



**Request for Tender  
RFT 21-159**

**Interior Renovations and Ventilation Upgrades  
at Rolling Meadows Public School**

**Closing Date: May 27, 2021**

**Closing Time: 2:00 p.m.**

Sealed RFTs will be received **via email to [chatelaina@hdsb.ca](mailto:chatelaina@hdsb.ca)**  
on or before 2:00 p.m., Eastern Daylight Time

***Late or Facsimile Bids will not be considered***

May 11, 2021

Amanda Chatelain, CPPB  
Senior Officer – Purchasing

## **Communications Notice**

To obtain documents online please visit: <https://hdsb.bidsandtenders.ca>

If you subscribe to bids & tenders you can login to your account to download the document(s) without the preview watermark. You may also opt to purchase a one-time download for this opportunity. Documents are not provided in any other manner.

All proponents shall be registered as a Plan Taker for this opportunity, which will enable the proponent to download the Request for Proposal (RFP) without the watermark preview, to receive addenda email notifications, and to download addenda.

Should the HDSB receive a proposal that is subsequently found to be from a bidder that is not registered with bids & tenders and the bidder did not obtain the proposal document from <https://hdsb.bidsandtenders.ca> the HDSB reserves the right to remove the proposal from further consideration.

To ensure receipt of the latest information and updates via email regarding this opportunity, the onus is on the proponent to register as a Plan Taker for this opportunity at <https://hdsb.bidsandtenders.ca>.

The following documents form part of all HDSB competitive proposal documents:

HDSB Procurement Administrative Procedure:

<https://www.hdsb.ca/our-board/Policy/Procurement.pdf>

HDSB Asbestos Management in Facilities Administrative Procedure:

<https://www.hdsb.ca/our-board/Policy/AsbestosManagementInFacilities.pdf>

HDSB Vendor Performance Management Administrative Procedure:

<https://www.hdsb.ca/our-board/Policy/VendorPerformanceManagement.pdf>

Broader Public Sector Procurement Directive

[https://www.doingbusiness.mgs.gov.on.ca/mbs/psb/psb.nsf/Attachments/001-BPS\\_Procurement\\_Directive/\\$FILE/BPS\\_Procurement\\_Directive.pdf](https://www.doingbusiness.mgs.gov.on.ca/mbs/psb/psb.nsf/Attachments/001-BPS_Procurement_Directive/$FILE/BPS_Procurement_Directive.pdf)



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## **Part A – Outline and Instructions**

### **1. Introduction and Board Profile**

The Halton District School Board is composed of approximately 104 school locations (86 elementary and 18 secondary schools). These locations service approximately 64,300 regular day school students (Junior Kindergarten to Grade 12). The Board employs approximately 6,600 employees. Please visit our website <http://www.hdsb.ca> for additional information.

### **2. General Terms of the RFT**

The Halton District School Board, hereinafter referred to as HDSB, is seeking qualified Contractors to complete Interior Renovations and Ventilation Upgrades at Rolling Meadows Public School located at 1522 Mountain Grove Ave, Burlington, ON L7P 2H5, in accordance with the drawings and specifications provided. Specific details of the RFT are to be found in the attached Scope of Work.

### **3. Bid Security and Bonding Requirements**

Any bid submission equal to or greater than \$500,000, must be submitted with a Bid Bond in the value of ten percent (10%) of the Total Cost and a Surety Consent in favour of the Halton District School Board. The Surety Consent shall cover a Performance Bond and a Labour & Materials Payment bond, each in the amount of fifty percent (50%) of the contract price as a guarantee that the Bidder shall execute the contract upon award.

The Bid Security so submitted shall be irrevocable and valid for 90 from closing date set for the submission of tender.

In order to be considered for award of a contract equal to or over \$500,000, the Bidder shall submit as part of their Submission, a Surety Consent, completed by a Bonding Company. Any others will not be accepted.

Upon receipt of written notice from the Halton District School Board that it has been awarded the Contract, the successful Bidder shall provide, within five (5) working days of such notice, an original Performance Bond and a Labour and Material Payment Bond, each for the amount of fifty per cent (50%) of the total lump sum price, to guarantee the performance of all obligations of the Contract.

### **4. RFT Closing Information**

Bidders must submit their Submission **via email** on or before 2:00 p.m., Eastern Daylight Time on **May 27, 2021** (the “Closing Time”) to the following address:

**chatelaina@hdsb.ca**  
**Attention: Amanda Chatelain**

Submissions will be deemed to be officially received by the time stamp issued by the HDSB's email server. Submissions received after the official closing time will be declared non-compliant and shall not be considered during the selection process. Electronic submission

shall be no larger than 25MB. Proponents are responsible for confirming that their submission has been successfully received.

### **5. Accuracy of Information/Liability for Errors or Omissions**

While the HDSB has used considerable efforts to ensure an accurate representation of information in this document, the information contained in it is supplied solely as a guideline for Bidders. Any data contained in this RFT or provided by way of Addenda are estimates only and are for the sole purpose of indicating to the Bidder the general size of what is being requested hereunder. The information is not guaranteed or warranted to be accurate by the HDSB, nor is it necessarily comprehensive or exhaustive. Nothing in this document is intended to relieve Bidders from forming their own opinions and conclusions with respect to the matters addressed in this RFT. It is the Bidder's responsibility to avail itself of all the necessary information to prepare a Submission in response to this RFT.

### **6. Communication After RFT Issuance**

All Communications regarding any aspect of this RFT must be submitted via Bids and Tenders.

Bidders that fail to comply with the requirement to direct all communications to the RFT Authority via Bids and Tenders may be disqualified from this RFT process. Without limiting the generality of this provision, Bidders shall not communicate with or attempt to communicate with the following as it relates to this RFT:

- any employee or agent of the HDSB, other than the RFT Purchasing contact;
- any member of the HDSB governing body including, without limitation, the director, officers, trustees, superintendents, and any advisors thereto;

Bidders shall promptly examine this RFT and all Appendices, including the Form of Tender, and:

- shall report any errors, omissions or ambiguities; and
- may direct questions or seek additional information on or before the Deadline for Questions to the RFT Purchasing contact.

It is the responsibility of the Bidder to seek clarification, by submitting questions to the RFT Authority via Bids and Tenders, on any matter it considers to be unclear. The HDSB shall not be responsible for any misunderstanding on the part of the Bidder concerning this RFT or its process.

In the event a Bidder has any reason to believe that an error, omission or ambiguity exists, the Bidder must notify the RFT Authority via Bids and Tenders prior to submitting a Proposal.

If appropriate, the RFT Authority will then clarify the matter for the benefit of all Bidders by publication on the same public platform, its website or by notice to Bidders who have requested a copy of this RFT in the same manner as set out in section 6 below.

In answering a Bidder's questions, the HDSB will set out the question, without identifying the Bidder that submitted the question, and the HDSB may in its sole discretion:

- edit the question for clarity;
- answer similar questions from various Bidders only once.

Where an answer results in any change to the RFT, such answer will be formally evidenced through the issue of a separate addendum for this purpose.

## ***7. Addenda***

If the HDSB for any reason, determines that it is necessary to provide additional information relating to this RFT, such information will be communicated to all Bidders by addendum in the same manner the RFT was communicated. Each Addendum shall form an integral part of this RFT. This RFT may only be amended in accordance with this section.

**All questions related to this Tender must be submitted in writing via bids and tenders prior to 2 p.m. on May 18, 2021. Any addendum will be posted no later than May 20, 2021.**

Any amendment or supplement to this RFT made in any other manner will not be binding on the HDSB.

All Addenda shall become an integral part of this RFT and shall be incorporated into any content. Each Bidder shall be responsible for verifying before depositing its Proposal that it has received all Addenda that have been issued.

## ***8. Planned Schedule of Events – Project Schedule***

<b>Event</b>	<b>Date</b>
Release of RFT	May 11, 2021
Non-Mandatory Pre-Bid Site Meeting	May 14, 2021
Question Deadline	May 18, 2021
Issuance of Final Addendum	May20, 2021
RFT Closing	May 27, 2021
Project Timelines for Completion	Project timelines for completion of Phase 1 is July 1, 2021 to August 30, 2021.  Project timelines for completion of Phase 2 is July 1, 2022 to August 30, 2022.

## **9. Bidder's Costs**

Bidders shall bear all costs and expenses incurred relating to any aspect of its participation in this RFT process, including all costs and expenses relating to the Bidder's participation in:

- the preparation, presentation and receipt of its Submission;
- the Bidders attendance at any meeting in relation to the RFT process, including any presentation or interview;
- the conduct of any due diligence on its part, including any information-gathering activity;
- the preparation of the Bidder's own questions prior to the Deadline for Questions; and
- any discussion and/or finalization, if any, in respect of the Form of Agreement.

## **10. Bidding Format**

Unless otherwise specified in these RFT documents or the final contract entered into between the HDSB and the successful Bidder, responses shall be for a stipulated sum without escalator clauses or other qualifications (when applicable). Bidders submitting a bid with escalator clauses or other qualifications that are not in accordance with the terms and conditions of this RFT may have their bid rejected.

All information entered on this RFT document must be type written or entered in ink. No pencil entries will be accepted.

Erasure(s), overwriting or strike-out(s) must be initialed in ink by the person signing this Submission.

**Respondents will use the following format for their submission:**

- Form of Tender (complete form must be included with your submission, including bonds and any other information as may be required herein)
- Appendix A - Signed Declaration Sheet (must be included with your submission)

## **11. Pricing**

Please do not add tax to base (unit) price. (when applicable). Early payment discounts may be considered part of the Submission. Credit Card payment acceptance may be considered part of the Submission.

## **12. Subcontractors**

The General Contractor must select a sub-contractor from the HDSB pre-qualified list of sub-contractors attached in Appendix B for Asbestos and Roofing.

General Contractors may select a subcontractor from the HDSB pre-qualified list of subcontractors attached in Appendix B or utilize an alternate subcontractor of their choosing.

The Contractor agrees to preserve and protect the rights of the parties under the contract with respect to work performed under subcontract, and shall:

- enter into contracts or written agreements with their subcontractors to require them to perform their work in accordance with and subject to the terms and conditions of the contract. Further, the Contractor shall be fully responsible to the Owner for acts and omissions of their subcontractors and of any persons directly or indirectly employed by them as for acts and omissions of persons directly employed by them.
- therefore, agree that they will incorporate the terms and conditions of the Contract Documents into all Subcontractor Agreements they enter into with their subcontractors. The HDSB reserves the right, at its discretion to waive the requirement to utilize the mandatory list of pre-qualified sub-trades at any time during the tendering process based on market conditions.

### ***13. Non-Mandatory Pre-Bid Site Meeting***

There will be a Non-Mandatory Pre-Bid Site Meeting starting on May 14, 2021 at the main office of Rolling Meadows School located at 1522 Mountain Grove Ave, Burlington, ON L7P 2H5. The second Site Meeting will begin at 1:30 p.m.

Bidders shall follow Public Health and HDSB Covid-19 protocols while on site.

## Part B – Standard Terms and Conditions

### 14. Scope

Unless otherwise expressly stated these Standard Terms and Conditions form a part of this document and apply in like force to contracts for the purchase of commodities as stated in this document. All Bidders will be bound by the terms and conditions set forth, except as specifically qualified in Special Terms and Conditions issued in connection with this document or any Addenda issued relating to this document.

### 15. Definitions

As used herein as well as in all RFSQ, RFQ, RFP, RFI, Tender or contract documents issued by the Halton District School Board, the following definitions will apply.

<b>Addenda/Addendum</b>	an addition/change made to this document, subsequent to its printing or publication.
<b>Applicable Law and Applicable Laws</b>	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.
<b>Bid/Submission/Proposal</b>	an offer from a Bidder in response to a Proposal/Tender which is subject to acceptance or rejection.
<b>Proponent</b>	a legal entity, being a company, partnership or individual who submits a Bid, Proposal, or Submission in response to a formal request for Bid, Proposal, or Submission.
<b>Board/HDSB</b>	means the Halton District School Board.
<b>Contract</b>	means the agreement, in writing, governing the performance of the Work and/or the purchase and sale of commodities and includes, without limitation, the document (including standard terms and conditions), Bidder Submission and the written document accepting the Bidder Submission (including any notice of acceptance or award).
<b>Document</b>	means the document describing the Goods and/or Services to be purchased and the terms upon which the Goods and/or Services are to be purchased and includes, without limitation, those documents referenced on the index of the document and such Addenda as may be issued by the HDSB.



<b>Goods or Services</b>	product and/or any and all labour, vehicles or equipment used by a Bidder in fulfilling a Contract.
<b>HST</b>	means Harmonized Sales Tax.
<b>Intellectual Property</b>	means any trademark, copyright, moral right, patent, industrial design, trade name, domain name, trade secret, know how, integrated circuit topography or other intellectual property, industrial property or proprietary right owned by, licensed to, or used by any third person.
<b>Mandatory Requirement</b>	a minimum requirement – where the words “mandatory”, “must”, “required”, “shall” and/or “will” are referenced in this document and such requirement is identified as a Mandatory Requirement. Failure to comply will deem the submission non-compliant and the bid/submission will be disqualified.
<b>Proposal/RFP</b>	a sealed written offer to supply Goods and/or Services of any value, acceptance of which may be subject to negotiation.
<b>Quotation/RFQ</b>	a written offer to supply Goods and/or Services with a value that is less than \$100,000.
<b>Response</b>	the package submitted by a Bidder in response to an RFP or RFT.
<b>Specifications</b>	those stated requirements for the Goods and/or Services set out in the document.
<b>Subcontractor</b>	a person, firm or corporation having a direct contract with the contractor to perform a part or parts of the Work, or to supply Goods worked to a special design according to the contract documents, but does not include one who merely supplies Goods not so worked.
<b>Tender/RFT</b>	a sealed written offer to supply Goods and/or Services with a value that is greater than \$100,000.
<b>Bidder Submission</b>	means the document as completed by the Bidder for the purpose of offering to sell to the HDSB the services and/or goods specified in the document, and includes but is not limited to Quotations, Tenders and Proposals.
<b>Work</b>	means the Work to be undertaken by the Bidder pursuant to the provisions of the Contract.

