment specified in Sections of Division 15 to have an extended warranty period, e.g. five years, the first year of the warranty period will be governed by the terms and conditions of the warranty in the Contract Documents, and the remaining years of the warranty will be direct from the manufacturer and/or supplier to the Owner. Submit signed and dated copies of the extended warranties to the Consultant before applying for a Certificate of Substantial Performance of the Work.

1.18 CONSTRUCTION SCHEDULE

- 1.18.1 Within one week of Award of Contract, submit to the Consultant a Construction Schedule. Show in the Work Schedule, a complete breakdown of the work of the Contract, together with planned progress dates.
- 1.18.2 Compare progress of work with the Work Schedule at every job meeting.
- 1.18.3 Provide a construction schedule with each monthly progress draw, even if there are no revisions. Prior to making any schedule revision dates from original construction schedule, obtain Consultant approval.

2 Products**2.1 MATERIALS**

- 2.1.1 Use materials specified herein or approved equal as defined in Clause "Material and Equipment".

2.2 BACKFILL

- 2.2.1 Use backfill material in accordance with the requirements of Division 2 unless specified or shown otherwise.

2.3 CONCRETE

- 2.3.1 Use concrete in accordance with the requirements of Division 3 unless specified or shown otherwise.

2.4 SLEEVES

- 2.4.1 In general, sleeves are not required through walls or floors except for penetrations through Service Room walls or floors, foundation walls, or for steam and condensate piping system wall or floor penetrations.
- 2.4.2 For all pipes passing through foundation walls, use Link-Seal pre-engineered mechanical seals between sleeves and pipes.
- 2.4.3 For sleeves through mechanical room floors, use Schedule 40 steel pipes with annular fins continuously welded at midpoint.
- 2.4.4 For rated separation requiring a FT firestopping rating, use materials in conformance with manufacturer's recommendations.

2.5 FIRESTOPPING

- 2.5.1 Use only service penetration firestop components and assemblies tested in accordance with CAN-ULC-S115 "Standard Method of Fire Test for Firestop Systems" and listed in most recent ULC "List of Equipment and Materials" or by another recognized independent testing and certification agency acceptable to the Consultant.
- 2.5.2 All pipe insulation passing through the fire separation to be approved with the listing of the firestop system.

2.5.3 Pipe sleeves through fire separations requiring an F rating are to be installed as per firestopping manufacturer's recommendations, as some firestopping manufacturers do not allow pipe sleeves within their approved system. Confirm pipe sleeve compatibility prior to starting work on site.

2.5.4 The following manufacturers of the above equipment will be considered equal subject to requirements of Clause "Material and Equipment":

Tremco

2.6 FIRE CLOSURES

2.6.1 Use only fire damper assemblies tested in accordance with CAN/ULC S115 Fire Tests of Firestop Systems and listed in most recent ULC "List of Equipment and Materials" or by another recognized independent testing and certification agency acceptable to the Consultant.

2.7 ESCUTCHEON PLATES

2.7.1 Use chrome or nickel-plated brass, solid type, with set screws for ceiling or wall mounting.

2.8 ACCESS DOORS

2.8.1 Access doors to be flush to edge of frame, concealed continuous hinge with screwdriver operated cam latch. Non fire-rated door construction to be minimum 14 gauge, with 16 gauge frame. Fire-rated door construction to be a minimum 20 gauge insulated door with 16 gauge frame. Insulation thickness to provide required rating.

2.8.2 Size doors to allow adequate operating/maintenance clearance for devices. Doors to be a minimum 600 mm x 600 mm (24" x 24") for body entry, and 300 mm x 300 mm (12" x 12") for hand entry, unless noted otherwise. Use the following access doors:

Masonry Walls	-	Acudor UF-5000
Drywall Walls	-	Acudor DW-5040
Drywall Ceilings	-	Acudor BP58, match ceiling thickness

2.8.3 The following manufacturers of the above equipment will be considered equal subject to requirements of Clause "Material and Equipment":

Adam
Price

2.9 ELECTRIC MOTORS

2.9.1 Provide motors of adequate size and type for intended service. Use CSA approved motors with the following characteristics:

250 watts (1/3 hp) and under	-	115 volt, 60 hertz, single phase
370 watts (1/2 hp) and over	-	60 hertz, three phase, voltage as shown on Drawings.

-
- 2.9.2 Motors are to be the voltage specified. Step down or step up transformers will not be accepted.
- 2.9.3 Motors 250 watts (1/3 hp) and under: Use continuously rated squirrel cage induction type with capacitor start, NEMA Design Class "B" with NEMA "N" or better starting characteristics and a minimum of Class "B" insulation, unless specified otherwise.
- 2.9.4 Motors 370 watts (1/2 hp) and over: Use continuously rated squirrel cage induction type, NEMA Design Class "B" with NEMA "B" or better starting characteristics and a minimum of Class "B" insulation.
- 2.9.5 Use open drip-proof type motor with a 1.15 service factor for motors located in dry locations indoors, unless specified or required otherwise by the motor location.
- 2.9.6 Use totally enclosed motors outdoors and in locations subject to water spray. Totally enclosed motors must be fan cooled and have a 1.0 service factor.
- 2.9.7 Use totally enclosed explosion-proof (TEXP) motors where indicated to prevent ignition of external gas.
- 2.9.8 All enclosures shall be rolled steel band or cast iron construction. Motor nameplate shall be mounted on enclosure with stainless steel fastening pins and shall have, as a minimum, all information as described in CSA C22.2 No 100-04 (R2009).
- 2.9.9 Unless specified otherwise, starters for electric motors will be provided by Division 16. Where multi-speed motors are specified, ensure that motors are compatible with starters supplied under Division 16.
- 2.9.10 All two speed motors to be single winding, unless specified otherwise. Provide inverter duty motors where indicated on drawings.
- 2.9.11 All motors 0.75 kW (1 hp) and above, use premium efficiency type motors in accordance with NEMA Premium efficiency standard.
- 2.10 **ELECTRICAL WIRING**
- 2.10.1 Meet all requirements of Division 16 for all wiring included in Division 15 and pre-wired equipment provided by Division 15.
- 2.10.2 Ensure all pre-wired electrical equipment is CSA approved. Where this is not possible, arrange and pay for special Electrical Safety Authority approval.
- 2.10.3 All electrical wiring, both line voltage and low voltage, for equipment supplied by Division 15 is the responsibility of Division 15. Line voltage wiring from power panels to starters and from starters to motors will be supplied and installed by Division 16.
- 2.11 **IDENTIFICATION NAME LABELS**
- 2.11.1 Identification name labels, directional arrows and colour bands for ductwork and piping to be plastic coated pressure sensitive "Brady" or "Westline" selfstick labels, waterproof, colourfast, dirt and grease resistant. For pipes up to and including 65 mm (2-1/2") diameter, use markers 28 mm (1-1/8") high. For pipes 80 mm (3") diameter and over, and all ductwork, use markers 57 mm (2-1/4") high. For all

piping exposed to view, use Smillie McAdams Summerlin Coil - Mark pipe covers.

- 2.11.2 The following manufacturers of the above equipment will be considered equal subject to requirements of Clause "Material and Equipment":

Visionmarker

2.12 VALVE AND CONTROLLER TAGS

- 2.12.1 Use brass valve and controller tags with 32 mm (1-1/4") stamped code lettering and numbers filled with black paint. Hang a copy of the valve chart in Mechanical Room.

2.13 EQUIPMENT NAMEPLATES

- 2.13.1 Use minimum size 90 mm x 40 mm x 2.4 mm (3-1/2" x 1-1/2" x 3/32") thick laminated phenolic plastic nameplates with black face and white lettering. Lettering to be minimum 6 mm (1/4") high.

2.14 BELT AND MACHINE GUARDS

- 2.14.1 Provide OSHA compliant expanded metal guards in steel frames to protect drives of all belt driven equipment and all equipment with exposed rotating or moving parts. Firmly bolt guards in place and make easily removable for servicing. Provide openings in metal guards to permit use of a tachometer without removing the guard.

2.15 FLASHING

- 2.15.1 For locations with roof penetrations serving a piece of equipment, such as for roof mounted, split system condensing units, etc, use Portals Plus, Inc. Alumi-Flash system consisting of 330 mm (13") high, one piece spun aluminum base with deck flange and EPDM rubber cap. Use caps suitable for required number and diameter of service penetrations. Flashing is for Division 15 and 16 use only. Coordinate with Division 16 to minimize the number of flashings required.

- 2.15.2 For plumbing vent roof penetrations, use Thaler SJ-38 "Stack Jack" insulated flashing consisting of 330 mm (13") high, one piece spun aluminum base with deck flange, urethane insulation line and EPDM base seal. Size seals to suit pipe diameter.

3 Execution

3.1 GENERAL

- 3.1.1 Instruct and supervise other Sections doing related work.
- 3.1.2 Supply the measurements of equipment to other Sections to allow for necessary openings to be left in the work of other Sections.
- 3.1.3 Install pipes, ducts and tubing, which are to be concealed, neatly and close to building structure so that the necessary furring can be kept as small as possible.
- 3.1.4 Install all ceiling components in direct accordance with reflected ceiling plans.

3.1.5 Mechanical Drawings show approximate locations for wall-mounted devices. Clarify exact location and mounting height with Consultant prior to roughing-in.

3.1.6 All serviceable equipment installed on the roof (including boiler vents) to be installed minimum 3m (10'-0") from roof edge.

3.2 DISSIMILAR METALS

3.2.1 Separate dissimilar metals by means of gaskets or shims of approved material or use dielectric unions or flanges in order to prevent electrolytic action. Where piping of dissimilar metals is connected, use approved dielectric unions or couplings. A brass fitting or brass valve may also be used in making connections between copper and steel piping.

3.3 STORAGE OF MATERIALS

3.3.1 Provide proper weatherproof storage for the protection of materials and equipment on site. Blank off openings in all equipment until required for use. Consultant may require materials which are not properly stored to be discarded and removed from the site.

3.4 EXCAVATION AND BACKFILL

3.4.1 Be responsible for any excavation and backfill required for work of Division 15. Slope or shore all trenching in accordance with all current regulations and safety standards. Where any pipes pass under building footings, backfill under footings with lean concrete.

3.4.2 Use materials and standards of compaction for backfill in accordance with Division 2 unless specified otherwise.

3.4.3 If changes are required in locations, depth of excavating or related data, advise the Consultant in reasonable time to avoid disruption of work sequence.

3.5 SUPPORTS AND BASES

3.5.1 Provide structural work required for installation of equipment provided under this Division.

3.5.2 Where piping and/or equipment is to be supported by steel stud walls, use brackets and supports which attach to steel studs. Support equipment independently of wall sheathing.

3.5.3 Set all floor-mounted equipment on concrete bases at least 100 mm (4") high. Provide bases, anchor bolts and any special isolation bases. Concrete bases for air handling equipment are to be sized to suit unit drain air seal requirements, but 100 mm (4") to remain as minimum. Size concrete equipment bases to suit the equipment actually supplied and in accordance with the Shop Drawings of such equipment. Do not start concrete work until anchor bolts and other embedded parts required for the complete installation, as well as Shop Drawings, are available at the site.

3.5.4 Carry out all concrete work in accordance with requirements of Division 3. Provide wire mesh, rebar and all necessary reinforcing.

3.5.5 For new concrete bases or pads on existing floors, first scrape and remove existing floor finish. Scarify existing floor so that new concrete adheres to it. Dowel new pads to existing floors.

3.6 CONCRETE INSERTS

3.6.1 General

3.6.1.1 Anchors for the support of pipes, ducts and equipment from the underside of suspended structural concrete systems may be by cast-in-place inserts placed prior to the pouring of concrete or by the use of inserts placed in holes drilled after the forms are stripped. The use of inserts cast into the concrete is the preferred option.

3.6.1.2 The safe load capacity of concrete anchors is affected by a number of variables such as specific anchor type, embedment, spacing between individual anchors, edge distances, direction of loading, concrete strength and "prying action". Refer to the manufacturer's recommendations for each specific insert proposed, including any dynamic or vibratory loads.

3.6.1.3 Be responsible for the proper selection and installation of inserts, including number, type, spacing and accurate placement to provide the necessary safe load capacity and satisfactory long term performance.

3.6.2 **Installation of Cast in Place Inserts:** Ensure that anchors are accurately placed and "fixed" in position with sufficient rigidity to maintain their position during the placement of concrete. Do not displace reinforcing to install anchors without the prior permission of the Consultant.

3.6.3 Installation of Inserts in Hardened Concrete:

3.6.3.1 Use inserts placed in pre-drilled holes. Do not use powder driven inserts or self-drilling inserts. Before drilling holes, accurately locate all reinforcing bars in the affected areas using an electro-magnetic locator.

3.6.3.2 Do not drill through or otherwise damage reinforcing bars. If reinforcing is encountered, the inserts must be relocated. Ensure that hole diameter, depth of penetration, spacing, etc., are in strict accordance with the insert manufacturer's recommendations for the specific insert type and load condition.

3.6.3.3 Due to the relatively close spacing of reinforcing bars in the bottom of many of the beams and girders, the preferred location of drilled-in-place anchors in beams and girders is into the sides of these members, rather than upwards into the bottom.

3.6.4 **Sleeves Embedded in Concrete:** Except as approved otherwise by the Consultant, install sleeves embedded in concrete in accordance with the following general guidelines:

3.6.4.1 Centre to centre spacing to be not less than 3 diameters of the maximum size adjacent sleeve.

3.6.4.2 Provide additional reinforcing at points of congestion as directed by the Consultant.

3.6.5 Sleeves through beams will be permitted only as directed by the Consultant.

3.6.6 The reinforcing in beams, slabs and columns must not be displaced from its intended position under any circumstances unless prior written approval is obtained from the Consultant.

3.7 SLEEVES

3.7.1 Provide sleeves for insulated pipe large enough to permit free movement of pipe without crushing the insulation.

3.7.2 Provide sheet metal framing around ducts through masonry walls in exposed areas to ensure a clean finish around ducts.

3.8 FIRESTOPPING

3.8.1 Provide a listed firestop system in accordance with the Ontario Building Code to seal around all piping, tubing, ducts, conduits, electrical wires and cables, and other similar mechanical services which penetrate part of a building assembly required to have a fire resistance rating or a fire separation. Refer to Architectural Drawings and Specifications Section "Firestopping and Smoke Seals" for building assembly and fire separation types and locations.

3.8.2 For all penetrations through fire separations required to have a fire resistance rating, use firestop systems with an F rating not less than the fire resistance rating for the fire separation. This includes the sealing of any sleeves provided for future uses. Provide an FT rating where required by the Ontario Building Code. For all penetrations through a Mechanical Room floor, provide a minimum W rating - Class 1 in addition to the fire resistance rating.

3.8.3 At each fire stopping penetrating location, provide a fire stopping identification label indicating the system number installed, products used, date installed and the installer's name. Locate label on penetrating service at the penetration location.

3.8.4 All firestopping must be thoroughly reviewed by the Technical Representative of the systems manufacturer on site before any firestopping is concealed and submit a report of compliance with the rating requirements. Technical Representative to complete 3 destructive tests to confirm compliance with ULC listing, minimum one floor test and one wall test, third test to be Contractor's choice. Contractor to replace fire stopping system after destructive test has been completed. Submit a copy of the report to the Consultant. Report to include as a minimum, confirmation fire stopping shop drawings were used during review, locations where destructive testing was completed, confirmation all fire stopping locations were reviewed and installed systems meet the manufacturer requirements.

3.8.5 Install duct fire damper assemblies in strict accordance with manufacturer's instructions provided with each assembly.

3.9 CUTTING AND PATCHING

3.9.1 Do not cut or drill holes through floors, roof or structural members before obtaining permission from the Consultant. All cutting and patching to be done by the trade specializing in the materials to be cut.

3.9.2 Flash holes through walls and roof to make weatherproof.

- 3.9.3 For penetrations through walls not required to have a fire rating, seal all spaces between pipe or pipe and surrounding wall construction with a fire-rated foam sealant. Use 3M Fire Barrier, Metacaulk, or Dow Fire Stop UL Classified fire rated foam sealants. Do this as the work progresses, to avoid leaving inaccessible holes at completion of the job. For penetrations through parts of the building assembly required to have a fire resistance rating or acting as a fire separation, see Clause "Firestopping" in this Section.
- 3.9.4 Where pipes and ducts are shown on the Mechanical Drawings passing through existing walls, floors, and roof, cut and patch the necessary openings. Include the cost of all cutting and patching in the Lump Sum Contract Price for the work of Division 15. Before drilling holes through floors or roof slabs, accurately locate and note sizes for each required hole. Get approval of Consultant before any cutting is started. Electrical conduits with live wiring may be embedded in concrete floor slabs.
- 3.9.5 Remove and replace ceiling where necessary to complete the work of this Division unless this work is specifically included in another Division.
- 3.10 **ELECTRICAL WORK**
- 3.10.1 Perform all electrical work included in the work of this Division in accordance with the requirements of Division 16.
- 3.11 **PAINTING**
- 3.11.1 Touch up minor damage to finish on equipment supplied with factory applied baked enamel finish. Completely refinish items suffering damage which, in the opinion of the Consultant, is too extensive to be remedied by touchup.
- 3.11.2 Paint all steel framework provided by this Division with a chromium oxide primer. All steel framework outside the building is to be hot dipped galvanized.
- 3.11.3 Exposed non-galvanized hangers, racks, strut and fasteners to be thoroughly degreased and primed.
- 3.11.4 Paint all exterior piping. Use two coats of paint. Use colours as selected by the Consultant.
- 3.11.5 Paint all new and existing gas piping. Use two coats of paint. Use colours as selected by the Consultant.
- 3.11.6 Where walls are cut and patched for mechanical work, paint walls to match existing. For walls less than 9.3m² (100 sq ft), paint entire wall. For walls larger than 9.3m² (100 sq ft), paint area of patch. Painting to be completed by painting contractor.
- 3.11.7 Include the cost of all painting in the Lump Sum Contract Price for the work of Division 15.
- 3.12 **ACCESS DOORS**
- 3.12.1 Supply access doors wherever equipment, valves, dampers, life safety devices, etc., are concealed behind walls or inaccessible ceilings. All devices installed requiring periodic maintenance to be made accessible. Doors will be installed by Division 9.

3.13 IDENTIFICATION

- 3.13.1 Identify all new piping and ductwork using name labels. Apply labels at 7 m (24') intervals and at all branch connections, valves, and access panel locations. Identify fan system number at each ductwork label. Mark each pipe in a space or area less than 7 m (24') at least once with a name label. Apply arrows indicating flow direction beside each name label.
- 3.13.2 To ensure permanent bond, apply 3M Adhesive EC-1341 to the surface of the insulation or pipe material. Apply the label with its own adhesive on this surface. Remove any labels "lifting" or "peeling". Clean the surface and repeat the procedure specified with a new label. Where labels do not adhere, use pipe banding tape spirally wrapped for full length of label. Apply label over the banding tape.
- 3.13.3 Use colour bands on all piping in accordance with Detail Sheet at end of this section. Where not indicated in Detail Sheet, use colours in accordance with current CGSB Publication for identification of piping systems. Submit list with all proposed colours and materials to the Consultant for review before ordering any materials.
- 3.13.4 Provide nameplate identifying equipment type, identification number, service and area served on each piece of mechanical equipment. For heat pumps, exhaust fans, condensing units, roof top air handling units, etc. list the rooms served by each piece of equipment.
- 3.13.5 Identify all manual and automatic control valves on all systems using brass tags attached with non-ferrous chains. Prepare a schedule of all tags for each system showing designating number, service and function. Include these schedules in the Operating and Maintenance Manuals and in the Mechanical Room.
- 3.13.6 Provide identification of all duct balancing dampers. Identify both support points of balancing damper and bottom of duct. Fluorescent orange spray paint is acceptable.
- 3.13.7 Where equipment is concealed above accessible ceilings, indicate location using coloured-coded marking devices, approved by Consultant, fastened to the ceiling components.

3.14 PIPING**3.14.1 General**

- 3.14.1.1 Conceal all piping except in equipment rooms, unfinished areas, and where specifically noted. Unless shown otherwise, install all above ground piping parallel to building walls and partitions.
- 3.14.1.2 Install escutcheon plates at walls, floors and ceilings where piping is exposed. Install piping to conserve headroom.
- 3.14.1.3 In locations where space is provided for future or other equipment requiring connection to systems installed under this Contract, install services with shutoff valves and caps to allow connection to the system without interruption.
- 3.14.2 **Drain Hose Connections:** Provide drain hose connections at the base of all risers, on the suction side of all pumps and in all locations shown on Drawings.

3.14.3 Supports and Hangers

- 3.14.3.1 Provide all hangers, supports and sway braces in accordance with ANSI B31.1 and the Ontario Building Code. Support all piping in accordance with the Ontario Building Code.
- 3.14.3.2 Use Anvil beam clamps.
- 3.14.3.3 Use line size adjustable wrought steel clevis type hangers for horizontal piping 32 mm and less (1-1/4" and less). For copper pipe, wrap pipe with tape at all hangers or use Anvil Figure CT-99C adjustable tubing ring hangers.
- 3.14.3.4 For piping 40 mm and over (1-1/2" and over) use adjustable wrought steel clevis type hangers large enough for pipe insulation. See Section 15260 for insulation shields.
- 3.14.3.5 Where specified and/or shown on Drawings and in schedules, use spring hangers. See Drawings for details.
- 3.14.3.6 Unless specified otherwise, support piping at maximum spacing as shown and within 460 mm (18") of each side of all valves and bends.
- 3.14.3.7 Support all plumbing piping in accordance with the Ontario Plumbing Code.
- 3.14.3.8 Support horizontal cast iron drainage piping at 1.5 m (5') maximum spacing. Where the drain has successive fittings with no pipes between the fittings exceeding 800 mm (1') in length, support the drain at intervals not exceeding 1 m (3'). Where mechanical joints are used, provide double hangers and sway bracing.
- 3.14.3.9 Where cast iron pipe with mechanical joints is used, support piping at both sides of all joints in horizontal runs, at all branch ends, and at all points where there is a change in direction. Where the pipe is 150 mm (6") or larger in horizontal runs, brace to prevent horizontal movement at each branch or change in direction. Use braces, blocks, rodding or other suitable method recommended by the joint manufacturer. Provide Inspection Report from the manufacturer's representative certifying the installation is in accordance with their published installation data.
- 3.14.3.10 Do not support piping from other piping or equipment, or from metal roof decking.

3.14.3.11 Schedule:

Pipe Size mm	20	25	32	40	50	65	80	100 to 200	250 & Over
Max. Span m	1.8	2.1	2.4	2.4	3	3.4	3.7	4.3	6.1

- 3.14.4 **Anchors:** Install anchors where shown and where required. Use "U" bolts for piping 80 mm (3") in diameter and less. For piping over 80 mm (3") diameter, use steel fabricated anchors welded directly to pipe.
- 3.14.5 **Provision for Expansion:** Make proper allowance for thermal expansion and contraction whether shown on the Drawings or not. Use adequate offsets on all takeoffs to allow for expansion and contraction of mains. Weld all steel pipe forming

an expansion loop regardless of size. Silver solder all copper pipe forming an expansion loop regardless of size. Use Flexonics or Anvil pipe alignment guides where shown and where required. Provide pipe guides for piping on either side of expansion loops, expansion joints and expansion compensators in accordance with "Standards of the Expansion Joint Manufacturers Association, Inc."

3.15 USE OF FANS

3.15.1 Do not use any fan supplied under this Contract for ventilation while the building is under construction. The building must be "broom clean" and all painting finished before permission will be granted for testing fans.

3.15.2 The Consultant reserves the right to use any piece of equipment, device, or material for such reasonable lengths of time and at such times as may be required to make a complete and thorough test of the same before final completion and acceptance of the work. Such tests are not to be construed as evidence of acceptance of the work, and it is agreed and understood that no claim for damage will be made for injury or breakage to any part or parts of the equipment and/or materials due to the aforementioned tests, where such injuries or breakage are caused by a weakness or inaccuracy of parts, or by defective materials and/or workmanship of any kind. Supply all labour and equipment required for such tests. Trial usage will not initiate or affect in any way the warranties required for devices being tested.

3.16 INSPECTION AND TESTING

3.16.1 **General:** Inspect and test all piping. Repair any leaks and retest until satisfactory. Do not cover or close in piping until inspection and tests are completed. Thoroughly test all systems before making arrangements for the final demonstration in the presence of the Owner's staff. At the completion of the work, demonstrate operation of all systems to the Owner's representative and the Consultant. Promptly rectify any malfunction found and retest.

3.16.2 **Soil, Waste, Vent and Building Drains:** Seal all openings in section under test, then fill with water to a height of 3 m (10') above top of section. Maintain water level for at least two hours. Test in sections as the work progresses. After all fixtures have been placed, apply a smoke test to the satisfaction of the local Plumbing Inspector.

3.16.3 **Natural Gas:** Test in accordance with latest CSA B149.1.

3.16.4 Refrigeration

3.16.4.1 Valve off compressor, pressure gauges, control devices and plug off all thermostatic expansion valves. Test with anhydrous carbon dioxide at 2400 kPa (350 psig) for 24 hours. A pressure regulator and gauge must be used to control the test pressure. Maintain pressure for 24 hours after correcting all leaks, then evacuate and dehydrate system.

3.16.4.2 Refrigeration systems are to be inspected by the Technical Standards and Safety Authority. Contractor to submit three sets of Piping Drawings and Specifications to the TSSA for review, contact the TSSA for a site visit to review materials and installation methods, and contact the TSSA after the piping is installed for a final inspection. All costs required for the inspections are to be included in the Bid Price.

3.17 PERFORMANCE VERIFICATION

- 3.17.1 All systems must be thoroughly tested by the Technical Representative of the system manufacturers before arrangements are made for the final demonstration in the presence of the Owner's staff.
- 3.17.2 At the completion of the work, demonstrate operation of all systems to the Owner's representative and the Consultant. Promptly rectify any malfunction found.
- 3.17.3 Systems to be tested are: Rooftop Unit, Variable Volume and Temperature Terminal Units and Controls, IT and Electrical Room Cooling Systems, Building Control System.
- 3.17.4 The manufacturer's representative must be present for the test period and submit a Certificate of Operation to the Consultant.

3.18 START-UP SERVICES

- 3.18.1 Provide the services of a qualified person to be in the building daily from 0800 hours to 1700 hours Monday through Friday for three weeks after work of this Contract is taken over by the Owner. Assist Owner's staff to become familiar with the system operation. Provide a similar service for week after switchover to the opposite air conditioning cycle (heating or cooling).

3.19 PLACING IN OPERATION

- 3.19.1 Upon completion of all work and before turning over the job, test each system for proper operation.
- 3.19.2 Flush through all drains and properly adjust flush valves and other fixtures.
- 3.19.3 Open and clean all new and existing traps, strainers and scale pockets after two weeks' operation.
- 3.19.4 Clean out all room heating units, terminal heating units and all air handling equipment with a vacuum cleaner when building is completed.
- 3.19.5 For each new filter bank, provide one extra set of filters.
- 3.19.6 Steam clean all existing convectors and wall-fin elements in the rooms where changes have been made. Do this after all other work has been completed.

3.20 COOPERATION BETWEEN TRADES

- 3.20.1 Cooperate and coordinate with other trades as required for satisfactory and expeditious completion of work. Take field dimensions relative to work. Fabricate and erect work to suit field dimensions and field conditions. Pay cost of extra work caused by and make up time lost as result of failure to provide necessary cooperation information or items to be fixed to or built-in, in adequate time.

3.21 MAINTENANCE OF EXISTING SERVICES

3.21.1 Take every precaution to locate and protect existing services so that no unscheduled interruption occurs. If any existing service is damaged due to the work of this Division, arrange and pay for repair. Bear any costs due to interruption of existing services.

3.21.2 The operation of the building by the Owner for day-to-day activities takes precedence over all construction related scope of work. The Contractor may be asked to cease work immediately in these instances and directed to work at another time. Assume all construction related activities which will impact the day-to-day operations of the facilities will be done after hours. Include all costs associated with after hours and overtime hours in the Base Bid. Additional costs related to after hours or overtime hours after Award of Contract will not be entertained.

3.21.3 Permission from the Owner is required before making any connections to or rerouting of existing services. Before any interruptions of service or restriction of use of any service, provide seven days prior written notice to the Consultant and Owner.

3.22 PROTECTING AND MAKING GOOD

3.22.1 Be responsible for protection of Owner's property, as well as finished and unfinished work, from damage due to execution of work under this Contract. Repair damage resulting from failure to provide such protection to the satisfaction of the Consultant, at no expense to the Owner.

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

3.23 REMOVAL OF EXISTING MATERIAL AND EQUIPMENT

3.23.1 Remove existing material and equipment where shown or specified. Unless noted or specified otherwise, all material and equipment which is removed becomes the property of the Contractor and must be immediately removed from the site.

3.24 EXAMINATION OF EXISTING EQUIPMENT

3.24.1 Report all damaged, defective and non-functioning equipment shown for reinstallation or relocation to the Consultant prior to removal and storage. All equipment will be assumed to be fully functional unless reported otherwise prior to removal.

3.24.2 Devices and equipment damaged during removal, storage or reinstallation will be replaced at no cost to the Owner.

3.25 PHASING

3.25.1 The work on this project is to be phased to enable continuous operation of the Owners facilities. See the Phasing Drawings in Appendix A for the proposed phasing of the work. Provide for temporary services, connections, bypasses, etc. to enable the phasing as described. Carry all associated costs in the Bid.

3.26 FIRE SAFETY IN EXISTING BUILDINGS

3.26.1 Where temporary shutdown of sprinkler systems, standpipe systems or other fire protection systems is required, do all work in compliance with Article 1.1.1.2, Clause 2.8.2.1.1.G and Subsections 6.4.1 and 6.5.2 of the Fire Code.

3.27 DEFICIENCY REVIEW

3.27.1 The Mechanical Contractor shall confirm in writing that the work is complete and ready for inspection. The Consultant will schedule a site visit to review the work and provide a written deficiency list. Once deficiencies have been corrected, the Mechanical Contractor shall confirm in writing to the Consultant that all deficiencies have been corrected. The Consultant will schedule a second site visit to review the correction of noted deficiencies. Should any noted deficiencies be found to be still outstanding, the Mechanical Contractor shall correct them and again notify the Consultant in writing. Charges to the Mechanical Contractor may result from repeat visits after the second visit.

3.27.2 The Mechanical Contractor is required to complete all work above ceilings and allow time for deficiency reviews and correction of noted deficiencies in a timely manner in order to accommodate the current Construction Schedule. This includes time for reinspection as required prior to concealing (drywall enclosures, drywall ceilings and acoustic tile ceilings) of any service. The Mechanical Contractor will be responsible for uncovering any concealed services for inspection.

3.28 HOURLY LABOUR RATE

3.28.1 Hourly labour rate shall be the actual rate paid to the worker as posted by the local Union Agreement plus a burden mark-up of 100% to compensate for contributions, assessments, employment insurance, health insurance, pension plans, WSIB, taxes, vacation pay, travel, parking, welfare, union package and membership dues, supervision, material handling, training, rest periods, down time, breaks, personal hygiene, small tools, clean up time, profit, other benefits paid to the worker and all other costs incurred by the Company including meetings, office time. Travel time to and from the site shall be at no charge to the Owner. For the purpose of mechanical work, the journeyman plumber union rate will be used for all trades completing any mechanical work.

3.29 TEMPORARY WATER SERVICE

3.29.1 Provide a Reduced Pressure type backflow preventer at each temporary water service connection used for construction purposes. Completely remove all temporary facilities once permanent systems are tested and operational.

3.30 LIST OF MECHANICAL SUBCONTRACTORS AND MANUFACTURERS

3.30.1 In the Bid documents, name the Subcontractors and Manufacturers for the items listed below. Use only one name for each item. See Clause "Material and Equipment". Where the name of a manufacturer is not entered on the Bid Form, the Contractor will be required to use the base specified manufacturer.