## **16. Reserved Rights of the HDSB**

The HDSB reserves the right to:

- (a) make public the names of any or all Bidders;
- (b) request written clarification or the submission of supplementary written information in relation to the clarification request from any Bidder and incorporate a Bidder's response to that request for clarification into the Bidder's Submission;
- (c) assess a Bidder's Submission on the basis of:
  - (i) a financial analysis determining the actual cost of the Submission when considering factors including quality, service, price and transition costs arising from the replacement of existing goods, services, practices, methodologies and infrastructure (howsoever originally established);
  - (ii) information provided by references;
  - (iii) the Bidder's past performance on previous contracts awarded by the HDSB;
  - (iv) the information provided by a Bidder pursuant to the HDSB exercising its clarification rights under this RFT process; or
  - (v) other relevant information that arises during this RFT process;
- (d) waive formalities and accept Submissions that substantially comply with the requirements of this RFT;
- (e) verify with any Bidder or with a third party any information set out in a Submission;
- (f) check references other than those provided by any Bidder;
- (g) disqualify any Bidder whose Submission contains misrepresentations or any other inaccurate or misleading information;
- (h) disqualify any Bidder or the Submission of any Bidder who has engaged in conduct prohibited by this RFT;
- (i) disqualify a Bidder for any conduct, situation or circumstance that constitutes a Conflict of Interest, as solely determined by the HDSB and at any time.
- (j) make changes, including substantial changes, to this RFT, provided that those changes are issued by way of addenda in the manner set out in this RFT;
- (k) select any Bidder other than the Bidder whose bid reflects the lowest cost to the HDSB;
- (l) review all Bidders utilizing the HDSB Vendor Performance Management Administrative Procedure, which can include suspension of Bidders who fail the meet

the HDSB's expectations or who are involved in litigation or threatened litigation against HDSB. The HDSB Vendor Performance Management Administrative Procedure is found at the attached link

([www.hdsb.ca/our-board/Policy/VendorPerformanceManagement.pdf](http://www.hdsb.ca/our-board/Policy/VendorPerformanceManagement.pdf))

- (m) award to one or more bidders according to their requirements;
- (n) cancel this RFT process at any time and for any or no reason;
- (o) cancel this RFT process at any stage and issue a new RFT for the same or similar deliverables;
- (p) accept any Submission in whole or in part; or
- (q) award to multiple bidders if circumstances are warranted;
- (r) reject any or all Submissions;
- (s) to limit the number of pre-qualified Bidders eligible to submit proposals for any future projects. HDSB shall not be obligated to provide all pre-qualified Bidders with the same opportunity to bid on all future projects within each stated category. By participating in this RFT, Bidders acknowledge that there is no guarantee that a Bidder will receive any assignments, work or projects and that there is no expectation that any specified number of projects will be made available during the pre-qualification term;

and these reserved rights are in addition to any other express rights or any other rights that may be implied in the circumstances.

In addition, the HDSB reserves the right at any time during normal business hours, and as often as the HDSB may deem necessary, to examine, the successful Bidder's records with respect to the successful Bidder's services under the Bidder's purchase order and/or Submission and any Contract. The successful Bidder shall permit the HDSB to audit, examine, and make copies, excerpts or transcripts from such records, and to make audits of data relating to matters covered by a Submission, any purchase order and/or any Contract. The successful Bidder shall maintain and retain all records and other documents related to a Submission, any purchase order, and/or any Contract for a period of seven (7) years from the date of final payment, except in cases where unresolved audit questions require a longer period of time for resolution, as determined by the HDSB.

### ***17. Litigation with the HDSB***

The HDSB may, in its absolute discretion, reject a Submission submitted by a Bidder **prior to or after a Submission opening, if the Bidder:**

- (a) is or has in the past 10 years been a party to litigation with the HDSB; or

- (b) directly or indirectly, including by common ownership or control or otherwise, is related to a party currently in litigation with the HDSB or a party that has in the past 10 years been in litigation with the HDSB; or
- (c) intends to use a subcontractor in respect of a specific project who is, or has in the past 10 years been a party to litigation with the HDSB, or who is related to a party currently in litigation with the HDSB or a party that has in the past 10 years been in litigation with the HDSB.

For the purposes hereof, the phrase “litigation with the HDSB” includes cases in which the Bidder or prospective Bidder or any of the parties named above, has advised the HDSB in writing of their intention to commence litigation, or have commenced or have advised the HDSB of their intention to commence an arbitral proceeding against the HDSB (excepting only construction lien demands, notices or proceedings or arbitrations under O. Reg 444/98 of the Education Act).

In determining whether or not to exercise its discretion as set out herein, the HDSB will consider whether the litigation (past or current) is likely to affect a Bidder’s ability to work with the HDSB, its consultants and representatives, and whether the HDSB’s experience with the Bidder, the related party or subcontractor, as the case may be, in the matter giving rise to the litigation, indicates that the HDSB is likely to incur increased staff and legal costs in the administration of the Contract if it is awarded to the Bidder.

### ***18. Accessibility for Ontarians with Disabilities (AODA)***

The HDSB is committed to accessibility and preventing and removing barriers for persons with disabilities. Where practicable, the HDSB will incorporate accessibility features and criteria when procuring or acquiring goods, services and facilities, in which case, a Bidder must be capable of recommending and delivering same in an inclusive and accessible manner, consistent with the Ontario Human Rights Code (“OHRC”), the Ontarians with Disabilities Act, 2005 (“AODA”) and its Regulations, in order to achieve accessibility for Ontarians with disabilities. If the HDSB determines that it is impractical to do so an explanation will be provided upon request.

In accordance with Ontario Regulation 429-07 made under the AODA, the HDSB has established policies, practices and procedures governing the provisions of its services to persons with disabilities, which may be found at:

<https://www.hdsb.ca/our-board/Pages/Accessibility.aspx>

### ***19. Ability to Negotiate/Contract Negotiations***

The HDSB reserves the right to enter into negotiations with any Bidder as it sees fit, or with another Bidder concurrently. The HDSB will not incur liability to any Bidder as a result of these negotiations.

The HDSB may, prior to and after Contract award, negotiate changes to the specifications, the type of materials or any conditions with the successful or preferred Bidder or one or more of the Bidders without having any duty or obligation to advise any other Bidder or to allow

them to vary their bid prices as a result of such changes, and the HDSB shall have no liability to any other Bidder as a result of such negotiations or modifications.

## ***20. Agree to Abide by the Established Process***

It is vital to the HDSB that the process leading to the recommendation of a bidder(s) and the conclusion of an agreement for the provision of these services be, and be seen to be, open and fair and that each of the respondents is treated equally.

No respondent can be seen to be deriving, intentionally or otherwise, an advantage or information, which is not equally available to all other respondents. Nor is it acceptable that any advantage or information be sought or obtained from any unauthorized staff or representative of the HDSB, or any benefit derived from any special or personal relationships or contacts.

All communications, including requests for information, between respondents to this RFT and the HDSB should be between only the representative(s) of the HDSB who has been authorized and designated for that particular purpose. Bidders must not rely on information from any other source.

## ***21. Assignment***

Unless otherwise stated in this document, it is mutually agreed and understood that the successful Bidder will not assign, transfer, convey, sublet or otherwise dispose of the Contract (in whole or in part) or the right, title or interest therein, or the Bidder's power to execute such contract to any other person, firm, company or corporation without the previous written consent of the HDSB. Any act in derogation of the foregoing shall be null and void. For the purposes hereof, the transfer or issuance of shares by a Bidder of more than fifty (50%) percent of the voting securities of a Bidder to any third party other than to an affiliate (as such term is defined in the Business Corporations Act (Ontario)) or the shareholder or shareholders of the Bidder as of the Closing Date, whether or not such transfer or issuance of voting securities takes place in one or more transactions, shall, for the purposes of this Agreement, be deemed to be an assignment of the Contract requiring the consent of the HDSB, unless such transfer or issuance of shares is made pursuant to an initial public offering of common shares under the Securities Act (Ontario).

## ***22. Award***

The final award will be based on (but not limited to) the best value for money and quality service delivery from a Bidder who complies with the provisions of this Submission solicitation, including specifications, contractual terms and conditions, who can reasonably be expected to provide satisfactory performance on the proposed Contract based on reputation, references, performance on previous contracts, and sufficiency of financial and other resources, and provides a solution that is a fit with the HDSB's requirements. The lowest price or bid shall not be the sole, determinative factor.

## **23. Breaking a Tie**

In the event of a tie score, the HDSB will resolve same based on the earlier date/time stamp of when the bid was received by HDSB in accordance with this RFT.

## **24. Change Orders**

A change order results when unforeseen conditions are identified from the original scope of work (Contract or Purchase Order) and is inextricably tied to the original scope.

The following steps should occur prior to issuance of a change order that does not originate from HDSB senior management:

- appropriate HDSB approval must be acquired prior to modifying any Contract or Purchase Order
- appropriate written HDSB approval must be obtained prior to commencing the work.

All requests or recommendations for Change Orders shall include the impact to both price and schedule for the work to be performed. HDSB shall have the right to retain consultants or experts to help identify the need or to verify the impact of the change order on the project.

No change in the work shall proceed without the written approval of the Owner.

Any change shall be initiated by Owners "WORK ORDERS" which shall bear the change cost and the Contractor's and Owner's representative's signatures as an instruction to proceed. All changes shall be restricted to five percent (5%) overhead and five percent (5%) profit applied to the labour and material cost.

## **25. Conflict of Interest**

For the purposes hereof, "Conflict of Interest" includes:

- (a) in relation to the Submission process, the Bidder has an unfair advantage or engaged in conduct, directly or indirectly, that may give the Bidder an unfair advantage, including:
  - (i) having or having access to information in the preparation of the Submission that is confidential to the HDSB and not available to other Bidders;
  - (ii) communicating with any person with a view to influencing preferred treatment in the Submission process; or
  - (iii) engaging in conduct that compromises or could be seen to compromise the integrity of the open and competitive process and render that process non-competitive and unfair; or
- (b) in relation to the performance of the Work, services or contractual obligations, the Bidder's other commitments, relationships or financial interests:

- (i) could or could be perceived to exercise an improper influence over the objective, unbiased and impartial exercise of the Bidder's independent judgments; or
- (ii) could or could be perceived to compromise or impair or be incompatible with the effective performance of the Bidder's work, services or contractual obligations.

The Bidder shall:

- (a) avoid any Conflict of Interest in the Submission process and in the performance of its contractual obligations;
- (b) disclose to the HDSB without delay any actual or potential Conflict of Interest that arises during the Submission process or during the performance of its contractual obligations; and
- (c) comply with any requirements prescribed by the HDSB to resolve any Conflict of Interest.

In addition to all other contractual rights or rights available at law or in equity, the HDSB may immediately disqualify a Submission or terminate the Contract upon giving notice to the Bidder where:

- i. the Bidder fails to disclose an actual or potential Conflict of Interest;
- ii. the Bidder fails to comply with any requirements prescribed by the HDSB to resolve a Conflict of Interest; or
- iii. the Bidder's Conflict of Interest cannot be resolved.

This paragraph shall survive any termination or expiry of the Contract.

## **26. HDSB Confidential Information**

For the purposes hereof, "HDSB Confidential Information" means all information of the HDSB that is of a confidential nature, including all confidential information in the custody or control of the HDSB, regardless of whether it is identified as confidential or not, and whether recorded or not, and however fixed, stored, expressed or embodied, which comes into the knowledge, possession or control of the Bidder in connection with the Contract. For greater certainty, HDSB Confidential Information shall:

- (a) include:
  - (i) all new information derived at any time from any such information whether created by the HDSB, the Bidder or any third party;



- (ii) all information (including Personal Information) that the HDSB is obliged or has the discretion not to disclose under provincial or federal legislation or otherwise at law; but
- (b) not include information that:
  - (i) is or becomes generally available to the public without fault or breach on the part of the Bidder of any duty of confidentiality owed by the Bidder to the HDSB or to any third party;
  - (ii) the Bidder can demonstrate to have been rightfully obtained by Bidder without any obligation of confidence, from a third party who had the right to transfer or disclose it to the Bidder free of any obligation of confidence;
  - (iii) the Bidder can demonstrate to have been rightfully known to or in the possession of the Bidder at the time of disclosure, free of any obligation of confidence when disclosed; or
  - (iv) is independently developed by the Bidder;

but the exclusions in this subparagraph shall in no way limit the meaning of Personal Information or the obligations attaching thereto under the Contract or at law.

During and following the term of the Contract, the Bidder shall:

- (a) keep all HDSB Confidential Information confidential and secure;
- (b) limit the disclosure of HDSB Confidential Information to only those of its directors, officer, employees, agents, partners, affiliates, volunteers or subcontractors who have a need to know it for the purpose of carrying out its obligations under the Contract and who have been specifically authorized to have such disclosure;
- (c) not directly or indirectly disclose, destroy, exploit or use any HDSB Confidential Information (except for the purpose of carrying out its obligations under the Contract or except if required by order of a court or tribunal), without first obtaining:
  - (i) the written consent of the HDSB; and
  - (ii) in respect of any HDSB Confidential Information about any third party, the written consent of such third party;
- (d) provide HDSB Confidential Information to the HDSB on demand; and
- (e) return all HDSB Confidential Information to the HDSB before the end of the Term, with no copy or portion kept by the Bidder.



## **27. Criminal Background Checks**

The Bidder acknowledges that the HDSB must be in compliance with Regulation 521/01 of the Education Act (Ontario) - Collection of Personal Information with respect to criminal background checks and offence declarations. The Bidder covenants and agrees to assist the HDSB in complying with same by providing the HDSB, or such other entity as the HDSB may designate, with a criminal background check covering offences under the Criminal Code, the Narcotics Control Act, and any other offences which would be revealed by a search of the automated Criminal Records Retrieval System maintained by the RCMP or, in instances where the Bidder will have access to or is responsible for minors or vulnerable persons, a Vulnerable Persons Clearance certificate in addition to the above ("Criminal Background Check"), together with an Offence Declaration in HDSB approved form, for every individual or employee of the Bidder who may come into direct contact with students on a regular basis at a school site of the HDSB, or who may have access to student information.

For the purposes of this document, the HDSB shall determine in its sole and unfettered discretion whether an individual or employee of the Bidder may come into direct contact with students on a regular basis or may have access to student information. The Bidder agrees to indemnify and save harmless the HDSB from all claims, liabilities, expenses, and penalties to which it may be subjected on account of the Bidder's failure to provide a Criminal Background Check and an Offence Declaration, as aforesaid. This indemnity shall survive the expiration or sooner termination of the Contract. In addition, and notwithstanding anything else herein contained, if the Bidder fails to provide a Criminal Background Check and an Offence Declaration for an individual or employee of the Bidder who may come into direct contact with students on a regular basis at a school site of the HDSB or who may have access to student information, then the HDSB shall have the right to forthwith terminate the Contract without prejudice to any other rights which it may have in the Contract, in law or in equity.