3.30.2 Subcontractors

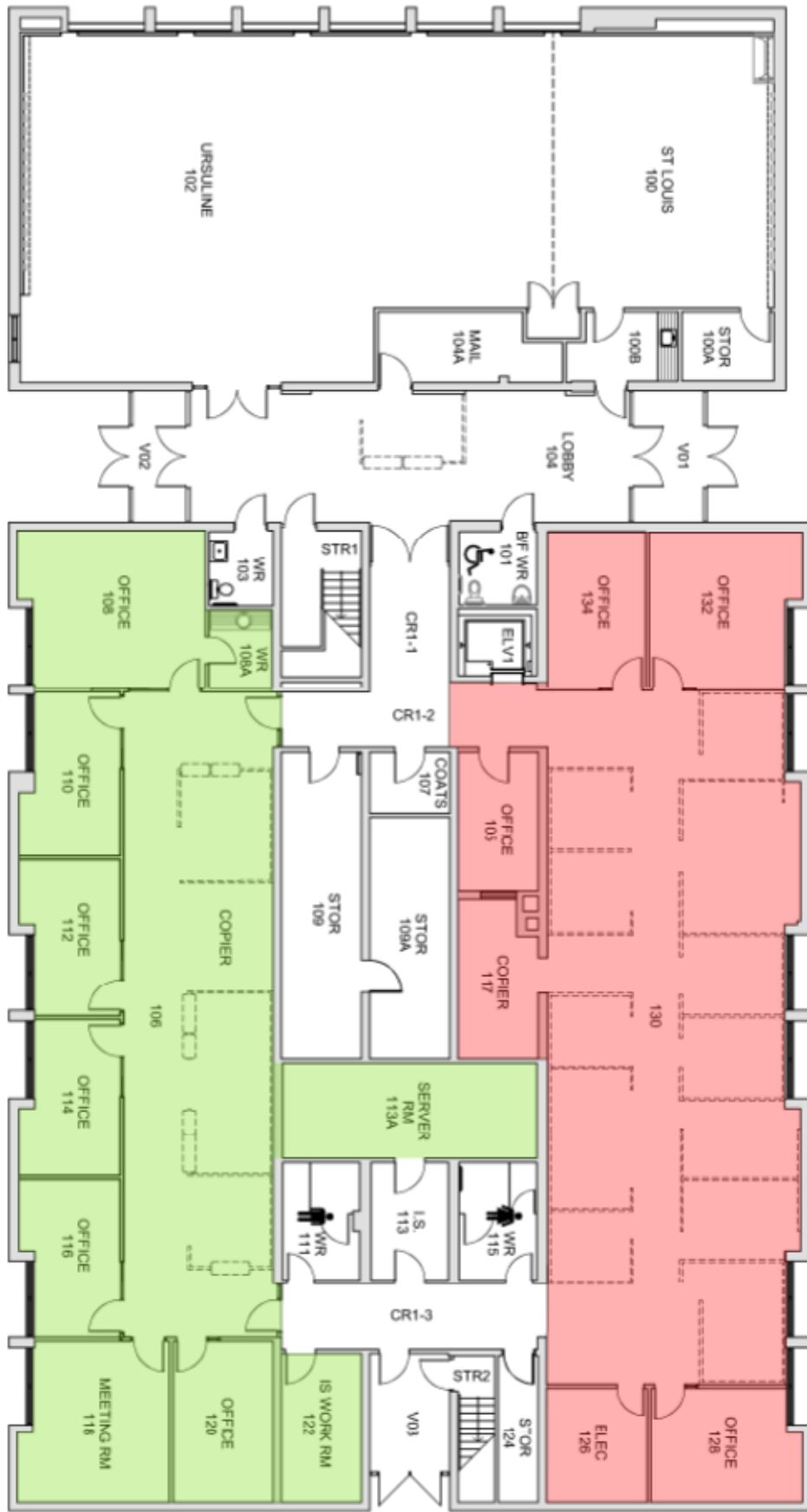
Insulation
Sheet Metal
Testing and Balancing


3.30.3 Manufacturers


Bypass Dampers
Rooftop Units
Split Systems
Variable Volume and Temperature (VVT) Terminal Units

END OF SECTION

SECTION 15001
A P P E N D I X 'A'
Phasing Plan



 - Ground floor
 - West section
 - Construction scheduled from July 6, 2020 to July 21, 2020

 - Ground floor
 - East section
 - Construction scheduled from July 21, 2020 to August 14, 2020

**Catholic Education Centre
CEC**

420 Creek Street, Wallaceburg, ON, N8A 4C4



**Ground Floor
Mechanical Upgrades**

02/12/2020



**ST. CLAIR CATHOLIC
DISTRICT SCHOOL BOARD**
Lighting the Way ~ Rejoicing in Our Journey

- Second floor
- West section
- Construction scheduled from July 6, 2020 to July 29, 2020

- Second floor
- East section
- Construction scheduled from July 27, 2020 to August 14, 2020



**Catholic Education Centre
CEC**

420 Creek Street, Wallaceburg, ON, N8A 4C4



**Second Floor
Mechanical Upgrades**

02/12/2020



**ST. CLAIR CATHOLIC
DISTRICT SCHOOL BOARD**

Lighting the Way ~ Rejoicing in Our Journey

-
- 1 General
- 1.1 **GENERAL REQUIREMENTS**
- 1.1.1 Conform to the requirements of Section 15001, "Mechanical General Provisions".
- 1.2 **MECHANICAL SYSTEMS COMMISSIONING**
- 1.2.1 The mechanical systems of this project will be thoroughly commissioned by a Third Party Commissioning Agent engaged by the Owner. Assist and cooperate with the commissioning agent as required. Include all related costs in the Base Bid.
- 1.3 **DESCRIPTION OF SYSTEMS**
- 1.3.1 **Supply Air, Return Air and Exhaust Air Systems:**
- 1.3.1.1 Existing rooftop units and VVT terminal units are being replaced. Most of the existing ductwork is being reused. Existing grilles, registers and diffusers associated with these VVT systems will be
- 1.3.2 **Dedicated Cooling Systems:**
- 1.3.2.1 Existing cooling systems for electrical room and IT room are being modified and a new split system is being added.
- 2 Products
- 2.1 **GENERAL**
- 2.1.1 Furnish all test equipment. All equipment will remain the property of the testing and balancing company. Use recently calibrated instruments. Provide verification of calibration to the Consultant when requested.
- 2.1.2 Approved testing and balancing companies for this project are:
- Accu-Air Windsor
C. J. Zettler & Associates Ltd. London
Caltab, Windsor
- 2.2 **MATERIALS**
- 2.2.1 Use materials specified herein or approved equal as defined in Section 15001, "Mechanical General Provisions", Clause "Material and Equipment".
- 2.3 **DUCT ACCESS HOLE PLUGS**
- 2.3.1 Use Duro Dyne Type IP 4 duct access hole plugs.

-
- 3 Execution
- 3.1 **GENERAL**
- 3.1.1 Include all labour, engineering and test equipment required to adjust and balance all heating, ventilating, air conditioning and exhaust systems installed or altered under this Contract.
- 3.1.2 Check rotation of all fans and pumps. Advise appropriate trade if any corrections are needed. Ensure corrections are made before starting any testing or balancing.
- 3.1.3 Ensure that all control valves, devices and equipment interlocks are operating in the manner required for the correct performance of the systems.
- 3.1.4 Where existing systems are modified, balance only the section or branches which serve the renovated areas.
- 3.1.5 Carry out testing and balancing under both extreme summer and extreme winter conditions. If you wish to simulate these conditions, obtain approval from the Consultant before beginning work.
- 3.2 **JOB CONDITIONS**
- 3.2.1 Schedule this work in cooperation with other trades involved.
- 3.2.2 Do not begin testing and balancing until the systems have been completely installed, tested and put in running order. Correct operation of equipment and system components and cleanliness of piping and ductwork is the responsibility of the appropriate trade.
- 3.3 **SUBMITTALS**
- 3.3.1 Record all test data and submit in pdf format to the Consultant. A copy of the reviewed final report is to be included in each of the Operation and Maintenance Manuals.
- 3.3.2 Use data sheets which are approved by the Consultant to record measurements. Include schematic diagrams of all systems identifying branches, inlets, outlets and equipment. Submit sample sheets for review using same procedure as for Shop Drawings.
- 3.3.3 Provide a Deficiency List to the Contractor for all materials and installation methods which are found not to be complying with the Specifications and, where specified, quantities could not be achieved within the required tolerances. Submit copy of Deficiency List to the Consultant at the same time it is issued to the Contractor.
- 3.3.4 Record all test data in SI units.
- 3.4 **AIR SYSTEMS**
- 3.4.1 Test and adjust fan speeds and dampers to deliver the required air quantities. For belt driven fans, determine size of sheaves required to properly balance systems and operate systems at minimum static pressures. Install selected sheaves. Sheaves will be supplied by fan supplier.

- 3.4.2 For each indoor and rooftop air handling unit provide static pressure profile including pressure drop across each individual unit component (i.e. coils, filter banks, fans, energy recovery wheels, etc) as well as static pressure in intake plenums, discharge supply ducts and return air ducts. Include return fan pressure differential whether return fan is located within air handling unit or not.
- 3.4.3 **Variable Volume Systems:** Make pitot tube traverse of main supply and return air ducts to measure total air quantities. Do this for both maximum and minimum air flow rate conditions. Assist controls trade in setting static pressure setpoint at minimum required pressure. Assist controls trade in calibration of flow measuring stations. Record calibration results and static pressure settings. For each volume box, measure minimum and maximum air flows, and inlet static pressure at each air flow measurement. Set minimum and maximum air flows as shown on the Drawings.
- 3.4.4 Seal duct access holes with plugs. Do not use duct tape to seal access holes.
- 3.4.5 Test and adjust each diffuser, grille, register and volume box to within 10% of design requirements, and also adjust so as to minimize drafts in all areas.
- 3.4.6 Record data as specified in Clause "Balancing Data".

3.5 **BALANCING DATA**

- 3.5.1 Include the following information in the test report:

3.5.1.1 **Motors:**

Manufacturer
 Model and/or Serial Number
 Rated amperage and voltage
 Rated kW (hp)
 Rated rpm
 Corrected full load amperage
 Measured amperage and voltage
 Calculated kW (hp)
 Measured rpm
 Sheave size, type and manufacturer

3.5.1.2 **Fans:**

Manufacturer
 Model and/or Serial number
 Rated L/s (cfm)
 Rated rpm
 Rated pressure rise
 Measured L/s (cfm)
 Measured rpm
 Measured pressure rise
 Pulley size, type and manufacturer
 Belt size and quantity
 Performance curve by manufacturer

3.5.1.3 **Air Systems (including inlets and outlets):**

Unit Ventilators (minimum flow and maximum flow)
 Grille, register or diffuser reference number and manufacturer
 Grille, register or diffuser location
 Design air quantity
 Effective area factor and size
 Measured air quantity
 Static Pressure Setpoint (VVT Systems)

3.5.1.4 **Testing and Balancing Instruments:**

Types
 Serial Numbers
 Dates of calibration

3.6 **DUCT LEAK TESTING**

3.6.1 Perform leakage testing on representative sections, as selected by the Consultant, involving at least 25% of the duct distribution systems. Include all ductwork types (rectangular, round) and pressure classifications in the leak testing.

3.6.2 Test duct systems to the following SMACNA standards.

Pressure Class	Seal Class	Leakage Class
All	A	6

3.6.3 Refer to Section 15800, Clause "Duct Leak Testing".

3.6.4 Test ductwork before ducts are insulated painted or concealed.

3.6.5 Immediately advise Contractor of any defects discovered during test. Retest systems after defects have been corrected.

3.7 **FINAL INSPECTION AND ACCEPTANCE**

3.7.1 After submission of balancing report, arrange a final inspection with the Consultant.

3.7.2 At final inspection recheck points or areas selected by the Consultant.

3.7.3 For each system, if more than 10% of the measurements at the selected recheck stations deviate by 10% or more from those in the Report, then the Report for that system will be rejected as unacceptable.

3.7.4 If Report is rejected, rebalance systems deemed to be unacceptable, submit new Reports, and make reinspection at no extra cost to the Owner.

3.7.5 Permanently mark settings of dampers and other adjustment devices so that adjustment can be restored if disturbed. Type of marking and method of application to be approved by the Consultant.

END OF SECTION

-
- 1 General
- 1.1 **GENERAL REQUIREMENTS**
- 1.1.1 Conform to the requirements of Section 15001, "Mechanical General Provisions".
- 1.2 **MECHANICAL SYSTEMS COMMISSIONING**
- 1.2.1 The mechanical systems of this project will be thoroughly commissioned by a Third Party Commissioning Agent engaged by the Owner. Assist and cooperate with the commissioning agent as required. Include all related costs in the Base Bid.
- 1.3 **DESCRIPTION OF SYSTEMS**
- 1.3.1 **Supply Air, Return Air and Exhaust Air Systems:**
- 1.3.1.1 Existing rooftop units and VVT terminal units are being replaced. Most of the existing ductwork is being reused. Existing grilles, registers and diffusers associated with these VVT systems will be
- 1.3.2 **Dedicated Cooling Systems:**
- 1.3.2.1 Existing cooling systems for electrical room and IT room are being modified and a new split system is being added.
- 1.4 **SHOP DRAWINGS**
- 1.4.1 Submit Shop Drawings in accordance with Section 15001, "Mechanical General Provisions", Clause "Shop Drawings", for the following equipment and materials:
- condensing units
 - split system air conditioning systems
 - valves
- 2 Products
- 2.1 **MATERIALS**
- 2.1.1 Use materials specified herein or approved equal as defined in Section 15001, "Mechanical General Provisions" Clause "Material and Equipment".
- 2.2 **PIPING AND FITTINGS**
- 2.2.1 **General**
- 2.2.1.1 Use the following materials for all piping systems provided by this Section.
- 2.2.2 **Refrigeration Piping:** Use Type ACR copper tubing, soft annealed or hard drawn in sizes up to and including 3/8". Use Type ACR hard drawn tubing conforming to ASTM B280 for sizes 5/8" and larger.
- 2.2.2.1 Use heavy wrought copper, solder joint type with adapter fittings where screwed connections are necessary, or, on size 3/8" and less, flareless compression type.

- 2.2.2.2 Provide flexible hose on all refrigerant line connections to all equipment with reciprocating or rotating elements. Provide hoses of all bronze construction with braided wire exterior jacket and union connection on one end, with a minimum length of 6 times the diameter of the hose. Use Flexonics or Anaconda hoses, suitable for 150°C (300°F) maximum temperature and 2760 kPa (400 psi) working pressure.
- 2.2.2.3 Provide sight glass with combination moisture and liquid indicator feature and extended ends for solder joint connection. Provide replaceable cartridge type filter dryer.
- 2.2.2.4 For unions use, 150°C (300°F) maximum temperature rating, 2760 kPa (400 psi) working pressure, brass tailpiece adapters for copper tubing, forged steel flanged, steel bolts, bronze nuts and asbestos-free fibre gasket.

2.3 VALVES

2.3.1 General

- 2.3.1.1 Use the following valves for all piping systems provided by this Section, unless specified otherwise.
- 2.3.2 **Refrigerant Valves:** Use Henry Valve Company Type 203 globe and Type 216 angle 135°C (275°F) maximum temperature rating, 3100 kPa (450 psi) working pressure, bronze body, forged brass wing cap seal, back seating, moulded ring packing, forged brass bolted bonnet with bonnet seal, solder ends.

2.4 SPLIT SYSTEM AIR CONDITIONING UNITS

2.4.1 General

- 2.4.1.1 Provide multiple variable refrigerant flow split systems consisting of indoor fan coil units and outdoor air cooled condensing units, and associated controllers, as shown on the Drawings. All components to be CSA approved.
- 2.4.1.2 Design is based on a Daikin Variable Refrigerant Volume system as specified, consisting of multiple evaporators, branch selector boxes, REFNET™ joints and headers, a two or three pipe refrigeration distribution system using PID control and Daikin VRV condensing unit. The condensing unit shall be a direct expansion (DX), air-cooled or water-cooled, multi-zone air-conditioning system with variable speed inverter driven scroll compressors using R-410A refrigerant. The condensing unit may connect to an indoor evaporator capacity up to 200% of the condensing unit capacity. All zones are each capable of operating separately with individual temperature control. Each indoor unit or group of indoor units shall be able to provide independent temperature set points via a local remote controller, a centralized Intelligent touch screen controller, or a BMS interface.
- 2.4.1.3 Standard T style joints are not acceptable for a variable refrigerant volume system. Manufacturer specific Y joints shall be supplied by the VRV manufacturer.
- 2.4.1.4 The units and the design shall be in compliance with CSA B52 Mechanical Refrigerant Code including the March 2009 Supplement
- 2.4.1.5 Provide optional condensate lift pump, where required. Coordinate with Contractor.

2.4.2 VRV IV Features

2.4.2.1 VRV system shall feature Variable Refrigerant Temperature, where the system automatically varies the target evaporating and condensing temperatures based on building load and weather conditions. The condensing unit shall also feature customizable operating modes which allows for the manual setting of target evaporating and condensing temperatures.

2.4.2.2 Each system shall be available with a configurator software package to allow for remote configuration of operational settings and assessment of operational data and error codes.

2.4.3 Indoor Fan Coil Units

2.4.3.1 **Wall Mounted Units:** Units shall be a wall mounted fan coil unit for installation onto a wall within a conditioned space. A mildew-proof, polystyrene condensate drain pan and resin net mold resistant filter shall be included as standard equipment. The sound pressure shall range from 31 dB(A) to 41 dB(A) at low speed measured at 3.3 feet below and from the unit. The unit shall have an auto-swing louver which ensures efficient air distribution, which closes automatically when the unit stops. The remote controller shall be able to set five (5) steps of discharge angle. The front grille shall be easily removed for washing. The discharge angle shall automatically set at the same angle as the previous operation upon restart. The cabinet shall be affixed to a factory supplied wall mounting template and located in the conditioned space. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation. The fan shall be a direct-drive cross-flow fan, statically and dynamically balanced impeller with high and low fan speeds available. Units shall be provided with a loose field installed condensate pump.

2.4.4 Indoor Unit Controllers

2.4.4.1 Provide Individual Zone Controllers, similar to Daikin Model BRC1E73, for each VRV fan coil unit. Unit to include return air temperature sensor, temperature setpoint adjustment, ON/OFF selection and fan speed selection. Controller will be mounted above the ceiling, near the equipment.

2.4.4.2 Provide BACnet interface for the system. Interface is to be capable of remote on/off for each unit, individual unit return air temperature setpoint adjustment, and status monitoring for all indoor and outdoor units. Coordinate with Section 15900.

2.4.5 Outdoor Air Cooled Condensing Units**2.4.6 Condensing Unit**

2.4.6.1 The condensing unit refrigeration circuit shall consist of Daikin inverter scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receiver and suction accumulator.

2.4.6.2 The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.

-
- 2.4.6.3 The unit shall incorporate an auto-charging feature and a refrigerant charge check function to ensure proper refrigerant charge.
- 2.4.6.4 The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure sensor, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
- 2.4.6.5 To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.
- 2.4.6.6 Oil recovery cycle shall automatically occur 2 hours after start of operation and then every 8 hours of operation.
- 2.4.6.7 The Daikin inverter scroll compressors shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency) shall be controlled to eliminate deviation from target value.
- 2.4.6.8 Non inverter-driven compressors, which may cause starting motor current to exceed the nominal motor current (RLA) and require larger wire sizing, shall not be allowed.
- 2.4.6.9 The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll "G-type" or "J-type".
- 2.4.6.10 Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
- 2.4.6.11 The compressors' motors shall have a cooling system using discharge gas, to avoid sudden changes in temperature resulting in significant stresses on winding and bearings.
- 2.4.6.12 Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
- 2.4.6.13 The compressor shall be spring mounted to avoid the transmission of vibration eliminating the standard need for spring insulation.
- 2.4.6.14 In the event of compressor failure, for condensing units with multiple compressors, the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.
- 2.4.6.15 In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours and extending the operating life of the system. When connected to a central control system, sequential start is activated for all

system on each DIII network.

- 2.4.6.16 The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish. The unit shall be modular in design and shall allow for side-by-side installation with minimum spacing requirements.
- 2.4.6.17 Provide custom Eco Foot Systems galvanized steel modular support frame with UV stabilized plastic support pads designed to support unit above roof surface. Support frame pads to be located directly above existing corridor walls with entire support frame assembly spanning the distance. Provide a vibropad at each condensing unit support point.
- 2.4.6.18 The fan motor shall have inherent protection and permanently lubricated bearings. The motor shall be provided with a fan guard to prevent contact with moving parts. The condensing unit shall consist of one or more propeller type, direct-drive 350 and 750 W fan motors that have multiple speed operation via a DC (digitally commutating) inverter. Motors shall be capable of delivering design air at high external static pressures up to 0.32 in WG (factory set as standard at 0.12 in. WG) to accommodate field applied duct for indoor mounting of condensing units.
- 2.4.6.19 Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature.
- 2.4.6.20 The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
- 2.4.6.21 The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design. The fins are to be covered with an anti--corrosion acrylic resin and hydrophilic film Type E1.
- 2.4.6.22 The fins are to be covered with an anti-corrosion Ultra Gold coating as standard with a salt spray test rating of 1000hr (ASTM B117 & Blister Rating:10), Acetic acid salt spray test: 500hr (ASTM G85 & Blister Rating:10).
- 2.4.6.23 The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.
- 2.4.6.24 The outdoor coil shall have three-circuit heat exchanger design. The lower part of the coil shall be used for inverter cooling and be on or off during heating operation enhancing the defrost operation.
- 2.4.7 **Warranty:** Provide extended five year warranty to cover compressors and condenser coil leaks. Include cost of labour for first year.
- 2.4.7.1 The manufacturer shall provide a factory trained service technician to start-up each unit. Manufacturer shall provide instruction to the owners' personnel on proper unit operation and maintenance.

2.4.8 The following manufacturers of the above equipment will be considered equal, subject to requirements of Clause "Material and Equipment":

Daikin
Mitsubishi
Panasonic
Samsung
Trane

3 Execution

3.1 PIPING

3.1.1 General

3.1.1.1 Use flanges or unions on all piping connections to equipment.

3.1.1.2 Install all control valves, fittings, water temperature sensors and flow switches supplied by Section 15900 "Controls". See Section 15900 "Controls" for equipment supplied.

3.1.1.3 See Section 15001 "Mechanical General Provisions" Clause "Piping".

3.2 SPLIT SYSTEM AIR CONDITIONING UNIT

3.2.1 Provide the services of a factory trained representative to be present at system startup and to instruct the Owner in system operation.

3.2.2 Install units and size refrigerant piping in strict accordance with manufacturer's recommendations. Provide shutoff valves on lines at condensing units.

3.2.3 Associated outdoor condensing unit to be mounted on a patio stone as shown on the Drawings. Condensing unit support frame to be lagged to the patio stone with stainless steel bolts.

END OF SECTION

-
- 1 General
- 1.1 **GENERAL REQUIREMENTS**
- 1.1.1 Conform to the requirements of Section 15001, "Mechanical General Provisions".
- 1.2 **MECHANICAL SYSTEMS COMMISSIONING**
- 1.2.1 The mechanical systems of this project will be thoroughly commissioned by a Third Party Commissioning Agent engaged by the Owner. Assist and cooperate with the commissioning agent as required. Include all related costs in the Base Bid.
- 1.3 **DESCRIPTION OF SYSTEMS**
- 1.3.1 **Supply Air, Return Air and Exhaust Air Systems:**
- 1.3.1.1 Existing rooftop units and VVT terminal units are being replaced. Most of the existing ductwork is being reused. Existing grilles, registers and diffusers associated with these VVT systems will be
- 1.3.2 **Dedicated Cooling Systems:**
- 1.3.2.1 Existing cooling systems for electrical room and IT room are being modified and a new split system is being added.
- 1.4 **SHOP DRAWINGS**
- 1.4.1 Submit Shop Drawings in accordance with Section 15001, Clause "Shop Drawings" for the following equipment and materials:
- access doors
 - duct sealer
 - ductwork gauges, material and methods of support for each pressure type, shape (i.e. round, rectangular) and size range.
 - rooftop unit
 - VVT terminal units
- 2 Products
- 2.1 **MATERIALS**
- 2.1.1 Use materials specified herein or approved equal as defined in Section 15001, "Mechanical General Provisions", Clause "Material and Equipment".
- 2.2 **DUCTWORK**
- 2.2.1 **Standards:** Construct all ductwork in accordance with the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) Manual "HVAC Duct Construction Standards - Metal and Flexible".
- 2.2.2 **Materials:** Unless specified otherwise, fabricate all ductwork from galvanized steel. Use SMACNA recommended thicknesses except where specified otherwise.

- 2.2.3 **Rectangular - Low Pressure:** Use SMACNA 2" W.G. pressure class. Use SMACNA recommended sheet metal thicknesses.
- 2.2.4 **Rectangular - Medium Pressure:** Fabricate according to current SMACNA standards for static pressures in duct up to 1490 Pa (6" W.G.).
- 2.2.5 **Round and Oval - Medium Pressure:** Fabricate according to current SMACNA standards for static pressures in duct up to 1490 Pa (6" W.G.). Use United Sheet Metal Spiral UniSeal round and oval ducts. Use United Sheet Metal UniForm machine formed fittings in all sizes up to and including 200 mm (8"). In larger sizes also use UniForm, but they may be either machine formed or shop fabricated. For shop fabricated fittings, make sample fittings and get approval of the Consultant before proceeding with fabrication of job fittings. The Consultant may require the Contractor to arrange and pay for testing of selected fittings by a recognized independent testing laboratory. Where round ductwork is shown internally lined, use Alpha or Plascad acoustic thermal duct consisting of Alpha free-flow spiral duct lined with 50 mm fibreglass insulation and 28 gauge steel perforated interior liner.
- 2.2.5.1 Where round ductwork is exposed to view, a decorative grade installation is required. Arrange for special handling and shipping to avoid dents and minimize scratches.

2.3 DUCT ACCESS DOORS

- 2.3.1 Use Nailor Industries Inc. 0800 Series duct access doors. For duct dimension up to 300 mm (12") use 250 mm x 150 mm (10" x 6") door. For duct dimension up to 600 mm (24"), use 380 mm x 250 mm (15" x 10") door. For all larger ducts, use 660 mm x 510 mm (26" x 20") door.
- 2.3.2 For insulated ducts, use doors factory insulated with 25 mm (1") thick fibreglass insulation.
- 2.3.3 The following manufacturer of the above equipment will be considered as equal, subject to requirements of Clause "Material and Equipment":

Acudor
Ductmate
Nailor
Ruskin

2.4 FLEXIBLE DUCT CONNECTORS

- 2.4.1 Use Duro Dyne "Durolon" or Ventfabrics "Ventlon" pre-assembled flexible duct connectors with 150 mm (6") fabric width.

2.5 BALANCING DAMPERS

- 2.5.1 For ducts 930 cm² (144 in²) and less in cross sectional area, use single blade dampers with locking quadrant and pin on far side. For larger ducts use, multi-blade, opposed blade dampers with external operator and locking quadrant. Provide spacers to maintain clearance between duct and damper blades.

2.6 DUCT SEALER

- 2.6.1 Use Duro Dyne DWN water based high pressure duct sealer.
- 2.6.2 The following manufacturers of the above material will be considered as equal, subject to requirements of Clause "Material and Equipment":

Childers
Multi-Purpose
3M Canada Inc.
United Sheet Metal
Hardcast

2.7 BYPASS DAMPERS

- 2.7.1 VVT system manufacturer is responsible for the selection of proper control dampers for the project, including sizing, pressure rating, flow co-efficient, flow characteristics, close-off rating and allowable leakage factor.
- 2.7.2 Use Tamco Series 1000 dampers. Equivalent Ruskin/Alumavent dampers will also be acceptable. Use opposed blade dampers for modulating service and parallel blade dampers for two-position service.
- 2.7.3 Blades on multi blade dampers not to exceed 200 mm (8") in width and 1220 mm (48") in length.
- 2.7.4 Use Belimo electronic, spring return, low voltage (24 VAC) operators with electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator. Mechanical end switches or magnetic clutch to deactivate the actuator at the end of rotation are not acceptable. Provide end switches where specified.
- 2.7.5 Proportional actuators to accept a 0 to 10 VDC or 0 to 20 mA control signal and provide a 2 to 10 VDC or 4 to 20 mA operating range. Actuators to provide a 2 to 10 VDC position feedback signal.
- 2.7.6 Size operators to control dampers against the maximum fan pressure or dynamic closing pressure, whichever is greater. Provide spring returns so that the dampers "fail safe" in normally open or closed position as dictated by freeze, fire, or other temperature protection.

2.8 VARIABLE VOLUME VARIABLE TEMPERATURE TERMINAL UNITS

- 2.8.1 Use Carrier Multiple Zone HVAC Control System - Variable Volume/Variable Temperature. Unit and all zones to communicate with BCS as specified in Section 15900.
- 2.8.2 Provide Carrier Variable Air Flow terminal boxes and actuators. See drawings for quantities and locations. Provide unit controllers, bypass controller and zone thermostats where shown on drawings and as specified.
- 2.8.3 Provide a zone sensor and damper for each room served by the system. Use zone controllers with override, set point adjustment and LCD Display.

-
- 2.8.4 Provide motorized bypass dampers and modulate to maintain static pressure in the supply ducts.
- 2.8.5 **VVT Zone Controls:** Provide BACnet VVT system controls for communication with BCS. Rooftop unit and VVT system controls to provide full stand alone control of systems with full visibility through BCS.
- 2.8.6 The following manufacturers of the above equipment will be considered equal, subject to requirements of Clause "Material and Equipment":
- Trane
- 2.9 **ROOFTOP HEATING AND COOLING UNIT (Drawing Reference RTU-102/103)**
- 2.9.1 Use Carrier Weathermaster 48 HC Series unit, capacity and cooling efficiency as indicated on Schedule on Drawings.
- 2.9.2 Unit must include either an etched metal nameplate, or a UV resistant sticker nameplate that is protected by an external accessible metal enclosure. Nameplate must include the natural gas approval marking for the unit.
- 2.9.3 **General**
- 2.9.3.1 Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic scroll compressor(s) for cooling duty and gas combustion for heating duty.
- 2.9.3.2 Factory assembled, single-piece heating and cooling rooftop unit. Contained within the unit enclosure to be all factory wiring, piping, controls, and special features required prior to field start-up.
- 2.9.3.3 Unit shall use environmentally sound, Puron refrigerant.
- 2.9.4 **Quality Assurance**
- 2.9.4.1 Unit to meet ASHRAE 90.1 minimum efficiency requirements. 3-phase units to be Energy Star certified.
- 2.9.4.2 Unit to be rated in accordance with AHRI Standards 210/240 and 340/360. Unit to be designed to conform to ASHRAE 15, 2001.
- 2.9.4.3 Unit to be UL-tested and certified in accordance with ANSI Z21.47 Standards and UL-listed and certified under Canadian standards as a total package for safety requirements.
- 2.9.4.4 Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- 2.9.4.5 Unit casing to be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).
- 2.9.4.6 Unit to be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.

-
- 2.9.4.7 Unit to be designed in accordance with UL Standard 1995, including tested to withstand rain.
- 2.9.4.8 Unit to be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box up to 40 mph.
- 2.9.4.9 Unit shake tested to assurance level 1, ASTM D4169 to ensure shipping reliability.
- 2.9.5 **Operating Characteristics**
- 2.9.5.1 Unit to be capable of starting and running at 125°F (52°C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 210/240 or 340/360 at ± 10% voltage.
- 2.9.5.2 Compressor with standard controls to be capable of operation down to 35°F (2°C), ambient outdoor temperatures.
- 2.9.5.3 Unit to be configured for vertical or horizontal supply and return configurations as shown on the Drawings.
- 2.9.6 **Unit Cabinet**
- 2.9.6.1 Unit cabinet to be constructed of galvanized steel, and to be bonderized and coated with a pre-painted baked enamel finish on all externally exposed surfaces.
- 2.9.6.2 Unit cabinet exterior paint to be: film thickness, (dry) 0.003 inches minimum, gloss (per ASTM D523, 60°F / 16°C): 60, Hardness: H-2H Pencil hardness.
- 2.9.6.3 Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standards 210/240 or 340/360 minimum exterior sweat criteria. Interior surfaces to be insulated with a minimum 1/2-in. thick, 1 lb density, flexible fiberglass insulation, neoprene coated on the air side. Aluminum foil-faced fiberglass insulation to be used in the gas heat compartment.
- 2.9.6.4 Base of unit shall have a minimum of four locations for thru-the-base gas and electrical connections (factory installed or field installed), standard.
- 2.9.6.5 **Base Rail:** Unit shall have base rails on a minimum of 4 sides. Holes to be provided in the base rails for rigging shackles to facilitate manoeuvring and overhead rigging. Holes to be provided in the base rail for moving the rooftop by fork truck. Base rail to be a minimum of 16 gauge thickness.
- 2.9.6.6 **Condensate Pan and Connections:** to be an internally sloped condensate drain pan made of a non-corrosive material. Comply with ASHRAE Standard 62. Use a 3/4-in. -14 NPT drain connection, possible either through the bottom or side of the drain pan.
- 2.9.6.7 **Top Panel:** To be a single piece top panel on 04 thru 12 sizes, two piece on 14 size.

- 2.9.6.8 **Gas Connections:** All gas piping connecting to unit gas valve shall enter the unit cabinet at a single location on side of unit (horizontal plane). Standard unit shall have a thru-the-base gas-line location using a raised, embossed portion of the unit basepan. Optional, factory-approved, water-tight connection method must be used for thru-the-base gas connections. No base pan penetration, other than those authorized by the manufacturer, is permitted.
- 2.9.6.9 **Electrical Connections:** All unit power wiring shall enter unit cabinet at a single, factory-prepared, knockout location. Standard unit shall have a thru-the-base electrical location (s) using a raised, embossed portion of the unit basepan. Optional, factory-approved, water-tight connection method must be used for thru-the-base electrical connections. No base pan penetration, other than those authorized by the manufacturer, is permitted.
- 2.9.6.10 **Component Access Panels:** Cabinet panels to be easily removable for servicing. Unit shall have one factory installed, tool-less, removable, filter access panel. Panels covering control box, indoor fan, indoor fan motor, gas components (where applicable), and compressors shall have a molded composite handles. Handles to be UV modified, composite. They to be permanently attached, and recessed into the panel. Screws on the vertical portion of all removable access panel shall engage into heat resistant, molded composite collars. Collars to be removable and easily replaceable using manufacturer recommended parts.
- 2.9.7 **Gas Heat**
- 2.9.7.1 Heat exchanger to be an induced draft design. Positive pressure heat exchanger designs shall not be allowed. Incorporate a direct-spark ignition system and redundant main gas valve. Gas supply pressure at the inlet to the rooftop unit gas valve must match that required by the manufacturer.
- 2.9.7.2 The heat exchanger to be controlled by an integrated gas controller (IGC) microprocessor. IGC board shall notify users of fault using an LED (light-emitting diode). The LED to be visible without removing the control box access panel. IGC board shall contain algorithms that modify evaporator-fan operation to prevent future cycling on high temperature limit switch. Unit to be equipped with anti-cycle protection with one short cycle on unit flame rollout switch or 4 continuous short cycles on the high temperature limit switch. Fault indication to be made using an LED.
- 2.9.7.3 **Stainless Steel Heat Exchanger**
- 2.9.7.3.1 Heat exchanger to be of the tubular-section type constructed of a minimum of 20-gauge type 409 stainless steel. Burners to be of the in-shot type constructed of aluminum-coated steel. Burners shall incorporate orifices for rated heat output up to 2000 ft (610m) elevation. Each heat exchanger tube shall contain multiple dimples for increased heating effectiveness.
- 2.9.7.3.2 Induced draft combustion motor and blower to be direct-drive, single inlet, forward-curved centrifugal type, made from steel with a corrosion-resistant finish. Use permanently lubricated sealed bearings, with inherent thermal overload protection, automatic reset feature.

- 2.9.8 **Coils:** Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed. Evaporator coils to be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 1995 burst test at 1775 psig. Condenser coils to be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.
- 2.9.9 **Refrigerant Components**
- 2.9.9.1 Refrigerant circuit shall include the following control, safety, and maintenance features:
- Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.
 - Refrigerant filter drier - Solid core design.
 - Service gauge connections on suction and discharge lines.
 - Pressure gauge access through a specially designed access port in the top panel of the unit.
- 2.9.9.2 Provide gauge line access port in the skin of the rooftop, covered by a black, removable plug. Plug to be easy to remove and replace. When the plug is removed, the gauge access port shall enable maintenance personnel to route their pressure gauge lines. This gauge access port shall facilitate correct and accurate condenser pressure readings by enabling the reading with the compressor access panel on. The plug to be made of a leak proof, UV-resistant, composite material.
- 2.9.9.3 Unit shall use fully hermetic, scroll compressor for each independent refrigeration circuit. Models to be available with single compressor/single stage cooling designs on 04 - 07 sizes models, and 2 compressor/2-stage cooling models on 08 - 14 sizes. Compressor motors to be cooled by refrigerant gas passing through motor windings. Compressors to be internally protected from high discharge temperature conditions. Compressors to be protected from an over-temperature and over-ampereage conditions by an internal, motor overload device. Compressor to be factory mounted on rubber grommets. Compressor motors shall have internal line break thermal, current overload and high pressure differential protection. Crankcase heaters shall not be required for normal operating range, unless provided by the factory.
- 2.9.10 **Filter Section:** Filters access is specified in the unit cabinet section of this specification. Filters to be held in place by a pivoting filter tray, facilitating easy removal and installation. Use 2" thick Camfill Farr 30/30 pleated filters with MERV 8a rating. Filters to be standard, commercially available sizes. Only one size filter per unit is allowed. Provide a spare set of filters for each unit.
- 2.9.11 **Evaporator Fan and Motor**
- 2.9.11.1 Evaporator Fan Motor to be NEMA premium efficient, with permanently lubricated bearings, inherent automatic-reset thermal overload protection or circuit breaker, and a maximum continuous bhp rating for continuous duty operation.