## **28. Debrief**

The HDSB, at the written request of a Bidder will conduct a debriefing. Bidders must submit their request within sixty (60) days of Contract award notification. The HDSB will only identify any weaknesses or strengths in the Bidder's submission. No information regarding other Bidders' submissions will be disclosed. The intent of the debriefing information session is to assist a Bidder in presenting a better Submission in subsequent procurement opportunities. Any debriefing provided is not for the purpose of providing any opportunity to challenge the procurement process.

## **29. Dispute Resolution**

In the event that a Bidder wishes to review the decision of the HDSB in respect of any material aspect of the RFT process, and subject to having attended a debriefing, the Bidder shall submit a protest in writing to the RFT Authority within ten (10) days from such a debriefing.

Any request that is not received in a timely manner will not be considered, and the Bidder will be notified in writing.

A 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; and
- (e) the Bidder's requested remedy.

For the purpose of a protest, the HDSB will review and address any protest in a timely and appropriate manner. HDSB's decision in this regard is final.

### ***30. Environmental Statement***

The Board, when practically and financially feasible, will consider the acquisition of goods and services that will reduce the environmental footprint of the Board.

### ***31. Force Majeure***

Delays in or failure of performance by either party under the Contract shall not constitute default thereunder or give rise to any claim for damages if caused by occurrences beyond the control of the party affected, including but not limited to, decrees of Governments, acts of God, fires, floods, riots, wars, rebellion, sabotage, and atomic or nuclear incidents. Lack of finances, strikes, lockouts or other concerted acts by workers shall not be deemed to be a cause beyond a party's control.

In the event that performance of the Contract in the reasonable opinion of either party is made impossible by an occurrence beyond the control of the party affected, then either party shall notify the other in writing. The HDSB shall either terminate the Contract forthwith and without any further payments being made, or authorize the Bidder to continue the performance of the Contract with such adjustments as may be required by the occurrence in question and agreed upon by both parties. In the event that the parties cannot agree upon the aforementioned adjustment, it is agreed by the parties that the Contract shall be terminated.

### ***32. Guarantees and Warranties***

All Work shall be done in a good and workmanship like manner. All materials, goods and services must meet the applicable specifications, either by the HDSB, its consultant on the project or the manufacturer. The Bidder warrants and guarantees that all materials, Goods; Services and workmanship will be free from defects and fit for the purpose intended by the HDSB. All Goods delivered by the Bidder must be new, in good working order and of the latest model possessing all accessories standard to the manufacturer's stock model. The Goods and/or Services must be covered by written guarantees and warranties acceptable to the HDSB.

### **33. Health & Safety / WHMIS**

Bidders and/or contractors must comply with the Occupational Health and Safety Act and its regulations. All Bidder's contractors and sub-contractors and their respective employees will have received health and safety training appropriate to their trade, and will be able to provide proof thereof to the HDSB upon request. Contractors shall be held responsible for any sub-contractors where such are permissible by the HDSB. The HDSB may request and suppliers/contractors/sub-contractors will provide evidence of such training at any time.

Suppliers/contractors/sub-contractors shall comply with the HDSB policies, programs and procedures at all times while on site. All suppliers/contractors/sub-contractors are required to sign in upon arrival/exit at a HDSB location prior to beginning and at completion of Work.

Suppliers and/or contractors/sub-contractors shall be held responsible for all fines and/or contraventions of legislation which have been incurred by the HDSB.

As per Ontario regulation 278/05 section 10 (5) the HDSB will provide contractors/sub-contractors performing work in HDSB buildings access to the site-specific asbestos inventory. Site specific asbestos inventories are available at each HDSB site. Contractors/sub-contractors shall review the site-specific asbestos inventory in relation to the scope of work they are undertaking, prior to the commencement of work. The requirements of the HDSB's Asbestos Management Administrative Procedure are to be adhered to at all times. A copy of the HDSB's Asbestos Management Administrative Procedure can be found at:

<http://www.hdsb.ca/our-board/Policy/AsbestosManagementInFacilities.pdf>.

All Work is subject to prior approval by the appropriate HDSB department.

Contractors shall examine carefully the HDSB's Asbestos Register for the Work site, in addition to examining existing conditions for suspected Asbestos Containing Materials (ACM), on which completion of Work is dependent.

Upon discovery of unforeseen suspected ACM affecting completion of the Work, the Contractor shall cease any operations that may disturb said materials and notify the Owner immediately.

The Contractor shall arrange for removal of ACM affecting completion of Work through a HDSB-approved ACM abatement contractor, and arrange for coordination of testing through HDSB Facility Services, if required.

Contractors shall be responsible for any sub-contractors in their employ with respect to the aforementioned requirements.

### **34. Indemnification and Liability**

The Bidder hereby agrees to indemnify and hold harmless the HDSB, its directors, officers, trustees, employees and agents from and against all liability, loss, costs, damages and expenses (including legal, expert and consultant fees), causes of actions, actions, claims,

demands, lawsuits or other proceedings, by whomever made, sustained, incurred, brought or prosecuted if:

- (a) resulting from the Bidder's failure to observe and conform to the standards established by law or by any other association which has established standards recognized by the Province of Ontario;
- (b) relating to labour and equipment furnished for the Work; and
- (c) involving inventions, copyrights, trademarks or patents, and rights thereto, used in doing the Work and in the subsequent use and operation of the Work or any part thereof upon completion.

### ***35. Insurance and Liability***

The successful bidder must indemnify the HDSB from any and all manner of damage or injury, risk, claims, demands, actions, penalties, causes of action, damages and any and all costs arising out of, or incurred by reason of provision of goods and/or services by the bidder. The cost of such insurance will be the responsibility of the Bidder.

The successful bidder(s) will obtain and provide current proof of insurance upon the award, that the successful Bidder will be covered by:

**at least Two Million Canadian Dollars (C\$2,000,000.00) of comprehensive commercial general liability insurance** for bodily injury, property damage, operations liability, contractual liability and tenant's legal liability, including umbrella liability insurance covering liability arising from premises, operations, independent contractors, products-completed operations, personal injury and liability assumed under the Contract;

**at least One Million Canadian Dollars (C\$1,000,000.00) of business automobile liability insurance** and, if necessary, umbrella liability insurance for owned, hired and non-owned vehicles covering bodily injury and property damage: and with an insurer licensed to carry on business in the Province of Ontario.

In the case of multi-year contracts, a copy of a valid certificate must be provided to the Halton District School HDSB annually thereafter, at least thirty (30) days prior to the anniversary date of the contract commencement date. At commencement of the Contract and throughout the Contract duration, certification shall be submitted on a Certificate of Insurance form with the above-mentioned coverage, thereby protecting the Halton District School Board against claims for property damage and bodily injuries, including accidental death, caused by the successful Bidder(s) or its employees and/or Sub-contractors during the performance of its obligations under the Contract.

The Halton District School Board must be named as additional insured, and the policy must contain a cross liability clause, and thirty (30) day prior notice clause of any cancellation, non-renewal or product change in coverage, terms or conditions.

As a condition precedent to contract award, Certificates of all such insurance policies shall be filed with the HDSB by the successful Bidder and shall be subject to the HDSB's approval as to the adequacy of protection.

All the above-mentioned insurance shall be maintained until the HDSB certifies that the work is complete.

### **36. Invoicing/Payment/EFT**

To ensure that payment is not deferred, the following information shall be on all invoices:

- Bidder's Name or Business Number, Address, Telephone Number and HST registration number
- Invoice Date
- Invoice Number
- Purchase Order Number, Name of Requester, Shipment Destination
- Name of Halton District School Board staff that issued this order
- Complete Good/Service Description (including hourly rates, service/delivery dates, service location)
- Attach Copy of Service Report/Work Order Completed
- Terms of payment
- Total of HST where applicable
- Total Amount Payable

The HDSB's method of payment is by Electronic Funds Transfer (EFT). If the Bidder is a new vendor or current vendor who has not previously utilized the EFT payment service or has banking information which has changed, then an "Application of Vendor Direct Deposit" form is required to be completed, which is available through the Purchasing contact for this document. This form along with a voided cheque or letter from the Bidder's bank should be sent to:

Halton District School Board  
Attention: Accounts Payable Department  
J.W. Singleton Centre,  
PO Box 5005 Stn LCD 1,  
Burlington ON L7R 3Z2 or

electronically to: [apect@hdsb.ca](mailto:apect@hdsb.ca) before any invoices are submitted to the HDSB for payment.

Payment terms are Net 28. Early payment discounts may be considered.

### **37. Irrevocability**

The Submission will be open for acceptance by the HDSB and irrevocable by the Bidder for a period of one hundred and twenty (120) calendar days from the Closing Date.

### **38. Municipal Freedom of Information and Protection of Privacy Act ("MFIPPA")**

- (a) The Bidder acknowledges and agrees that the HDSB is subject to MFIPPA. The Bidder further expressly acknowledges and agrees that, upon the acceptance of a successful Submission and conclusion of this process (including execution and delivery of the Contract between the HDSB and the successful Bidder), subject to subsection (b) below, the Submission shall not be considered confidential for the purposes of Section 10 of MFIPPA and, in the event of an access request or at the discretion of HDSB, shall be subject to release in its entirety without redaction.
- (b) Notwithstanding paragraph (a) above, the Bidder and the HDSB acknowledge and agree that the information listed below is considered to be supplied by the Bidder to the HDSB in confidence:
  - 1. For Services: Hourly rates/fees and information from which such rates/fees could be reasonably deduced.
  - 2. For Goods: Unit costs and information from which such unit costs could be reasonably deduced.
- (c) Notwithstanding the foregoing, the Bidder acknowledges and agrees that, because the HDSB is subject to MFIPPA, all or part of any Submission, including information supplied in confidence, may be subject to release in response to an access request submitted pursuant to MFIPPA. In the event that the HDSB receives a request for access to all or part of a Submission supplied in confidence, the HDSB shall deliver the relevant notice to the Bidder, who shall bare all costs, legal or otherwise, with respect to any objection the Bidder may have in respect of the release of any or all parts of the Submission pursuant to MFIPPA.

### ***39. No Guarantee of Work or Exclusivity of Contract***

The HDSB makes no guarantee of the value or quality of goods or services or volume of work to be assigned to the successful Bidder. Any Contract executed with a successful Bidder may not be an exclusive Contract for the provision of the requested Goods or Services. Quantity where specified more or less, are estimates of previous consumption and are furnished without liability to the HDSB.

### ***40. Non-Performance/Termination of Contract***

If the Bidder delivers substandard, unapproved or defective items, which are rejected by the HDSB, the Bidder agrees to replace these items at the Bidder's expense with items of a quality deemed acceptable to the HDSB within a 48-hour period of the mutual satisfactory agreement being reached. If the Bidder fails to replace the items within this 48-hour period, the parties agree that the HDSB may purchase substitutes for the rejected items in the open market at no additional cost or liability to the HDSB.

Where at any time the quality of the Goods or Service supplied by the successful Bidder is not of a satisfactory standard, the HDSB may issue a verbal warning outlining the deficiency in supply or other aspects of performance and requiring the successful Bidder to correct those deficiencies within such period of time as stated. If the deficiency is not corrected



within the time specified, or having been corrected, there is a further instance of deficient performance, the HDSB may issue a written notice to the successful Bidder, identifying the deficiency in performance and setting a final date or time period for its correction, and advising that if corrective steps are not taken by that date or within that time, the HDSB may terminate the Contract and take corrective action itself.

Until the HDSB is satisfied that the unsatisfactory performance has been corrected, the HDSB may hold back from any payment an amount sufficient to rectify the unsatisfactory performance until its requirements have been met.

The HDSB reserves the right, in its absolute discretion, to terminate a Contract immediately without penalty, costs or damages of any kind whatsoever, where the Bidder has violated any laws or performed any of the following acts while performing work with the HDSB and further reserves the right to take that failure into account with respect to the award of any future contract.

- a) over-billing or duplicate billing;
- b) splitting of invoices;
- c) charging for items not supplied;
- d) charging for items not approved prior to invoicing;
- e) charging for items of one grade, while supplying items of an inferior grade;
- f) Misrepresentation as to the quality or origin of goods, their functionality or suitability for a purpose, or their performance characteristics;
- g) not responding to the HDSB or, failure to complete contract.

#### ***41. Ownership***

The Submission, along with all correspondence, documentation and information provided to the HDSB by any Bidder in connection with or arising out of the Submission, once received by the HDSB, shall become the property of the HDSB and may be appended to any Contract and/or purchase order with the successful Bidder.

#### ***42. Permits, Licenses and Approvals***

Bidders shall obtain all permits, licences and approvals required in connection with the supply of the Goods and/or Services. The costs of obtaining such permits, licences and approvals shall be the responsibility of, and shall be paid for by the Bidder.

Where a Bidder is required by any Applicable Law to hold or obtain any such licence, permit, or approval to carry on an activity contemplated in its Submission or in the Contract, neither the acceptance of the Submission nor the execution of the Contract by the HDSB shall be considered an approval by the HDSB for the Bidder to carry on such activity without the requisite licence, permit, consent or authorization.

Without in any way limiting the generality of the foregoing, any electrical Goods being proposed for consideration pursuant to this RFT must be authorized or approved in accordance with the Electrical Safety Code or by a certification organization accredited with the Standards Council of Canada Act (Canada), and shall bear the certification organization's mark identifying the Goods certified for use in Canada. Certification shall be to the standard that is appropriate for the intended use of the electrical Goods at any of the HDSB's schools or facilities.

#### ***43. Co-operative Purchasing Provisions***

This document is being issued by the HDSB to meet the HDSB's requirements. The successful Bidder acknowledges that the Provincial Government encourages cooperative procurement initiatives by School HDSBs. Bidders shall indicate on the Form of Quotation if they are willing to extend pricing and submission terms to other District School Boards in the province of Ontario where the scope of work is deemed similar or the same and where both parties are in agreement, in which case they shall be deemed to have granted consent to the HDSB to share the Submission with such HDSBs, subject to such HDSBs agreeing to receive the Submission in confidence on the understanding that the Submission contains financial, commercial, technical and other sensitive information of the Bidder. The Bidder will not be penalized if it does not agree to this provision. The HDSB will not incur any financial responsibility in connection with any purchase by another School Board. Each School Board shall accept sole responsibility for its own contract management such as placing orders and making payments to the successful Bidder.

#### ***44. Proof of WSIB Coverage***

If the Bidder is subject to the Workplace Safety and Insurance Act ("WSIA") or the Workplace Safety and Insurance Amendment Act, 2008 ("WSIAA"), the Bidder shall submit a valid clearance certificate of Workplace Safety and Insurance Board ("WSIB") coverage to the HDSB before commencing the performance of any work or services. In addition, the Bidder shall, from time to time during the term of the Contract and at the request of the HDSB, provide additional WSIB clearance certificates. The Bidder covenants and agrees to pay when due, and to ensure that each of its subcontractors pays when due, all amounts required to be paid by it or its subcontractors, from time to time during the term of the Contract, under the WSIA and/or the WSIAA, failing which the HDSB shall have the right, in addition to and not in substitution for any other right it may have pursuant to the Contract or otherwise at law or in equity, to pay to the WSIB any amount due pursuant to the WSIA or the WSIAA unpaid by the Bidder or its subcontractors and to deduct such amount from any amount due and owing from time to time to the Bidder pursuant to the Contract together with all costs incurred by the HDSB in connection therewith.

#### ***45. Right to Withdraw***

Submissions may be withdrawn prior to the Closing Time. Following Closing, no Submission may be withdrawn. Any Bidder who attempts to do so may have a negative Performance Evaluation placed on record with the HDSB in accordance with the Vendor Performance Management Administrative Procedure



#### **46. Smoking on HDSB Property**

Smoking of any substance and in any manner is prohibited in all HDSB buildings and on all HDSB property. This includes, without limitation, tobacco, cannabis in any form and vaping.

#### **47. Vehicle Operation on HDSB Property**

The successful Bidder shall use due care and caution when motorized vehicles are in operation on school property while students are expected to enter or exit the school building and/or are visible outside the school building on school property or adjacent property, particularly during recess, lunch period and preceding and following the end of the school day. Vehicles operated in parking lot and driveway areas shall not be driven at a speed in excess of 8-kilometers/per hour.

Further, on school property drivers must turn off vehicles and remove the keys during any stop. At no time are vehicles to be left running while unattended. It is recommended that the vehicle be locked when left unsupervised. The HDSB will not be responsible for any theft of, or any theft from, vehicles operated by the successful Bidder.

Asphalt play areas around the exterior of the school building are not constructed to handle heavy vehicles. Bidders will be held responsible for any damage to HDSB property including but not limited to asphalt or natural surfaces as a result of using them for access of heavy vehicles. Making good of natural surfaces or asphalt areas that are damaged in the course of the work shall be to the original (new) condition irrespective of their condition prior to commencement of the work, or the condition of the adjacent unaffected areas. Vehicles are only permitted to access, stand or be parked in areas designated by administrative staff of HDSB, which for the purposes of this provision does not include principals of schools.

#### **48. Bidder Conduct**

When on HDSB property, the Bidder and its employees must:

- have proper identification (name badge, uniform with logo, photo I.D. etc).
- be dressed appropriately (the following are not appropriate: clothing that fails to contain the anatomy when the person is carrying out normal duties; clothing with printed slogans, advertising or designs that are obscene or could have a double meaning).
- use appropriate language.
- refrain from wearing scented products or fragrances such as perfume, cologne, after shave, shampoos (as required).
- work with dignity, courtesy and respect for self and others.

- not make noise or move in corridors during morning announcements, and playing of the national anthem.
- observe procedures during fire evacuation and lockdowns, whether they are actual or test (drills).
- park in spots designated by the Principal.

The Bidder must observe all HDSB policies and procedures including but not limited to: Smoke-Free Environment; Sexual, Racial and Ethno Cultural Harassment, etc.

The Bidder will ensure that the education program is not interrupted and that the health and safety of the students and staff is not compromised.

No person who is impaired by alcohol or drugs will enter and/or remain on HDSB property.

The Bidder agrees that its employees and sub-contractors will observe and comply with all standards, procedures, policies, rules and regulations of the HDSB, including but not limited to privacy, use of facilities, equipment, building security and computer technology.



## FORM OF TENDER

**Project:** Interior Renovations and Ventilation Upgrades – Rolling Meadows PS

**Project Reference #:** RFT 21-159

From (Bidder): \_\_\_\_\_  
Company Name

Street Address

City, Province and postal code

Phone Number

Email Address

To (Owner): Halton District School Board  
2050 Guelph Line  
Burlington, Ontario L7P 5A8

We, the undersigned, having examined the Tender Documents for the above-named Project, including Addenda, hereby offer to perform the Work in accordance with the Tender Documents, for the Stipulated Price of:

Base Bid Amount	\$
Cash Allowance	<b>\$35,000</b>
Contingency Allowance	<b>\$100,000</b>
Total Bid (Excluding HST)	\$

Proposed Sub-Contractors:

Asbestos Contractor	_____
Electrical Contractor	_____
Mechanical Contractor	_____
Roofing Contractor	_____

We, the undersigned, declare that:

- a. We agree to perform the Work within the required completion time specified in the Tender Documents,
- b. We have arrived at the Tender without collusion with any competitor,
- c. This Tender is open to acceptance by the Owner for a period of 90 days from the date of Tender Closing,
- d. All Form of Tender supplements called for by the Tender Documents form an integral part of this Tender.

Signature: _____	_____
LEGAL NAME OF BIDDER	DATE

_____ AUTHORIZED SIGNATURE OF BIDDER I have the authority to bind the Bidder	& _____ TITLE  SEAL	_____ PRINTED NAME
--	------------------------------	-----------------------

## UNIT PRICE SHEET

**(Note: Unit price will be applied for control points or equipment not shown on drawings, all other equipment shown on drawings shall be included in base bid price)**

<b>Equipment</b>	<b>Hardware Requirements</b>	<b>Cost / credit per unit</b>
Status <sup>1</sup>	Current Sensor	
Occupancy <sup>1</sup>	Occupancy Sensor	
Temperature (Pipe) <sup>1</sup>	Temperature Sensor	
Temperature (Duct) <sup>1</sup>	Temperature Sensor	
Temperature (Air) <sup>1</sup>	Temperature Sensor	
CO2 <sup>1</sup>	CO2 Sensor	
Plate Type Room Sensor <sup>1</sup>	Stainless Plate Sensor	
Room Sensor (new) <sup>1</sup>	Allure or Microtouch Room Communicating Sensor	
Heating boiler control (per boiler)	Start/stop, status, alarm	
Room Controller Unit Ventilator <sup>2</sup>	All	
3-way zone control valve (3" modulating)	Valve supplied and installed by others	
Room Controller Unit Ventilator with Hydronic perimeter heat (existing control valve) <sup>2</sup>	All	
Room Controller Electric	Start/stop and status	
Room Controller Hydronic Heat (new 3/4" control valve)	Valve supplied by BAS Contractor and installed by others	
MAU <sup>3</sup>	All	
HVAC <sup>4</sup>	All	
Exhaust Fan	Enable/Disable and Status	
Ancillary Heater Electric	Enable/Disable and Status	
Ancillary Heater Hydronic	Enable/Disable and Status	
Exhaust, Supply or Return Fan	Enable/Disable and Status	

**Notes:**

1. Wire length not to exceed 50 ft, including boxes, conduits, wire molds, and/or chase requirements.
2. Unit Ventilator base is single stage heat, two (2) stage cooling and outdoor air damper, utilizing Distech ECB 203 or Alerton VLC-550 controller
3. MAU base exhaust air fan, supply air fan, single modulating heat, 3 stages cooling, ERV, outdoor air damper, and exhaust air damper
4. HVAC base return air fan, supply air fan, 2-stage heat, 2 stages cooling, outdoor air damper, return air damper, and exhaust air damper



## **APPENDIX A - DECLARATION SIGNATURE SHEET**

1. I/WE DECLARE that this Submission is made without collusion, knowledge, and comparison of figures or arrangement with any other company, firm or person submitting a Submission for the same work.
2. I/WE DECLARE that to our knowledge no member of Halton District School Board is, will be or has become financially interested, directly or indirectly, in any aspect of the Contract other than in the appropriate discharge of his/her obligations as an employee/officer of Halton District School Board.
3. I/WE HAVE READ, Understood and agree to abide by the Agreement to Abide by the Established Process.
4. I/WE HAVE CAREFULLY examined the RFT documents, and have a clear and comprehensive knowledge of what is being requested hereunder. By submitting the Submission, the Bidder agrees and consents to the administrative procedures of the Board, as well as the procedures, terms, conditions and provisions of the RFT, including the Form of Tender.
5. I/WE have carefully examined all of the Proposal Documents, and that we have thoroughly reviewed all proposal documentation and addenda number \_\_\_\_ to \_\_\_\_, and hereby accept and agree to same as forming part and parcel of the proposed Contract.
6. I/WE ARE AUTHORIZED BY and have the authority to bind the Bidder.

DATE: \_\_\_\_\_

NAME: \_\_\_\_\_  
Please Print

SIGNATURE: \_\_\_\_\_

TITLE: \_\_\_\_\_

COMPANY NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

PHONE NUMBER: \_\_\_\_\_

E-MAIL ADDRESS: \_\_\_\_\_

E-MAIL to Send PO: \_\_\_\_\_

## **APPENDIX B – HDSB PRE-QUALIFIED LIST OF SUB-CONTRACTORS**

### **Asbestos (Mandatory to pick a sub-contractor from this list)**

<p>I&amp;I Construction Services Limited  70 Newkirk Road, Unit 6  Richmond Hill, Ontario  L4C 3G3  905-884-1290  Contact: John Watters  (<a href="mailto:jwatters@landl.ca">jwatters@landl.ca</a>)</p>	<p>Biggs and Narciso Construction Services Inc.  181 Bentley Street, Unit 14  Markham, Ontario  L3R 3X1  1-866-771-0859  Contact: James Graham  (<a href="mailto:james@biggsandnarciso.com">james@biggsandnarciso.com</a>)</p>
<p>QM Environmental  345 Homer Avenue, Suite 300  Toronto, Ontario  M8W 1Z6  416-253-6000  Contact: Mark Reinhardt  (<a href="mailto:mark.reinhardt@qmenv.com">mark.reinhardt@qmenv.com</a>)</p>	<p>Alliance Environmental &amp; Abatement Contractors Inc.  589 Middlefield Road, Unit 14  Scarborough, Ontario  M1V 4Y6  416-298-4500  Contact: Dean Power  (<a href="mailto:info@allianceenvironmental.com">info@allianceenvironmental.com</a>)</p>
<p>Inflector Environmental Services.  2325 Hurontario Street, Suite 298  Mississauga, Ontario  L5A 4K4  416-726-2817  Contact: Robert Miedema  (<a href="mailto:rmiedema@inflector.ca">rmiedema@inflector.ca</a>)</p>	<p>JMX Environmental Inc.  1885 Clements Road, Unit 252  Pickering, Ontario  L1W 3V4  905-426-8315  Contact: Peter Bensley  (<a href="mailto:peter.bensley@jmxenvironmental.com">peter.bensley@jmxenvironmental.com</a>)</p>
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**Mechanical (May use this list or an alternate)**

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Besseling Mechanical Inc	Cameron Besseling	<a href="mailto:cameron@besselingmechanical.com">cameron@besselingmechanical.com</a>	905-560-0200
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## **SCOPE OF WORK**

The Halton District School Board, hereinafter referred to as the Board, invites pre-qualified Contractors for RFT 21-159 to Bid for the supply of all necessary labour, materials, equipment required to provide Contracting services along with all associated sub-contractors required for the Interior Renovations Ventilation Upgrades taking place at Rolling Meadows PS Public School.

- All demolition and construction for this project will be completed in conjunction with Grguric Architects drawings and specifications which have been included with this document.
- Renovations include, Office/Washrooms/Ceiling/Lighting Renovations as well as Ventilation upgrades within Rolling Meadows PS.
- Cash allowances and Contingencies have been carried on this project

### **Note: Completion Timelines**

#### **Phase One Area of Work: To be completed by **August 31, 2021****

1. Structural modifications for AHU-1, AUH-2 and ERV- 1 and ERV-2
2. Ground floor and Second Floor HVAC Modifications (Ducts, piping and bulkheads)
3. Ground and second floor ceiling modifications
4. Ground floor and second floor lighting modifications.
5. Ground and second floor washroom renovations
6. Main Office Renovations
7. Main Entrance renovations and front walk modifications.

#### **Phase Two Area of Work: To be completed by **August 31, 2022****

1. Wall and Window openings for All Unit Ventilators
2. Installation and final connections of ground floor unit ventilators
3. Curbs and Roof openings for AHU-1, AHU-2, ERV-1 and ERV-2
4. Installation and final connections of AHU-1, AHU-2, ERV-1 and ERV-2
5. HVAC modifications (Ducts and grilles) in Gymnasium, Library and Auditorium

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End of Section

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**1. Hazardous Building Materials Assessment**

1. A copy of a detailed designated substance survey report with respect to the identified portion of the Work is being made available as part of the Bid Documents; titled as follows:
  - .1 Titled: Pre-Renovation Designated Substances and Hazardous Materials Survey
  - Prepared by: ARCADIS
  - Project No.: 30065539
  - Dated: May 5, 2021
  - No. of Pages: 54
2. These reports provide detailed descriptions of the assessment criteria, findings, recommendations and limitations with respect to toxic or hazardous materials present at the identified property.
3. The reports, by their nature, cannot reveal all conditions that exist or can occur. Should conditions, in the opinion of the Consultant, be found to vary substantially from the report, changes in the scope of Work will be made, with resulting credits or expenditures to the Contract Price accruing to the Owner.
4. Direct questions pertaining to the designated substance survey reports to their respective authors.