2.9.11.2 Belt-driven Evaporator Fan to include an adjustable-pitch motor pulley, sealed, permanently lubricated ball-bearing type bearings. Blower fan to be double-inlet type with forward-curved blades, assembly constructed from steel with a corrosion resistant finish and dynamically balanced.

2.9.12 **Condenser Fans and Motors**

2.9.12.1 Condenser Fan Motors to be a totally enclosed motor with permanently lubricated bearings, inherent thermal overload protection with an automatic reset feature. Use a shaft-down design on 04 to 12 models and shaft-up on 14 size with rain shield.

2.9.12.2 Condenser Fans to be a direct-driven propeller type fan with aluminum blades riveted to corrosion-resistant steel spiders, dynamically balanced.

2.9.13 **EnergyX and Economizer**

2.9.13.1 One-piece EnergyX (Energy Recovery Ventilation) unit is an electrically controlled ventilation air pre-conditioner utilizing an ARI 1060 certified Energy Recovery Cassette to reduce the cooling and heating loads placed on the primary HVAC unit by untreated outdoor air. Building exhaust air to be introduced to the EnergyX unit through ductwork. Unit to be designed as a factory-installed option to be used with WeatherMaster 48HC units for use in vertical return applications only.

2.9.13.2 Unit to be designed in accordance with UL Standard 1995. Energy Recovery unit to be ETL tested and certified. Rooftop unit and Energy Recovery unit to be ETL certified as one single system. Roof curb or curb extension to be designed to conform to NRCA Standards. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation. Unit casing to be capable of withstanding ASTM No. 141 (Method 6061) 500-hour salt spray test. Unit shall contain ARI 1060 certified Energy Recovery Cassette. Unit shall leakage rates to be capable of meeting ASHRAE Standard 62.1 requirements for use of class-2 exhaust with class-1 ventilation air.

2.9.13.3 The EnergyX unit to be a factory assembled, single piece unit. Contained within the unit enclosure to be all factory wiring with a single, pre-determined point of power input and a single point of 24-volt control wiring.

2.9.13.4 Unit cabinet to be constructed of galvanized steel coated with a pre-painted baked enamel finish. All models shall have hoods installed over outside air intake and exhaust openings. Outside air hood shall have aluminum water entrainment filters. All models have 1-in., 2 pound density fiberglass insulation. Hinged access doors with compression latches to be provided on all units for access to fans and filters. Hinged doors to be provided with at least one handle capable of being locked. Exhaust air stream shall have back-draft dampers to prevent air penetration during off cycles. Holes to be provided in the base rails for rigging shackles to facilitate overhead rigging.

2.9.13.5 Blowers to be direct drive with variable speed motors. Blower wheel to be made of steel with a corrosion resistant finish. It to be dynamically balanced, double-inlet type with backward-curved blades. Blower to be mounted on neoprene vibration isolation pads. Motor to be high efficiency and have thermal overload protection.

2.9.13.6 Standard filter section shall accept commercially available, 2" pleated filter(s). Use Camfill Farr 30/30 filters. Provide a spare set of filters with each unit.

-
- 2.9.13.7. **Controls and Safeties:** The EnergyX unit shall operate in conjunction with rooftop unit fan.
- 2.9.13.8 All unit power wiring shall enter unit cabinet at a single location.
- 2.9.13.9 **Energy Recovery Cassette:** The energy recovery media shall have a minimum of 70% effectiveness at nominal unit airflow. Energy wheel performance to be ARI Standard 1060 Certified and bear the ARI Certified Product Seal. The energy recovery cassette to be an UL Recognized component for electrical and fire safety. The wheel to be coated with silica gel desiccant, permanently bonded without the use of binders or adhesives. Coated wheels to be washable with detergent or alkaline coil cleaner and water. The silica gel shall not dissolve or deliquesce in the presence of water or high humidity. The substrate to be made of a lightweight polymer and shall not degrade or require additional coatings for application in coastal environments. The wheel polymer layers to be wound continuously with one flat and one structured layer in an ideal parallel plate geometry providing laminar flow and minimum pressure drop. The polymer layers to be captured in a stainless steel wheel frame or aluminum and stainless steel segment frames that provide a rigid and self-supporting matrix. Energy recovery wheels greater than 19" in diameter to be provided with removable wheel segments. Wheel frame to be a welded hub, spoke and rim assembly of stainless, plated, and or coated steel and to be self supporting without the wheel segments in place. Wheel segments to be removable without the use of tools to facilitate maintenance and cleaning. Wheel rim to be continuous rolled stainless steel and the wheel to be connected to the shaft by means of taper locks. Wheel bearings shall provide an L-10 life of 400,000 hours. Drive belts of stretch urethane to be provided for wheel rim drive without the need for external tensioners or adjustment.
- 2.9.13.10 **Supply and Exhaust Air Frost Control Option:** Factory-installed frost protection module shall sense pressure differential across the energy recovery cassette. Supply blower to be shut-off if the pressure differential across the energy recovery cassette exceeds an adjustable set point. Blower shall remain off for an adjustable time period. Exhaust blower and wheel shall remain in operation in order to remove any frost build-up on the wheel.
- 2.9.13.11 **Energix Free Cooling with Enthalpy and Stop/jog Control:** An enthalpy sensor shall prevent the wheel from rotating if the outside air conditions are acceptable for free cooling. Both exhaust and supply blowers will remain on. Stop-Jog-Control shall energize the wheel periodically during the free cooling operation of the EnergyX to prevent dirt build-up on the wheel.
- 2.9.13.12 **Economizer Option:** The economizer to be integrated in the energy recovery module and shall allow air to bypass the energy recovery wheel for free cooling and fail safe operation. Tilting wheel mechanisms shall not be allowed. The economizer damper to be motorized with factory installed, 24-volt Belimo actuator. The EnergyX to be capable of using the economizer in a free cooling operation. The economizer shall utilize enthalpy sensor controls when in the economizer mode.
- 2.9.14 **Flue Discharge Deflector:** Flue discharge deflector shall direct unit exhaust vertically instead of horizontally. Deflector to be defined as a "natural draft" device by the National Fuel and Gas (NFG) code.

-
- 2.9.15 **Roof Curb:** Provide a custom prefabricated insulated roof curb with vibration isolation to provide continuous support of the air handling unit. Insulate with 40 mm (1-1/2") board insulation on inner faces of curb. Use spring isolators with 25 mm (1") static deflection.
- 2.9.16 **Controls and Safeties**
- 2.9.16.1 Units to be completely factory wired with necessary controls and contactor pressure lugs or terminal block for power wiring. Provide onboard comfortlink controller to control EnergyX unit and defrost functions, fans, cooling, economizer and heating when externally commanded on by BCS. Comfortlink controller to include compressor anti-short cycle protection, and provide enthalpy economizer control.
- 2.9.16.2 Provide terminal strip for BCS connection. Coordinate with control system supplier and refer to Section 15900 "Controls". Terminal strip to include the following points:
- supply fan start/stop
 - heating enable
 - cooling enable
 - economizer damper override (close outside air damper)
- 2.9.16.3 Provide BacNET communication card with each unit. Card is to allow BCS to read only the following points:
- unit alarm status
 - wheel alarm status
 - filter status
 - economizer damper position
 - heating stage 1 status
 - heating stage 2 status
 - wheel speed
 - wheel status
- 2.9.17 **Warranty:** In addition to the one year warranty specified in Section 15001 "Mechanical General Provisions", provide an additional four year warranty to cover compressors and condenser coil leaks.
- 2.9.18 The following manufacturers of the above equipment will be considered as equal, subject to requirements of Clause "Material and Equipment":
- Carrier
Trane
- 3 Execution
- 3.1 **DUCTWORK**
- 3.1.1 **General**
- 3.1.1.1 Construct ALL ductwork located inside Mechanical Equipment Rooms to Medium Pressure duct standards. Unless specified otherwise, construct ALL other ductwork to Low Pressure duct standards. Construct all ducts designated on Drawings as round or oval to Medium Pressure duct standards.

-
- 3.1.1.2 Fabricate and install ductwork in accordance with the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) Manual "HVAC Duct Construction Standards - Metal and Flexible".
 - 3.1.1.3 Pay particular attention to Section 15001 "Mechanical General Provisions", Clause "Cutting and Patching". This will be strictly enforced on this project. Coordinate work with trades responsible for floor and wall construction to reduce difficulty of making tight seals.
 - 3.1.1.4 Fabricate all ductwork to the clear inside dimensions shown on the Drawings. Where internal lining is specified, dimensions shown are inside insulation.
 - 3.1.1.5 Do not suspend ducts from metal roof deck.
 - 3.1.1.6 Make duct connections to fans with flexible duct connectors.
 - 3.1.1.7 Install access doors for easy access to each damper, thermostat, coil, valve, or other concealed device which requires servicing. Use at least 1 m (36") of removable duct on inlet and outlet of axial return air fans.
 - 3.1.1.8 Provide backdraft dampers where shown or specified.
 - 3.1.1.9 Install fire damper assemblies in strict accordance with manufacturer's instructions provided with each fire damper.
 - 3.1.1.10 Where ductwork has to be altered from dimensions shown due to construction conditions, use the same effective cross sectional areas, without exceeding a 4 to 1 aspect ratio. Carry out such changes at no additional cost to the Owner.
 - 3.1.1.11 Install ductwork to maximize clear floor to ceiling heights.
 - 3.1.1.12 Transitions are described in the direction of air flow. For converging transitions, use a maximum slope of 1 in 4 and, for diverging transitions, use a maximum slope of 1 in 7.
 - 3.1.1.13 Apply one coat zinc chromate primer over all welded surfaces.
 - 3.1.1.14 If there is a conflict between the duct sizes shown on the floor plans and the duct sizes shown on sections, elevations or details, the floor plans will govern.
 - 3.1.1.15 Seal all transverse joints, longitudinal seams and duct wall penetrations to SMACNA Seal Class A standards.
 - 3.1.2 **Low Pressure - Rectangular Ductwork**
 - 3.1.2.1 Fabricate and install according to current SMACNA standards. Use 2" W.G. pressure class. Use SMACNA recommended sheet metal thicknesses. Fabricate with all flat surfaces wider than 450 mm (18") either cross broken or transverse beaded, regardless of whether the duct is insulated, lined or bare.
 - 3.1.2.2 Use elbows in the following order of preference:
 - 3.1.2.2.1 Full radius elbows with inside radius equal to duct width.

-
- 3.1.2.2.2 Square elbows with turning vanes.
- 3.1.2.2.3 For duct takeoff to a single register, diffuser, grille or branch, use balancing damper located at the branch takeoff. Do **NOT** use splitter dampers.
- 3.1.3 **Medium Pressure Ductwork**
- 3.1.3.1 Fabricate and install according to current SMACNA standards for 1490 Pa (6" W.G.) pressure class.
- 3.1.3.2 Pressurize duct systems to normal maximum operating pressures. Locate and seal all audible leaks and those leaks which can be detected by hand.
- 3.2 **INTERNAL DUCT LINING**
- 3.2.1 Install lining in accordance with liner manufacturer's published recommendations and SMACNA "HVAC Duct Construction Standards - Metal and Flexible". Use only Armaflex Low VOC adhesive. Prepare and clean all internal duct surfaces and install insulation in accordance with manufacturer's instructions.
- 3.2.2 Internally line ducts where shown on drawings. Where shown or noted on Drawings, line return air and exhaust air ducts. Use 25 mm (1") thickness.
- 3.2.3 Where acoustic plenums are not specified, internally line outside air intake ducts and plenums with 40 mm (1-1/2") thickness.
- 3.3 **FLEXIBLE DUCT CONNECTORS**
- 3.3.1 Make all duct connections to fans, fan cabinets and heat pump units with preassembled duct connectors. On all return air fans, fabricate an acoustic seal over flexible connectors. See Drawings for details.
- 3.4 **ROOFTOP UNITS**
- 3.4.1 Provide the services of the unit manufacturer's service representative to supervise startup. Manufacturer's representative to provide written report to the Consultant certifying that the unit assembly and installation is done in accordance with the manufacturer's recommendation. Provide 610 mm x 610 mm (24" x 24") patio stone at condensate drain discharge.
- 3.5 **ROOF CURB INSULATION**
- 3.5.1 Provide attenuation on roof deck inside rooftop unit roof curbs. Use two layers of 25 mm (1") thick, 72 kg/m³ (4.5 lb) density insulating board on roof deck. Stagger board joints. Board to be butted tightly to sides of ductwork and curb.
- 3.5.2 Seal all joints and edges with acoustic sealant.
- 3.5.3 Advise Consultant when this work is complete and ready for review. Seal joints to satisfaction of Consultant.

3.6 FILTER GAUGES

3.6.1 Install filter gauge across each filter bank.

3.7 TESTING AND BALANCING

3.7.1 Cooperate with the Testing and Balancing trade. See Section 15200, "Testing and Balancing". Make any changes deemed necessary by the Testing and Balancing trade to permit proper testing and balancing of the systems.

3.7.2 Provide additional balancing dampers where required by the Testing and Balancing Company.

3.7.3 Be responsible for the initial alignment and tension of all fan pulleys and belts.

3.7.4 Provide any changes to fan drives, pulleys and belts as required to allow a proper air balance as recommended by the Testing and Balancing Company for equipment supplied under this Contract.

3.8 DUCT LEAK TESTING

3.8.1 Duct leakage tests are specified in Section 15200, "Testing and Balancing".

3.8.2 Cap and seal ducts for the test sections as directed by the Testing and Balancing trade. Provide all necessary fittings and duct connections as required for the leak testing procedure.

3.8.3 Ensure all required duct access doors are installed before tests are started.

3.8.4 Immediately correct defects discovered during test and arrange for retesting until satisfactory results are obtained.

END OF SECTION

-
- 1 General
- 1.1 **CASH ALLOWANCE**
- 1.1.1 The work of this section is included in a Cash Allowance. See Section 15001, "Mechanical General Provisions" for details.
- 1.1.2 The existing Building Control System was provided by Durell Control Systems. For the work of this Section, use only Durell Control Systems. Contact Gary Vieira at 905-685-5432 .
- 1.1.3 The work of this project is to be performed only by skilled factory-trained technicians under the direction of experienced engineers, all of whom shall be properly trained and qualified for this work and who are employed directly by the firms listed above.
- 1.2 **REQUIREMENTS**
- 1.2.1 Conform to the requirements of Section 15001, "Mechanical General Provisions".
- 1.2.2 Conform to the requirements of "Master Specifications for DDC Control System Upgrades prepared for SCCDSB", July 2004. These specifications are available from the SCCDSB on request. Follow all requirements of the following Sections of the Master Specification:
- Section 13820 - General Profile of the Work
 - Section 13830 - Hardware Specifications
 - Section 13840 - Software Specifications
 - Section 13850 - Execution of the Contract General Specifications
 - Section 13860 - Acceptance of Work
 - Section 13870 - Documentation and Training
 - Section 13880 - Warranty
- 1.3 **SCOPE OF WORK**
- 1.3.1 This Section of the Contract includes the execution of all Mechanical Systems Controls called for or implied by the Drawings and Specifications, together with all necessary incidentals whether referred to or not, as required to complete the work to the full intent and meaning of the Drawings and Specifications. This includes the supply and installation of complete digital and electric controls systems as indicated.
- 1.3.2 Existing electronic/electric, direct digital control (DDC) system to be extended to make the new mechanical and electrical systems controls completely operational.
- 1.3.3 The Controls Subcontractor is responsible for arranging, coordinating and supervising the installation of the above devices in a suitable manner and location.
- 1.3.4 Wire components of temperature control system in accordance with the requirements of Division 16. Include wiring between control components and electrical circuits of fans, pumps, and any other equipment or apparatus as indicated in this section or required for the proper functioning of controls as described in this section. Provide necessary transformers, relays, etc. to accomplish specified control function. All controls provided by this Section to be wired by this Section.

- 1.3.5 For each controller, choose a unit that will provide a minimum of 10% spare points of the total available points, for each type of point, for future use. If these additional points will necessitate the installation of an expansion module for the controller, which will otherwise not include any connected points, seek Consultant's direction and provide expansion modules where directed by Consultant.
- 1.3.6 Controls Contractor must attend site meetings twice monthly to review progress of the work for the construction period 5 months prior to substantial completion through to the completion of the project.
- 1.3.7 Remove all redundant control systems in areas of work. Turn over existing controllers to SCCDSB.
- 1.3.8 Where existing systems are modified, the existing control system serving these systems should be updated to provide control of these new components to provide a fully functional and independent existing control system.

1.4 **COMMISSIONING**

- 1.4.1 Commission the entire system as described in Section 15990, "Building Control System Commissioning". Work is to be performed only by skilled factory-trained technicians under the direction of experienced engineers, all of whom shall be properly trained and qualified for this work and who are employed directly by the firms listed above.

1.5 **SHOP DRAWINGS AND SUBMITTALS**

- 1.5.1 Controls Contractor must submit a list of schedule milestones with the project shop drawings, indicating phasing of controls installation, e.g. at substantial completion of mechanical room piping, controls contractor requires X additional days for terminations, testing and commissioning, etc.

1.5.2 **Direct Digital Control System Hardware**

- 1.5.2.1 A complete bill of materials of equipment to be used indicating quality, manufacturer, model number, and other relevant technical data.

- 1.5.2.2 Manufacturer's description and technical data, such as performance curves, product specification sheets, and installation/maintenance instructions for the items listed below and other relevant items not listed below:

Direct Digital Controller (Controller panels)
 Transducers/Transmitters
 Sensors (Including Accuracy Data)
 Actuators
 Control Valves
 Control Dampers
 Switches

- 1.5.2.3 Wiring Diagrams and layouts for each control panel. Show all termination numbers.

- 1.5.2.4 Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware.

1.5.3 Central System Hardware and Software

1.5.3.1 Complete Bill of material and equipment used, indicating quantity, manufacturer, model number, and other relevant technical data.

1.5.3.2 Schematic Diagrams for all control, communication, and power wiring. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers model numbers and functions. Show all interface wiring to the control system.

1.5.3.3 Riser diagrams of wiring between central control unit and all control panels.

1.5.4 Controlled Systems

1.5.4.1 A complete description of the operation of the control system, including sequences of operation. The description shall include a reference to the schematic diagram of the controlled system.

1.5.4.2 A point list for each system controller including both inputs and outputs (I/O), point number, the controlled device associated with the I/O point, and the location of the I/O device. Software flag points, alarm points, etc.

1.5.5 Maintenance Data

1.5.5.1 In addition to requirements specified in 15001 "Mechanical General Provisions", upon completion of the work, the control manufacturer shall provide three sets of Maintenance Data to the Mechanical Contractor for inclusion in Project Maintenance Manuals and affix a fourth, plastic coated set near or at the appropriate control panel. Maintenance Data to include the following:

1.5.5.2 Copies of the complete, approved, Shop Drawings

1.5.5.3 Copy of the Electrical Safety Final Inspection Certificate

1.5.5.4 Project Record Drawings

1.5.5.5 As-built versions of the submittal Shop Drawings

1.5.5.6 Operations Manual with procedures for operating the control systems, including logging on/off, alarm handling, producing point reports, trending data, overriding computer control, and changing set points and other variables

1.5.5.7 Licences, guarantees, and warranty documents for all equipment and systems.

1.6 ACCEPTANCE PROCEDURES

1.6.1 Refer to SCCDSB Master Specification. Upon completion of the system, the Control Contractor to indicate in writing to the Consultant that the acceptance procedure can commence.

1.7 TRAINING

1.7.1 Refer to SCCDSB Master Specification.

1.8 WARRANTY

1.8.1 Refer to SCCDSB Master Specification. All controls, equipment and material to be unconditionally warranted for a period of one year from the date of acceptance by the Owner. The warranty period is to commence when the building is turned over for occupancy.

1.8.2 Provide warranty service at no cost to the Owner for the warranty period. This to include, but not limited to the following:

- Emergency repair service on regular working hour basis during warranty.
- Replacing defective parts and components as required.
- Servicing by factory trained and employed service representatives of system manufacturer.

1.9 WIRING, CONDUIT AND CABINETS

1.9.1 All of the installation requirements, be they temporary or permanent, to comply with the Canadian Electrical Code and all local and Provincial codes.

1.9.2 For future expansion purposes, the Contractor to ensure that wires are available in all conduits to accommodate the addition of possible future points to maximum capability of panel.

1.9.3 The Contractor to supply, install and connect all conduits, boxes and wiring between the different components related to the Control System, including all required line voltage to the equipment. All power to be from appropriately sized dedicated circuits from the nearest electrical panel with space provided by the Contractor. Circuits to be identified inside each control panel and on Shop Drawings using the same code. Provide circuit breaker lock-offs and clearly mark breaker(s) with "BCS".

1.9.4 All high voltage wiring, 50 volts or more, to be a minimum of #12 gauge copper stranded TNN, run in conduit. All low voltage wiring, less than 50 volts, to be a minimum of #18 gauge copper stranded TEW-105.

1.9.5 All signal and communications wiring for the local field panels to be multi conductor, shielded twisted pairs, with ground drain wire. All drain wires to be grounded at the panel end. The other end to be protected from grounding with a dielectric material/electrical tape.

1.9.6 If wiring picks up unwanted noise, correct problem by replacing or rerouting wire at no additional expense to the Board.

1.9.7 Wiremold and/or raceway may not be used unless specifically approved by the Consultant and as specified in Division 16100.

1.9.8 FT6 wiring is to be acceptable in all rooms except Mechanical and Electrical Rooms, and exposed areas (refer to reflected ceiling plans). Wiring to be installed parallel to building lines or approved by the Consultant. In areas where cable tray or other raceway has been provided by other trades for communications, coordinate with other trade and locate wiring in raceway.

-
- 1.9.9 Use thin-walled Electrical Metallic Tubing (EMT) conduit complete with T & B 5120 Series watertight steel ring couplings and connectors in all Mechanical Rooms and Electrical Rooms, and set screw connectors and couplings in all other exposed installations in finished areas. OZ/Gedney 7000 Series/Crouse Hinds 600 Series equals.
- 1.9.10 Flexible conduit to be used only in areas where vibrations and/or expansion joints are present. The length of any run of flexible conduit not to exceed 2 m.
- 1.9.11 All conduit to be supported at least every 1.525 m, and in accordance with the Ontario Electrical Safety Code. Supports to also be located at all connectors along the length of the conduit.
- 1.9.12 In damp or weather exposed areas, the conduit and related equipment to be suitable for the application.
- 1.9.13 All conductors to be continuous from device to panel.
- 1.9.14 High and low voltage wire to not be run in the same conduit.
- 1.9.15 Sensor, power and control wiring to be run in separate conduit.
- 1.9.16 Where wiring penetrates fire separation, use firestop sealant to maintain fire wall ratings.
- 1.10 **PULL BOXES AND JUNCTION BOXES**
- 1.10.1 All boxes to comply with the Canadian Electrical Code in reference to size, capacity, etc.
- 1.10.2 All boxes to be fabricated of galvanized metal, unless otherwise warranted.
- 1.10.3 A pull box to be located every 30 m. The Contractor is responsible for the location and for obtaining any required approvals from the Consultant.
- 1.10.4 In suspended ceilings, all boxes to be installed on the structure.
- 1.10.5 All boxes to be clearly marked with "BCS" as part of the energy management system.
- 1.11 **WIRING IDENTIFICATION**
- 1.11.1 The two extremities of all wiring to be identified using the same code and cross referenced to the Record Drawings.
- 1.11.2 The terminal strips to be numbered. All Drawings to show wire identification codes and terminal numbers.
- 1.11.3 The identification to be done using plastic ring or band type. Paper with adhesive backing or Type C plastic labels are not acceptable.

1.11.4 The following colour code to apply to all wiring:

Power

White

Red, Yellow, Blue

Neutral

Phase leads

Black

Switch travellers, for single pole switched circuits, the phase colour shall be carried through the switch to the outlet.

1.11.4.1 All ground wiring to be green.

1.11.4.2 All 24 VAC wiring to be brown - load side; yellow - neutral side of transformer.

1.12 NAMEPLATES

1.12.1 Identify each piece of equipment and panel with nameplate identifying equipment and functions in plain English, using the local naming convention.

1.12.2 Use laminated plastic nameplates of at least 75 mm x 25 mm x 3 mm (3" x 1" x 1/8") with black face and white centre and 6 mm (1/4") high engraved lettering. To be securely attached to equipment by screws. Dymo tape name tags are not acceptable. Provide black phenolic nameplates engraved with white letters for all electrical equipment, panels, disconnect switches, etc., as directed.

1.12.3 Identify motorized equipment as follows:

Pumps

Heat Pump Units

Pump 301, etc.

HP-401, etc.

1.12.4 Identify the motor, starter and branch circuit breaker and disconnecting means.

1.12.5 Index terminal strips and tag wires. Label exposed junction boxes including function and nature of service. Tag all wires within the junction boxes including purpose and nature of service.

1.12.6 Use self adhesive strip or clip on style plastic markers for wire tags. Secure tags to each individual wire at both ends.

2 Products

2.1 CONTROL ELEMENTS

2.1.1 Controllers

2.1.1.1 Refer to SCCDSB Master Specification.

2.1.1.2 Provide individual local control panels to control fluid cooler, air handling equipment, boilers, pumps, rooftop unit and all other equipment.

2.1.1.3 Where controller is NEMA 1 rated, a separate NEMA 1 enclosure is not required for the controller.

2.1.2 Automatic Control Valves and Operators

2.1.2.1 Contractor is responsible for the selection of control valves whose entire characteristics are suitable for the required application, including sizing, pressure rating, flow co-efficient, flow characteristics, close-off rating, fail position and allowable leakage factor.

2.1.2.2 Use only Belimo ball style control valves with stainless steel ball and stem and Teflon seals for sizes 12 mm (1/2") through 50 mm (2"). Plug, globe or zone style control valves will not be acceptable. For larger valves, use Belimo globe style control valves. Ensure that straight-through water valves are single seated with equal percentage flow characteristics.

2.1.2.3 Use 3-way valves which are linear for each port giving constant total flow. On valves 50 mm (2") and smaller, use screwed 1030 kPa (150 psig) bronze bodies. On valves 65 mm (2-1/2") and larger, use flanged 860 kPa (125 psig) cast iron bodies. Size valves based on maximum 21 kPa (3 psi) pressure drop.

2.1.2.4 Use Belimo proportional action actuators. Size actuators to control valves against the maximum pump pressure or dynamic closing pressure, whichever is greater. Provide spring returns so that the valves "fail safe" in normally open or closed position as dictated by freeze, fire, or other temperature protection. Fail in place valves without spring return will be acceptable only for individual radiant ceiling panel control valves only. Spring return valves must be provided for all other services including individual convectors, etc.

2.1.3 Space Temperature Sensors

2.1.3.1 Space temperature sensors in classrooms, offices and other regularly occupied rooms to be equipped with LCD display, limited setpoint adjustment and pushbutton for occupancy override. Sensors to be programmed not to display the room temperature.

2.1.3.2 In change rooms, washrooms, corridors, vestibules, gymnasiums, LAN rooms, mechanical rooms and other regularly unoccupied rooms, use only Greystone blank stainless steel coverplate style sensors.

2.1.3.3 All space sensors are to be located away from any direct influence from air diffusers or areas affected by drafts.

2.1.4 Temperature Sensors, Thermostats, Freezestats and Firestats

2.1.4.1 All temperature sensors to be k OHM thermistors, with a suitable range to match the application. For hot water loop, use RTD sensors. The accuracy to be $\pm 0.2^{\circ}\text{C}$ maximum.

2.1.4.2 **Only Greystone sensors will be accepted for water temperature sensors and air temperature sensors.**

2.1.4.3 All temperature sensors shall be mounted in an enclosure suitable for the application.

-
- 2.1.4.4 Outdoor temperature sensor is to be mounted in an enclosure complete with sunshield and shall be thermally isolated from all indoor conditions. Conduit entrance to sensor must be sealed with duct seal or equivalent sealant and mounted on a North wall, in a serviceable location, away from any building exhaust/intake vents.
- 2.1.4.5 All mixed air temperatures to be sensed with averaging sensors having a minimum active length of at least three duct cross sector.
- 2.1.4.6 Sensor averaging elements are to be mounted in straight sections of duct, in serpentine fashion, equally spaced to provide adequate coverage of duct cross section to prevent stratification. Furthermore, sensor's installation must not present a safety hazard nor impede access to fan compartments.
- 2.1.4.7 All return and supply air temperatures to be sensed with duct-mounted sensors having a minimum probe length sufficient to reach the middle third of the duct space.
- 2.1.4.8 All liquid temperature sensors to be mounted in wells.
- 2.1.4.9 Freezestats to be low limit, normally closed DPDT, manual reset thermostats complete with cover and case. Switch to open on temperature fall. Provide 6.1 m (20') capillary sensing element. Provide on all air handling units and wire to starter 120 volt control circuit. Wire second pole to DDC panel for indication of status.
- 2.1.4.10 Firestats shall be high limit, normally closed DPDT, manual reset thermostats complete with cover and case. Switch to open on temperature rise. Provide on all air handlers and exhaust fans and wire one pole to starter 120 volt control circuit. Wire second pole to DDC panel for indication of status.
- 2.1.4.11 Provide wire guards in all public areas.
- 2.1.5 **Relays and Contactors**
- 2.1.5.1 All interfacing/control relays and contactors to be sized to match the application. Low voltage coils to be used wherever possible, except where it is financially beneficial to use high voltage coils.
- 2.1.5.2 Mount interfacing relays in control cabinets, where possible. Do not locate relays within electrical starter enclosure. If necessary, use separate enclosure to house interface relays.
- 2.1.5.3 Contactors to be equipped with auxiliary contacts wherever such status indication is required.
- 2.1.5.4 All contactors are to be mounted in a NEMA 1 cabinet, enclosing contactor, transformer, protection, etc.
- 2.1.6 **Current Sensing Relays:** All equipment status monitoring to be accomplished through the use of a current monitoring sensor. This device should output a 4-20 mA or 0 - 10 V signal proportional to measured current. Provide sensors to monitor status of all new electrically driven, mechanical equipment. (Include all new unit ventilators, fans, pumps and rooftop units). Wire to the BCS.

-
- 2.1.7 **Differential Pressure Sensors:** Use Rosemount or Veris self-contained strain gauge type sensor with reverse polarity protection, NEMA 4 enclosure, accuracy \pm 0.25% of calibrated span.
- 3 Execution
- 3.1 **GENERAL**
- 3.1.1 Use competent tradesmen regularly employed by the manufacturer of the control equipment to install control system.
- 3.1.2 Unless noted otherwise, mount all room sensors and thermostats at 1200 mm (47") above floor or in the classroom control module.
- 3.1.3 DDC controller to be mounted in same room as equipment being controlled. Where this is not practical, provide a communication interface at equipment location for communication to DDC panel. Provide Points List on inside of DDC panels.
- 3.1.4 Nomenclature in DDC programming to match Control Shop Drawing nomenclature. DDC panels to be labelled as per Shop Drawings.
- 3.1.5 Provide a copy of all graphical interfaces to Consultant for review at completion of programming.
- 3.1.6 Remove all redundant controls and return control components to the Owner.
- 3.2 **WIRING**
- 3.2.1 Conceal wiring in all finished areas.
- 3.2.2 Provide an installation which follows horizontal and perpendicular lines to fit into the layout of the area. Properly support and install in a neat and workmanlike manner throughout.
- 3.3 **NAMEPLATES**
- 3.3.1 Install nameplates at all duct mounted devices including transmitters, controllers, gauges, etc. Similarly label manual switches, unless they are delivered with standard nameplates.
- 3.4 **CONTROL PANELS**
- 3.4.1 Mount all equipment inside the cabinet. Mount a plasticized "as-built" control diagram for water system, complete with control piping and wiring layout, on the face of door section. Locate panels in main Mechanical Rooms. Do not locate in ceiling spaces.
- 3.5 **ELECTRICAL WORK**
- 3.5.1 Provide all wiring from power supplies to valves, dampers, thermostats, sensors, etc., and all necessary control transformers and relays required for the control system. Provide power from nearest panel.

-
- 3.5.2 Coordinate electrical requirements with the electrical trade. Arrange and pay for any modifications necessary to complete the work of this section.
- 3.5.3 Provide all necessary control wiring for equipment specified under Division 15.
- 3.5.4 Conceal all wiring. Install wiring in conduit within block walls. In unfinished areas exposed to view, install wiring in conduit. Tie-wrap fire-rated cable elsewhere. Wire in accordance with Division 16 requirements.
- 3.6 **DDC CONTROL SYSTEM**
- 3.6.1 Vendor's representatives to install complete control system providing adjustment of all controlled systems.
- 3.6.2 Vendor's representatives to provide full startup, calibration and commissioning of complete system. Connect all mechanical equipment in accordance with the Specifications.
- 3.7 **PERFORMANCE VERIFICATION**
- 3.7.1 Provide verification check sheets for all new control points and all associated control sequences. This work must be done, submitted and approved by the consultant prior to the commissioning agent being engaged and final payment being released. The approved reports are to be included in the maintenance manuals.
- 3.7.2 Verification check sheets for each piece of equipment must contain list of all control points associated with this piece of equipment. Proper operation of each sensor, actuator, terminal unit, or any other control point must be confirmed in the field by direct observation (if possible) and through the graphical user interface. Each verification sheet must be dated and signed by controls contractor.
- 3.7.3 Setup and verify trends for all new equipment and all control points. Provide trend verification sheets and sample sheets indicating trended points for consultant's approval
- 3.7.4 One month after these checks and commissioning are complete, setup a meeting with mechanical contractor, Owner and consultant to confirm the operation of all new equipment. At this meeting all trends will be reviewed and confirmed with the Owner. Prior to the meeting the Controls contractor will be required to provide trend graphs or numerical data in Excel spread sheet form, for all monitored systems for the last month of operation. If numerical data is provided the date/time data must follow Excel formatting.
- 3.7.5 Controls contractor will be responsible for correcting of all deficiencies found during this process and will be required to submit trends to verify operation of all equipment after making corrections.
- 3.8 **PACKAGED ROOFTOP AIR HANDLING UNITS AND VVT (RTU-102/103)**
- 3.8.1 Connect to BACnet interface for rooftop units and VVT system. Provide graphical interface for rooftop unit operation and VVT system operation. Allow for mapping of 50 BACnet input/output points per rooftop unit.