**2. Asbestos Abatement Specifications**

1. Titled: Asbestos Abatement Specifications for Rolling Meadows Public School
- Prepared by: ARCADIS
- Project No.: 30065539
- Dated: May 2021
- No. of Pages: 27

End of Section



HALTON DISTRICT SCHOOL BOARD

# **PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY**

**ROLLING MEADOWS PUBLIC SCHOOL**

1522 MOUNTAIN GROVE AVENUE, BURLINGTON, ONTARIO

May 6, 2021

30065539

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PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY  
ROLLING MEADOWS PUBLIC SCHOOL



---

Paul Smith, B.Sc., IHT  
Senior Industrial Hygienist



---

Ada Nguyen, B.Sc., CIH  
Project Manager, Industrial Hygienist

**PRE-RENOVATION  
DESIGNATED  
SUBSTANCES AND  
HAZARDOUS  
MATERIALS SURVEY**

Rolling Meadows Public School  
1522 Mountain Grove Avenue,  
Burlington, Ontario

Prepared for:

**Halton District School Board  
J.W. Singleton Education Center  
2050 Guelph Line  
Burlington, Ontario L7P 5A8  
Attention: Jason Dachuk**

Prepared by:

**Arcadis Canada Inc.  
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Our Ref.:  
30065539

Date:  
May 6, 2021

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PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY  
ROLLING MEADOWS PUBLIC SCHOOL

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## 1 INTRODUCTION

Arcadis Canada Inc. (Arcadis) was retained by the Halton District School Board (HDSB) to conduct a pre-renovation designated substances and hazardous materials survey in designated areas of Rolling Meadows Public School located at 1522 Mountain Grove Avenue, Burlington, Ontario.

The information in this report is to be provided to all bidders on a project in accordance with the requirements of the *Occupational Health and Safety Act*.

It is our understanding that renovations are to take place in designated areas of the building referred to in this report as the designated study areas. The survey was limited to the designated study areas and building materials that are anticipated to be affected by the proposed building upgrade project. The locations of the designated study areas were based on information provided to Arcadis by the HDSB.

The designated study areas and eras of construction are shown on the floor plans provided in Appendix A.

The survey was undertaken to report on the presence or suspected presence of readily observable designated substances and hazardous materials.

### 1.1 Scope of Work

The scope of work for our investigation included:

- review of existing information;
- investigation of readily-accessible areas in the designated study areas for the presence of designated substances and hazardous materials used in building construction materials;
- obtaining representative bulk samples of materials suspected of containing asbestos and paint chip samples;
- laboratory analyses of bulk samples for asbestos content;
- laboratory analyses of paint chip samples for lead content; and
- preparation of a report outlining the findings of the investigation.

Mr. Paul Smith of Arcadis visited the site on January 19 and 21, and April 7, 2021 to conduct the designated substances and hazardous materials survey at Rolling Meadows Public School.

## 2 REGULATORY DISCUSSION AND METHODOLOGY

### ***Ontario Occupational Health and Safety Act (OHSA)***

The Ontario *Occupational Health and Safety Act* (OHSA) sets out, in very general terms, the duties of employers and others to protect workers from health and safety hazards on the job. These duties include, but are not limited to:

- taking all reasonable precautions to protect the health and safety of workers [clause 25(2)(h)];
- ensuring that equipment, materials and protective equipment are maintained in good condition [clause 25(1)(b)];
- providing information, instruction and supervision to protect worker health and safety [clause 25(2)(a)]; and
- acquainting a worker or a person in authority over a worker with any hazard in the work and in the handling, storage, use, disposal and transport of any article, device, equipment or a biological, chemical or physical agent [clause 25(2)(d)].

In addition, Section 30 of the OHSA deals with the presence of designated substances on construction projects. Compliance with the OHSA and its regulations requires action to be taken where there is a designated substance hazard on a construction project.

Section 30 of the OHSA requires the owner of a project to determine if designated substances are present on a project and, if so, to inform all potential contractors as part of the bidding process. Contractors who receive this information are to pass it onto other contractors and subcontractors who are bidding for work on the project.

### ***Regulation for Construction Projects, O.Reg. 213/91***

The *Regulation for Construction Projects*, O.Reg. 213/91, applies to all construction projects. The following sections of the regulation would apply to situations where there is the potential for workers to be exposed to designated substances:

- |            |     |   |
|------------|-----|---|
| Section 14 | (5) | A competent person shall perform tests and observations necessary for the detection of hazardous conditions on a project.   |
| Section 21 | (1) | A worker shall wear such protective clothing and use such personal protective equipment or devices as are necessary to protect the worker against the hazards to which the worker may be exposed. |
|            | (2) | A worker's employer shall require the worker to comply with subsection (1).   |

PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY  
ROLLING MEADOWS PUBLIC SCHOOL

- (3) A worker required to wear personal protective clothing or use personal protective equipment or devices shall be adequately instructed and trained in the care and use of the clothing, equipment or device before wearing or using it.
- Section 30 Workers who handle or use substances likely to endanger their health shall be provided with washing facilities with clean water, soap and individual towels.
- Section 46
  - (1) A project shall be adequately ventilated by natural or mechanical means,
    - (a) if a worker may be injured by inhaling a noxious...dust or fume;
  - (2) If it is not practicable to provide natural or mechanical ventilation in the circumstances described in clause (1)(a), respiratory protective equipment suitable for the hazard shall be provided and be used by the workers.
- Section 59 If the dissemination of dust is a hazard to a worker, the dust shall be adequately controlled or each worker who may be exposed to the hazard shall be provided with adequate personal protective equipment.

***Regulation for Designated Substances (O.Reg. 490/09)***

The *Designated Substance Regulation* (O.Reg. 490/09) specifies occupational exposure limits (OELs) for designated substances and requires an assessment and a control program to ensure compliance with these OELs.

Although, O.Reg. 490/09 and the OELs do not apply to an employer on a construction project, or to their workers at the project, employers still have a responsibility to protect the health of their workers and to comply with the OHSA and other applicable regulations. Section 25(2)(h) of the OHSA requires that employers take "every precaution reasonable in the circumstances for the protection of a worker".

Other regulatory requirements (and guidelines) which apply to control of exposure to designated substances and hazardous materials are referenced in the sections below.

## **2.1 Asbestos**

Asbestos has been widely used in buildings, both in friable applications (materials which can be crumbled, pulverized or powdered by hand pressure, when dry) such as pipe and tank insulation, sprayed-on fireproofing and acoustic texture material and in non-friable manufactured products such as floor tile, gaskets, cement board and so on. The use of asbestos in friable applications was curtailed around the mid-1970s and, as such, most buildings constructed prior to about 1975 contain some form of friable construction material with an asbestos content. The use of asbestos in certain non-friable materials continued beyond the mid-1970s.

Control of exposure to asbestos is governed in Ontario by Regulation 278/05 – *Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations*. Disposal of asbestos waste

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(friable and non-friable materials) is governed by Ontario Regulation 278/05 and by Ontario Regulation 347, *Waste Management – General*. O.Reg. 278/05 classifies asbestos work operations into three types (Type 1, 2 and 3), as shown in Table C-1 in Appendix C, and specifies procedures to be followed in conducting asbestos abatement work.

### 2.2 Lead

Lead is a heavy metal that can be found in construction materials such as paints, coatings, mortar, concrete, pipes, solder, packings, sheet metal, caulking, glazed ceramic products and cable splices. Lead has been used historically in exterior and interior paints.

The *Surface Coating Materials Regulations* (SOR/2016-193) made pursuant to the Canada Consumer Product Safety Act states that a surface coating material must not contain more than 90 mg/kg total lead. Health Canada defines a lead-containing surface coating as a paint or similar material that dries to a solid film that contains over 90 mg/kg dry weight of lead.

Information from the United States Occupational Health and Safety Administration (OSHA) suggests that the improper removal of lead paint containing 600 mg/kg lead results in airborne lead concentrations that exceed half of the permissible exposure limit. Lead concentrations as low as 90 mg/kg may present a risk to pregnant women and children<sup>(1)</sup>.

The *National Plumbing Code* allowed lead as an acceptable material for pipes until 1975 and in solder until 1986.

The Ministry of Labour *Guideline, Lead on Construction Projects*, dated April 2011, provides guidance in the measures and procedures that should be followed when handling lead containing materials during construction projects. In the guideline, lead-containing construction operations are classified into three groups - Type 1 (low risk), Type 2 (medium risk) and Type 3 (high risk) based on presumed airborne concentrations of lead, as shown in Appendix C, Table C-2. Any operation that may expose a worker to lead that is not a Type 1, Type 2, or Type 3b operation, is classified as a Type 3a operation.

### 2.3 Mercury

Mercury has been used in electrical equipment such as alkaline batteries, fluorescent light bulbs (lamps), high intensity discharge (HID) lights (mercury vapour, high pressure sodium and metal halide), “silent switches” and in instruments such as thermometers, manometers and barometers, pressure gauges, float and level switches and flow meters. Mercury-containing lamps, the bulk of which are 1.22 m (four foot) fluorescent lamps contain between 7 and 40 mg of mercury each. Mercury compounds have also been

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<sup>(1)</sup> *Lead-Containing Paints and Coatings: Preventing Exposure in the Construction Industry*. WorkSafe BC, 2011.



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used historically as additives in latex paint to protect the paint from mildew and bacteria during production and storage.

The intentional addition of mercury to Canadian-produced consumer paints for interior use was prohibited in 1991. Mercury may have remained in paints after 1991, however, as a result of impurities in the paint ingredients or cross-contamination due to other manufacturing processes. The *Surface Coating Materials Regulations* made under the *Hazardous Products Act* set a maximum total mercury concentration of 10 mg/kg (0.001 percent) for surface coating materials (including paint). This criterion level applies to the sale and importation of new surface coating materials.

Mercury-containing thermostats and silent light switches are mercury tilt switches which are small tubes with electrical contacts at one end of the tube. A mercury tilt switch is usually present when no switch is visible. Mercury switches often have the word “TOP” stamped on the upper end of the switch, which is visible after removing the cover plate. If mercury switches are to be removed, the entire switch should be removed and placed into a suitable container for storage and disposal.

Waste light tubes generated during renovations or building demolition and waste mercury from equipment must either be recycled or disposed of in accordance with the requirements of Ont. Reg. 347 - *Waste Management, General*.

Waste mercury in amounts less than 5 kg (per month) are exempt from the generator registration requirements prescribed by O.Reg. 347 – *Waste Management – General*. Waste mercury from mercury switches or gauges should, however, be properly collected and shipped to a recycling facility or disposed of as a hazardous waste. Removal of mercury-containing equipment (e.g., switches, gauges, controls, etc.) should be carried out in a manner which prevents spillage and exposure to workers.

### 2.4 Silica

Silica exists in several forms of which crystalline silica is of most concern with respect to potential worker exposures. Quartz is the most abundant type of crystalline silica. Some commonly used construction materials containing silica include brick, refractory brick, concrete, concrete block, cement, mortar, rock and stone, sand, fill dirt, topsoil and asphalt containing rock or stone.

The Ministry of Labour *Guideline, Silica on Construction Projects*, dated April 2011, provides guidance in controlling exposure to silica dust during construction activities. In the guideline, silica-containing construction operations are classified into three groups - Type 1 (low risk), Type 2 (medium risk) and Type 3 (high risk) based on presumed airborne concentrations of respirable crystalline silica in the form of cristobalite, tridymite, quartz and tripoli as shown in Appendix C, Table C-3.

### 2.5 Vinyl Chloride

Vinyl chloride vapours may be released from polyvinyl chloride (PVC) products in the event of heating or as a result of decomposition during fire. PVC is used in numerous materials that may be found in building construction, including, for example, piping, conduits, siding, window and door frames, plastics, garden hoses, flooring and wire and cable protection.

## 2.6 Acrylonitrile

Acrylonitrile is used to produce nitrile-butadiene rubber, acrylonitrile-butadiene-styrene (ABS) polymers and styrene-acrylonitrile (SAN) polymers. Products made with ABS resins which may be found in buildings include telephones, bottles, packaging, refrigerator door liners, plastic pipe, building panels and shower stalls. Acrylonitrile can be released into the air by combustion of products containing ABS.

## 2.7 Other Designated Substances

Isocyanates are a class of chemicals used in the manufacture of certain types of plastics, foams, coatings and other products. Isocyanate-based building construction materials may include rigid foam products such as foam-core panels and spray-on insulation and paints, coatings, sealants and adhesives. Isocyanates may be inhaled if they are present in the air in the form of a vapour, a mist or a dust.

Benzene is a clear, highly flammable liquid used mainly in the manufacture of other chemicals. The commercial use of benzene as a solvent has practically been eliminated, however it continues to be used as a solvent and reactant in laboratories.

Arsenic is a heavy metal used historically in pesticides and herbicides. The primary use in building construction materials was its use in the wood preservative chromated copper arsenate (CCA). CCA was used to pressure treat lumber since the 1940's. Pressure-treated wood containing CCA is no longer being produced for use in most residential settings.

Ethylene oxide is a colourless gas at room temperature. It has been used primarily for the manufacture of other chemicals, as a fumigant and fungicide and for sterilization of hospital equipment.

Coke oven emissions are airborne contaminants emitted from coke ovens and are not a potential hazard associated with building construction materials.

## 2.8 Polychlorinated Biphenyls (PCBs)

The management of equipment classified as waste and containing Polychlorinated Biphenyls (PCBs) at concentrations of 50 parts per million (mg/kg) or greater is regulated by Ontario Regulation 362, *Waste Management – PCBs*. Under this regulation, PCB waste is defined as any waste material containing PCBs in concentrations of 50 mg/kg or greater. Any equipment containing PCBs at or greater than this level, such as transformers, switchgear, light ballasts and capacitors, which is removed from service due to age, failure or as a result of decommissioning, is considered to constitute a PCB waste. Although current federal legislation (effective 1 July 1980) has prohibited the manufacture and sale of new equipment containing PCBs since that time, continued operation of equipment supplied prior to this date and containing PCBs is still permitted. Handling, storage and disposition of such equipment is, however, tightly regulated and must be managed in accordance with provincial and federal government requirements as soon as it is taken out of service or becomes unserviceable.

In most institutional, commercial facilities and in smaller industrial facilities, the primary source of equipment potentially containing PCBs is fluorescent and H.I.D. light ballasts. Small transformers may also be present.

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In larger industrial facilities, larger transformers and switch gear containing, or potentially containing, PCBs may also be present.

PCBs were also commonly added to industrial paints from the 1940s to the late 1970s. PCBs were added directly to the paint mixture to act as a fungicide, to increase durability and flexibility, to improve resistance to fires and to increase moisture resistance. The use of PCBs in new products was banned in Canada in the 1970s. PCB amended paints were used in specialty industrial/institutional applications prior to the 1970s including government buildings and equipment such as industrial plants, radar sites, ships as well as non-government rail cars, ships, grain bins, automobiles and appliances.

Removal of in-service equipment containing PCBs, such as fluorescent light ballasts, capacitors and transformers, is subject to the requirements of the federal *PCB Regulations* (discussed below).

The *PCB Regulations*, which came into force on 5 September 2008, were made under the *Canadian Environmental Protection Act*, 1999 (CEPA 1999) with the objective of addressing the risks posed by the use, storage and release to the environment of PCBs, and to accelerate their destruction. The *PCB Regulations* set different end-of-use deadlines for equipment containing PCBs at various concentration levels.

*The Regulations Amending the PCB Regulations and Repealing the Federal Mobile PCB Treatment and Destruction Regulations* were published on 23 April 2014, in the Canada Gazette, Part II, and came into force on 1 January 2015. The most notable part of the amendments is the addition of an end-of-use deadline date of 31 December 2025 for specific electrical equipment located at electrical generation, transmission and distribution facilities.

When the PCB materials are classified as waste, jurisdiction falls under the Ontario Ministry of the Environment and Climate Change (MOECC) and O.Reg. 362. All remedial and PCB management work must be carried out under the terms of a Director's Instruction issued by an MOECC District Office (for quantities of PCB fluid greater than 50 litres). The PCB waste stream, regardless of quantity, must be registered with the MOECC, in accordance with O.Reg. 347, *General - Waste Management*. O.Reg. 362 applies to any equipment containing greater than 1 kg of PCBs.

## 2.9 Ozone-Depleting Substances (ODS) and Other Halocarbons

Ontario Regulation 463/10 – *Ozone Depleting Substances and Other Halocarbons*, applies to the use, handling and disposal of Class 1 ozone-depleting substances, including various chlorofluorocarbons (CFCs), halons and other halocarbons, Class 2 ozone-depleting substances, including various hydrochlorofluorocarbons (HCFCs) and halocarbons, and other halocarbons, including fluorocarbons (FCs) and hydrofluorocarbons (CFCs). The most significant requirements for handling of ozone-depleting substances (ODS) and other Halocarbons, which include, for example, refrigerants used in refrigeration equipment and chillers, include the following:

- certification is required for all persons testing, repairing, filling or emptying equipment containing ODS and other halocarbons;

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- the discharge of a Class 1 ODS or anything that contains a Class 1 ODS to the natural environment or within a building is prohibited;
- the making, use of, selling of or transferring of a Class 1 ODS is restricted to certain conditions;
- the discharge of a solvent or sterilant that contains a Class 2 ODS is prohibited;
- the making, use of, selling of or transferring of a solvent or sterilant that contains a Class 2 ODS is restricted to certain conditions;
- fire extinguishing equipment that contains a halon may be discharged to fight fires, except fires for firefighting training purposes;
- portable fire extinguishing equipment that contains a halon may be used or stored if the extinguisher was sold for use for the first time before 1 January 1996;
- records of the servicing and repair of equipment containing ODS and other halocarbons must be prepared and maintained by the owner of the equipment; and
- equipment no longer containing ODS and other halocarbons must be posted with a notice completed by a certified person.

Ontario Regulation 347, *General – Waste Management*, has also been amended to provide for more strict control of CFCs. The requirements under the amended regulation apply primarily to the keeping of records for the receipt or recycling of CFC waste.

## 2.10 Mould

Moulds are forms of fungi that are found everywhere both indoors and outdoors all year round. Outdoors, moulds live in the soil, on plants and on dead and decaying matter. More than 1000 different kinds of indoor moulds have been found in buildings. Moulds spread and reproduce by making spores, which are all small and light-weight, able to travel through air, capable of resisting dry, adverse environmental conditions, and hence capable of surviving a long time. Moulds need moisture and nutrients to grow and their growth is stimulated by warm, damp and humid conditions.

Control of exposure to mould is required under Section 25(2)(h) of the Ontario *Occupational Health and Safety Act*, which states that employers shall take every precaution reasonable in the circumstances for the protection of workers. Recommended work practices are outlined in the following documents:

- *Mould Guidelines for the Canadian Construction Industry*. Standard Construction Document CCA 82 2004. Canadian Construction Association.
- *Mould Abatement Guidelines*. Environmental Abatement Council of Ontario. Edition 3. 2015.

### 3 RESULTS AND DISCUSSION

#### 3.1 Asbestos

Arcadis reviewed a report prepared by Arcadis for the Halton District School Board entitled *Survey of Asbestos-Containing Materials, Rolling Meadows Public School, 1522 Mountain Grove Avenue, Burlington, Ontario* dated September 25, 2020. Information and/or bulk sample analysis results obtained from this existing report was utilized by Arcadis during the course of our investigation and in the preparation of this report.

During the course of our site investigations, representative bulk samples of material were collected by Arcadis staff. The samples were forwarded to EMSL Canada Inc. (EMSL) for asbestos analyses. Results of bulk sample analysis for asbestos content are provided in Table 3.1. Table 3.1 also include sample results that are outside of the designated study areas. This information is provided for references purposes only. Laboratory reports are provided in Appendix B. Locations of accessible asbestos-containing materials are outlined on the floor plans provided in Appendix A.

**Table 3.1. Summary of Results of Analyses of Bulk Samples for Asbestos Content**

Sample No.	Sample Location	Sample Description	Asbestos Content
1-A	Room 100	(12" x 12') tan vinyl floor mastic	<b>1% chrysotile</b>
2-A	Room 102A	(9" x 9") red vinyl floor tile	<b>6.1% chrysotile</b>
2-A	Room 102A	(9" x 9") red vinyl floor tile mastic	<b>2% chrysotile</b>
3-A	Room 215	(9" x 9") gbs vinyl floor tile mastic	None detected
3-B	Room 219	(9" x 9") gbs vinyl floor tile mastic	None detected
3-C	Room 117	(9" x 9") gbs vinyl floor tile mastic	None detected
4-A	Room 207	(9" x 9") green vinyl floor tile mastic	<b>5% chrysotile</b>
5-A	Room 105	(12" x 12") beige vinyl floor tile mastic	<b>3% chrysotile</b>
6-A	Room 136	carpet mastic	None detected
6-B	Room 136	carpet mastic	None detected
6-C	Room 136	carpet mastic	None detected
7-A	Room 116	ceramic tile grout	<0.25% chrysotile <sup>(1)</sup>
7-B	Room 116	ceramic tile grout	<b>1% chrysotile</b>
8-A	Room 212	ceramic tile grout	<b>1% chrysotile</b>
9-A	Room 127A	vinyl baseboard	None detected (PLM) None detected (TEM)
9-A	Room 127A	vinyl baseboard mastic	None detected
9-B	Room 127A	vinyl baseboard	None detected
9-B	Room 127A	vinyl baseboard mastic	None detected
9-C	Room 127A	vinyl baseboard	None detected
9-C	Room 127A	vinyl baseboard mastic	None detected
10-A	Outside Room 100	exterior brick mortar, 1960	None detected

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Sample No.	Sample Location	Sample Description	Asbestos Content
10-B	Outside Room 104	exterior brick mortar, 1960	None detected
10-C	Outside Room 113	exterior brick mortar, 1960	None detected
11-A	Outside Room 117	exterior brick mortar, 1964	None detected
11-B	Outside Room 119	exterior brick mortar, 1964	None detected
11-C	Outside Room 121	exterior brick mortar, 1964	None detected
12-A	Outside Library	exterior brick mortar, 1973	None detected
12-B	Outside Library	exterior brick mortar, 1973	None detected
12-C	Outside Library	exterior brick mortar, 1973	None detected
13-A	Room 105	masonry mortar, 1960	None detected
13-B	Room 901	masonry mortar, 1960	None detected
13-C	Room 921	masonry mortar, 1960	None detected
14-A	Room 907	masonry mortar, 1964	None detected
14-B	Room 908	masonry mortar, 1964	None detected
14-C	Room 914	masonry mortar, 1964	None detected
15-A	Room 136	masonry mortar, 1973	None detected
15-B	Room 136	masonry mortar, 1973	None detected
15-C	Room 136	masonry mortar, 1973	None detected
16-A	Cor. 907 at 220	yellow textured wall paint, 1964	None detected
16-B	Cor. 908 at 216	yellow textured wall paint, 1964	None detected
16-C	Cor. 914 at 117	yellow textured wall paint, 1964	None detected
17-A	Room 100	white textured/shiny wall paint, 1960	None detected
17-B	Room 100	white textured/shiny wall paint, 1960	None detected
17-C	Room 100	white textured/shiny wall paint, 1960	None detected
1-A	Door at 920	Exterior black door frame caulking	<b>2% chrysotile</b>
5-A	Room 923	Sprayed fireproofing, grey (Vestibule, 1960 Era)	None detected <sup>(2)</sup>
5-B	Room 923	Sprayed fireproofing, grey (Vestibule, 1960 Era)	None detected <sup>(2)</sup>
5-C	Room 923	Sprayed fireproofing, grey (Vestibule, 1960 Era)	None detected <sup>(2)</sup>
3-A	Corridor 923	(2' x 4') ceiling tile – chicken feet and random pinhole	None detected <sup>(2)</sup>
3-B	Corridor 923	(2' x 4') ceiling tile – chicken feet and random pinhole	None detected <sup>(2)</sup>
3-C	Corridor 923	(2' x 4') ceiling tile – chicken feet and random pinhole	None detected <sup>(2)</sup>
6A-Paint	Corridor 923	Paint – concrete block wall, 1960	None detected <sup>(2)</sup>
6B-Paint	Corridor 901	Paint – concrete block wall, 1960	None detected <sup>(2)</sup>
6C-Paint	Corridor 901	Paint – concrete block wall, 1960	None detected <sup>(2)</sup>
1-A	Room 207	(12" x 12") ceiling tile adhesive-brown	None detected <sup>(2)</sup>
1-B	Room 205	(12" x 12") ceiling tile adhesive-brown	None detected <sup>(2)</sup>
1-C	Room 203	(12" x 12") ceiling tile adhesive-brown	None detected <sup>(2)</sup>
4-A	Room 206	concrete block mortar, 1960	None detected <sup>(2)</sup>

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Sample No.	Sample Location	Sample Description	Asbestos Content
4-B	Room 222	concrete block mortar, 1960	None detected <sup>(2)</sup>
4-C	Room 219	concrete block mortar, 1964	None detected <sup>(2)</sup>
7-A	Room 206	(2' x 4') ceiling tile – pinhole and fissure on 2'	None detected <sup>(2)</sup>
7-B	Room 206	(2' x 4') ceiling tile – pinhole and fissure on 2'	None detected <sup>(2)</sup>
7-C	Room 207	(2' x 4') ceiling tile – pinhole and fissure on 2'	None detected <sup>(2)</sup>
8-A	Room 210	(2' x 4') ceiling tile – pinhole and deep random fissure	None detected <sup>(2)</sup>
8-B	Room 222	(2' x 4') ceiling tile – pinhole and deep random fissure	None detected <sup>(2)</sup>
8-C	Room 211	(2' x 4') ceiling tile – pinhole and deep random fissure	None detected <sup>(2)</sup>
9-A	Corr. 908	(2' x 4') ceiling tile – pinhole and thin chicken feet	None detected <sup>(2)</sup>
9-B	Corr. 905	(2' x 4') ceiling tile – pinhole and thin chicken feet	None detected <sup>(2)</sup>
9-C	Corr. 907	(2' x 4') ceiling tile – pinhole and thin chicken feet	None detected <sup>(2)</sup>
10-A	Room 215	(2' x 4') ceiling tile – pinhole and random small fissures	None detected <sup>(2)</sup>
10-B	Room 216	(2' x 4') ceiling tile – pinhole and random small fissures	None detected <sup>(2)</sup>
10-C	Room 217	(2' x 4') ceiling tile – pinhole and random small fissures	None detected <sup>(2)</sup>
1-A	Room 104	(12" x 12") vinyl floor tile – grey in colour with light and grey flecks	None detected (PLM) <sup>(2)</sup> None detected (TEM) <sup>(2)</sup>
1-B	Room 104	(12" x 12") vinyl floor tile – grey in colour with light and grey flecks	None detected <sup>(2)</sup>
1-C	Room 104	(12" x 12") vinyl floor tile – grey in colour with light and grey flecks	None detected <sup>(2)</sup>
2-A	Room 103	(9" x 9") vinyl floor tile – pink in colour with white streaks	<b>3.7% chrysotile</b> <sup>(2)</sup>
3-A	Room 106A	(12" x 12") vinyl floor tile – teal/grey in colour with light and dark flecks	None detected (PLM) <sup>(2)</sup> None detected (TEM) <sup>(2)</sup>
3-B	Room 127A	(12" x 12") vinyl floor tile – teal/grey in colour with light and dark flecks	None detected <sup>(2)</sup>
3-C	Room 127A	(12" x 12") vinyl floor tile – teal/grey in colour with light and dark flecks	None detected <sup>(2)</sup>
4-A	Room 102	(12" x 12") vinyl floor tile – tan in colour with brown and white flecks	None detected (PLM) <sup>(2)</sup> None detected (TEM) <sup>(2)</sup>
4-B	Room 100	(12" x 12") vinyl floor tile – tan in colour with brown and white flecks	None detected <sup>(2)</sup>
4-C	Room 119	(12" x 12") vinyl floor tile – tan in colour with brown and white flecks	None detected <sup>(2)</sup>
5-A	Room 111	(9" x 9") vinyl floor tile – beige in colour with white and brown streaks	<b>3.2% chrysotile</b> <sup>(2)</sup>