3.9 SPLIT AIR CONDITIONING SYSTEM**3.9.1 Description and Objectives**

3.9.1.1 Split system air conditioning units are provided for rooms which require cooling 24 hours per day, when the air system may not be operating.

3.9.1.2 Split system controls are not sufficiently flexible to enable full external control by the BCS. A combination of BCS and stand alone control will be used as described below.

3.9.1.3 Where a remote wall mounted temperature sensor is noted on the Split System Schedule on the Drawings, Division 23 will provide a wall mounted controller with temperature sensor for each fan coil unit.

3.9.1.4 Allow for monitoring of 20 points through BACnet interface provided by the equipment supplier.

3.9.2 Safeties and Miscellaneous Controls

3.9.2.1 Monitor fan coil and condensing unit alarms. Alarm on high or low space temperatures.

3.10 CONTROL SYSTEM ACCEPTANCE

3.10.1 A complete system check-out is required. Before starting this, provide a detailed step-by-step checkout plan.

3.10.2 Demonstrate to the Owner's satisfaction at job site, the methods, test gear and simulation equipment to be used in check-out of each part of control system. Demonstrate the actual hook-up of test gear, exercise of inputs, trouble isolation and correction technique, and final operation test of a typical remote panel. Owner may check the operation of all sensors, transducers with own equipment to ensure proper operation.

3.10.3 After completion of the check-out, make all necessary corrections and repeat the check. When the system is fully operational, demonstrate in full detail, all functions/indications to the Owner.

3.10.4 Submit a checkout list to the Owner documenting that each point has been checked and is operating satisfactorily. The check should include field wiring, relay operation and HAND/OFF/AUTO checkout.

3.11 PROGRAM START AND STOP TIMES

3.11.1 Provide optimal start and stop times programming to compensate for outside temperature. Provide morning warm up routine.

3.11.2 For all systems using hot water or heat pump loop for cooling or heating, program an individual, dedicated warm-up or cool-down cycle to bring space temperature from night setback to occupied temperature setpoint. During that cycle all outside air dampers must remain closed. Program each system individually with optimum temperature recovery time. Follow Standard ASHRAE 90.1.

3.11.3 Program various system operational times based on the normally occupied periods of the building. Program a yearly calendar to allow for daylight savings time and standard time changes. Provide separate weekly time schedules for heat pumps, exhaust fans, and each air handler.

3.11.4 Provide graphical links to fan systems including display of operating schedule, Timed Overrides and Event Mode programming. Timed override shall allow for operation of the fan systems for a 2 hour (adjustable by super user) period, mechanical cooling shall be locked out. Event mode shall allow fans to operate in normal daytime operation for a user adjustable, defined period of operation using a calendar type function. Upon entry of an Event, a report shall be generated and sent to the school board indicating the date, duration, user, and permit number. Event mode shall be linked to associated heat pumps within the building, refer to heat pump sequences above.

3.12 TREND LOGS

3.12.1 Set up trend logs to continuously monitor critical parameters for each system. Consultant will assist in determining critical parameters.

3.13 ENVIRONMENTAL ALARMS

3.13.1 Provide digital outputs to the building security alarm panel for environmental alarms listed below. Wiring to panel is the responsibility of this Division. Final terminations will be provided by the Security System Contractor.

3.13.2 Provide the individual alarms to the security system listed below. Alarms are listed with the Security System label to be used shown in brackets:

- Low space temperature in any room ("Low Space")

3.13.3 For low space temperature alarm and heating system water temperature alarm, coordinate setpoint with SCCDSB. Alarms are to be active only for ambient temperatures below 5°C.

3.13.4 Submit proposed setpoints for each alarm for Owner approval. Provide graphic displaying settings so that Owner can easily modify.

END OF SECTION

-
- 1 General
- 1.1 **GENERAL PROVISIONS**
- 1.1.1 This Section and Division 1 - General Requirements apply to and govern the work of all Sections of Division 16.
- 1.2 **VISITING SITE**
- 1.2.1 Visit the site and be familiar with working conditions and work involved before submitting Bids. **NO EXTRAS WILL BE GRANTED DUE TO LACK OF A THOROUGH PRELIMINARY INVESTIGATION.**
- 1.2.2 Remove and replace existing ceiling tiles to inspect ceiling for existing Mechanical, Electrical and Structural obstructions. Include cost of all necessary changes in Bid Price. No extras will be granted due to lack of a thorough preliminary investigation of accessible ceiling spaces.
- 1.3 **CONTRACT DRAWINGS**
- 1.3.1 Electrical Drawings show Electrical work only and are not intended to show Structural details, Mechanical details or Architectural features. Take building dimensions and details from Architectural or Structural Drawings or from job measurements only.
- 1.3.2 Electrical Drawings indicate only the general locations of equipment and outlets. Wiring requirements are shown diagrammatically. Responsibility for the detailed layout of equipment, outlets, raceways and wiring is part of the work of this Division. Specific outlet locations are detailed on elevations.
- 1.3.3 If shown, only the general location and route of conduit, cable trays and communication hooks are shown. Install all services neatly to conserve headroom. All conduit, cable trays and communication hooks are to be accessible after work by other trades is complete. Install all services parallel to building lines unless shown otherwise.
- 1.3.4 The Consultant reserves the right to revise the locations of equipment and outlets within any given room without altering the Contract Price provided Notice of Change is given prior to roughing-in.
- 1.3.5 In case of conflict between work of other trades and work of this Division, clarify the location of these items with the Consultant before roughing-in.
- 1.3.6 In the event of any discrepancies or ambiguity of any symbol, note, abbreviation, etc., used in this Specification or on the Contract Drawings, obtain clarification, in writing, from the Consultant prior to submitting Bid. No allowance will be made for additional costs arising from failure to obtain proper clarification of conflicting information before Bid.
- 1.3.7 All dimensions and sizes are in SI units, Generally units are in millimetres. All exceptions to this are noted.

CONDUIT SIZES

Imperial (Inches)	½	¾	1	1-¼	1-½	2	2-½	3	3-½	4	4-½	5	6
S.I. (metric) (mm)	16	21	27	35	41	53	63	78	91	103	116	129	155

1.4 SHOP DRAWINGS

- 1.4.1 Submit Manufacturers' Shop Drawings, Electrical Wiring Diagrams and Control System Drawings to the Consultant. Provide title sheet for Shop Drawing submitted. Include project name, Shop Drawing item (including Specification paragraph reference) and approval stamps. The Consultant reserves the right to have samples submitted of any specified products.
- 1.4.2 Before submitting shop drawings, provide a complete list of shop drawings to be submitted in Microsoft Excel format. List all shop drawings and approximate date of submission.
- 1.4.3 Submit all shop drawings electronically in Adobe® Acrobat® PDF format. File attachments to an email must total no more than 5 MB and must be submitted unzipped. If multiple items are submitted in single PDF file, each individual piece of equipment must be "book marked" using equipment labels as per Design Drawings. All shop drawings submitted electronically must be checked and stamped by Contractor as specified below.
- 1.4.4 Catalogues, manuals or price lists will not be accepted as Shop Drawings. Before submission, check Shop Drawings, make necessary corrections, apply stamp "Checked and Certified Correct", sign and date.
- 1.4.5 Submit one reviewed set of Shop Drawings with each set of Maintenance and Operating Instructions.
- 1.4.6 The review of Shop Drawings by Chorley + Bisset Ltd. is for the sole purpose of ascertaining conformance with the general design concept. This review does not mean that Chorley + Bisset Ltd. approves the detail design inherent in the Shop Drawings, responsibility for which remains with the Contractor. Such review does not relieve the Contractor of his responsibility for errors or omissions in the Shop Drawings or of his responsibility for meeting all requirements of the Construction and Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation, and for coordination of the work of all subtrades.
- 1.4.7 The Contractor is to review each shop drawing and document the differences between the shop drawing submission and the description listed in the specification. If there are no differences listed, the Contractor implicitly declares the shop drawing meets all requirements of the Specification.
- 1.4.8 Ensure at least one copy of the reviewed Shop Drawings is kept on site at all times for reference.

-
- 1.4.9 Prepare all Drawings in SI units.
 - 1.4.10 Shop Drawings to include the following:
 - 1.4.10.1 Indicate details of construction, dimensions, capacities, weight and electrical performance characteristics of equipment or material.
 - 1.4.10.2 Where applicable, include wiring, single line and schematic diagram including interconnect with work of other sections.
 - 1.4.10.3 Include manufacturer's special installation instructions where applicable.

1.5 **FIELD DRAWINGS**

- 1.5.1 Submit, to the General Contractor, Drawings accurately showing all openings for busducts, conduits, etc. Drawings must include the size of openings and their locations by dimensions, including the location of the structural members framing these openings. Each trade will be responsible for detail layout of their own work.
- 1.5.2 Assume full responsibility for the detailed coordination of all Division 16 work. Prepare Field Drawings to determine the exact location of each service. On these drawings, include all mechanical and electrical services, architectural features, and structural details. If a conflict becomes apparent after the installation of services, pay all costs associated with removing and reinstalling these services.
- 1.5.3 If the General Contractor separates the Communication, Security or similar work from the other work of Division 16, the General Contractor assumes full responsibility for this coordination work including the preparation of the Field Drawings.

1.6 **AS-BUILT DRAWINGS**

- 1.6.1 The Contractor will be provided with Mechanical and Electrical Files used to produce the contract documents. The following digital formats were used and are to be maintained: AutoCAD and PDF. The Contractor is to print Drawings from the PDF files provided.
- 1.6.2 Revise and maintain the prints as work progresses. Show all revisions, relocations and changes, to scale. Use colour markings.
- 1.6.3 Contractor shall take as-built measurements, prior to backfill, of all buried ductbanks and conduits under floor slab. Show routing, depths and dimensions from fixed points on as-built drawings.
- 1.6.4 Transfer information from the marked prints to AutoCAD files on a monthly basis to match the software that version the original files were created in.. Have the marked prints and updated CAD prints on site for review by the Consultant at all times. Monthly draws will not be approved unless all changes have been shown.
- 1.6.5 Prior to testing, balancing and final commissioning, complete the transfer of marked prints to the AutoCAD files. Fill in the Owner's equipment numbering system in the Schedules on the Drawings and on the plans where blank placeholder tags have been shown.

-
- 1.6.5.1 AutoCAD format files are to match exactly the layering system and symbology of the Consultant. Bind all external references.
- 1.6.6 Mark Drawings "As-Built Drawings" and insert name and logo of Contractor. Submit one set of printed "As-Built Drawings" for review by the Consultant. Remove Engineers Stamp. Include Contractors name and Logo.
- 1.6.7 Submit completed As Built Drawings on disks in same digital data software program, and version as original contract documents. Also provide one set of Drawings with the Operating and Maintenance Manuals.
- 1.6.8 For the purposes of Contract payments, As Built Drawings will be assumed to have a value of \$500.00. This will not be released until As Built Drawings have been accepted as complete and acceptable by the Consultant. This amount is in addition to the normal 10% holdback required by the Construction Lien Act, 2018.

1.7 **SIMULTANEOUS PROJECTS**

- 1.7.1 Other projects may be under construction simultaneously on this site during the course of this construction project. The Owner will not be the "constructor" as defined by The Ontario Health & Safety Act & Regulations. This Contractor is to maintain a separation between this project and all other Contractors, by time or space, as defined by The Ontario Health & Safety Act & Regulations.

1.8 **CONFLICTS AND PRECEDENCE**

- 1.8.1 Immediately upon discovery of any conflict, ambiguity, error or omission in the Contract Documents, request clarification in writing from Consultant prior to starting the work in questions.
- 1.8.2 Failure to give such written notice will constitute an irrevocable waiver and release of any claim for additional compensation or delays incurred.
- 1.8.3 Where work fails to conform to Contract Documents, as clarified by Consultant, promptly remove and replace such work as directed, without adjustment to Contract price.

1.9 **FIRESTOPPING**

- 1.9.1 Before starting any work on site, submit detailed Shop Drawings to the Consultant for review and comments. Include:
- 1.9.1.1 Manufacturer's technical product data and installation instructions for each specific type and location of penetration.
- 1.9.1.2 Certification that proposed firestopping materials and assemblies comply with CAN4-115-M.
- 1.9.1.3 For each specific type and location of penetration, provide installation instructions from a recognized independent testing agency.
- 1.9.2 Mark penetration types and locations on set of white prints. At completion of project, transfer this information to As Built Drawings.

1.9.3 Comply with all requirements of Ontario Building Code Clause 3.1.9, "Building Services in Fire Separations and Fire Rating Assemblies".

1.10 MAINTENANCE AND OPERATING INSTRUCTIONS

1.10.1 For the Electrical Division 16 work only, assemble three sets of equipment literature (cuts), operating instructions, maintenance instructions, voltage test results, certificate, other pertinent data and Letter of Warranty. Place in three ring binders, complete with index pages, indexing tabs and cover identification at front and side. Submit to Consultant for approval.

1.10.2 Make changes or submit additional information as required to obtain approval. Final Certificate of Completion will not be issued until the Consultant possesses approved sets. Include copies of reviewed Shop Drawings and name and address of Spare Parts' Suppliers with manuals.

1.10.3 Provide two electronic copies of the maintenance and operating manual in Adobe Acrobat PDF format on a USB Drive and submit with the final version of manuals. Electronic copy of manual to be provided as one file formatted with bookmarks in accordance with the sections of the hard copy manuals. Do not include separate files in sub folders. Divide the maintenance manuals into sections which correspond with Specification Sections.

1.10.4 The following information is to be contained within the Sections:

1.10.4.1 **Section 1:** A list of names, addresses and telephone numbers of the Consultants, General Contractor and Electrical Contractor. Written warranty of the Electrical systems.

1.10.4.2 **Section 2:** Electrical Safety Authority Inspection Permit, Fire Alarm Verification Report and Certificate, Emergency Lighting Verification Letter.

1.10.4.3 Remaining Sections - By Specification Section

1.10.4.3.1 A list of names, addresses and telephone numbers of all suppliers. A copy of all reviewed Shop Drawings.

1.10.4.3.2 A complete and comprehensive maintenance and operating instructions details D (daily), W (weekly), M (monthly), SA (semi-annually), A (annually) for maintenance.

1.10.4.3.3 Copies of warranties.

1.10.4.3.4 Complete control diagrams, wiring diagrams and description of applicable control systems and the functioning of the system.

1.11 REGULATIONS AND PERMITS

1.11.1 Carry out the work in accordance with the latest editions of relevant codes, local bylaws, and requirements of local Authority Having Jurisdiction. Apply for and obtain permits and pay all fees. Consultant will submit Drawings to Electrical Safety Authority if required.

1.11.2 Enforce all prevailing Provincial and local safety regulations at all times. Abide by

all St Clair Catholic District School Board safety and security policies and procedures and conform to all regulations of the current Occupational Health & Safety Act.

- 1.11.3 After completion of the work, furnish to Consultant a Certificate of Unconditional Approval from Inspecting Authorities.

1.12 **MATERIAL AND EQUIPMENT**

- 1.12.1 Where an item of material or any equipment is specifically identified by a manufacturer's trade name and/or catalogue number, make no substitution except as provided for in paragraphs 3, 4 and 5 below.

- 1.12.2 In the case of some items of equipment, one or more additional names of acceptable equal manufacturers are listed in the Clause describing an item or a group of items. The design, layout, space allocation, connection details, etc., are based on the products named first in the description of each item. The products named first in the description of each item establish the quality of manufacture and design standards for all other manufacturers of that item. The general approval indicated by listing the names of other manufacturers is subject to final review of Shop Drawings, performance data, test reports, production samples (if required) by Consultant, and equipment shipped to site. Ensure that the products used meet the requirements specified and as shown on the Contract Drawings.

- 1.12.3 Suppliers wishing to submit other items of equipment for approval as an equal to those specified must apply to the Consultant at least 8 working days before Bid closing date. Requests must be accompanied by complete description and technical data on the items proposed. Approval for substitution of equipment will only be given on the understanding that all details, accessories, features and performance meet the Specifications unless otherwise stated. Deviations from the Specifications must be stated in writing at time of application for approval.

- 1.12.4 Include in the Bid, the equipment named in the Specifications or approved as an equal as in paragraph 3 above. This will form the Base Bid. Any number of alternative bids, as defined below, may be included in addition to the Base Bid.

- 1.12.5 Items of equipment by Manufacturers not named in the Specifications may be offered as alternatives to the manufacturers named in the Specifications. The alternative proposals must be accompanied by full descriptive and technical data, together with the statement of amount of addition or deduction from the Base Bid, if the alternative is accepted. Prior approval by the Consultant is not required on items submitted as alternative bids.

- 1.12.6 After execution of the Contract, substitution of equipment will be considered only if equipment accepted cannot be delivered in time to complete the work in proper sequence, or if the manufacturer has stopped production of the accepted item. In such cases, requests for substitution must be accompanied by proof of equality and difference in price and delivery, in the form of Certified Quotations from Suppliers of both specified and proposed equipment. Credit any decrease in price involved in substitution to the Owner by reduction of the Contract Price. The Contractor will not be reimbursed for any such increase in price.

- 1.12.7 Where equipment other than the equipment used as a basis for design, layout and space allocation is used, produce and submit revised layouts of equipment, pipes, ducts, etc., in the areas affected. Submit these Drawings with the Shop Drawings.

Failure to produce these Drawings is indication by the Contractor that they are not required and the original space allocations are adequate for the substituted equipment.

- 1.12.8 Name the Subcontractors and Manufacturers in the Bid as indicated in Clause "List of Electrical Subcontractors and Manufacturers".

1.13 **INTERPRETATION OF CONTRACT DOCUMENTS**

- 1.13.1 The decision as to which trade provides required labour or materials rests solely with the Contractor. Extra payments will not be considered based on a difference in interpretation of the Contract Documents as to which trade involved provides materials or labour for specific items of work. The Consultant will not enter into such discussions.

1.14 **SITE VISITS**

- 1.14.1 The Electrical Contractor shall have an office representative (not site personnel) at each site meeting and deficiency review. Attendance at these meetings is mandatory.

1.15 **PROGRESS DRAWS**

- 1.15.1 Electrical Contractor shall review all supplier and subcontractor draws submitted to their office to ensure they are fair and reasonable for the amount of work completed on site to date prior to submitting to the General Contractor. Electrical Contractor will be responsible for the validity of supplier and subcontractor draw claims.

1.16 **WARRANTY**

- 1.16.1 Warranty all workmanship, material and equipment supplied by Division 16 for one year after Substantial Completion except where specifically specified otherwise. Make good damage caused due to defects and workmanship.
- 1.16.2 Where equipment specified in Sections of Division 16 to have an extended warranty period, e.g. five years, the first year of the warranty period will be governed by the terms and conditions of the warranty in the Contract Documents, and the remaining years of the warranty will be direct from the manufacturer and/or supplier to the Owner. Submit signed and dated copies of the extended warranties to the Consultant before applying for a Certificate of Substantial Performance of the Work.

1.17 **DIMENSIONS AND QUANTITIES**

- 1.17.1 Dimensions shown on Drawings are approximate. Verify dimensions by reference to Shop Drawings and field measurement.
- 1.17.2 Verify equipment access and coordinate with equipment supplier to ensure equipment can be physically transported to installation location. Under no circumstances will any claim be allowed for extra cost to disassemble and/or assemble equipment at the final location which will be considered as part of equipment installation.
- 1.17.3 Quantities or lengths indicated in any of the Contract Documents are approximate only and will not be held to gauge or limit the work. No adjustment to the Contract

Price will be allowed to complete the work.

1.17.4 Provide labour, products and services specified, but not shown on Drawings and vice versa, and all other labour, products and services necessary for completion of the work.

1.17.5 Make any necessary changes or additions to routing of conduit, cables, cable trays, and the like to accommodate structural, mechanical and architectural conditions, without adjustment to Contract price.

1.17.6 Provide work in accordance with the approved Schedule to meet completion date and specified interim Schedules.

1.18 **COOPERATION BETWEEN TRADES**

1.18.1 Cooperate and coordinate with other trades as required for satisfactory and expeditious completion of work. Take field dimensions relative to work. Fabricate and erect work to suit field dimensions and field conditions. Pay cost of extra work caused by and make up time lost as result of failure to provide necessary cooperation information or items to be fixed to or built-in, in adequate time.

1.19 **COOPERATE WITH OWNER'S STAFF**

1.19.1 Maintain close cooperation with Owner's staff. The Owner will determine the times during which work may be carried out in certain areas. If the work cannot be completed in the allowed time, the Contractor may be required to clean up the area and finish the work at some future time.

1.19.2 Shutdowns will be scheduled during unoccupied times. Include any overtime wages due to conditions stipulated above in the Bid Price.

1.19.3 Provide seven day's minimum notice, in writing, prior to any interruptions of service or restriction of use of any service.

1.19.4 Provide all phase testing, as required, prior to disconnecting existing and connecting new to avoid damage to equipment.

1.19.5 The Owner's operations must take precedence over Contractors' operations at all times. Interruptions due to noise, drilling, etc., will not be allowed without Owner's prior approval.

1.19.6 Include any overtime wages due to conditions stipulated above in the Bid Price.

1.20 **EXAMINATION OF DAMAGED DEVICES**

1.20.1 Report all damaged, defective and non-functioning devices and equipment shown for reinstallation or relocation to the Consultant prior to removal and storage. All devices and equipment will be assumed to be fully functional unless reported otherwise prior to removal.

1.20.2 Devices and equipment damaged during removal, storage or reinstallation will be replaced at no cost to the Owner.

1.21 **CONSTRUCTION SCHEDULE**

-
- 1.21.1 Within one week of Award of Contract, submit to the Consultant a Construction Schedule. Show in the Work Schedule, a complete breakdown of the work of the Contract, together with planned progress dates.
- 1.21.2 Compare progress of work with the Work Schedule at every job meeting.
- 1.21.3 Provide a construction schedule with each monthly progress draw, even if there are no revisions. Prior to making any schedule revision dates from original construction schedule, obtain Consultant approval.
- 2 Products
- 2.1 **MATERIALS**
- 2.1.1 Use materials specified herein or approved equal as defined in Clause "Material and Equipment".
- 2.2 **SLEEVES**
- 2.2.1 In general, sleeves are not required through walls or floors except in service room floors and foundation walls.
- 2.2.2 Use Schedule 40 steel pipe sleeves through concrete structural members, walls and floor slabs. Extend sleeves minimum 1" AFF and seal pipe to sleeve.
- 2.2.3 For all conduits passing through foundation walls, use Link-Seal pre-engineered mechanical seals between sleeves and pipes.
- 2.2.4 For rated separation requiring a FT firestopping rating, use materials in conformance with manufacturer's recommendations.
- 2.3 **FIRESTOPPING**
- 2.3.1 Use only service penetration firestop components and assemblies tested in accordance with CAN.ULC S115 "Fire Tests of Firestop Systems" and listed in most recent ULC "List of Equipment and Materials" or by another recognized independent testing and certification agency acceptable to the Consultant.
- 2.3.2 Pipe sleeves through fire separations requiring a rating are to be installed as per firestopping manufacturer's recommendations, as some firestopping manufacturers do not allow pipe sleeves within their approved system. Confirm pipe sleeve compatibility prior to starting work on site.
- 2.3.3 The following manufacturers of the above equipment will be considered equal subject to requirements of Clause "Material and Equipment":
- 3M
Hilti
Tremco
- 2.4 **ACCESS DOORS**
- 2.4.1 Access doors to be flush to edge of frame, concealed continuous hinge with screwdriver operated cam latch. Non fire-rated door construction to be minimum

14 gauge, with 16 gauge frame. Fire-rated door construction to be a minimum 20 gauge insulated door with 16 gauge frame. Insulation thickness to provide required rating.

- 2.4.2 Size doors to allow adequate operating/maintenance clearance for devices. Doors to be a minimum 600 mm x 600 mm (24" x 24") for body entry, and 300 mm x 300 mm (12" x 12") for hand entry, unless noted otherwise. Use the following access doors:

Masonry Walls	Acudor UF-5000
Drywall Walls	Acudor DW-5040
Drywall Ceilings	Acudor BP58, match ceiling thickness
Fire-Rated	Acudor FW-5050/FB-5060 to match fire separation
Wet Areas, Operating Rooms	Acudor UF-5000 (stainless)

- 2.4.3 The following manufacturers of the above equipment will be considered equal subject to requirements of Clause "Material and Equipment":

Adam
Ancon LeHage
E. H. Price

2.5 IDENTIFICATION NAME LABELS

- 2.5.1 Provide white lamacoid identification labels with black uppercase lettering, minimum 14 pt Arial or Helvetica typeface, for identification of all MCCs, switchboards, distribution panels, panelboards, transformers and transfer switches.
- 2.5.2 Submit a complete list of nameplate wording for review by Consultant prior to installation.
- 2.5.3 Warning plates are to be red with white letters, minimum 14 pt Arial or Helvetica typeface, as indicated on drawings.

2.6 FLASHING

- 2.6.1 For locations with roof penetrations serving a piece of equipment, such as for roof mounted split system condensing units, receptacles, etc, use Portals Plus, Inc. Alumi-Flash system consisting of 100 mm (4") high, one piece spun aluminum base with deck flange and EPDM rubber cap. Use caps suitable for required number and diameter of service penetrations. Flashing is for Division 16 use only.
- 2.6.2 The following manufacturers of the above equipment will be considered equal subject to requirements of Clause "Material and Equipment":

Portals Plus

- 3 Execution

3.1 GENERAL

- 3.1.1 Instruct and supervise other Sections doing related work.

- 3.1.2 Supply the measurements of equipment to other Sections to allow for necessary openings to be left in the work of other Sections.
- 3.1.3 Install conduit, which is to be concealed, neatly and close to building structure so that the necessary furring can be kept as small as possible.
- 3.1.4 Carry out all work in accordance with the latest regulations of the Ontario Electrical Safety Code and all applicable Municipal, Provincial and Federal Codes and Regulations. In no instance, however, is the standard established by the Drawings and Specifications, to be reduced by any of the Codes referred to above.
- 3.1.5 Install all ceiling components in direct accordance with reflected ceiling plans.
- 3.1.6 Electrical Drawings show approximate locations for wall-mounted devices. Clarify exact location and mounting height with Consultant prior to roughing-in.
- 3.1.7 All serviceable equipment installed on the roof (including receptacles) to be installed minimum 3 m (10'-0") from roof edge unless otherwise noted on Drawings.

3.2 STORAGE OF MATERIALS

- 3.2.1 Provide proper weatherproof storage for the protection of materials and equipment on site. Blank off openings in all equipment until required for use. Consultant may require materials which are not properly stored to be discarded and removed from the site.

3.3 SUPPORTS AND BASES

- 3.3.1 Provide structural work required for installation of equipment provided under this Division.
- 3.3.2 Set all floor-mounted equipment on concrete bases at least 100 mm (4") high. Size concrete equipment bases to suit the equipment actually supplied and in accordance with the Shop Drawings of such equipment. Do not start concrete work until anchor bolts and other embedded parts required for the complete installation, as well as Shop Drawings, are available at the site.
- 3.3.3 Extend existing concrete bases as required for replacement or new equipment. Match existing height.
- 3.3.4 For new concrete bases or pads on existing floors, first scrape and remove existing floor finish. Scarify existing floor so that new concrete adheres to it. Dowel new pads to new and existing floors.
- 3.3.5 Provide all brackets and supports required in steel stud walls. All conduits and equipment must be supported on brackets or supports attached to steel studs. Do not support materials or equipment from wall sheathing.
- 3.3.6 Provide independent support; brackets and unistrut structures where required to install electrical equipment; disconnect switches, splitters, panels, etc:
- in areas where the equipment is located on walls/columns that are not suitable for direct installation.
 - When installation away from structural building elements is called for.

- When it is necessary to elevate the electrical equipment to ensure code compliance or ergonomical operator access.

3.3.7 For all supports of suspended or wall hung electrical equipment, provide structural drawings stamped and signed by a structural engineer holding a P.Eng. designation and registered in the Province of Ontario. This engineer is to submit proof of professional liability insurance. Equipment to be supported from the bottom.

3.3.8 Do not mount starters, VFD's, etc. on building equipment.

3.3.9 Do not suspend luminaires greater than 11.3kg (25 lbs), cable tray, conduit racks, etc from metal roof deck. Provide supports as required to suspend from roof joists.

3.3.10 Provide lintels for double-width and adjacent tubs and multiple conduits running in parallel, where located in block and poured walls.

3.4 **CONCRETE INSERTS**

3.4.1 **General**

3.4.1.1 Anchors for the support of conduits and equipment from the underside of suspended structural concrete systems may be by cast-in-place inserts placed prior to the pouring of concrete or by the use of inserts placed in holes drilled after the forms are stripped.

3.4.1.2 The safe load capacity of concrete anchors is affected by a number of variables such as specific anchor type, embedment, spacing between individual anchors, edge distances, direction of loading, concrete strength and "prying action". Refer to the manufacturer's recommendations for each specific insert proposed, including any dynamic or vibratory loads.

3.4.1.3 Be responsible for the proper selection and installation of inserts, including number, type, spacing and accurate placement to provide the necessary safe load capacity and satisfactory long term performance.

3.4.2 **Installation of Inserts in Hardened Concrete:**

3.4.2.1 Use inserts placed in pre-drilled holes. Do not use powder driven inserts or self-drilling inserts. Before drilling holes, accurately locate all reinforcing bars in the affected areas using an electro-magnetic locator.

3.4.2.2 Do not drill through or otherwise damage reinforcing bars. If reinforcing is encountered, the inserts must be relocated. Ensure that hole diameter, depth of penetration, spacing, etc., are in strict accordance with the insert manufacturer's recommendations for the specific insert type and load condition.

3.4.2.3 Due to the relatively close spacing of reinforcing bars in the bottom of many of the beams and girders, the preferred location of drilled-in-place anchors in beams and girders is into the sides of these members, rather than upwards into the bottom.

3.4.2.4 Inserts to be zinc plated female concrete anchors. Nylon or plastic anchors are not acceptable.

3.4.3 Concrete screws without anchors are not acceptable.

3.5 SLEEVES

3.5.1 **Sleeves Embedded in Concrete:** Except as approved otherwise by the Consultant, install sleeves embedded in concrete in accordance with the following general guidelines:

3.5.1.1 Centre to centre spacing to be not less than 3 diameters of the maximum size adjacent sleeve.

3.5.1.2 Provide additional reinforcing at points of congestion as directed by the Consultant.

3.5.1.3 Sleeves through beams will be permitted only as directed by the Consultant.

3.5.1.4 The reinforcing in beams, slabs and columns must not be displaced from its intended position under any circumstances unless prior written approval is obtained from the Consultant.

3.5.2 Provide sleeves for all conduits which pass through service room floors and foundation walls. Sleeves to extend minimum 1" above finished floor.

3.6 FIRESTOPPING

3.6.1 Provide a listed firestop system in accordance with the Ontario Building Code to seal around all conduits, electrical wires and cables, and other similar electrical services which penetrate part of a building assembly required to have a fire resistance rating or a fire separation. Refer to Architectural Drawings and Specifications Section "Firestopping and Smoke Seals" for building assembly and fire separation types and locations.

3.6.2 For all penetrations through fire separations required to have a fire resistance rating, use firestop systems with an F rating not less than the fire resistance rating for the fire separation. This includes the sealing of any sleeves provided for future uses. Provide an FT rating where required by the Ontario Building Code. For all penetrations through a Service Room floor, provide a minimum W rating - Class 1 in addition to the fire resistance rating.

3.6.3 All firestopping must be thoroughly reviewed by the Technical Representative of the systems manufacturer on site before any firestopping is concealed and submit a report of compliance with the rating requirements. Technical Representative to complete 3 destructive tests to confirm compliance with ULC listing, minimum one floor test and one wall test, third test to be Contractor's choice. Contractor to replace fire stopping system after destructive test has been completed. Submit a copy of the report to the Consultant. Report to include as a minimum, confirmation fire stopping shop drawings were used during review, locations where destructive testing was completed, confirmation all fire stopping locations were reviewed and installed systems meet the manufacturer requirements.

3.6.4 Provide instruction wall labels on both sides of wall for all thru-wall penetrations using FlameStopper. Locate adjacent to penetration as required to be visible from standing position.

3.7 CUTTING AND PATCHING

3.7.1 Flash holes through walls and roof to make weatherproof.

-
- 3.7.2 Do not cut or drill holes through floors, roof or structural members before obtaining permission from the Consultant.
- 3.7.3 For penetrations through walls not required to have a fire rating, seal all spaces between pipe or pipe and surrounding wall construction with a fire-rated foam sealant. Use 3M Fire Barrier, Metacaulk, or Dow Fire Stop UL Classified fire rated foam sealants. Do this as the work progresses, to avoid leaving inaccessible holes at completion of the job. For penetrations through parts of the building assembly required to have a fire resistance rating or acting as a fire separation, see Clause "Firestopping" in this Section.
- 3.7.4 Before drilling holes through floors or roof slabs, accurately locate and note sizes for each required hole. Get approval of Consultant before any cutting is started.
- 3.7.5 Where conduits are required to pass through existing walls, floors, and roof, cut and patch the necessary openings.
- 3.7.6 Where recessed electrical equipment is removed or replaced with equipment of a smaller size, patch openings to match existing wall material.
- 3.7.7 Where wiring devices (switches, receptacles, etc) are removed from drywall walls, remove device box and patch opening to match existing wall.
- 3.7.8 Where wiring devices (switches, receptacles, etc) are removed from poured concrete or block walls, remove device and provide blank coverplate.
- 3.7.9 Include the cost of all cutting and patching in the Lump Sum Contract Price for the work of Division 16.
- 3.7.10 Remove and replace ceiling where necessary to complete the work of this Division unless this work is specifically included in another Division.
- 3.7.11 All cutting and patching to be done by the trade specializing in the materials to be cut.
- 3.7.12 For devices to be removed on existing walls, allow for patching wall entirely to match adjacent surfaces. Paint wall as noted in paragraph "Painting" below.
- 3.7.13 Replace tiles where existing devices removed or allow for patching gypsum ceilings.
- 3.8 **PAINTING**
- 3.8.1 Touch up minor damage to finish on equipment supplied with factory applied baked enamel finish. Completely refinish items suffering damage which, in the opinion of the Consultant, is too extensive to be remedied by touchup.
- 3.8.2 Paint both sides and edges of plywood backboards for electrical and communications equipment before installing equipment. Use one coat fire retardant primer and two coats fire retardant paint.
- 3.8.3 Paint disconnect switch or breaker for fire alarm and exit light systems in red enamel. Use one coat of primer and one finish coat.
- 3.8.4 Where walls and/or ceilings are cut and patched for electrical work including the

removal of existing devices, paint walls and ceilings to match existing. For walls and ceilings less than 9.3m² (100 sq ft), paint entire wall. For walls and ceilings larger than 9.3m² (100 sq ft), paint area of patch. Painting to be completed by painting contractor.

3.8.5 **Uninsulated Piping, Conduits and Unprimed Metal Surfaces:** Paint with one coat of red Chromate Primer followed by two coats of eggshell enamel. Colour to be selected by the Owner.

3.8.6 Include the cost of all painting in the Lump Sum Contract Price for the work of Divisions 16.

3.9 ACCESS DOORS

3.9.1 Supply access doors wherever equipment, junction boxes, life safety devices, etc., are concealed behind walls or inaccessible ceilings. All devices installed requiring periodic maintenance to be made accessible. Doors will be installed by the trade specializing in the materials receiving access doors.

3.10 IDENTIFICATION

3.10.1 Colour code control wiring consistently throughout the installation and generally match colour coding of internal wiring of pre-wired components. Match existing colour coding in use on site. Verify with Owner prior to installation.

3.10.2 All branch circuits shall be:

- Phase A - red
- Phase B - black
- Phase C - blue

3.10.3 Identify all disconnects, starters, and other control equipment with lamacoid nameplates indicating the equipment controlled and all panels, transformers, etc identifying equipment name.

3.10.4 Lamacoid labels to be mechanically attached with self-tapping screws or rivets. Lamacoid labels attached using adhesive methods are not acceptable.

3.10.5 Identify the panel and circuit number for each wiring device with self-adhesive label on the coverplate. Use clear tape with black 14 pt Arial or Helvetica typeface. Locate labels for receptacles on front of coverplate and labels for switches on rear of coverplate.

3.10.6 Identify all pull boxes, junction boxes or octagon boxes located in the ceiling cavity with the exact use of the box, including circuits contained within. Felt pen is acceptable.

3.10.7 Where equipment is concealed above accessible ceilings, indicate location using coloured-coded marking devices, approved by Consultant, fastened to the ceiling components.

3.11 LOCKS AND KEYS

3.11.1 Where locked panelboards, control panels, terminal cabinets, etc., are specified, use

a separate key pattern for each system with all locks in each system common to one key. Provide seven keys of each pattern to the Owner on a 25 mm (1") key ring. Submit one set of keys with manuals.

3.12 **TESTING**

3.12.1 All systems must be thoroughly tested before arrangements are made for the final demonstration in the presence of the Owner's staff. Systems to be tested are:

1. N/A

3.12.2 For the following systems, the manufacturer's Testing Representative must be present for the test period and submit a Certificate of Operation to the Consultant:

1. N/A

3.12.3 At the completion of the work, demonstrate operation of all systems to the Owner's representative and the Consultant. Promptly rectify any malfunction found.

3.13 **TEMPORARY ELECTRICAL FACILITIES FOR CONSTRUCTION**

3.13.1 Temporary electrical power is available at the site. Cooperate with owner for use of this power.

3.13.2 Tie in at one location only, as directed. Distribute temporary power from this location.

3.13.3 Arrange and pay for the cost of inspection of the temporary service.

3.13.4 Notify the monitoring company and Owner each and every time a part of the fire alarm system is shut down and reactivated.

3.13.5 Completely remove all temporary facilities when they are no longer required.

3.13.6 Provide fixed temporary lighting for open areas, stairwells and each enclosed room. In open areas and enclosed rooms use 150W A21 lamps, or equivalent, at spacings not exceeding 7.5m. In stairwells use one 100W A21 lamp, or equivalent, at each landing. Lighting to be on dedicated circuits.

3.13.7 Temporary lighting stipulated in this Section, do not include provisions for higher intensity lighting required for a specific operation (concrete finishing, plastering, etc.). This will be the responsibility of the specific trade requiring the higher intensity.

3.13.8 Provide minimum two 120V 20A GFCI receptacles, on dedicated circuits, per 150 m² construction area.

3.13.9 Temporary power requirements stipulated in this Section, do not include provisions for electric space heating, electric welders, or any other item of equipment which requires either a 3 phase supply or connection to a single phase circuit rated in excess of 20 amperes. Any trade using equipment which falls into above categories is to be responsible for providing additional facilities required for such equipment, including any increased sizing. This Division is responsible to see the connection to the temporary system is safe.

3.13.10 Use non-metallic sheathed cable, Type NMW-10, #12 AWG, manufactured in accordance with CSA Spec. C22.2 No. 38, for all temporary lighting branch circuit wiring.

3.13.11 **Temporary Fire Alarm Devices**

3.13.11.1 Notify the local Fire Department and Owner each and every time a part of the fire alarm system is shut down and reactivated.

3.13.11.2 Provide new temporary hard wired fire alarm detectors, pull stations and notification appliances within the construction area.

3.13.11.2.1 Provide one 135°F rate-of-rise heat detector for every 465 m² (5000 ft²) of floor area.

3.13.11.2.2 Provide smoke detectors in all temporary corridors spaced maximum 10m (30 ft).

3.13.11.2.3 Provide a manual pull station at every exit/entrance to the construction area.

3.13.11.2.4 Provide one surface mounted bell for every 560 m² (6000 ft²) of floor area.

3.13.11.3 Use #14 AWG, AC-90 cable for temporary wiring to devices.

3.13.11.4 Connect devices to dedicated fire alarm zones, grouped on a floor-by-floor basis. Provide zone cards as required to suit existing fire alarm panel.

3.13.11.5 Completely verify temporary fire alarm devices any time temporary devices are added, removed or relocated.

3.13.11.6 Once the permanent fire alarm system is operational completely remove all temporary devices and wiring. Turn devices over to the Owner.

3.14 **EQUIPMENT SCHEDULE**

3.14.1 Equipment Schedules are as shown on Drawings.

3.14.2 In general, the motor or item numbers shown in the Equipment Schedules coincide with those numbers shown for Mechanical Trades.

3.15 **GROUNDING**

3.15.1 Ground all components of the Electrical system in accordance with the requirements of Section 10 of the Ontario Electrical Safety Code latest edition and the Inspection Authority.

3.15.2 Provide a separate green ground conductor in all raceways.

3.15.3 Ground secondary neutrals of transformers to building ground conductor.

3.15.4 Where attached to equipment, conduits, cabinets, etc., use suitable approved solderless lugs, compression connectors. No soldered or split bolt type connections are to be used on grounding circuits at any point.

3.15.5 All compression connectors, lugs, etc., used in grounding circuits in any location are to have bolts, nuts, etc., of silicone bronze alloy equal to "Everdur" metal.

-
- 3.15.6 Clean all surfaces to which bus or cable are to be bolted, of all paint, rust, etc., and work to a bright, flat surface.
- 3.15.7 Conduit expansion joints and telescoping sections or metal raceways not thoroughly bonded otherwise, are to be provided with approved bonding jumpers or not less than #8 AWG stranded bare copper.
- 3.15.8 Provide a separate #14 green ground wire for all isolated ground receptacles.
- 3.16 **START-UP SERVICES**
- 3.16.1 Provide the services of a qualified person to be on call and available to the site within one hour, for 2 weeks after work of this Contract is taken over by the Owner. Assist Owner's staff to become familiar with the system operation.
- 3.17 **MAINTENANCE OF EXISTING SERVICES**
- 3.17.1 Take every precaution to locate and protect existing services so that no interruption occurs. If any existing service is damaged due to the work of this Division, arrange and pay for repair. Bear any costs due to interruption of existing services.
- 3.17.2 Be responsible for maintaining continuity of existing services, and for programming work so that the Owners can carry out their normal business uninterrupted, with the exception of scheduled shutdowns for connection to or rerouting of existing services, at a time agreed to by the Owners, on weekdays, over weekends or after normal working hours.
- 3.17.3 Permission from the Owner is required before making any connections to or rerouting of existing services. Give seven days prior notice to the Consultant and Owner.
- 3.18 **PROTECTING AND MAKING GOOD**
- 3.18.1 Be responsible for protection of Owner's property, as well as finished and unfinished work, from damage due to execution of work under this Contract. Repair damage resulting from failure to provide such protection to the satisfaction of the Consultant, at no expense to the Owner.
- 3.18.2 Attach and fasten fixture and fittings in place in safe, sturdy, secure manner so that they cannot work loose or fall or shift out of position during occupancy of building, as the result of vibrating or other causes in normal use of building.
- 3.18.3 Coordinate and cooperate with other trades, taking into account existing installations, to assure best arrangement of equipment in available space. For critical locations, prepare interference and installation drawing showing work of various sections as well as existing installations, for approval before commencing work.
- 3.18.4 All new equipment shall be delivered to site wrapped in plastic and removed only after room is thoroughly cleaned and painted, if applicable. Where existing or new equipment must be operational throughout construction in adjacent spaces, ensure door sweeps are installed and mechanical ventilation systems are fully operational. Provide filters with minimum filtration rate of 10 micron (MERV 5) on all make-up air and supply ducts. Ensure filters are regularly changed to maintain adequate airflow.

3.19 REMOVAL OF EXISTING MATERIAL AND EQUIPMENT

3.19.1 Remove existing material and equipment where shown or specified. Equipment such as Fire Alarm devices, and any other special devices are to be turned over to the Owner. Relocate these items to a designated storage site as directed by Owner. Other material and equipment which is removed becomes the property of the Contractor, and must be immediately removed from the site.

3.20 LOAD BALANCE

3.20.1 Measure phase current to distribution panels and MCCs with normal loads operating at time of acceptance.

3.20.2 Submit, at completion of work, a report listing phase and neutral currents on panelboards, dry-core transformers and motor control centre, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

3.21 REBATES AND INCENTIVES

3.21.1 Provide all invoices and proof of purchase documentation to Owner as requested for application by Owner for rebates and incentives. All incentives will be paid to the Owner.

3.22 CASH ALLOWANCES

3.22.1 Refer to Section 01020 for cash allowances carried by the General Contractor.

3.22.2 Any amounts in excess of the cash allowances will be paid by the Owner. Return any unused portions of the cash allowances in full to the Owner.

3.23 PHASING

3.23.1 The work on this project is to be phased to enable continuous operation of the Owners facilities. See the Architectural Drawings and Specifications regarding the proposed phasing of the work. Provide for temporary services, connections, bypasses, etc. to enable the phasing as described. Carry all associated costs in the Bid.

3.24 DEFICIENCY REVIEW

3.24.1 The Electrical Contractor shall confirm in writing that the work is complete and ready for inspection. The Consultant will schedule a site visit to review the work and provide a written deficiency list. Once deficiencies have been corrected, the Electrical Contractor shall confirm in writing to the Consultant that all deficiencies have been corrected. The Consultant will schedule a second site visit to review the correction of noted deficiencies. Should any noted deficiencies be found to be still outstanding, the Electrical Contractor shall correct them and again notify the Consultant in writing. Charges to the Electrical Contractor may result from repeat visits after the second visit.

3.24.2 The Electrical Contractor is required to complete all work above ceilings and allow time for deficiency reviews and correction of noted deficiencies in a timely manner

in order to accommodate the current Construction Schedule. This includes time for reinspection as required prior to concealing (drywall enclosures, drywall ceilings and acoustic tile ceilings) of any service. The Electrical Contractor will be responsible for uncovering any concealed services for inspection.

3.25 HOURLY LABOUR RATE

3.25.1 Hourly labour rate shall be the actual rate paid to the worker as posted by the local Union Agreement plus a burden mark-up of 100% to compensate for contributions, assessments, employment insurance, health insurance, pension plans, WSIB, taxes, vacation pay, travel, parking, welfare, union package and membership dues, supervision, material handling, training, rest periods, down time, breaks, personal hygiene, small tools, clean up time, profit, other benefits paid to the worker and all other costs incurred by the Company including meetings, office time. Travel time to and from the site shall be at no charge to the Owner. For the purpose of electrical work, the journeyman electrician rate will be used for all trades completing any electrical work.

3.26 LIST OF ELECTRICAL SUBCONTRACTORS AND MANUFACTURERS

3.26.1 In the Bid documents, name the Subcontractors and Manufacturers for the items listed below. Use only one name for each item. See Clause "Material and Equipment". Where the name of a manufacturer is not entered on the Bid Form, the Contractor will be required to use the base specified manufacturer.

3.26.2 Subcontractors

N/A

3.26.3 Manufacturers

Disconnect Switches
Panelboards
Wiring Devices

END OF SECTION

-
- 1 General
- 1.1 **GENERAL REQUIREMENTS**
- 1.1.1 Conform to the requirements of Section 16001, "Electrical General Provisions".
- 1.2 **DESCRIPTION OF SYSTEM**
- 1.2.1 Provide all new wiring and raceways. Where possible, conceal all wiring and raceways above ceilings, in walls and partitions. See Section 16001, "Electrical General Provisions".
- 2 Products
- 2.1 **MATERIALS**
- 2.1.1 Use materials specified herein or approved equal as defined in Clause "Material and Equipment".
- 2.1.2 All outlet boxes, wiring devices, equipment and accessories must be C.S.A. approved and be designed for the application intended.
- 2.2 **RACEWAYS**
- 2.2.1 Use E.M.T. in concealed locations in concrete block walls, drywall partitions and for main and branch circuit wiring above ceiling spaces.
- 2.2.2 Use minimum 1/2" (16 mm) conduit for power wiring and 3/4" (21 mm) conduit for motor circuits.
- 2.2.3 Raceways for motors and equipment are to be dedicated home runs back to source and shall not be grouped with adjacent motors and equipment.
- 2.2.4 Use set screw steel couplings and connectors. Use raintight steel couplings and connectors complete with "O" rings, in sprinklered buildings.
- 2.2.5 Use red conduit for Fire Alarm wiring concealed above ceilings, in concrete walls and in mechanical and electrical rooms.
- 2.2.6 For new devices on existing block or poured concrete walls exposed in finished areas, provide metallic single compartment raceway and appropriate bases.
- 2.2.7 Use conduit expansion coupling for expansion joint crossing.
- 2.2.8 Use flexible metal conduit for all final connections to motors and other equipment subject to vibration or which has adjustable mountings. Minimum size 1/2" (16 mm).
- 2.2.9 Use rigid PVC underground and in concrete floors, unless otherwise noted. Provide marking tape for underground installations in accordance with Ontario Electrical Safety Code.
- 2.2.10 For exterior above grade installations, use rigid aluminum conduits and fittings. All boxes and conduit bodies shall be die-cast, copper-free aluminum with aluminum

covers and neoprene gaskets.

- 2.2.11 Fasten all raceways with approved supports. Use clamps and all mounting hardware of the same material as the conduit or compatible material to prevent galvanic corrosion.

2.3 CONDUCTORS

- 2.3.1 Aluminum conductors are NOT permitted on this project.
- 2.3.2 Use minimum copper #12 AWG RW-90XLPE **stranded** for branch circuiting and receptacle wiring.
- 2.3.3 Use RWU-90XLPE wire in all below grade locations.
- 2.3.4 Use minimum size of #14 AWG RW-90XLPE for control wiring.
- 2.3.5 Type AC-90 cable may be used for final drops (maximum 2 m [6.5']) to lighting fixtures and devices in accessible ceiling spaces. **DO NOT USE AS MAIN BRANCH WIRING FROM PANELBOARDS OR FOR BRANCH CIRCUIT WIRING (i.e. RECEPTACLES, ETC.).**
- 2.3.6 For wiring to heating equipment, recessed lighting fixtures or where body of fluorescent fixture is used as raceway, use conductors with high temperature insulation of type approved by Electrical Safety Authority.
- 2.3.7 Use all wire and cable insulation rated 600 volts minimum unless specified otherwise.

2.4 OUTLET BOXES

- 2.4.1 Use only masonry approved boxes in concrete and masonry construction.
- 2.4.2 Use 100 mm (4") square or utility type boxes for surface-mounted boxes and 100 mm (4") octagonal boxes for ceiling outlet boxes. Use multi-gang boxes for grouped devices. Use wrap-around covers for utility boxes. Use cast aluminium FS type boxes where surface mounted in finished areas.
- 2.4.3 Use flush-mounted boxes complete with adjustable ears, extension rings and plate rings as required. Do not use shallow or narrow boxes.
- 2.4.4 Provide FS type boxes c/w rain tight fittings where surface mounted in service rooms or for any surface boxes in sprinklered buildings not located above ceilings.

2.5 WIRING DEVICES

- 2.5.1 Use specification grade wiring devices, types and ratings shown on the Drawings.
- 2.5.2 Switched receptacles to be black. Use red devices for receptacles\switches fed from emergency circuits.
- 2.5.3 Confirm colour of wiring devices and plates with Consultant prior to ordering.

2.5.4 Receptacles

- 2.5.4.1 125 volt 20 amp white self-testing GFCI Duplex Receptacle (CSA 5-20R)
Hubbell Catalogue No. GFST20W

2.5.5 Cover Plates

- 2.5.5.1 In general, use 302 stainless steel face plates for all flush-mounted devices and die-cast face plates for all surface-mounted devices.

- 2.5.5.2 All receptacles exposed to weather to have die-cast aluminum duplex gasketed spring door in-use covers.

- 2.5.6 The following manufacturers of the above equipment will be considered as equal subject to requirements of Clause "Material and Equipment":

Cooper
Hubbell
Leviton
Pass & Seymour

2.6 DISCONNECT SWITCHES

- 2.6.1 Unless specified otherwise, fused or unfused disconnect switches to be conditionally hp rated, heavy duty type with visible break industrial safety switches in general purpose or weatherproof enclosures as required.

- 2.6.2 For 120V mechanical equipment, provide Hubbell Cat. #HBL1379D disconnect switch with aluminum housing and lockable switch.

- 2.6.3 For equipment above ceilings such as fans and heat pumps single phase and three phase 30A and below: Hubbell Cat # HBL1372 disconnect switch with aluminum housing or equivalent to be approved by Consultant.

- 2.6.4 For exterior roof mounted equipment single phase and three phase 30A and below: Hubbell Cat # HBL13R series NEMA 3R disconnect switch with aluminum housing. Or equivalent to be approved by Consultant.

- 2.6.5 The door to be mechanically interlocked with the operating handle to prevent it from being opened when the switch is in the "ON" position. The handle is to be capable of being padlocked in the "OFF" or "ON" position.

- 2.6.6 The following manufacturers of the above equipment will be considered as equal subject to requirements of Clause "Material and Equipment":

Eaton
Schneider
Siemens

2.7 OVERCURRENT PROTECTIVE DEVICES - FUSES

- 2.7.1 Provide fuses for all fusible equipment in this Contract.

- 2.7.2 Fuse interrupting rating is to be 200,000 amps RMS symmetrical unless otherwise noted.
- 2.7.3 Rated as noted on the Drawings, 600 volts AC, fuses will be CSA certified HRCI J/Class J Time Delay with dimensions and current limiting performance in accordance with CSA Specification C22.2 No. 106-05 or UL Standard 198C for Class J fuses. HRCI/JY fuses are not acceptable.
- 2.7.4 The following manufacturers of the above equipment will be considered as equal subject to requirements of Clause "Materials and Equipment":
- Cooper Bussmann
General Electric Power Controls
Littlefuse
Mersen

3 Execution

3.1 GENERAL

- 3.1.1 Unless shown otherwise, the minimum size of all raceways and conductors to be in accordance with the Ontario Electrical Safety Code.

3.2 CONDUIT INSTALLATION

- 3.2.1 Conceal all conduits except in equipment rooms, unfinished area, and where specifically noted. Flush mount all devices, starters, etc., in finished areas. Install all exposed conduits parallel to building walls and partitions.
- 3.2.2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- 3.2.3 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- 3.2.4 Run parallel or perpendicular to building lines.
- 3.2.5 Run conduits in flanged portion of structural steel. Do not pass conduits through structural members except as indicated.
- 3.2.6 Group conduits wherever possible on suspended surface channels.
- 3.2.7 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers. Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- 3.2.8 Horizontal runs of conduit will not be permitted in walls unless noted otherwise.
- 3.2.9 In any case, horizontal runs must be located above level of door or transom frames in area.
- 3.2.10 Vertical conduits must be supported at each floor slab and at the top and bottom of each riser.

3.2.11 Conduits must be supported from building structure. Provide independent unistrut under obstructions such as ductwork for support as required. Support unistrut from structural members. Do not secure to underside of metal pan roof deck.

3.2.12 Conduit placement should follow the following priority:

- Below grade
- In walls or partitions
- In ceiling cavity
- Exposed

3.2.13 Maintain continuity of ground through all connection points. Use sealer lubricant on all threaded connections embedded in concrete, buried in ground or exposed outdoors.

3.2.14 Leave all conduit systems finished complete with outlet boxes, coverplates, bushings, caps, nylon fish wire, etc. Provide bushings for all sleeves.

3.3 CONDUCTORS

3.3.1 Join #8 AWG and larger conductors with compression connectors properly sized. On #10 AWG and smaller, relaxed wing-nut type connectors may be used. Ideal Industries 451, 452 or 453.

3.3.2 Size conductors for a maximum of 2% voltage drop from the supplying panel to the furthest outlet in the circuit. In calculating voltage drop, use 80% of overcurrent rating or design load where known, whichever is less.

3.3.3 Draw wiring into raceways only after all other work that may cause injury to the wire is completed. Use only wiring lubricants that do not shorten insulation life. Use continuous lengths for feeders to panels and large equipment. Do not splice without permission from Consultant.

3.4 GROUNDING

3.4.1 Ground all components of the Electrical system in accordance with the requirements of Section 10 of the Electrical Safety Code latest edition and the Inspection Authority.

3.4.2 **Provide a separate ground conductor in all raceways.**

3.4.3 Ground secondary neutrals of transformers to building ground conductor.

3.4.4 Where attached to equipment, conduits, cabinets, etc., use suitable approved solderless lugs, compression connectors. No soldered or split bolt type connections are to be used on grounding circuits at any point.

3.4.5 All compression connectors, lugs, etc., used in grounding circuits in any location are to have bolts, nuts, etc., of silicone bronze alloy equal to "Everdur" metal.

3.4.6 Clean all surfaces to which bus or cable are to be bolted, of all paint, rust, etc., and work to a bright, flat surface.

3.4.7 Conduit expansion joints and telescoping sections or metal raceways not thoroughly

bonded otherwise, are to be provided with approved bonding jumpers or not less than #8 AWG stranded bare copper.

- 3.4.8 Provide a separate #14 green ground wire for all outlets connected to a GFCI circuit breaker.

3.5 OUTLET BOXES

- 3.5.1 Support all boxes independently of the conduits running to them. Use flush boxes in areas where concealed conduit is used.

- 3.5.2 Check the Drawings to ensure that no outlets are roughed-in at inaccessible locations, where built-in furniture, counters, etc., are to be installed. In such locations, install the outlets above and clear of the trim by approximately 100 mm (4") unless shown otherwise on the Drawings.

- 3.5.3 **DO NOT INSTALL OUTLET BOXES OF ANY SYSTEM BACK TO BACK.** Offset as necessary to prevent sound transmission between areas.

3.6 WIRING DEVICES

- 3.6.1 Install light switches on lock jamb side of the door as finally hung. Check door swing before roughing-in. Install switches with the "ON" position up. Locate switch as close as practical to door jamb but not closer than 1". Coordinate location with built-in and Owner supplied equipment and furnishings.

- 3.6.2 When two or more devices are grouped together, mount under a common coverplate unless shown otherwise.

- 3.6.3 Mount light switches at height as indicated on Drawings.

- 3.6.4 Mount duplex receptacles 25 mm (1") above a countertop backsplash to bottom of device coverplate.

END OF SECTION

-
- 1 General
- 1.1 **GENERAL REQUIREMENTS**
- 1.1.1 Conform to the requirements of Section 16001, "Electrical General Provisions" and Section 16100, "Basic Materials and Methods".
- 1.2 **DESCRIPTION OF WORK**
- 1.2.1 Provide circuit breakers as shown on the Drawings and Panel Schedules.
- 2 Products
- 2.1 **MATERIALS**
- 2.1.1 Use materials specified herein or approved equal.
- 2.1.2 Unless noted otherwise on the Drawings or in Specifications, user operated devices, display and controls shall be located between 125mm (5") and 1830mm (72") from bottom of floor mounted equipment.
- 2.2 **DISTRIBUTION EQUIPMENT**
- 2.2.1 **Distribution and Panelboard Circuit Breakers**
- 2.2.1.1 Unless noted otherwise on Drawings or panel schedules, circuit breakers are to be moulded case as rated below. Series rated breakers are not acceptable unless stated otherwise on the Drawings (ground fault breakers excluded).
- 2.2.1.2 Breakers are to be suitable for the panelboards provided. All breakers are to be bolted in place. Plug-in only type are not acceptable.
- 2.2.1.3 For 250V panelboards, main and branch breakers to be rated minimum 22,000 amperes RMS symmetrical at 208 or 240 volt.
- 2.2.1.4 For 600V panelboards, main and branch breakers to be rated minimum 22,000 amperes RMS symmetrical at 600 volt.
- 2.2.1.5 All circuit breakers smaller than 400A to be moulded case thermal-magnetic type providing inverse time-current tripping curves. Multi-pole breakers to have common-trip device with single handle.
- 2.2.1.6 All circuit breakers 400A and larger to have adjustable Long-time Short-time Instantaneous (LSI) solid state trip unit.
- 2.2.1.7 Shunt trip breakers to be 120V AC solenoid type. Electrically held shunt trip breakers are not acceptable.
- 2.2.1.8 Provide ground fault circuit interrupters breakers as indicated on Panel Schedules. Provide separate neutral conductors for each circuit. Unless noted otherwise, ground fault circuit interrupter breakers are Class A, Group 5mA.

-
- 2.2.1.9 Provide quantity of spare breakers as called for on the Panel Schedules or Drawings
- 2.2.2 The following manufacturers of the above equipment will be considered as equal subject to requirements of Clause "Material and Equipment":
- Eaton
 - Schneider
 - Siemens
- 3 Execution
- 3.1 **PANELBOARDS**
- 3.1.1 Provide new typewritten directories for all existing panelboards affected by work.
- 3.1.2 Contractor to provide updated schedules complete with room numbers. Trace out existing circuits as required.
- 3.1.3 Include room number and description of load for each breaker. For circuits serving mechanical equipment, indicate room number mechanical equipment serves. Coordinate on site with Division 15.
- 3.2 **ARC FLASH HAZARD WARNING LABELS**
- 3.2.1 Provide generic shock and arc flash warning labels on all new panelboards, MCC's and disconnect switches and splitters in accordance with Ontario Electrical Safety Code 2-306.
- 3.2.2 Label shall be located so that it is clearly visible to persons before examination, adjustment, servicing, or maintenance of equipment. Locate label on the inside door of panelboards.

END OF SECTION

SECTION 16400

A P P E N D I X

Panel Schedules

PROJ. NAME: CEC Rooftop Unit Replacement
PROJ. NO : 8923

PANEL ID: LP-B
MAINS: 225A
VOLTAGE: 240/120V, 1Ø, 3W
MOUNTING: SURFACE
NO OF CKT: 60

LOCATION: SERVER ROOM
FED FROM: EX DISTRIBUTION PANEL 'DPE'
COMMENTS:
 PROVIDE NEW BREAKERS TO SUIT EXISTING
 CUTLER HAMMER PANEL

CKT	BRKR	DESCRIPTION	WATTS	CKT	BRKR	DESCRIPTION	WATTS
1	20	EX SERVER ROOM REC		2	20	EX SERVER ROOM REC	
3	20	EX SERVER ROOM REC		4	20	EX SERVER ROOM REC	
5	20	EX SERVER ROOM REC		6	20	EX SERVER ROOM REC	
7	20	EX SERVER ROOM REC		8	20	EX SERVER ROOM REC	
9	20	EX SERVER ROOM REC		10	20	EX SERVER ROOM REC	
11	20	EX SERVER ROOM REC		12	20	EX SERVER ROOM REC	
13	20	EX SERVER ROOM REC		14	20	EX SERVER ROOM REC	
15	20	EX SERVER ROOM REC		16	20	EX SERVER ROOM REC	
17	20	EX COMP ROOM REC		18	20	EX SERVER ROOM REC	
19	20	EX COMP ROOM REC		20	20	EX SERVER ROOM REC	
21	20	EX COMP ROOM REC		22	20	EX COMP ROOM REC	
23	20	EX COMP ROOM REC		24	20	EX COMP ROOM REC	
25	15	EX SERVER ROOM REC		26	20	EX COMP ROOM REC	
27	15	EX SERVER ROOM REC		28	20	EX COMP ROOM REC	
29	15	SPARE		30	15	EX CONTROLS	
31	15	CONDENSER HEATER		32	15	SPARE	
33	20	EX SERVER ROOM REC		34	15	SPARE	
35	20	EX SERVER ROOM REC		36	15	SPARE	
37	30	EX UPS		38	20	EX TEL RM REC	
39	2P			40	2P		
41	30	EX UPS		42	20	EX TEL RM REC	
43	2P			44	2P		
45	30	CU-610		46	20	EX GEN HEATER	
47	2P			48	20	EX GEN HEATER	
49	15	AC-510 AND AC-511		50			
51	2P			52			
53				54			
55				56			
57				58			
59				60			

A P P E N D I X 'A'

Designated Substances Survey/Asbestos Products Re-Assessment



DESIGNATED SUBSTANCES SURVEY
(per Section 30, OHSA)
ASBESTOS PRODUCTS RE-ASSESSMENT
(per Section 8, O.Reg. 278/05)

Catholic Education Centre
Wallaceburg, Ontario

Prepared for:

St. Clair Catholic District School Board
1930 Wildwood Drive
Bright's Grove, Ontario
N0N 1C0

September 26, 2019

Project No.: 19-1713

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
2.0	SURVEY METHODOLOGY.....	1
2.1	ASBESTOS	2
2.2	OTHER HAZARDOUS BUILDING MATERIALS AND DESIGNATED SUBSTANCES	2
3.0	REGULATORY REQUIREMENTS	2
4.0	RESULTS	3
4.1	LEAD.....	3
4.2	MERCURY	3
4.3	SILICA	3
4.4	ACRYLONITRILE, BENZENE, ISOCYANATES, ARSENIC, ETHYLENE OXIDE, VINYL CHLORIDE AND COKE OVEN EMISSIONS.....	3
4.5	MOULD	4
5.0	RECOMMENDATIONS.....	4
5.1	LEAD.....	4
5.2	MERCURY	5
5.3	SILICA	5
5.4	MOULD	6
6.0	LIMITATIONS AND WARRANTY.....	6

APPENDICES

APPENDIX I DRAWINGS

1.0 INTRODUCTION

OH Solutions Inc. (OHS) was retained by the St. Clair Catholic District School Board to conduct a visual inspection for mould at Catholic Education Centre located at 420 Creek Street in Wallaceburg, Ontario.

The building is a two storey structure, with a total area of 20,500 square feet. The original building was constructed in the 1960's with extensive interior demolition and renovation in late 1990s. In addition to the investigation for mould, the building was evaluated for the presence of any other designated substances.

Under the *Occupational Health & Safety Act* (OSHA), an owner must determine whether any Designated Substances are present at a site and is required to prepare a list of all Designated Substances that are present. These substances may require special handling procedures. The current OSHA regulation lists the following eleven (11) substances as Designated Substances in the workplace: acrylonitrile, arsenic, asbestos, benzene, coke oven emissions, ethylene oxide, isocyanates, lead, mercury, silica and vinyl chloride.

Based on the estimated construction date and the reported use of the building, the review undertaken by OHS targeted lead, mercury, and silica which, in our experience, are most likely to be present on-site.

The following report explains our survey methodology and summarizes the hazardous building materials found at the Site.

2.0 SURVEY METHODOLOGY

During this investigation the surveyor inspected the building for construction materials suspected of containing Designated Substances.

Note:

- Repetitive testing was generally not performed. Items, which were visually similar to others tested, were considered to be of like material and were not sampled again. However, due to the variable nature of some products, several samples may have been collected of some materials.
- No destructive testing was performed. The inaccessible spaces within the building were not inspected. This includes areas above plaster or drywall ceilings (in the absence of access panels) as well as shafts, chases and bulkheads. Similarly, doors, motors and other equipment were not disassembled to determine composition.

There was no access to the roof at the time of the assessment.

2.1 Asbestos

Interior finishes in the building were removed and replaced at a time when asbestos materials were not used in most construction. Asbestos may be present in some products such as gaskets, mastics, and caulking which were not sampled as a part of the survey

2.2 Other Hazardous Building Materials and Designated Substances

All other hazardous building materials or Designated Substances were identified based on visual assessment and historical usage.

3.0 REGULATORY REQUIREMENTS

Under Section 30 of the OHS Act an owner is required to determine whether any Designated Substances are present at a project site before beginning construction. If any portion of the project is tendered, the person issuing the tenders is required to list the Designated Substances present at the project site. The constructor is then required to ensure that every contractor and sub-contractor receives a copy of the list.

Designated Substances are regulated under Ontario Regulation 490/09, which identifies the occupational exposure limits for these materials. Under Subsection 3(3) of the Regulation, construction projects are excluded from the OELs and most of the other requirements of the Regulation. For this reason, the Ministry of Labour (MOL) has issued regulations and guidelines to cover asbestos, lead and silica on construction.

Ontario Regulation 278/05 classifies all disturbance of asbestos as Type 1, Type 2 or Type 3, each of which is associated with defined work practices. All asbestos material waste is subject to special handling and disposal practices, and must be removed prior to partial or full demolition. Removal of any quantity of asbestos of more than 1m² requires notification of the MOL. Disposal of asbestos waste is subject to waste management regulations under Ontario Regulation 347/90 as amended to Ontario Regulation 102/07.

The Guidelines: "Silica on Construction Projects" and "Lead on Construction Projects" identify precautions required for various activities that may disturb silica, or lead during construction, renovation or maintenance activities.

The MOL guideline for the control of lead exposures during the removal of lead on construction projects does not include criteria for categorizing lead paint. The

Ontario Ministry of Labour (MOL) does not have a standard to state what percentage of lead a material must have to be considered lead-containing. The Environmental Abatement Council of Ontario (EACO) has issued a "Lead Guideline for Construction, Renovation, Maintenance or Repair". This guideline recommends procedures to protect against lead exposure when concentrations of lead in paint exceed 0.1% by weight, but suggests that finishes with concentrations below 0.1% by weight do not require lead specific precautions provided the material is not disturbed in an aggressive manner (e.g. grinding or sandblasting) and that general dust control is adequate.

There are currently no regulations specifically covering exposure to mould or outlining mould remediation practices. In addition, there are no occupational exposure limits stating acceptable levels of exposure without adverse health effects.

However, Sections 25 and 27 of the Ontario *Occupational Health and Safety Act* states that an employer must take every reasonable precaution to ensure the health and safety of their workers. This includes exposure to moulds.

4.0 RESULTS

4.1 Lead

Painted finishes in the building were not sampled. Lead may be present in some finishes within the building.

4.2 Mercury

Mercury is present within fluorescent light tubes and may be present in thermostats and located within the building.

4.3 Silica

Common construction sand contains free crystalline silica and is present in concrete products, mortar, brick, etc. These construction products are typically found throughout building structures.