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Sample No.	Sample Location	Sample Description	Asbestos Content
6-A	Room 122	(12" x 12") vinyl floor tile – beige in colour with light and grey specks	None detected (PLM) <sup>(2)</sup> None detected (TEM) <sup>(2)</sup>
6-B	Room 206	(12" x 12") vinyl floor tile – beige in colour with light and grey specks	None detected <sup>(2)</sup>
6-C	Room 206	(12" x 12") vinyl floor tile – beige in colour with light and grey specks	None detected <sup>(2)</sup>
8-A	Room 206A	(9" x 9") vinyl floor tile – white in colour with black streaks	<b>2.1% chrysotile</b> <sup>(2)</sup>
18-A	Room 127C	sipporex on ceiling	None detected <sup>(2)</sup>
18-B	Room 127C	sipporex on ceiling	None detected <sup>(2)</sup>
18-C	Room 127C	sipporex on ceiling	None detected <sup>(2)</sup>
20	Room 134	pipe fitting insulation – grey in colour	<b>45% chrysotile</b> <sup>(2)</sup>
21-A	Room 138	anti-sweat insulation with black paper	<0.25% chrysotile (TEM) <sup>(1,2)</sup>
21-B	Room 138	anti-sweat insulation with black paper	None detected <sup>(2)</sup>
21-C	Room 138	anti-sweat insulation with black paper	None detected <sup>(2)</sup>
22	Room 111	anti-sweat insulation with black paper	<0.25% chrysotile <sup>(1,2)</sup>
25-A	Room 134	(2' x 4') ceiling tile – random pinholes with dimpled face	None detected <sup>(2)</sup>
25-B	Room 134	(2' x 4') ceiling tile – random pinholes with dimpled face	None detected <sup>(2)</sup>
25-C	Room 912	(2' x 4') ceiling tile – random pinholes with dimpled face	None detected <sup>(2)</sup>
26-A	Room 119	(2' x 4') ceiling tile – ceramic look	None detected <sup>(2)</sup>
26-B	Room 119A	(2' x 4') ceiling tile – ceramic look	None detected <sup>(2)</sup>
26-C	Room 119B	(2' x 4') ceiling tile – ceramic look	None detected <sup>(2)</sup>
27-A	Room 117	(12" x 12") ceiling tile – random pinholes-	None detected <sup>(2)</sup>
27-B	Room 117	(12" x 12") ceiling tile – random pinholes-	None detected <sup>(2)</sup>
27-C	Room 117	(12" x 12") ceiling tile – random pinholes-	None detected <sup>(2)</sup>
5-A	Room 121	(12" x 12") vinyl floor tile – beige with brown streaks	None detected (PLM) <sup>(2)</sup> None detected (TEM) <sup>(2)</sup>
5-B	Room 121A	(12" x 12") vinyl floor tile – beige with brown streaks	None detected <sup>(2)</sup>
5-C	Room 121B	(12" x 12") vinyl floor tile – beige with brown streaks	None detected <sup>(2)</sup>
6-A	Room 121	(9" x 9") vinyl floor tile – beige with multi-coloured streaks	<b>1.1% chrysotile</b> <sup>(2)</sup>
7-A	Room 121	mastic under (12" x 12") vinyl floor tile	None detected (PLM) <sup>(2)</sup> None detected (TEM) <sup>(2)</sup>
7-B	Room 121	mastic under (12" x 12") vinyl floor tile	None detected <sup>(2)</sup>
7-C	Room 121	mastic under (12" x 12") vinyl floor tile	None detected <sup>(2)</sup>
16-A	Room 922	anti-sweat insulation with black paper	None detected (TEM) <sup>(2)</sup>
16-B	Room 921	anti-sweat insulation with black paper	None detected <sup>(2)</sup>



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Sample No.	Sample Location	Sample Description	Asbestos Content
18-A	Room 121	(2' x 4') ceiling tile – "L" fissures with pinholes	None detected <sup>(2)</sup>
18-B	Room 121	(2' x 4') ceiling tile – "L" fissures with pinholes	None detected <sup>(2)</sup>
18-C	Room 121	(2' x 4') ceiling tile – "L" fissures with pinholes	None detected <sup>(2)</sup>
1-A	Room 106	mastic – black in colour under (9" x 9") vinyl floor tile	<b>0.65% chrysotile</b> <sup>(2)</sup>
8-A	Room 106	Mastic – brown in colour from (12" x 12") ceiling tile	None detected <sup>(2)</sup>
8-B	Room 106	Mastic – brown in colour from (12" x 12") ceiling tile	None detected <sup>(2)</sup>
8-C	Room 106	Mastic – brown in colour from (12" x 12") ceiling tile	None detected <sup>(2)</sup>
9-A	Room 106	(12" x 12") ceiling tile – white in colour with large and small holes	None detected <sup>(2)</sup>
9-B	Room 106	(12" x 12") ceiling tile – white in colour with large and small holes	None detected <sup>(2)</sup>
9-C	Room 106	(12" x 12") ceiling tile – white in colour with large and small holes	None detected <sup>(2)</sup>
RMPS#3	Room 128	rainwater leader pipe fitting insulation	<b>50% chrysotile</b> <sup>(2)</sup>
RMPS#4	Boys' Change Room	hot water heating pipe fitting insulation	<b>20% chrysotile</b> <sup>(2)</sup>
RMPS#8	Room 111	rainwater leader pipe fitting insulation	<b>20% chrysotile</b> <sup>(2)</sup>
RMPS#9	Room 111	hot water heating pipe fitting insulation	<b>57% chrysotile</b> <sup>(2)</sup>
RMPS#11	Corridor 922	rainwater leader pipe fitting insulation (anti-sweat insulation with black paper)	<0.5% chrysotile (TEM) <sup>(1,2)</sup>
RMPS#14	Corridor 922	hot water heating pipe fitting insulation	<b>21% chrysotile</b> <sup>(2)</sup>
RMPS#17	Corridor 922	rainwater leader pipe fitting insulation (anti-sweat insulation with black paper)	None detected (TEM) <sup>(2)</sup>
8-A	Room 105	caulking, grey interior window frame	None detected (TEM) <sup>(3)</sup>
8-B	Room 105	caulking, grey interior window frame	None detected <sup>(3)</sup>
8-C	Room 121	caulking, grey interior window frame	None detected <sup>(3)</sup>
9-A	Room 105	caulking, white, interior window frame, sectional wall	None detected (TEM) <sup>(3)</sup>
9-B	Room 105	caulking, white, interior window frame, sectional wall	None detected <sup>(3)</sup>
9-C	Room 105	caulking, white, interior window frame, sectional wall	None detected <sup>(3)</sup>
10-A	Exterior 105	caulking, grey, tacky exterior window frame/brick	None detected (TEM) <sup>(3)</sup>
10-B	Exterior 121	caulking, grey, tacky exterior window frame/brick	None detected <sup>(3)</sup>
10-C	Exterior 121B	caulking, grey, tacky exterior window frame/brick	None detected <sup>(3)</sup>
11-A	Exterior 105	caulking, grey, exterior window frame/glass	None detected (TEM) <sup>(3)</sup>
11-B	Exterior 121	caulking, grey, exterior window frame/glass	None detected <sup>(3)</sup>

PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY  
ROLLING MEADOWS PUBLIC SCHOOL

Sample No.	Sample Location	Sample Description	Asbestos Content
11-C	Exterior 121B	caulking, grey, exterior window frame/glass	None detected <sup>(3)</sup>
12-A	Room 105A	caulking, grey old look exterior door	<0.25% chrysotile (TEM) <sup>(1), (3)</sup>
12-B	Room 105A	caulking, grey old look exterior door	<0.25% chrysotile <sup>(1), (3)</sup>
12-C	Room 105A	caulking, grey old look exterior door	<0.25% chrysotile <sup>(1), (3)</sup>

**NOTES:**

< = Less than.

(1) "Asbestos-containing material" is defined as material that contains 0.5% or more asbestos by dry weight.

(2) Sample results derived from a report prepared by Arcadis for the HDSB entitled *Survey of Asbestos-Containing Materials, Rolling Meadows Public School, 1522 Mountain Grove Avenue, Burlington, Ontario* dated September 25, 2020.

(3) Sample results derived from a report prepared by Arcadis for the HDSB entitled *Pre-Renovation Designated Substances and Hazardous Materials Survey, Rolling Meadows Public School, 1522 Mountain Grove Avenue, Burlington, Ontario* dated April 8, 2020.

Bulk samples were analyzed by Polarized Light Microscopy (PLM) analysis, except where "TEM" is noted, in which case Transmission Electron Microscopy analysis was also performed.

< = less than.

Chrysotile = Chrysotile asbestos.

Determination of the locations of asbestos-containing material was made based on the review of existing information, results of bulk sample analysis, visual observations and physical characteristics of the applications as well as our knowledge of the uses of asbestos in building materials.

Based on visual observations and results of laboratory analyses of samples collected by Arcadis Canada Inc., the following asbestos-containing materials were found to be present in the designated study areas:

- thermal insulation applied to pipe fittings below ceilings in Rooms 113, 114, 123, 127A, 128, 136, 212 and Stairwell 910 and Corridor 916;
- thermal insulation applied to pipe fittings above ceilings in Rooms 104, 106W, 117, 136, 212 and Corridors 913, 914, 915, 918, 919, 920, 921, 922 and 923;
- thermal insulation applied to pipe fittings (assumed to be present) above solid ceilings or in pipe chases in Rooms 100, 100A, 100B, 102, 102A, 102B, 103, 113, 114, 115, 116 and 214;
- (9" x 9") vinyl floor tiles and underlying mastic in Rooms 100B (under carpet), 102, 102A (under carpet), 102B (under carpet), 113, 114, 123, 201, 202, 203, 205, 207, 208, 210, 211, 222 and 223, and Corridors 901, 902, 903 and 905;
- (9" x 9") vinyl floor tiles in Rooms 117, 124, 215, 216, 217, 218, 219 and 220, and Corridors 907 and 908;
- (12' x 12') vinyl floor tile mastic in Rooms 100, 100A, 103, 104, 105, 127A and 206;
- (12" x 12") vinyl floor tiles in Room 121;

## PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY ROLLING MEADOWS PUBLIC SCHOOL

- ceramic tile grout in Rooms 116 and 212; and
- black door frame caulking applied to the exterior side of entrance door at Corridor 920.

During the course of the site investigations, Arcadis staff accessed cavities in exterior concrete block walls in several different locations throughout the designated study areas where renovation activities may disturb the concrete block walls. Materials suspected of containing asbestos (e.g. vermiculite block-fill insulation) was not observed in all block wall cavities accessed.

Asbestos-containing thermal insulation applied to pipe fittings is a white/grey-coloured cementitious material.

Glass fibre insulation is readily visually distinguishable (typically yellow in colour) from asbestos-containing insulation materials and was, therefore, not tested for asbestos content.

Thermal insulation is a friable material. The removal, alteration and/or disturbance of less than 1 m<sup>2</sup> of friable asbestos-containing materials is classified as a Type 2 enclosure operation as specified in O.Reg. 278/05. The removal, alteration and/or disturbance of more than 1 m<sup>2</sup> of friable asbestos-containing materials is classified as a Type 3 operation.

Vinyl floor tiles, mastics, caulking and grout are non-friable materials. The removal, alteration and/or disturbance of these non-friable asbestos-containing materials can be performed as a Type 1 operation as specified in O. Reg. 278/05 if the material is wetted and the work is done only using non-powered, hand-held tools (see Table C-1 in Appendix C). If the removal, alteration and/or disturbance work is done using power tools that are attached to dust-collecting devices equipped with HEPA filters, then the work is classified as Type 2. If the power tools do not have HEPA filtered dust collecting devices, then the work is Type 3.

Asbestos may also be present in materials which were not sampled during the course of the asbestos survey carried out by Arcadis, including, but not limited to, areas outside the designated study areas, roofing materials, asphaltic pavement, etc., and/or in locations that are presently inaccessible (e.g., in pipe chases and behind walls). Confirmatory testing of any such materials could be undertaken as the need arises (i.e., at the time of renovations, modifications or demolition) or the materials can be assumed to contain asbestos based on findings in adjacent areas.

If any materials which may contain asbestos and which were not tested during the course of the designated substances and hazardous materials survey are discovered during any construction activities, the work shall not proceed until such time as the required notifications have been made and an appropriate course of action is determined.

### **3.2 Lead**

During the course of our site investigations, samples of the predominant paint colours were collected and submitted to Bureau Veritas Inc, a laboratory in Mississauga, Ontario, for lead analysis. The results of bulk

PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY  
ROLLING MEADOWS PUBLIC SCHOOL

sample analysis for lead content are provided in Table 3.2, and a copy of the laboratory report is provided in Appendix B.

Additional paint samples may be required to confirm lead content. Representative samples of paint were collected at the time of the survey based on, in part, the visual appearances of the paints (i.e., colours). Paints of similar colours may have been applied at different times and have varying amounts of lead.

**Table 3.2. Summary of Results of Analyses of Bulk Samples for Lead**

Sample No.	Sample Location	Sample Description	Lead Content (mg/kg)
P-1	Room 100	white door/frame paint	65
P-2	Room 105	beige radiator paint	<b>500</b>
P-3	Room 116	light blue wall paint	<b>260</b>
P-4	Room 119	black wall paint	16
P-5	Room 127A	grey wall paint	4.3
P-6	Room 208	yellow wall paint	<b>250</b>
P-7	Room 219	yellow wall paint	<b>430</b>
P-8	Hall 923	beige wall paint	<b>490</b>

**NOTE:**

mg/kg = milligrams lead per kilogram paint.

1 mg/kg = 1 part per million (ppm).

Based on the results of the laboratory analyses, lead was found to be present at levels above the 90 mg/kg criterion value (Surface Coating Materials Regulations) in five of the eight samples collected. The levels of lead were below 90 mg/kg in the remaining three samples collected in the designated study areas.

Lead may also be present in lead pipe, mortar, glazing on ceramic tiles, in the solder on the seals of bell joints of any cast iron drainpipe and in the solder on the sweated-on joints between copper pipe and fittings.

The Ministry of Labour *Guideline – Lead on Construction Projects*, dated April 2011, provides guidance in the measures and procedures that should be followed when handling lead containing materials during construction projects. In the guideline, lead-containing construction operations are classified into three groups - Type 1 (low risk), Type 2 (medium risk) and Type 3 (high risk) based on presumed airborne concentrations of lead, as shown in Appendix C, Table C-2. Any operation that may expose a worker to lead that is not a Type 1, Type 2, or Type 3b operation, is classified as a Type 3a operation.

In addition, the *EACO Lead Abatement Guidelines, 2014 — Edition 1*, Environmental Abatement Council of Ontario, also provides guidance and recommended work practices.

### 3.3 Mercury

During the course of our site investigation, fluorescent lights were observed in the designated study areas. Mercury should be assumed to be present as a gas in all fluorescent light tubes and in all paint applications, albeit at low levels. The fluorescent light tubes should be recycled for mercury, if the lights are removed.

Proper procedures for removing and handling mercury-containing fluorescent light tubes typically involve:

- ensuring that electrical power to light fixtures has been disconnected and locked out;
- taking all necessary precautions to ensure that fluorescent lamp tubes are removed in a manner that prevents breakage; and
- transporting fluorescent lamp tubes to a licensed processing location for separation and recovery of mercury.