4.4 Acrylonitrile, Benzene, Isocyanates, Arsenic, Ethylene Oxide, Vinyl Chloride and Coke Oven Emissions

Evidence suggesting the presence of acrylonitrile, benzene, isocyanates, arsenic, ethylene oxide, vinyl chloride monomer or coke oven emissions was not observed in this building.

4.5 Mould

In recent years, contamination of buildings with mould has become a major concern. Mould growth will occur on any water damaged building material. Evidence does exist to support the relationship between exposure to mould in buildings and many health effects.

This re-assessment included the inspection of areas for visible mould growth. In the absence of occupants experiencing symptoms, the inspection for and remediation of visible mould present in the building will be an appropriate response to the issue. Where occupants are experiencing symptoms, in the absence of visible mould growth, some invasive inspection may be necessary to find potential sources of mould. In general this was beyond the scope of this assessment.

Although some evidence of water damage was present, visible mould was not evident in the course of this inspection. Locations where water stained/damaged tiles were identified are outlined in the following table:

Location	Quantity of Water Damaged Material
Storage 109	2 stained ceiling tiles
Women's Washroom 211	1 stained ceiling tile
Copy Room 214	1 stained ceiling tile
Men's Washroom 207	1 stained ceiling tile
Storage 205	3 stained ceiling tiles
Staff Room 200	1 stained ceiling tile
Mechanical Room 228	1 stained ceiling tile

5.0 RECOMMENDATIONS

The following recommendations are made with respect to Designated Substances noted at Catholic Education Centre:

5.1 Lead

Although samples were not collected, it should be assumed that lead is present within paint finishes at the site. As a result, the handling or disturbance of painted

finishes should be evaluated to help ensure that workers are not adversely affected.

The lead-containing materials in the building will not generate airborne lead dust in the absence of disturbance. However, significant lead dust levels can result when uncontrolled work procedures are used on lead-based materials. The control of dust levels during the demolition of the buildings can be accomplished through proper work practises such as wetting the surface of the materials to reduce overall dust levels and providing workers with washing facilities and proper respiratory protection.

The procedures outlined in the MOL document 'Guideline – Lead on Construction Projects' (2004) should provide an adequate standard for the handling or disturbance of the material.

The disposal of construction waste containing lead is controlled under Ontario Regulation 347, as amended by O. Reg. 102/07, and may be subject to Leachate Criteria (Schedule 4) of this regulation.

5.2 Mercury

The presence of mercury in fluorescent light tubes and thermostats poses minimal risk to occupants or workers provided the equipment is handled properly and the mercury is not allowed to escape. In the event of future renovations, light tubes and thermostat tubes should be removed intact to prevent the mercury vapour from escaping.

It is good management practice to take precautions to prevent mercury vapours from becoming airborne during building demolition. Exposure to airborne mercury is regulated under Ontario Regulation 490/09 made under the *Occupational Health and Safety Act*. The current TWAEV for mercury vapour is 0.025 mg/m³ (except alkyl compounds).

Mercury waste must be handled and disposed of according to Ontario Regulation 347, as amended by O. Reg. 102/07, and may be subject to Leachate Criteria (Schedule 4) of this regulation.

5.3 Silica

Disturbance of materials containing silica will occur during demolition of walls and ceilings, saw cutting floor slabs and removal of lay-in acoustic ceiling tiles containing silica and is regulated under Ontario Regulation 490/09. The current TWAEV for amorphous fused silica is 0.1 mg/m³ and is 0.05 mg/m³ for crystalline silica (quartz). This can be accomplished through proper work practises such as

wetting the surface of the materials to reduce overall dust levels and providing workers with washing facilities and proper respiratory protection.

5.4 Mould

Mould growth on building materials was not observed during this investigation. At this time, no further action is required regarding conditions observed. Some water damaged acoustic tiles were observed at the site, OHS recommends that this material be removed to reduce the potential for mould growth on the water impacted surface

Moisture issues are the only factor in the growth of mould that may be controlled by the building operator. Any existing moisture problems in the building must be addressed to prevent or control mould growth. The following general recommendations are made to reduce the potential for future mould growth within the building:

- Promptly respond to any water infiltration, including minor leaks.
- Where HVAC units permit, maintain relative humidity below 60%.
- Maintain caulking at sinks, bathrooms and at exterior locations.

In the event of a flood, remove water by pumping or vacuuming as soon as possible. Drying of construction and finishing materials must begin promptly (in less than 24 hours). It may be practical to remove and dispose of some wetted materials, (e.g. drywall and carpet) in some cases.

6.0 LIMITATIONS AND WARRANTY

OHS has prepared this report for the exclusive use of the Client in evaluating the Site at the time of OHS's assessment. OHS will not be responsible for the use of this report by any third party, or reliance on or any decision to be made based on it without the prior written consent of OHS. OHS accepts no responsibility for damages, if any, by any third party because of decisions or actions based on this report.

The findings and conclusions documented in this report have been prepared for specific application to this project and have been developed in a manner consistent with that level of care and skill normally exercised by qualified professionals currently practising in this area of environmental assessment. No other warranty, expressed or implied, is made.

The findings contained in this report are based upon conditions as they were observed at the time of investigation. No assurance is made regarding changes in conditions subsequent to the time of investigation.

If new information is developed in future work, OHS should be contacted to re-evaluate the conclusions of this report and to provide amendments as required.

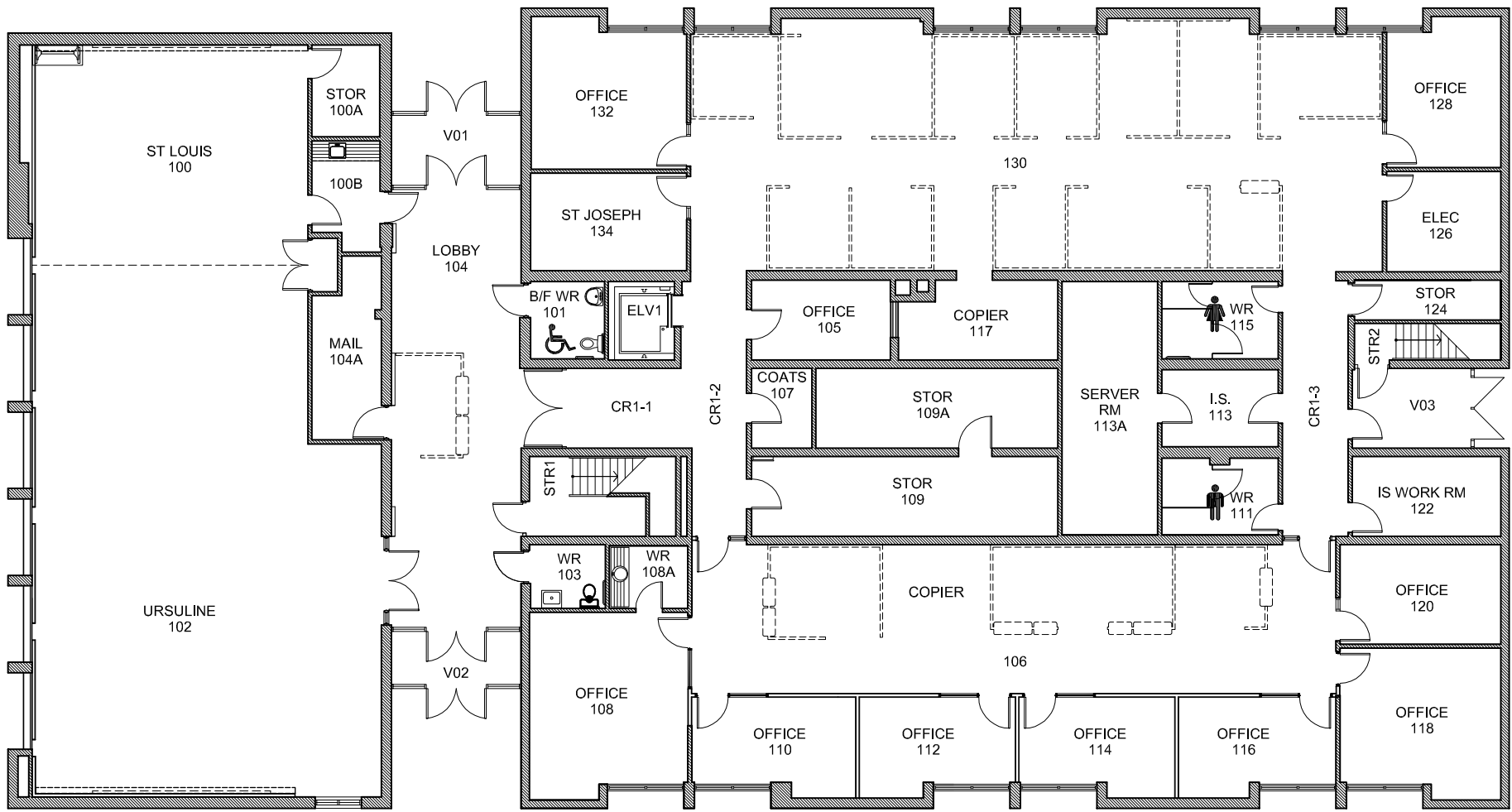
Respectfully submitted,

OH Solutions Inc.

A handwritten signature in black ink, appearing to read 'K. Olson', with a long horizontal stroke extending to the right.

Kris Olson, P.Eng., CIH
Senior Project Manager

APPENDIX I
DRAWINGS

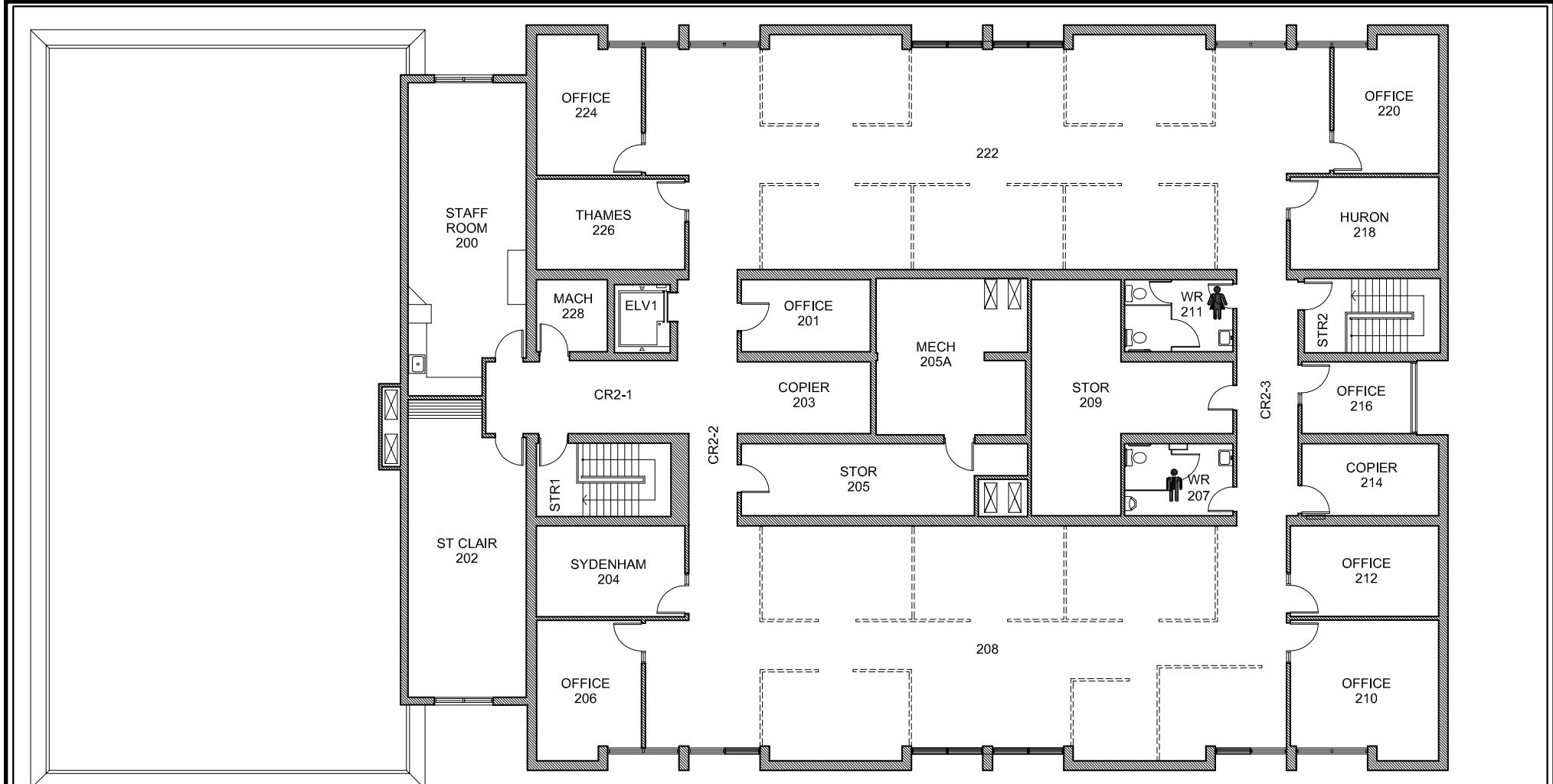


Occupational Hygiene Solutions
 119 Thames Street South
 Ingersoll, Ontario
 N5C 2T3

OH SOLUTIONS

St. Clair Catholic School Board
 Catholic Education
 Centre, Wallaceburg
 Main Floor

Project: 19-1713	Prepared by: JE
Scale: N.T.S.	Date: Sept 2019



Occupational Hygiene Solutions
 119 Thames Street South
 Ingersoll, Ontario
 N5C 2T3

**St. Clair Catholic School Board
 Catholic Education
 Centre, Wallaceburg**

Second Floor

Project: 19-1713	Prepared by: JE
Scale: N.T.S.	Date: Sept 2019

ROOFTOP UNIT AND VVT SYSTEM REPLACEMENT

CATHOLIC EDUCATION CENTRE
WALLACEBURG, ONTARIO



ST. CLAIR CATHOLIC
DISTRICT SCHOOL BOARD
Lighting the Way ~ Rejoicing in Our Journey

ST. CLAIR CATHOLIC DISTRICT SCHOOL BOARD

ISSUED FOR BID
11 MARCH 2020



201 QUEENS AVE., UNIT 800
LONDON ON, N6A 1J1

250 CITY CENTRE AVE., SUITE 403
OTTAWA ON, K1R 6K7



201 QUEENS AVE., UNIT 800
LONDON ON, N6A 1J1

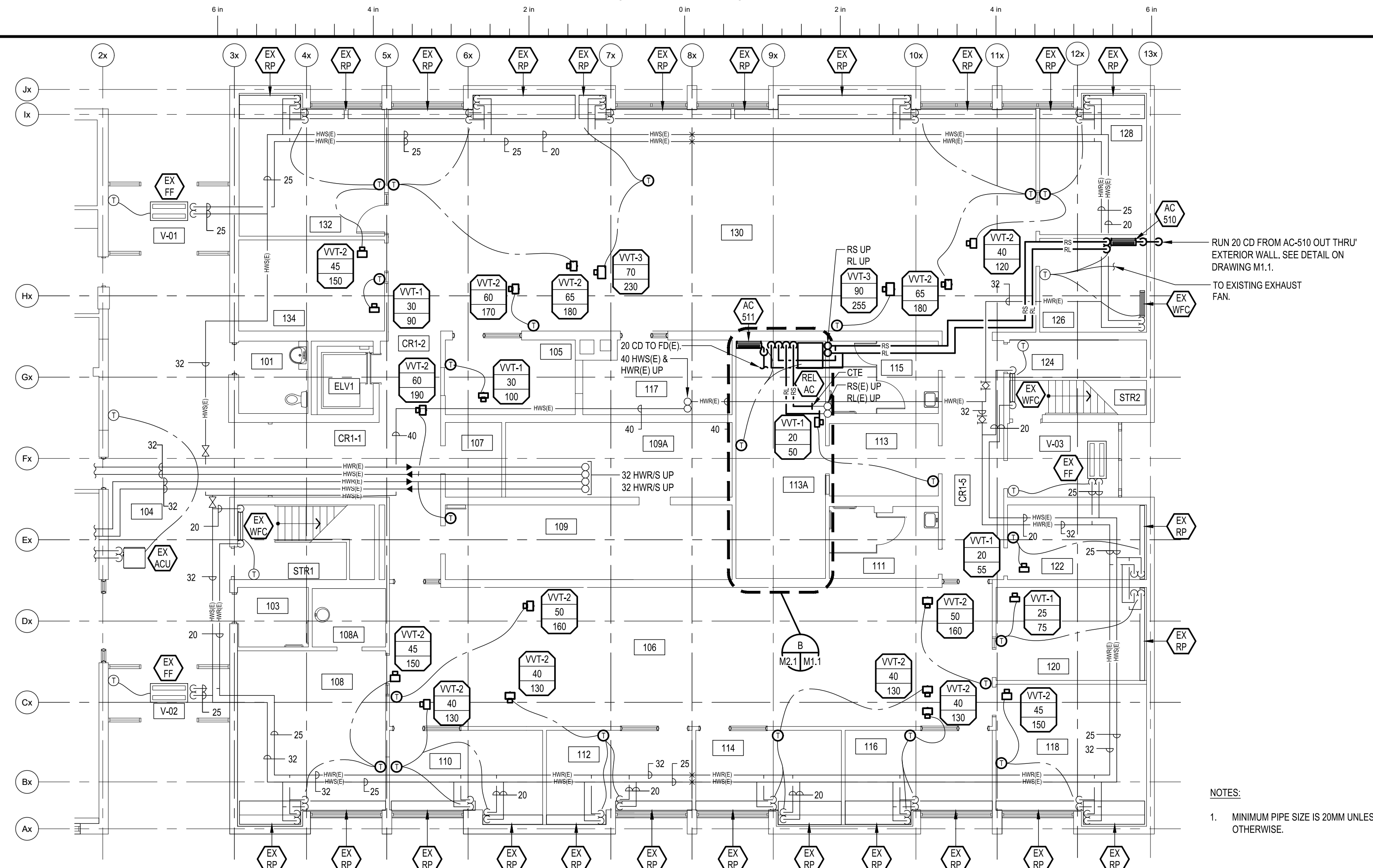
250 CITY CENTRE AVE., SUITE 403
OTTAWA ON, K1R 6K7

MECHANICAL DRAWINGS

- M1.1 MECHANICAL LEGEND, ABBREVIATIONS AND SCHEDULES
- M2.1 GROUND AND SECOND FLOOR PLANS HEATING
- M3.1 GROUND AND SECOND FLOOR PLANS AIR DISTRIBUTION
- M4.1 ROOF PLAN MECHANICAL
- M5.1 GROUND AND SECOND FLOOR PLANS HEATING DEMOLITION
- M5.2 GROUND AND SECOND FLOOR PLANS AIR DISTRIBUTION DEMOLITION
- M5.3 ROOF PLAN MECHANICAL DEMOLITION

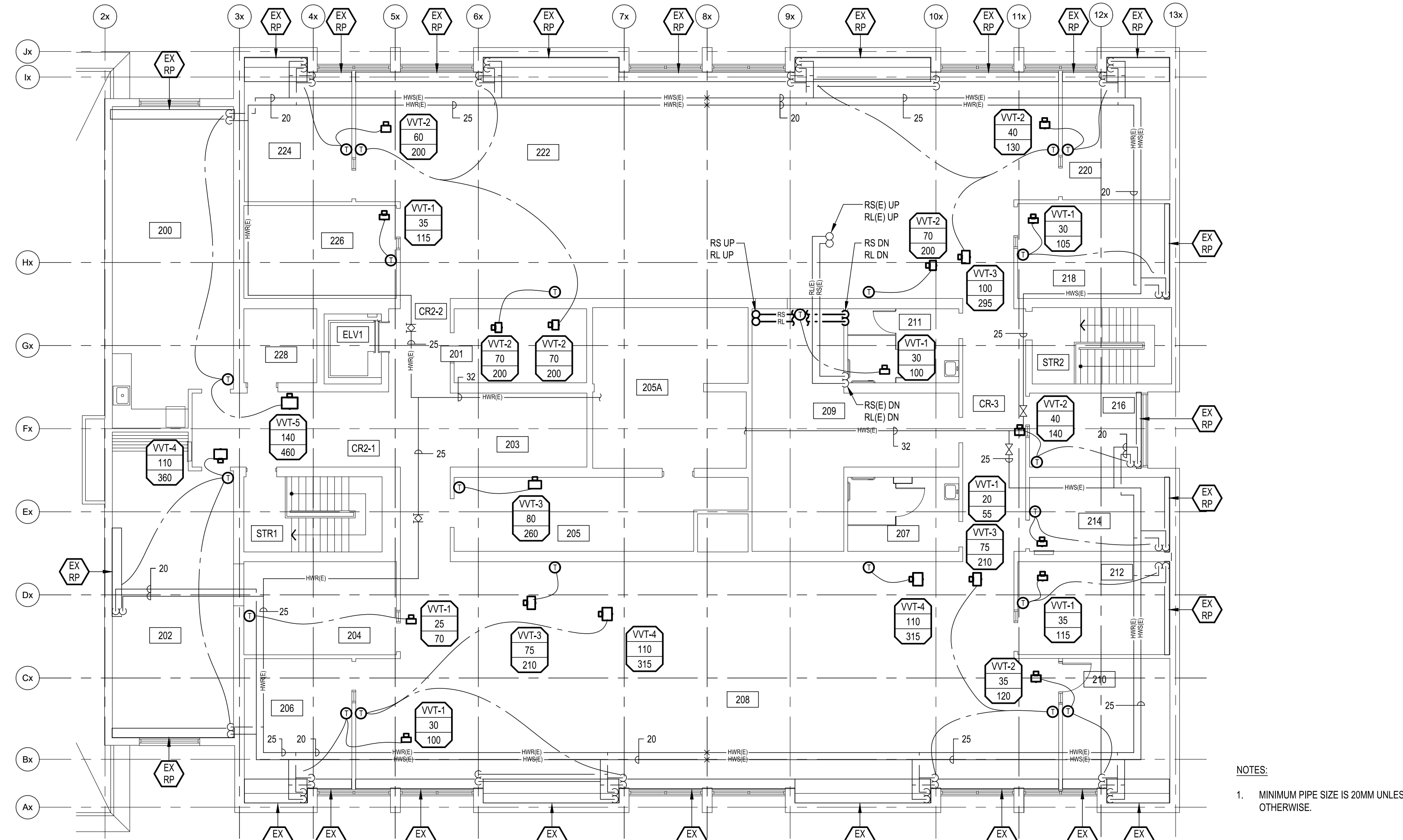
ELECTRICAL DRAWINGS

- E1.1 ELECTRICAL LEGEND, DRAWING LIST, SCHEDULES AND DETAILS
- E2.1 GROUND AND SECOND FLOOR PLANS AND ROOF PLANS - ELECTRICAL



GROUND FLOOR PLAN - HEATING
SCALE: 1:100

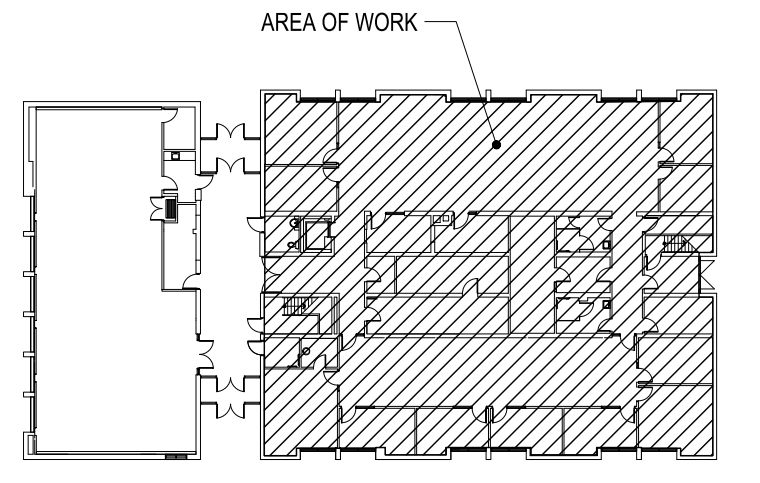
NOTES:
1. MINIMUM PIPE SIZE IS 20MM UNLESS NOTED OTHERWISE.



SECOND FLOOR PLAN - HEATING
SCALE: 1:100

NOTES:
1. MINIMUM PIPE SIZE IS 20MM UNLESS NOTED OTHERWISE.

FILE NAME: R:\PROJECTS\2020\11-MAR-2020\6.53 AM
 DATE PLOTTED: 11-MAR-2020 8:53 AM
 DATE PLOTTED: 11-MAR-2020 8:53 AM



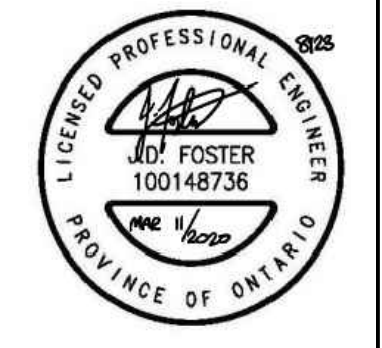
KEY PLAN
N.T.S.

No.	By	Revisions	Date
1	JDF	ISSUED FOR OWNER REVIEW	05 FEB 2020
2	JDF	ISSUED FOR OWNER REVIEW	06 MAR 2020
3	JDF	ISSUED FOR BID	11 MAR 2020

A	DETAIL NO.
B	DWG NO. - WHERE REQUIRED
C	DWG NO. - WHERE DETAILED

DO NOT SCALE THE DRAWINGS. ALL MEASUREMENTS ARE TO BE CHECKED AND VERIFIED ON SITE BY THE CONTRACTOR. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT BEFORE PROCEEDING WITH THE WORK.

COPYRIGHT © ALL RIGHTS RESERVED. ALL DRAWINGS AND RELATED DOCUMENTS ARE THE COPYRIGHT OF THE CONSULTANT AND MUST BE RETURNED UPON REQUEST OR AT THE COMPLETION OF THE WORK. REPRODUCTION OF THESE DRAWINGS OR RELATED DOCUMENTS IN PART OR IN WHOLE, BY ELECTRONIC OR MECHANICAL MEANS, IS FORBIDDEN BY LAW WITHOUT THE PRIOR WRITTEN PERMISSION OF THE CONSULTANT.



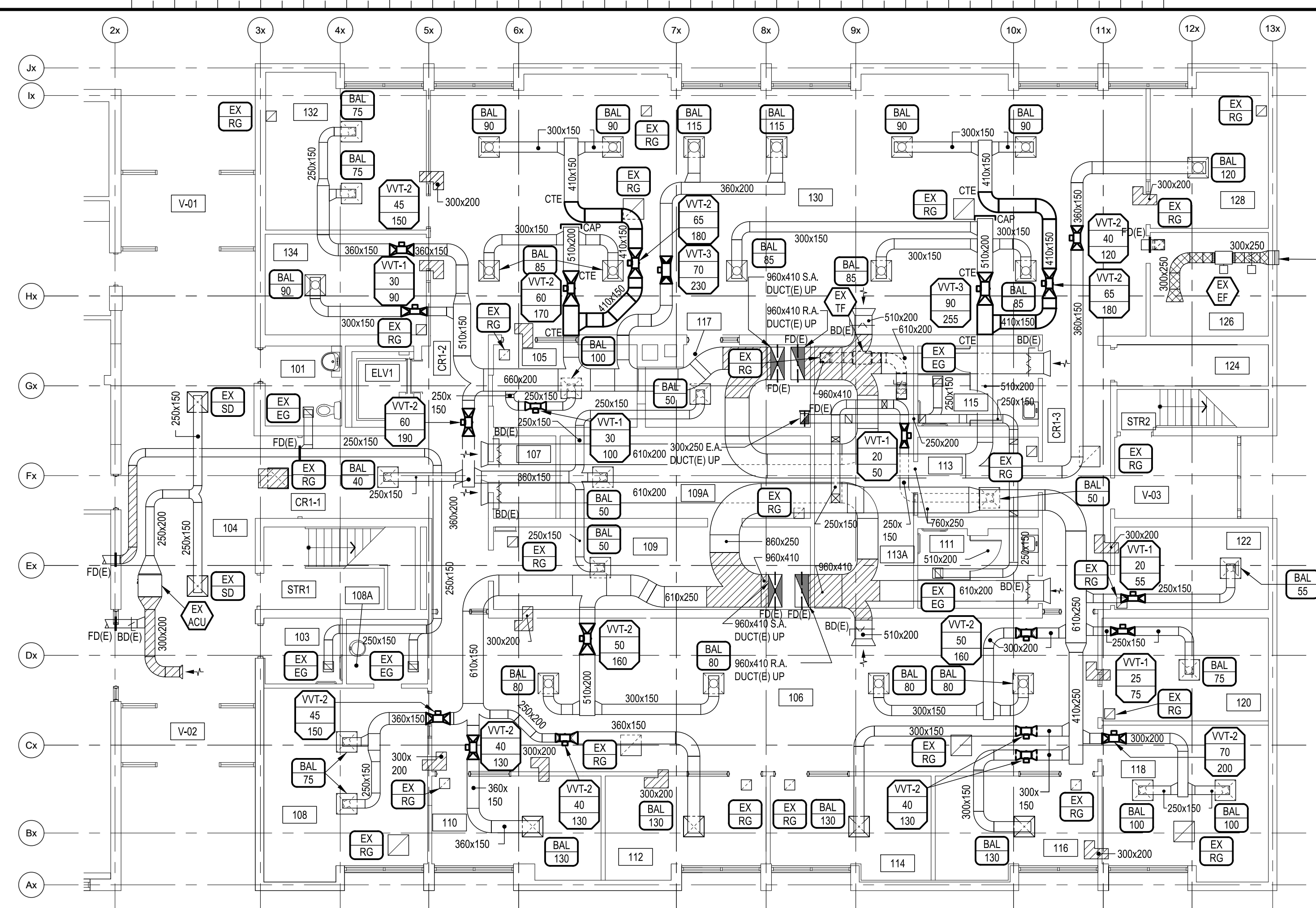
Chorley+Bisset
CONSULTING ENGINEERS
201 QUEENS AVE., UNIT 800 LONDON ON, N6A 1J1
250 CITY CENTRE AVE., SUITE 403 OTTAWA ON, K1R 6K7

Project Title
ROOFTOP UNIT AND VVT SYSTEM REPLACEMENT

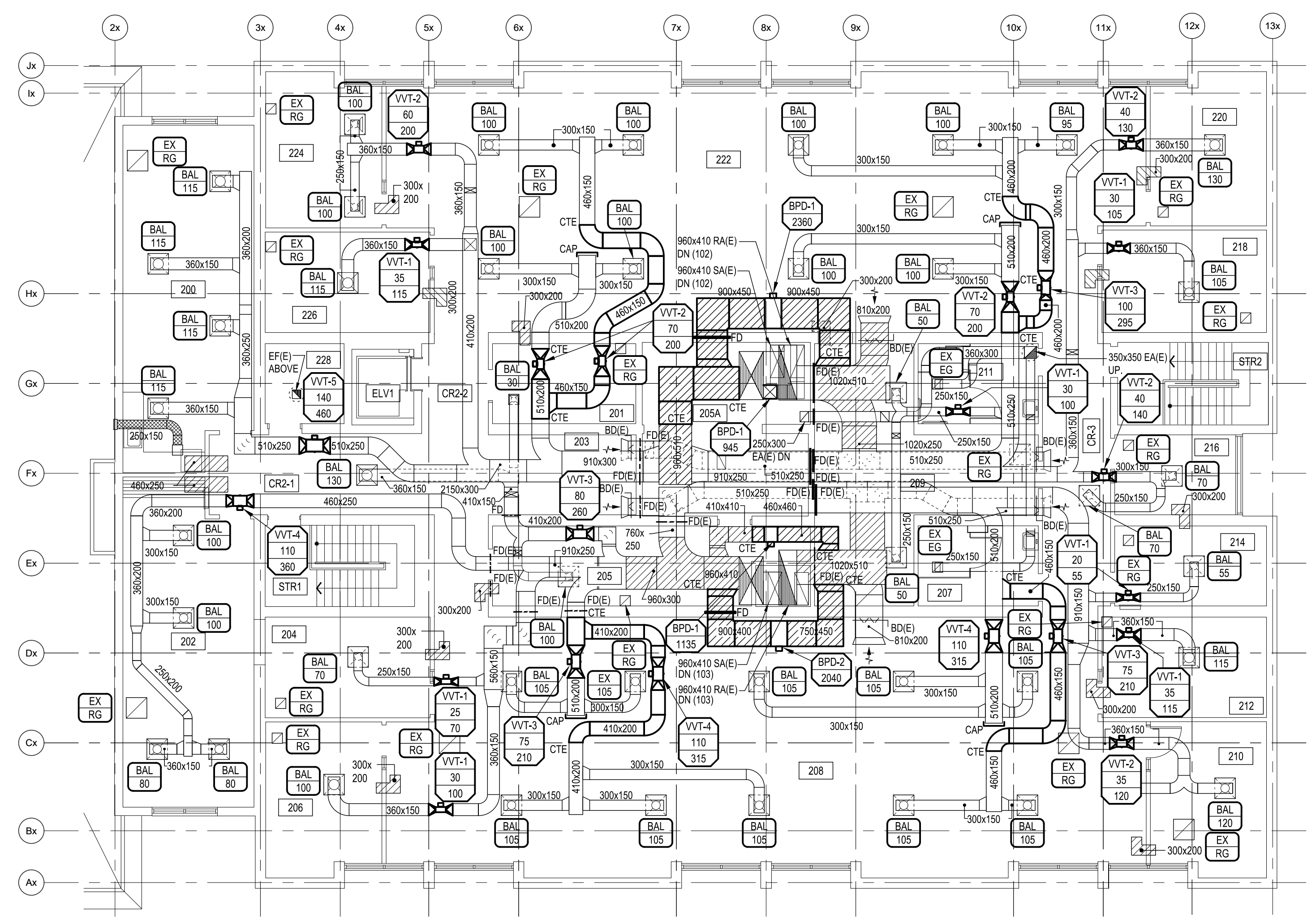
CATHOLIC EDUCATION CENTRE SCDSB
WALLACEBURG, ONTARIO

Drawing Title
GROUND AND SECOND FLOOR PLANS HEATING

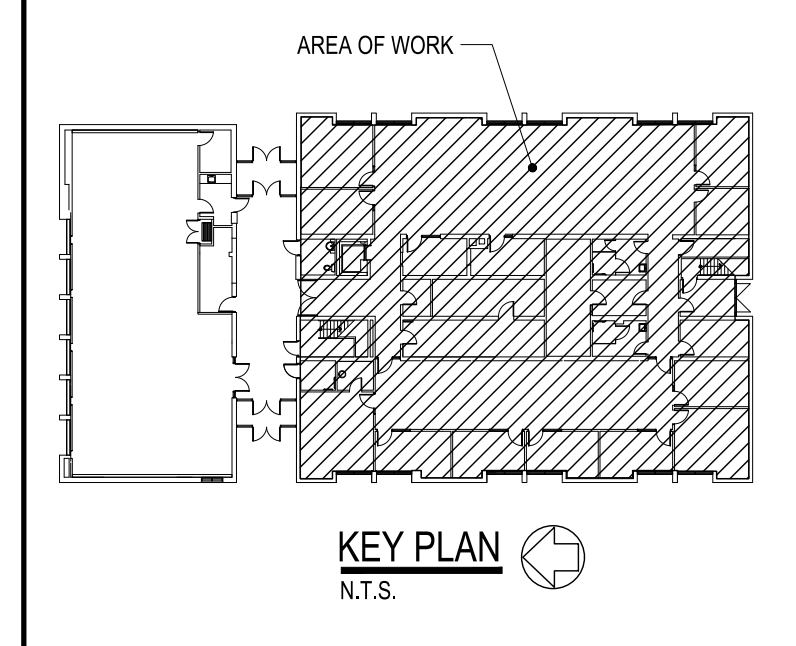
Drawn DAC	Checked JDF	Approved JDF	Drawing No. M2.1
Scale AS NOTED	Date MARCH 2020	Project No. 8923	Rev. No.



GROUND FLOOR PLAN - AIR DISTRIBUTION
SCALE: 1:100



SECOND FLOOR PLAN - AIR DISTRIBUTION
SCALE: 1:100



No.	By	Revisions	Date
1	JDF	ISSUED FOR OWNER REVIEW	05 FEB 2020
2	JDF	ISSUED FOR OWNER REVIEW	06 MAR 2020
3	JDF	ISSUED FOR BID	11 MAR 2020

NOTES:

1. MODIFY DUCTWORK WHERE NECESSARY TO SUIT INSTALLATION OF NEW VVT DAMPERS AND CONNECT TO EXISTING DUCTWORK. (TYPICAL).

A B C	A	DETAIL NO.
	B	DWG NO. - WHERE REQUIRED
	C	DWG NO. - WHERE DETAILED

DO NOT SCALE THE DRAWINGS. ALL MEASUREMENTS ARE TO BE CHECKED AND VERIFIED ON SITE BY THE CONTRACTOR. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT BEFORE PROCEEDING WITH THE WORK.

COPYRIGHT © ALL RIGHTS RESERVED. ALL DRAWINGS AND RELATED DOCUMENTS ARE THE COPYRIGHT OF THE CONSULTANT AND MUST BE RETURNED UPON REQUEST OR AT THE COMPLETION OF THE WORK. REPRODUCTION OF THESE DRAWINGS OR RELATED DOCUMENTS IN PART OR IN WHOLE, BY ELECTRONIC OR MECHANICAL MEANS, IS FORBIDDEN BY LAW WITHOUT THE PRIOR WRITTEN PERMISSION OF THE CONSULTANT.



Chorley+Bisset
CONSULTING ENGINEERS
chorley.com

201 QUEENS AVE., UNIT 800 LONDON ON, N6A 1J1
250 CITY CENTRE AVE., SUITE 403 OTTAWA ON, K1R 6K7

Project Title
ROOFTOP UNIT AND VVT SYSTEM REPLACEMENT

CATHOLIC EDUCATION CENTRE SCDSB
WALLACEBURG, ONTARIO

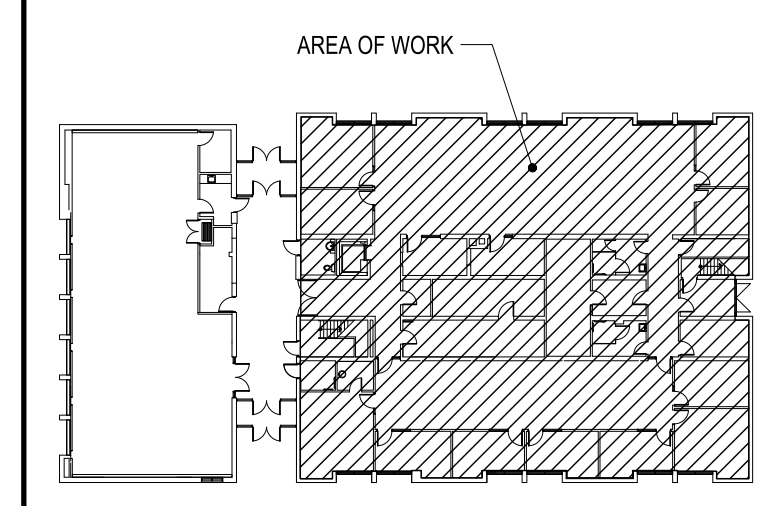
Drawing Title
GROUND AND SECOND FLOOR PLANS AIR DISTRIBUTION

NOTES:

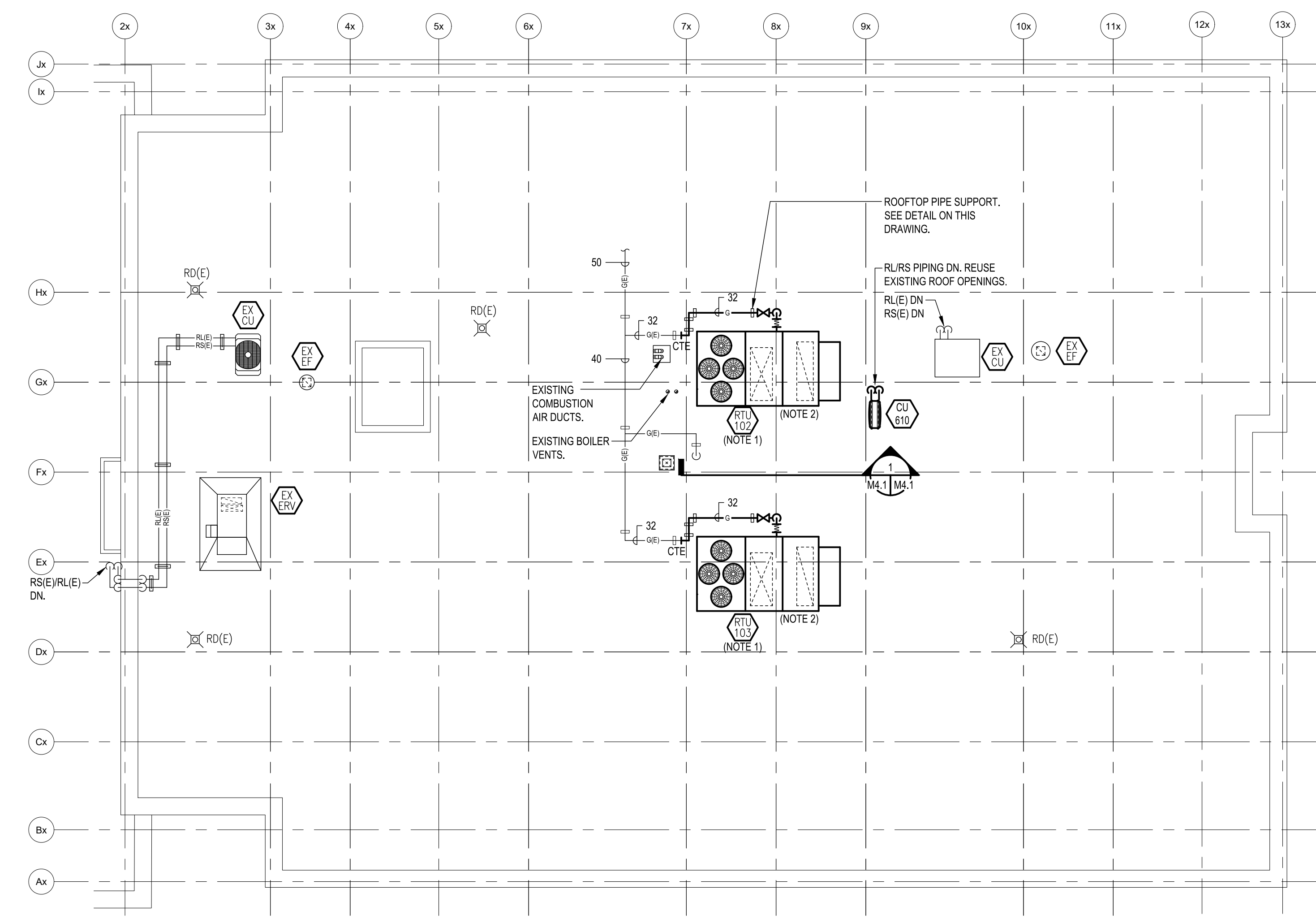
1. MODIFY DUCTWORK WHERE NECESSARY TO SUIT INSTALLATION OF NEW VVT DAMPERS AND CONNECT TO EXISTING DUCTWORK. (TYPICAL).

Drawn DAC	Checked JDF	Approved JDF	Drawing No. M3.1
Scale AS NOTED	Date MARCH 2020	Project No. 8923	Rev. No.

REVISED: JDF
DATE SHOWN: 10-MAR-2020 11:08 AM
DATE PLOTTED: 11-MAR-2020 8:57 AM



KEY PLAN
 N.T.S.

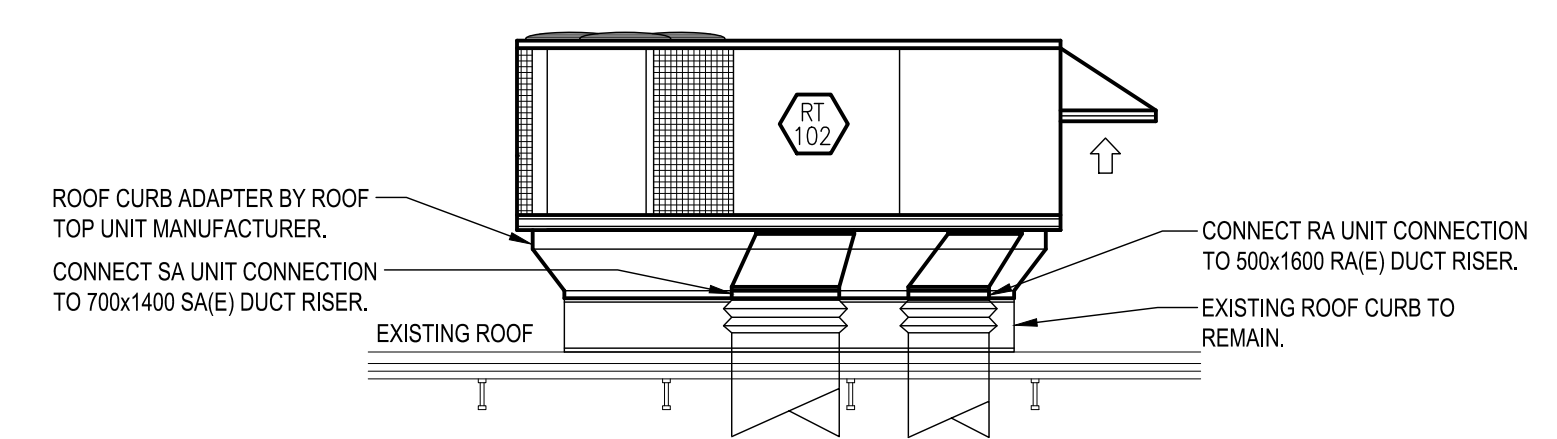


No.	By	Revisions	Date
1	JDF	ISSUED FOR OWNER REVIEW	05 FEB 2020
2	JDF	ISSUED FOR OWNER REVIEW	06 MAR 2020
3	JDF	ISSUED FOR BID	11 MAR 2020

ROOF PLAN MECHANICAL
 SCALE 1:100

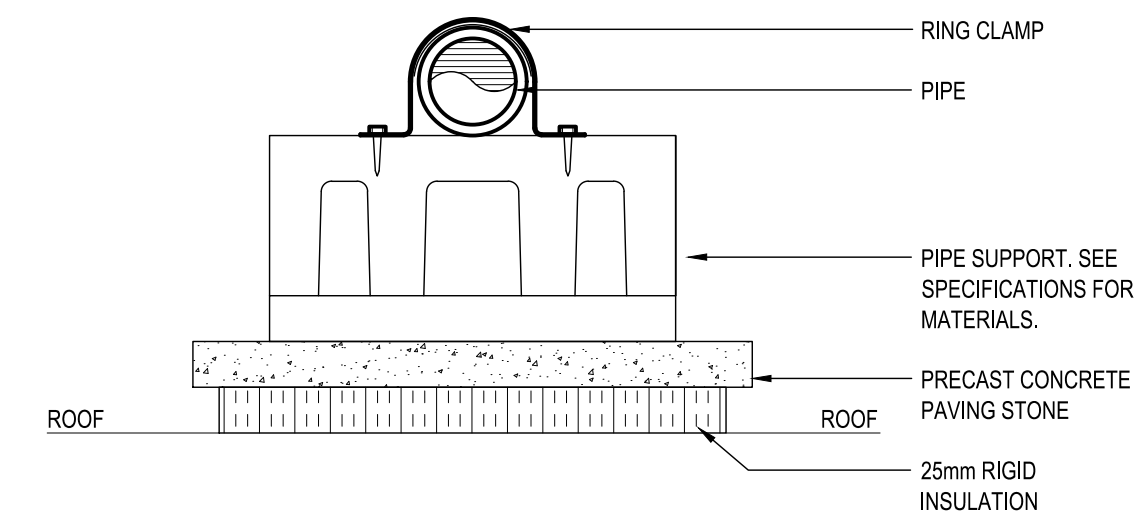
NOTES:

1. INSTALL NEW RTU-102 & RTU-103 ON ROOF CURB ADAPTERS SUPPLIED BY UNIT MANUFACTURER.
2. CONNECT EXISTING SA AND EXISTING RA DUCT RISERS TO NEW UNIT CONNECTIONS. SEE SECTION ON THIS DRAWING.



SECTION
 SCALE 1:50
 M4.1 M4.1

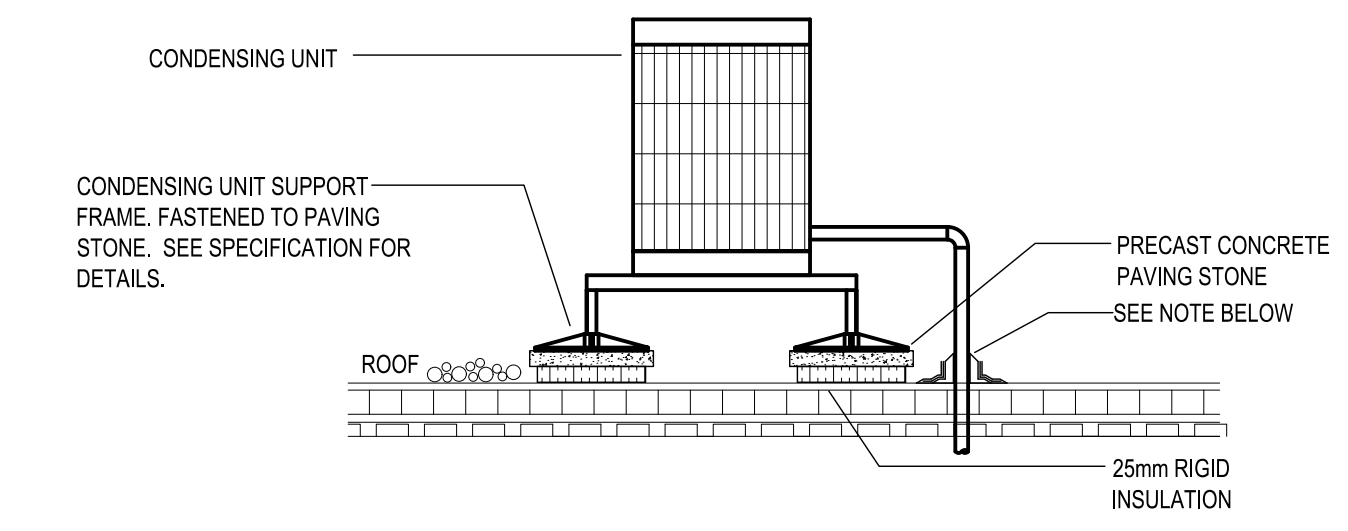
- NOTES:**
1. ROOF TOP UNIT RTU-103 IS SIMILAR.



ROOFTOP PIPE SUPPORT DETAIL
 N.T.S.

NOTE:

1. PROVIDE ROOFTOP SUPPORT FOR PIPING AT EACH CHANGE IN DIRECTION AND ON MAX 3M CENTRES.
2. PROVIDE HEIGHT EXTENSION, BLOCK EXTENSION RODS, PIPE ROLLERS, SECURING BRACKET ACCESSORIES AS REQUIRED TO SUIT INSTALLATION.



STAND MOUNTED CONDENSING UNIT INSTALLATION DETAIL
 N.T.S.

- NOTE:**
- USE PORTALS PLUS INC. ALUMI-FLASH SYSTEM.

A	DETAIL NO.
B	DWG. NO. - WHERE REQUIRED
C	DWG. NO. - WHERE DETAILED

DO NOT SCALE THE DRAWINGS. ALL MEASUREMENTS ARE TO BE CHECKED AND VERIFIED ON SITE BY THE CONTRACTOR. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT BEFORE PROCEEDING WITH THE WORK.

COPYRIGHT © ALL RIGHTS RESERVED. ALL DRAWINGS AND RELATED DOCUMENTS ARE THE COPYRIGHT OF THE CONSULTANT AND MUST BE RETURNED UPON REQUEST OR AT THE COMPLETION OF THE WORK. REPRODUCTION OF THESE DRAWINGS OR RELATED DOCUMENTS IN PART OR IN WHOLE, BY ELECTRONIC OR MECHANICAL MEANS, IS FORBIDDEN BY LAW WITHOUT THE PRIOR WRITTEN PERMISSION OF THE CONSULTANT



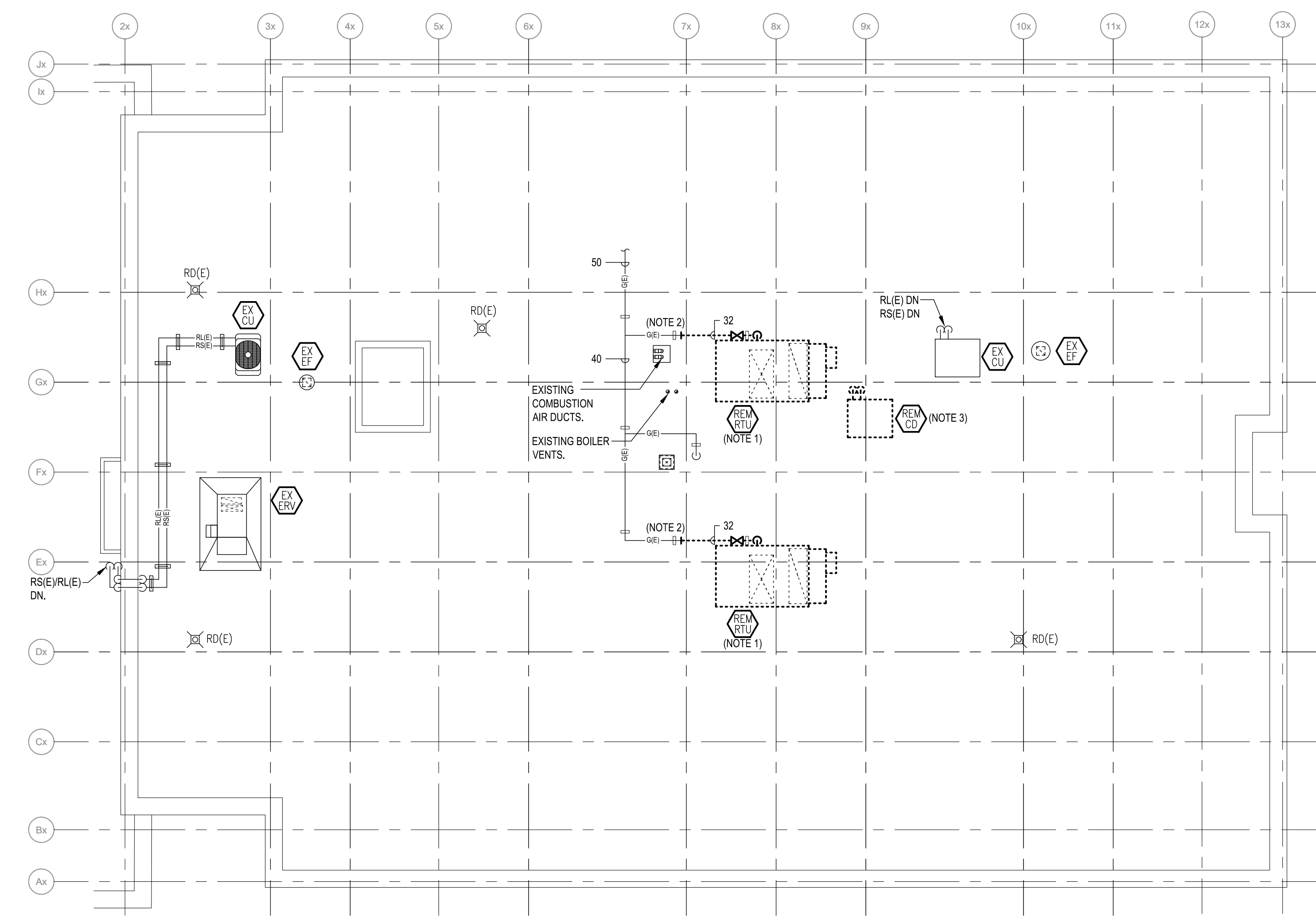
Chorley+Bisset
 CONSULTING ENGINEERS
 201 QUEENS AVE., UNIT 800 LONDON ON, N6A 1J1
 250 CITY CENTRE AVE., SUITE 403 OTTAWA ON, K1R 6K7
 chorley.com

Project Title
ROOFTOP UNIT AND VVT SYSTEM REPLACEMENT

CATHOLIC EDUCATION CENTRE SCDSB
 WALLACEBURG, ONTARIO

Drawing Title
ROOF PLAN MECHANICAL

Drawn DAC	Checked JDF	Approved JDF	Drawing No. M4.1
Scale AS NOTED	Date MARCH 2020	Project No. 8823	Rev. No.

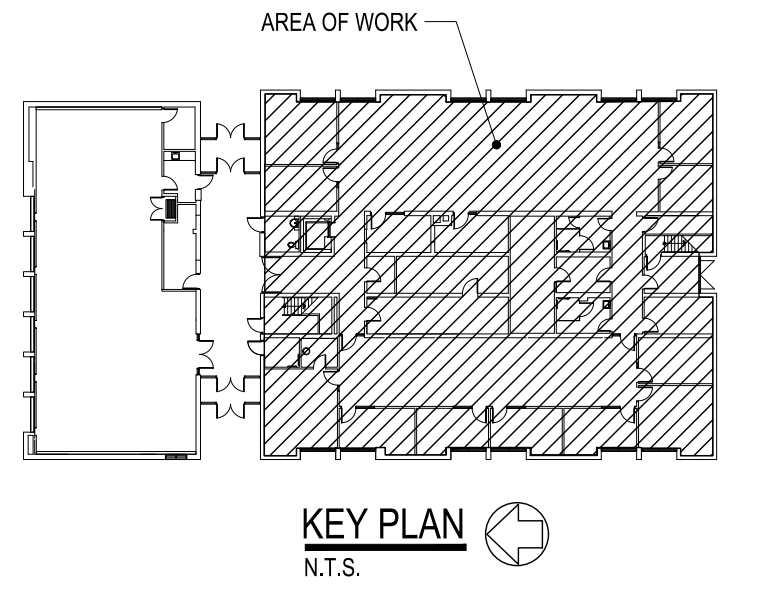


**ROOF PLAN
 MECHANICAL DEMOLITION**

SCALE 1:100

NOTES:

1. DISCONNECT SA(E)/RA(E) UNIT CONNECTIONS AND REMOVE EXISTING ROOFTOP UNIT, ASSOCIATED CONTROLS, WIRING, AND ALL ACCESSORIES. EXISTING ROOF CURB TO REMAIN.
2. CUT BACK G(E) AND REMOVE REDUNDANT PIPING.
3. REMOVE EXISTING CONDENSING UNIT, ASSOCIATED CONTROLS, SUPPORTS, COMPONENTS AND ALL ACCESSORIES. CUT BACK RL(E)/RS(E) AND REMOVE REDUNDANT PIPING.

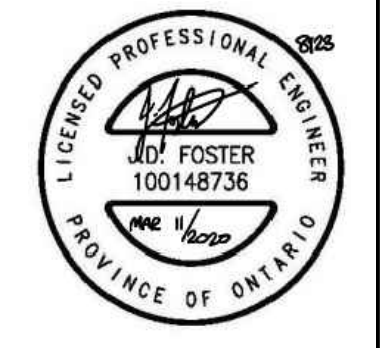


No.	By	Revisions	Date
1	JDF	ISSUED FOR OWNER REVIEW	05 FEB 2020
2	JDF	ISSUED FOR OWNER REVIEW	06 MAR 2020
3	JDF	ISSUED FOR BID	11 MAR 2020

A	DETAIL NO.
B	DWG. NO. - WHERE REQUIRED
C	DWG. NO. - WHERE DETAILED

DO NOT SCALE THE DRAWINGS. ALL MEASUREMENTS ARE TO BE CHECKED AND VERIFIED ON SITE BY THE CONTRACTOR. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT BEFORE PROCEEDING WITH THE WORK.

COPYRIGHT © ALL RIGHTS RESERVED. ALL DRAWINGS AND RELATED DOCUMENTS ARE THE COPYRIGHT OF THE CONSULTANT AND MUST BE RETURNED UPON REQUEST OR AT THE COMPLETION OF THE WORK. REPRODUCTION OF THESE DRAWINGS OR RELATED DOCUMENTS IN PART OR IN WHOLE, BY ELECTRONIC OR MECHANICAL MEANS, IS FORBIDDEN BY LAW WITHOUT THE PRIOR WRITTEN PERMISSION OF THE CONSULTANT.



Chorley+Bisset
 CONSULTING ENGINEERS
 201 QUEENS AVE., UNIT 800 LONDON ON, N6A 1J1
 250 CITY CENTRE AVE., SUITE 403 OTTAWA ON, K1R 6K7

Project Title
**ROOFTOP UNIT AND VVT SYSTEM
 REPLACEMENT**

**CATHOLIC EDUCATION CENTRE
 SCCDSB**
 WALLACEBURG, ONTARIO

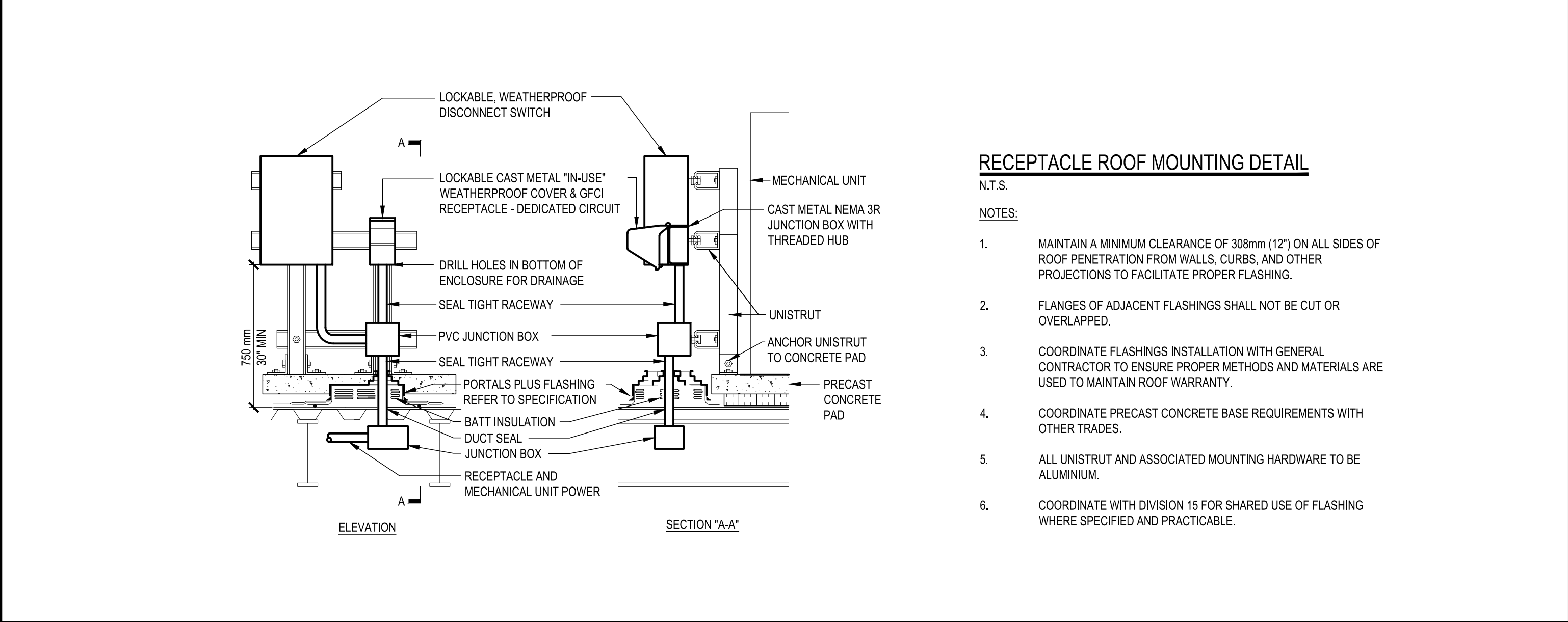
Drawing Title
**ROOF PLAN MECHANICAL
 DEMOLITION**

Drawn DAC	Checked JDF	Approved JDF	Drawing No. M5.3
Scale AS NOTED	Date MARCH 2020	Project No. 8823	Rev. No.

MECHANICAL EQUIPMENT SCHEDULE												
EQUIPMENT SUPPLIED AND INSTALLED BY DIVISION 15, WIRED BY DIVISION 16						CONTROL EQUIPMENT SUPPLIED AND INSTALLED BY DIVISION 16				NOTES		
ITEM	DESCRIPTION	LOCATION	hp	MCA	PHASE	VOLTS	STARTER/CONTROL TYPE	FED FROM	BREAKER SIZE			
ROOFTOP UNITS												
RTU-102	ROOF TOP UNIT	ROOF		35.8	3	600	DS, WP	PANEL 'DP-1'	40 (EX)	3	3#8	27mm
RTU-103	ROOF TOP UNIT	ROOF		42.1	3	600	DS, WP	PANEL 'DP-1'	50 (EX)	3	3#8	27mm
INDOOR UNIT												
AC-510	AIR CONDITIONING UNIT	ELECTRICAL ROOM 122		0.6	1	208	DS	PANEL 'LP-B'	15	2	2#12	21mm
AC-511	AIR CONDITIONING UNIT	SERVER ROOM 117A		0.6	1	208	DS	PANEL 'LP-B'	15	2	2#12	21mm
OUTDOOR UNIT												
CU-610	CONDENSING UNIT	WALL MOUNTED (EXTERIOR)		28.1	1	208	DS, WP	PANEL 'LP-B'	30	2	2#10	21mm

NOTES:
 1. DIVISION 16 TO OBTAIN COPIES OF MECHANICAL EQUIPMENT SHOP DRAWINGS AND COORDINATE ELECTRICAL SERVICES.
 2. PROVIDE LOCAL NON-FUSED DISCONNECT SWITCHES AT MOTORS IN ACCORDANCE WITH SECTION 28-604 OF THE ONTARIO ELECTRICAL SAFETY CODE.
 3. UNLESS INDICATED OTHERWISE ALL CONTROL WIRING IS BY DIVISION 15.

MOTOR CONTROL ABBREVIATIONS		
DS	UN-FUSED DISCONNECT SWITCH	MCA MINIMUM CIRCUIT AMPACITY



- RECEPTACLE ROOF MOUNTING DETAIL**
 N.T.S.
- NOTES:
1. MAINTAIN A MINIMUM CLEARANCE OF 308mm (12") ON ALL SIDES OF ROOF PENETRATION FROM WALLS, CURBS, AND OTHER PROJECTIONS TO FACILITATE PROPER FLASHING.
 2. FLANGES OF ADJACENT FLASHINGS SHALL NOT BE CUT OR OVERLAPPED.
 3. COORDINATE FLASHINGS INSTALLATION WITH GENERAL CONTRACTOR TO ENSURE PROPER METHODS AND MATERIALS ARE USED TO MAINTAIN ROOF WARRANTY.
 4. COORDINATE PRECAST CONCRETE BASE REQUIREMENTS WITH OTHER TRADES.
 5. ALL UNISTRUT AND ASSOCIATED MOUNTING HARDWARE TO BE ALUMINIUM.
 6. COORDINATE WITH DIVISION 15 FOR SHARED USE OF FLASHING WHERE SPECIFIED AND PRACTICABLE.

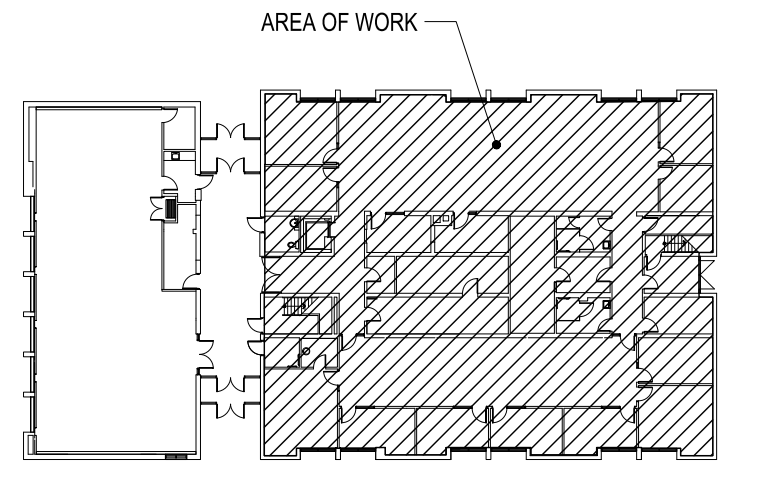
- ELECTRICAL GENERAL NOTES**
1. REMOVE, PROTECT AND REINSTALL IN THE SAME OR NEW LOCATION ON NEW SURFACES ALL EXISTING ELECTRICAL EQUIPMENT THAT WILL BE REUSED. EQUIPMENT IDENTIFIED FOR REUSE THAT IS LOST OR DAMAGED MUST BE REPLACED AT NO COST TO THE OWNER.
 2. CONCEAL ALL CONDUITS AND BOXES IN EXISTING WALLS WHERE POSSIBLE. PROVIDE V500700 SERIES SURFACE RACEWAY FOR NEW DEVICES ON EXISTING WALLS THAT CANNOT HAVE CONCEALED SERVICES. PROVIDE APPROPRIATE SURFACE RACEWAY DEVICE BOXES.

ABBREVIATIONS

EX	EXISTING TO REMAIN
GFCI	GROUND FAULT DEVICE
P	POLE
REL	IF DASHED - EXISTING TO BE RELOCATED
REL	IF SOLID - EXISTING IN NEW LOCATION
REM	EXISTING TO BE REMOVED
WP	WEATHERPROOF

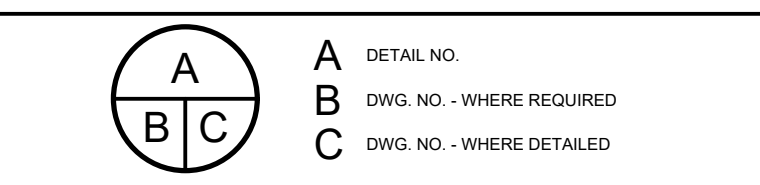
ELECTRICAL LEGEND

SYMBOL	DESCRIPTION	MOUNTING
	DUCT SMOKE DETECTOR	EXISTING
	FIRE ALARM CONTROL PANEL	EXISTING
	15/20 AMP 120 VOLT 3 WIRE GROUNDED DUPLEX RECEPTACLE CSA 5-20R	460mm (18") A.F.F.
	MOTOR	
	ELECTRICAL PANEL	SEE PANEL SCHEDULE



KEY PLAN
 N.T.S.

No.	By	Revisions	Date
1	JDF	ISSUED FOR OWNER REVIEW	05 FEB 2020
2	JDF	ISSUED FOR OWNER REVIEW	06 MAR 2020
3	JDF	ISSUED FOR BID	11 MAR 2020



DO NOT SCALE THE DRAWINGS. ALL MEASUREMENTS ARE TO BE CHECKED AND VERIFIED ON SITE BY THE CONTRACTOR. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT BEFORE PROCEEDING WITH THE WORK.

COPYRIGHT © ALL RIGHTS RESERVED. ALL DRAWINGS AND RELATED DOCUMENTS ARE THE COPYRIGHT OF THE CONSULTANT AND MUST BE RETURNED UPON REQUEST OR AT THE COMPLETION OF THE WORK. REPRODUCTION OF THESE DRAWINGS OR RELATED DOCUMENTS IN PART OR IN WHOLE, BY ELECTRONIC OR MECHANICAL MEANS, IS FORBIDDEN BY LAW WITHOUT THE PRIOR WRITTEN PERMISSION OF THE CONSULTANT.



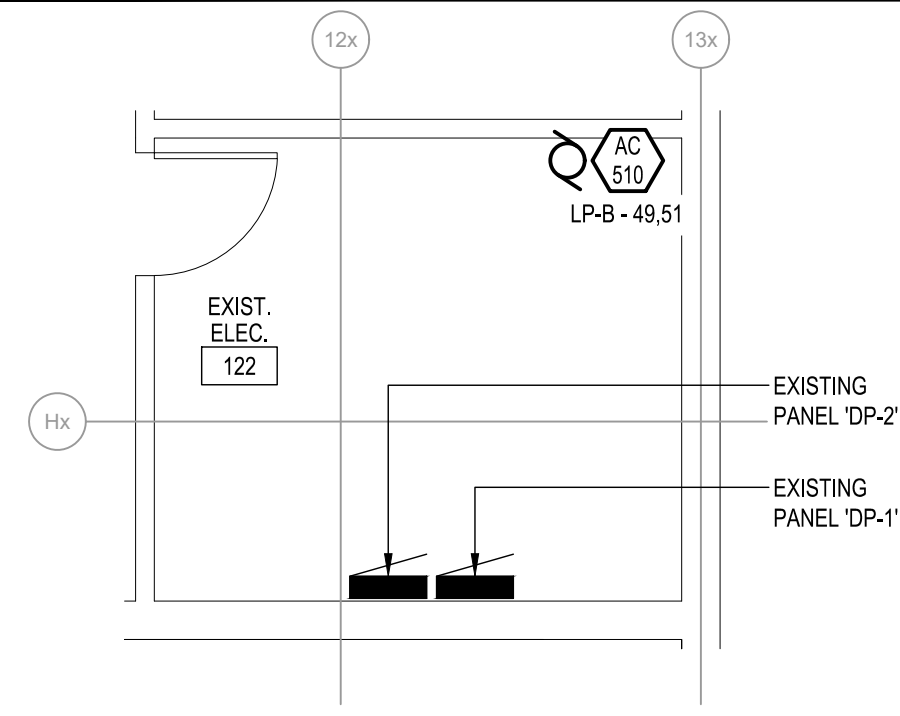
Chorley+Bisset
 CONSULTING ENGINEERS
 201 QUEENS AVE., UNIT 800 LONDON ON, N6A 1J1 | 250 CITY CENTRE AVE., SUITE 403 OTTAWA ON, K1R 6K7

Project Title
ROOFTOP UNIT AND VVT SYSTEM REPLACEMENT

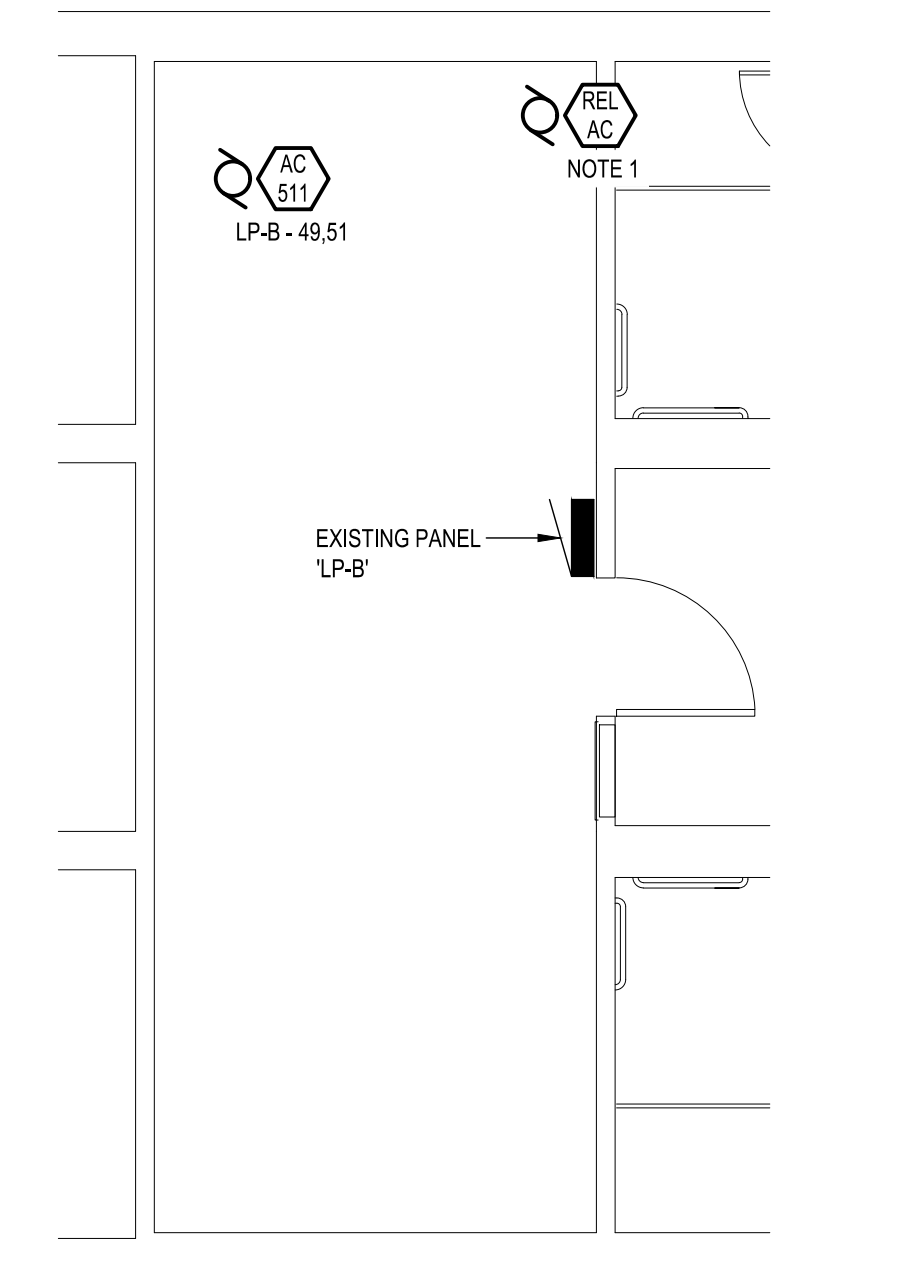
CATHOLIC EDUCATION CENTRE SCDSB
 WALLACEBURG, ONTARIO

Drawing Title
ELECTRICAL LEGEND, DRAWING LIST, SCHEDULES AND DETAILS

Drawn ZJRL	Checked ZJRL	Approved MFM	Drawing No. E1.1
Scale AS NOTED	Date MAR 2020	Project No. 8923	Rev. No.

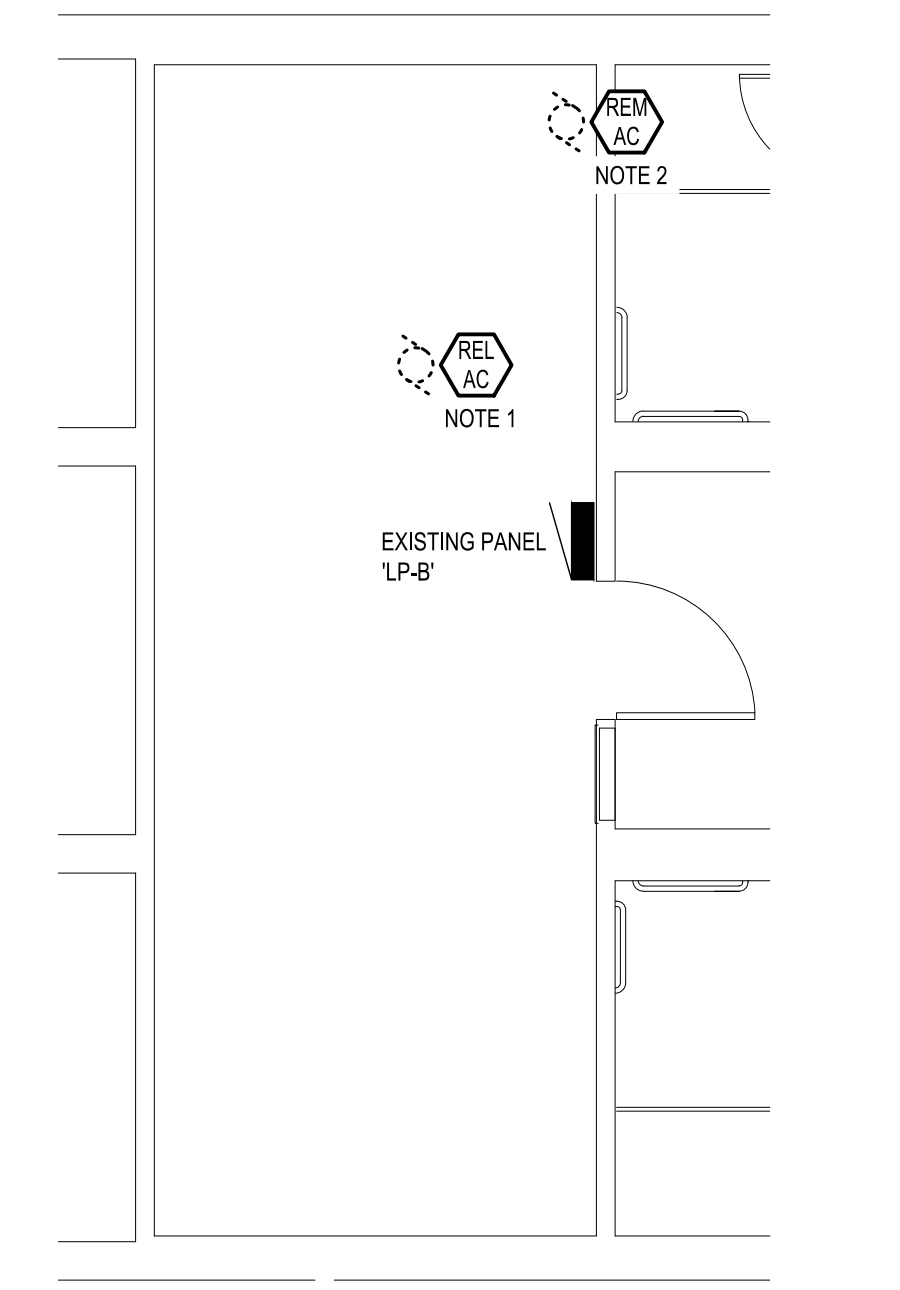


ELECTRICAL ROOM DETAIL
SCALE: 1:50



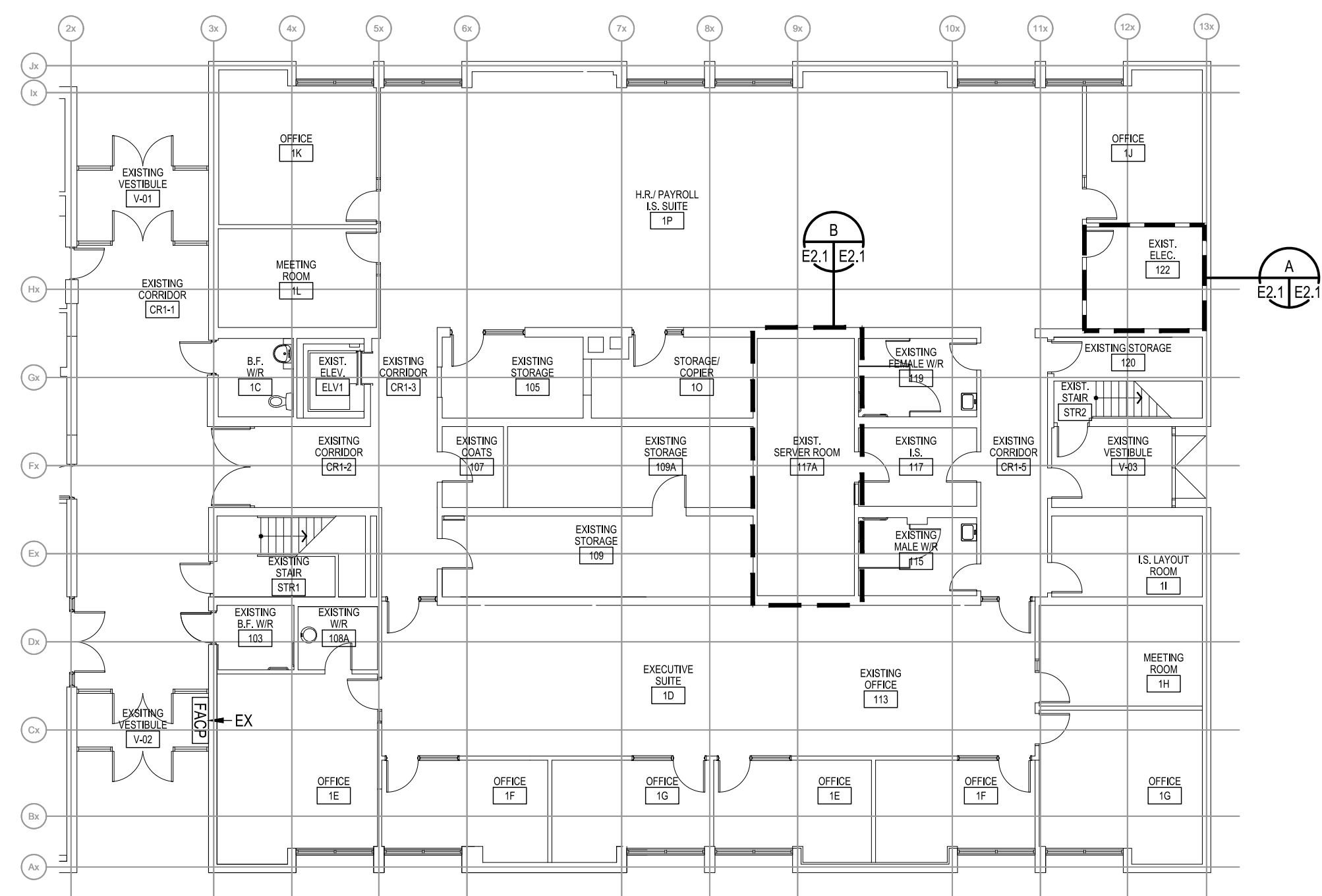
SERVER ROOM DETAIL
SCALE: 1:50

- NOTES:
1. RELOCATE EXISTING DISCONNECT SWITCH TO AC UNIT IN NEW LOCATION. REWORK EXISTING WIRING AND CONDUIT TO AC UNIT IN NEW LOCATION. PROVIDE NEW FLEX CONDUCTORS FROM DISCONNECT TO AC UNIT.



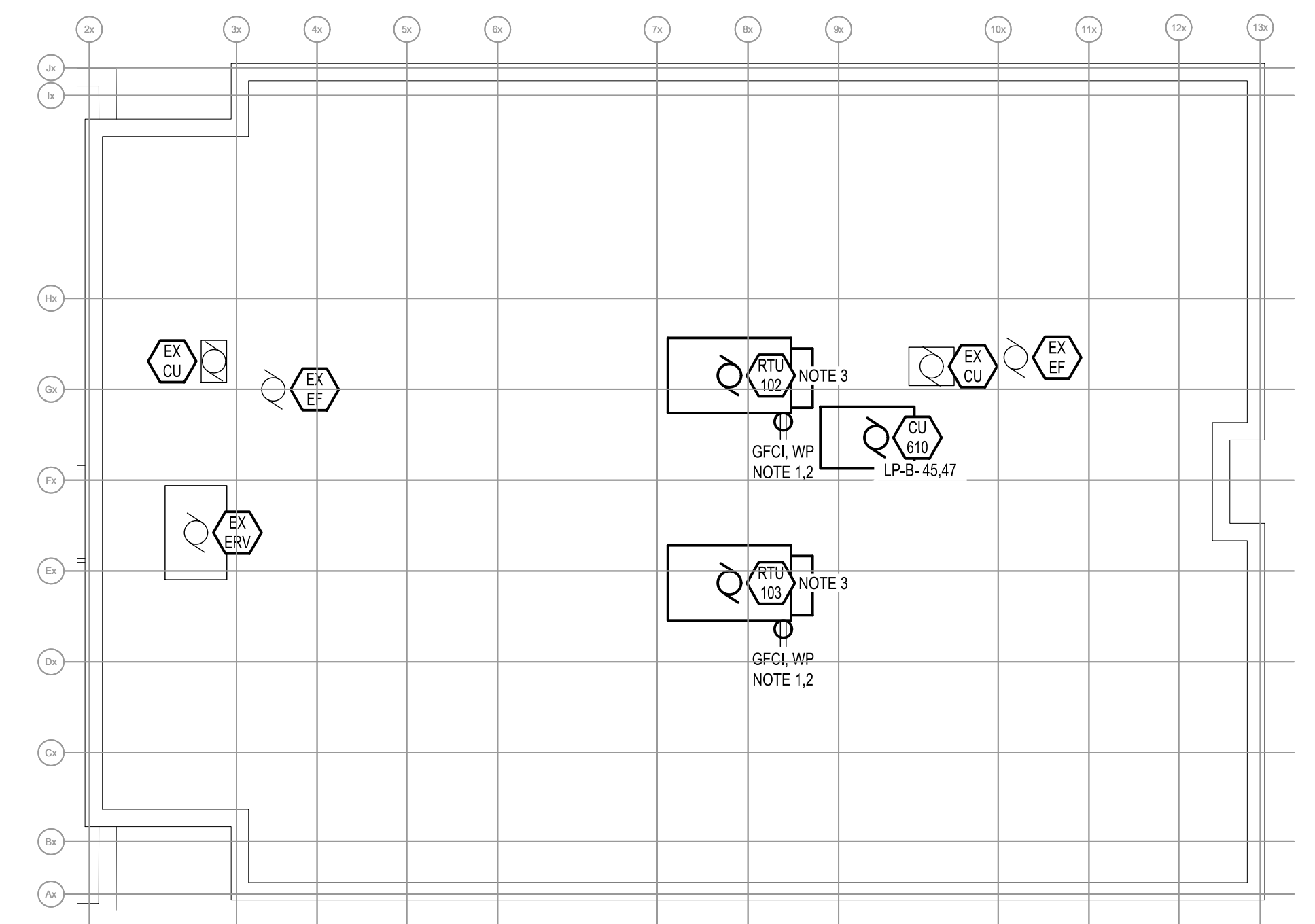
SERVER ROOM DETAIL - DEMOLITION
SCALE: 1:50

- NOTES:
1. DISCONNECT AND MAKE SAFE FOR RELOCATION BY DIVISION 15.
 2. DISCONNECT AND MAKE SAFE FOR REMOVAL BY DIVISION 15. COMPLETELY REMOVE ALL WIRING AND CONDUIT BACK TO SOURCE. REMOVE ALL ASSOCIATED ACCESSORIES.



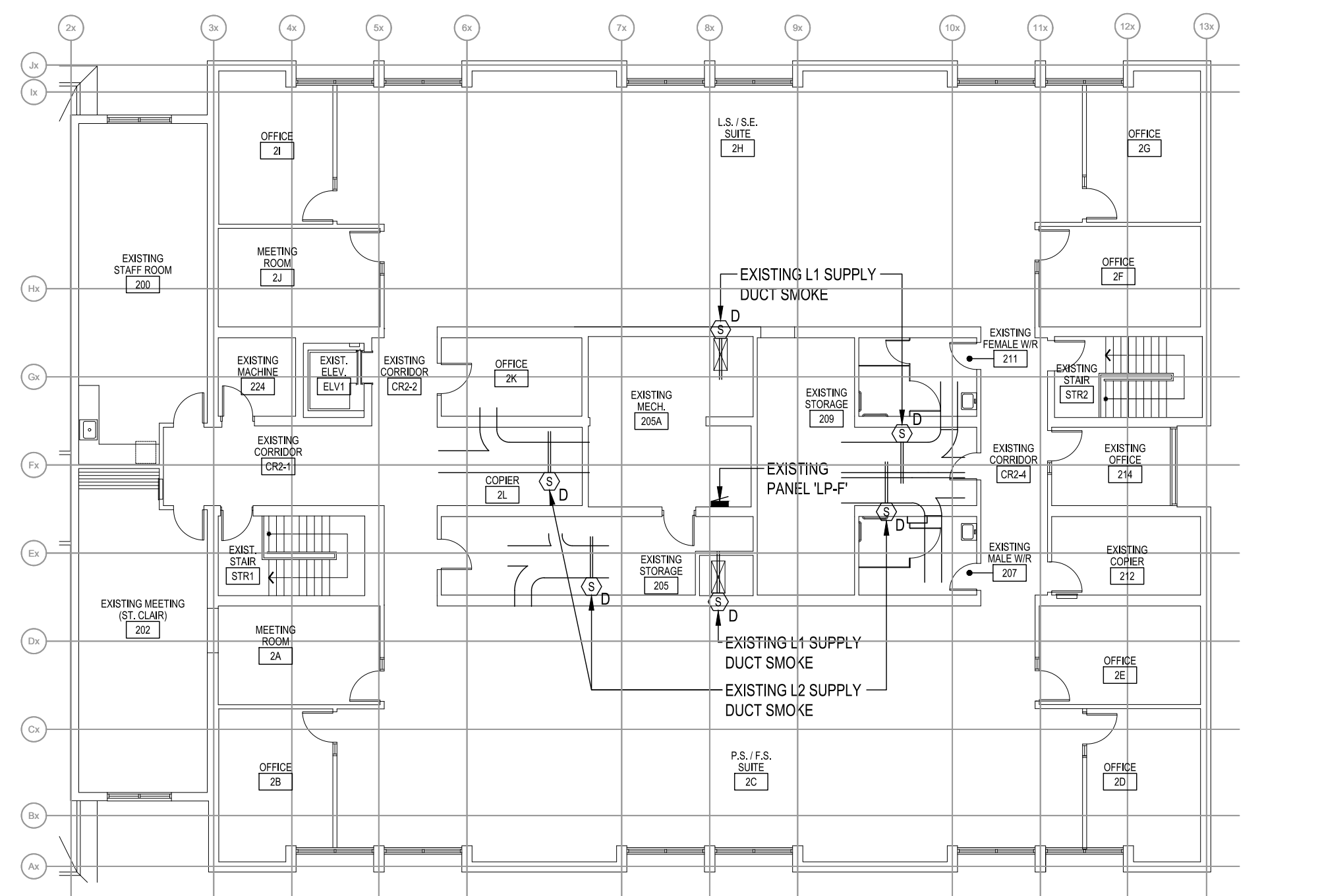
PARTIAL GROUND FLOOR PLAN - ELECTRICAL
SCALE: 1:150

- NOTES:
1. REMOVE AND REINSTALL ALL CEILING MOUNTED LIGHTING, FIRE ALARM, POWER, AND SYSTEMS DEVICES TO ALLOW FOR VOLUME BOX REPLACEMENT. PROVIDE NEW CHAIN HANGERS FOR ALL LUMINAIRES. COORDINATE WITH DIVISION 15.
 2. WHERE CEILING GRID IS REMOVED AND REPLACED FOR AIR TERMINAL REPLACEMENT, TEMPORARILY SUPPORT ALL LIGHTING, FIRE ALARM, POWER, AND SYSTEMS DEVICES. REINSTALL DEVICES IN NEW CEILING ONCE WORK IS COMPLETE. PROVIDE NEW CHAIN HANGERS FOR ALL LUMINAIRES. COORDINATE WITH DIVISION 15.



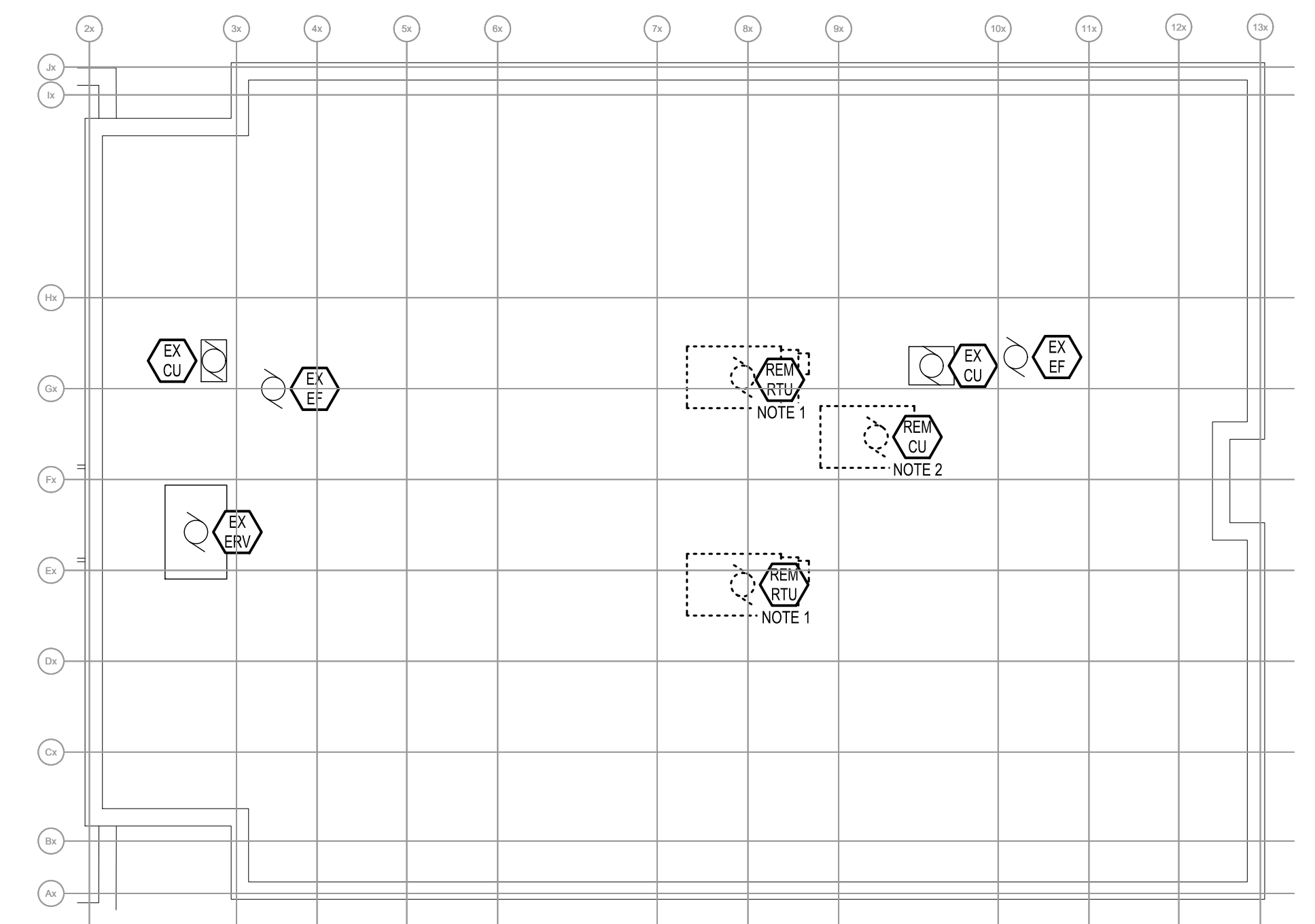
PARTIAL ROOF PLAN - ELECTRICAL
SCALE: 1:150

- NOTES:
1. GFCL RECEPTACLE CONNECTED TO STANDARD BREAKER. REFER TO RECEPTACLE ROOF MOUNTING DETAIL FOR ADDITIONAL MOUNTING REQUIREMENTS.
 2. CONNECT TO NEW DEDICATED 20A 1P CIRCUITS IN PANEL LP-F. PROVIDE TWO NEW 20A 1P BREAKERS TO SUIT EXISTING EATON PANEL.
 3. REWORK EXISTING WIRING AND CONDUIT INTO NEW ROOF TOP UNIT. PROVIDE NEW DISCONNECT.



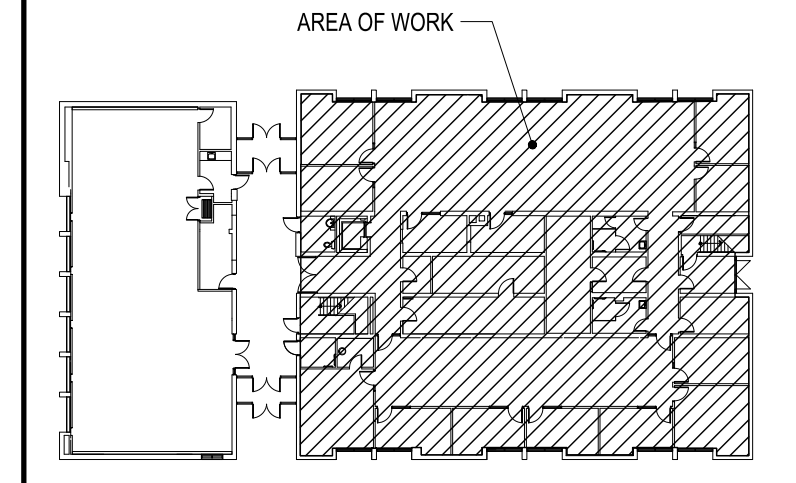
PARTIAL SECOND FLOOR PLAN - ELECTRICAL
SCALE: 1:150

- NOTES:
1. REMOVE AND REINSTALL ALL CEILING MOUNTED LIGHTING, FIRE ALARM, POWER, AND SYSTEMS DEVICES TO ALLOW FOR VOLUME BOX REPLACEMENT. PROVIDE NEW CHAIN HANGERS FOR ALL LUMINAIRES. COORDINATE WITH DIVISION 15.
 2. WHERE CEILING GRID IS REMOVED AND REPLACED FOR AIR TERMINAL REPLACEMENT, TEMPORARILY SUPPORT ALL LIGHTING, FIRE ALARM, POWER, AND SYSTEMS DEVICES. REINSTALL DEVICES IN NEW CEILING ONCE WORK IS COMPLETE. PROVIDE NEW CHAIN HANGERS FOR ALL LUMINAIRES. COORDINATE WITH DIVISION 15.



PARTIAL ROOF PLAN - ELECTRICAL DEMOLITION
SCALE: 1:150

- NOTES:
1. DISCONNECT AND MAKE SAFE FOR REMOVAL BY DIVISION 15. COMPLETELY REMOVE ALL ACCESSORIES. EXISTING WIRING AND CONDUIT TO REMAIN FOR REWORK INTO NEW ROOF TOP UNITS. MAINTAIN SERVICES TO AREAS NOT UNDER CONSTRUCTION.
 2. DISCONNECT AND MAKE SAFE FOR REMOVAL BY DIVISION 15. COMPLETELY REMOVE ALL WIRING AND CONDUIT BACK TO SOURCE. REMOVE ALL ASSOCIATED ACCESSORIES.



KEY PLAN
N.T.S.

No.	By	Revisions	Date
1	JDF	ISSUED FOR OWNER REVIEW	05 FEB 2020
2	JDF	ISSUED FOR OWNER REVIEW	06 MAR 2020
3	JDF	ISSUED FOR BID	11 MAR 2020

A	DETAIL NO.
B	DWG NO. - WHERE REQUIRED
C	DWG NO. - WHERE DETAILED

DO NOT SCALE THE DRAWINGS. ALL MEASUREMENTS ARE TO BE CHECKED AND VERIFIED ON SITE BY THE CONTRACTOR. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT BEFORE PROCEEDING WITH THE WORK.

COPYRIGHT © ALL RIGHTS RESERVED. ALL DRAWINGS AND RELATED DOCUMENTS ARE THE COPYRIGHT OF THE CONSULTANT AND MUST BE RETURNED UPON REQUEST OR AT THE COMPLETION OF THE WORK. REPRODUCTION OF THESE DRAWINGS OR RELATED DOCUMENTS IN PART OR IN WHOLE, BY ELECTRONIC OR MECHANICAL MEANS, IS FORBIDDEN BY LAW WITHOUT THE PRIOR WRITTEN PERMISSION OF THE CONSULTANT.




Chorley+Bisset
CONSULTING ENGINEERS
chorley.com

201 QUEENS AVE., UNIT 800
LONDON ON, N6A 1J1

250 CITY CENTRE AVE., SUITE 403
OTTAWA ON, K1R 6K7

Project Title
ROOFTOP UNIT AND VVT SYSTEM REPLACEMENT

CATHOLIC EDUCATION CENTRE SCDSB
WALLACEBURG, ONTARIO

Drawing Title
GROUND AND SECOND FLOOR PLANS AND ROOF PLANS - ELECTRICAL

Drawn ZJRL	Checked ZJRL	Approved MFM	Drawing No. E2.1
Scale AS NOTED	Date MAR 2020	Project No. 8823	Rev. No.