The measures and procedures outlined in the MOL *Guideline, Lead on Construction Projects* for control of potential exposure to lead in paint during construction activities will also serve to control potential exposure to any mercury in paint.

### 3.4 Silica

Materials observed in the designated study areas which should be considered to contain silica included cementitious pipe fitting insulation, ceiling tiles, mortar on the back side of ceramic tile bases, terrazzo, concrete, cement block walls, mortar and brick.

The Ministry of Labour *Guideline, Silica on Construction Projects*, April 2011, provides guidance in controlling exposure to silica dust during construction activities. In the guideline, silica-containing construction operations are classified into three groups - Type 1 (low risk), Type 2 (medium risk) and Type 3 (high risk) based on presumed airborne concentrations of silica, as shown in Appendix C, Table C-3.

Additional precautionary measures should also be implemented for certain types of materials (e.g., plaster and texture coat materials, including non-asbestos applications, concrete block, etc.). For minor disturbances such as drilling, a HEPA-filtered attachment should be used. For removal of more than a minor amount of material, enclosures should be constructed for dust control and separation of the work area from adjacent areas.

### 3.5 Vinyl Chloride

As mentioned in Section 2.5 above, vinyl chloride would only be a potential exposure concern in the event of combustion of PVC products.

### 3.6 Acrylonitrile

As mentioned in Section 2.6 above, acrylonitrile would only be a potential exposure concern in the event of combustion of ABS products.

### 3.7 Other Designated Substances

No other designated substances (benzene, isocyanates, arsenic, ethylene oxide and coke oven emissions) were observed to be present in the designated study areas, and none would be expected to be encountered in any building materials in a form that would represent an exposure concern. Arsenic may be present at low levels in paint applications. The measures and procedures outlined in the *MOL Guideline, Lead on Construction Projects* for control of potential exposure to lead in paint during construction activities will also serve to control potential exposure to any arsenic (or mercury) in paint.

### 3.8 Polychlorinated Biphenyls (PCBs)

Fluorescent lights (T8 and T12 types) were observed in the designated study areas during the course of our site investigations. Light ballasts, such as those associated with some of the type of fluorescent lights (T8s) observed in the designated study areas, are usually an electronic-type which do not contain PCBs, however, this would be confirmed by an electrician at the time of dismantling of the lights.

Light ballasts, such as those associated with the other type of fluorescent lights (T12s) observed on site, are typically a magnetic type which may contain PCBs. This would also be confirmed by an electrician at the time of dismantling of the lights.

Inspection of product codes and date codes on the ballasts can be used to determine the likely presence or absence of PCBs.

### 3.9 Ozone-Depleting Substances (ODS) and Other Halocarbons

Equipment potentially containing ozone-depleting substances observed during the course of the site investigation was limited to refrigerators. Refrigerators are not anticipated to be affected by the proposed project.

### 3.10 Mould

Readily evident mould was not observed during the course of the site investigations. The inspection of mould was limited to visual observations of readily-accessible surfaces and did not include intrusive inspections of wall cavities. During renovations or interior demolition work, any mould-impacted materials uncovered/discovered should be remediated following the measures and procedures outlined in the *Canadian Construction Association Standard Construction Document CCA-82 2004 - Mould Guidelines for the Canadian Construction Industry*.

## **4 USE AND LIMITATIONS OF THIS PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY REPORT**

This report, prepared for the Halton District School Board, does not provide certification or warranty, expressed or implied, that the investigation conducted by Arcadis Canada Inc. identified all designated substances (as defined in the Ontario *Occupational Health and Safety Act*) in the designated study areas at the subject facility. The work undertaken by Arcadis Canada Inc. was directed to provide information on the presence of designated substances in building construction materials based on review of existing information, visual investigation of readily accessible areas in the designated study areas of the building and on the results of laboratory analysis of a limited number of bulk samples of material for asbestos content and laboratory analysis of a limited number of paint samples for lead content. The survey did not include for identification of asbestos in process materials, equipment (including electrical equipment and wiring), furniture (e.g., chairs, table tops, etc.), nor material outside of the building (e.g., asphaltic pavement).

The material in this report reflects Arcadis Canada Inc.'s best judgment in light of the information available at the time of the investigation, which was performed on January 19 and 21, 2021.

This report is not intended to be used as a scope of work or technical specification for remediation of designated substances or hazardous materials.

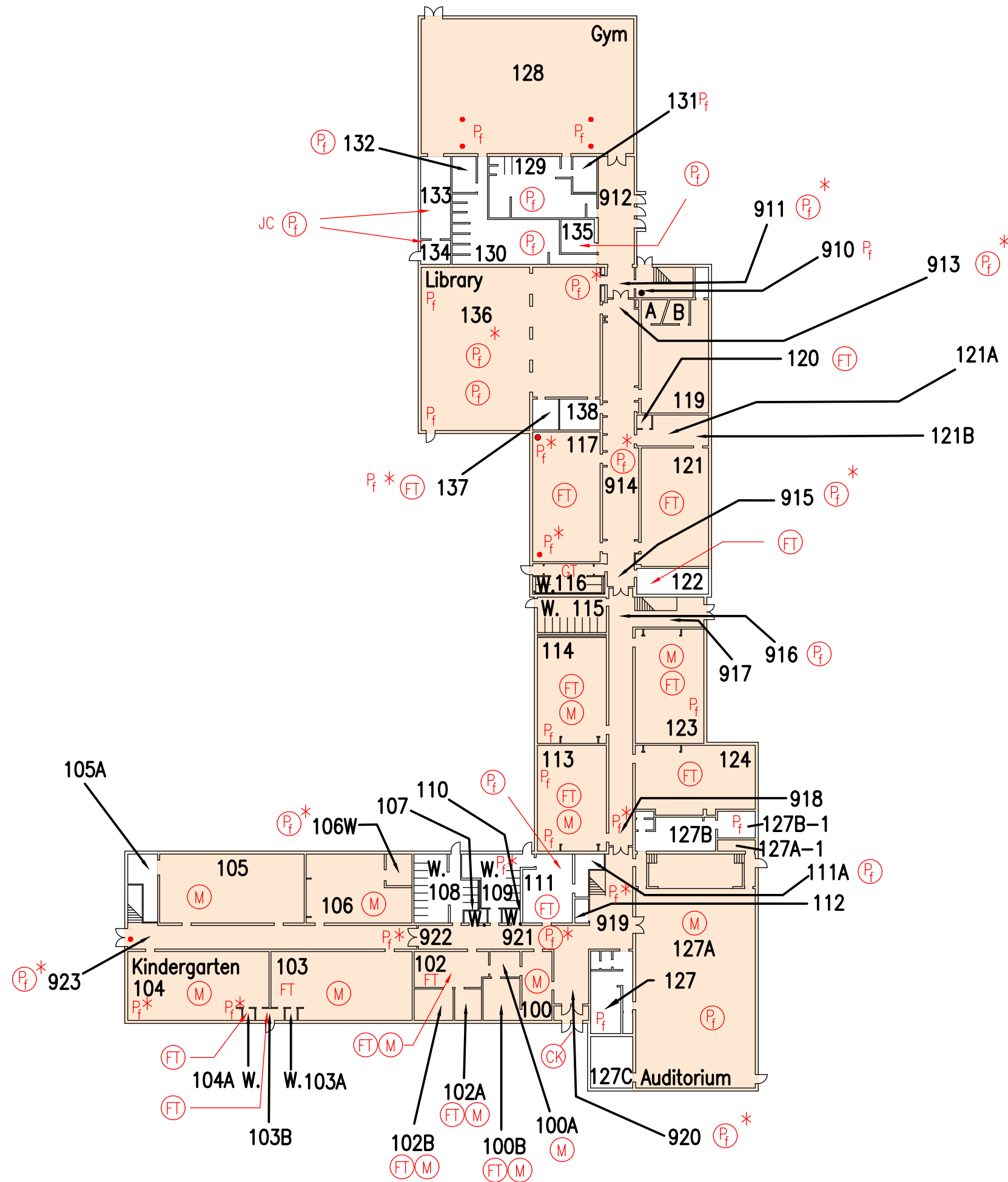
This report was prepared by Arcadis Canada Inc. for the Halton District School Board. Any use which any other party makes of the report, or reliance on, or decisions to be based on it, is the responsibility of such parties.

# APPENDIX A

## Floor Plans







#### LEGEND:

- 128** FUNCTIONAL SPACE
- THROUGHOUT FUNCTIONAL SPACE
- \*** ABOVE CEILING ASSEMBLY
- P<sub>f</sub>** ASBESTOS ON PIPE FITTINGS ONLY (FRIABLE)
- FT** ASBESTOS FLOOR TILE (NON-FRIABLE)
- JC** ASBESTOS DRYWALL JOINT COMPOUND (NON-FRIABLE)
- M** ASBESTOS FLOOR TILE MASTIC (NON-FRIABLE)
- GT** ASBESTOS GROUT (NON-FRIABLE)
- CK** ASBESTOS CAULKING (NON-FRIABLE)
- STUDY AREAS

#### NOTES:

1. INTERIORS OF ALL FIRE DOORS ARE ASSUMED TO CONTAIN ASBESTOS.

#### REVISIONS:

No.	Date:	By:	Revisions

#### REFERENCE:

- 1.



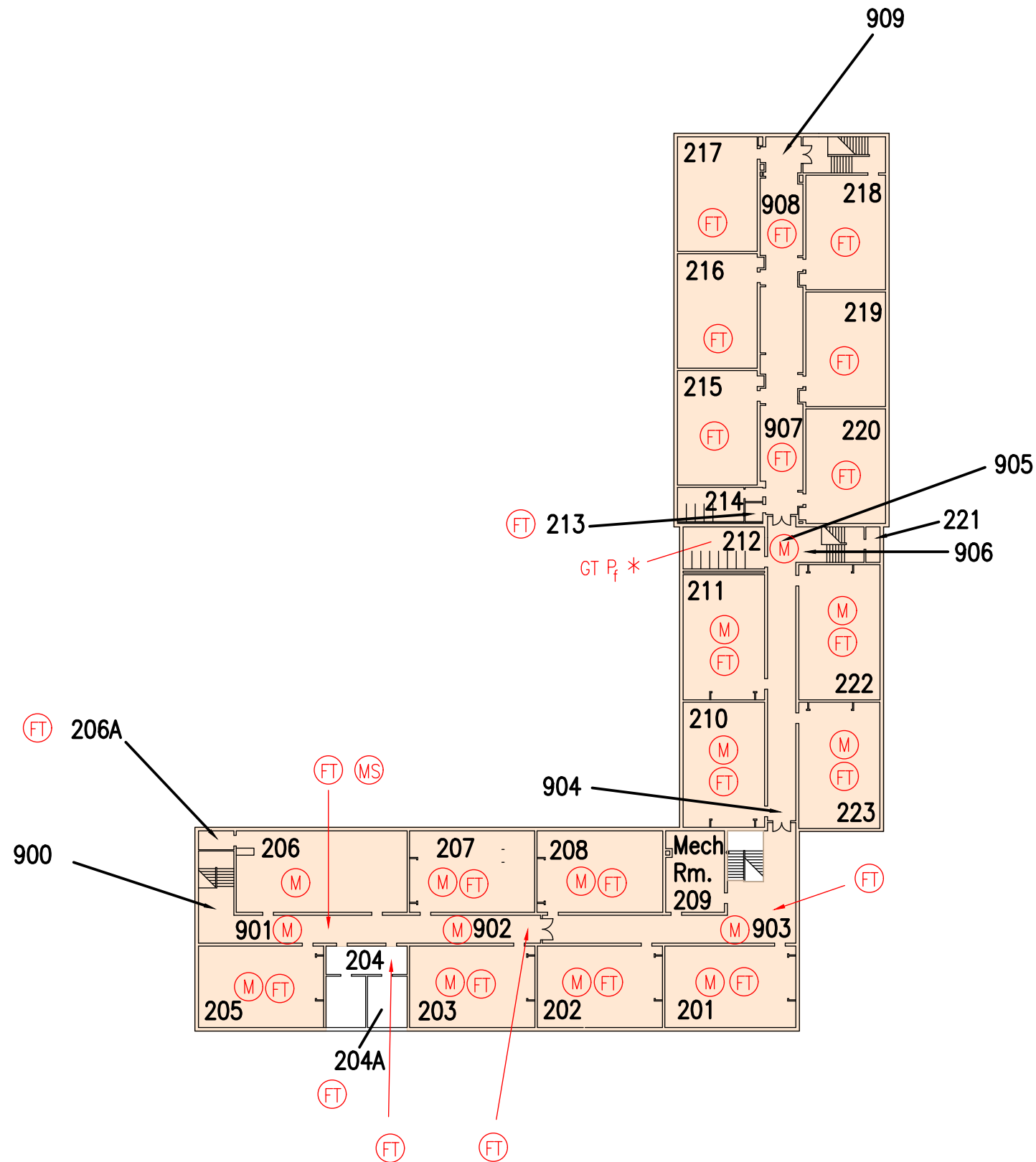
HALTON DISTRICT SCHOOL BOARD

#### PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY

LOCATIONS OF ASBESTOS-CONTAINING  
MATERIALS AND STUDY AREAS

ROLLING MEADOWS PUBLIC SCHOOL  
1522 MOUNTAIN GROVE AVE, BURLINGTON, ON  
FIRST FLOOR

Drawn By: M.S	Approved By: A.N.	Project No: 30065539
Date: APRIL 2021	Scale: N.T.S	Drawing No: 30065539-1



#### LEGEND:

- 217** FUNCTIONAL SPACE
- THROUGHOUT FUNCTIONAL SPACE
- ABOVE CEILING ASSEMBLY
- FT** ASBESTOS FLOOR TILE (NON-FRIABLE)
- P<sub>f</sub>** ASBESTOS ON PIPE FITTINGS ONLY (FRIABLE)
- M** ASBESTOS MASTIC (NON-FRIABLE)
- GT** ASBESTOS GROUT (NON-FRIABLE)
- STUDY AREAS

#### NOTES:

- INTERIORS OF ALL FIRE DOORS ARE ASSUMED TO CONTAIN ASBESTOS.

#### REVISIONS:

No.	Date:	By:	Revisions

#### REFERENCE:

- 



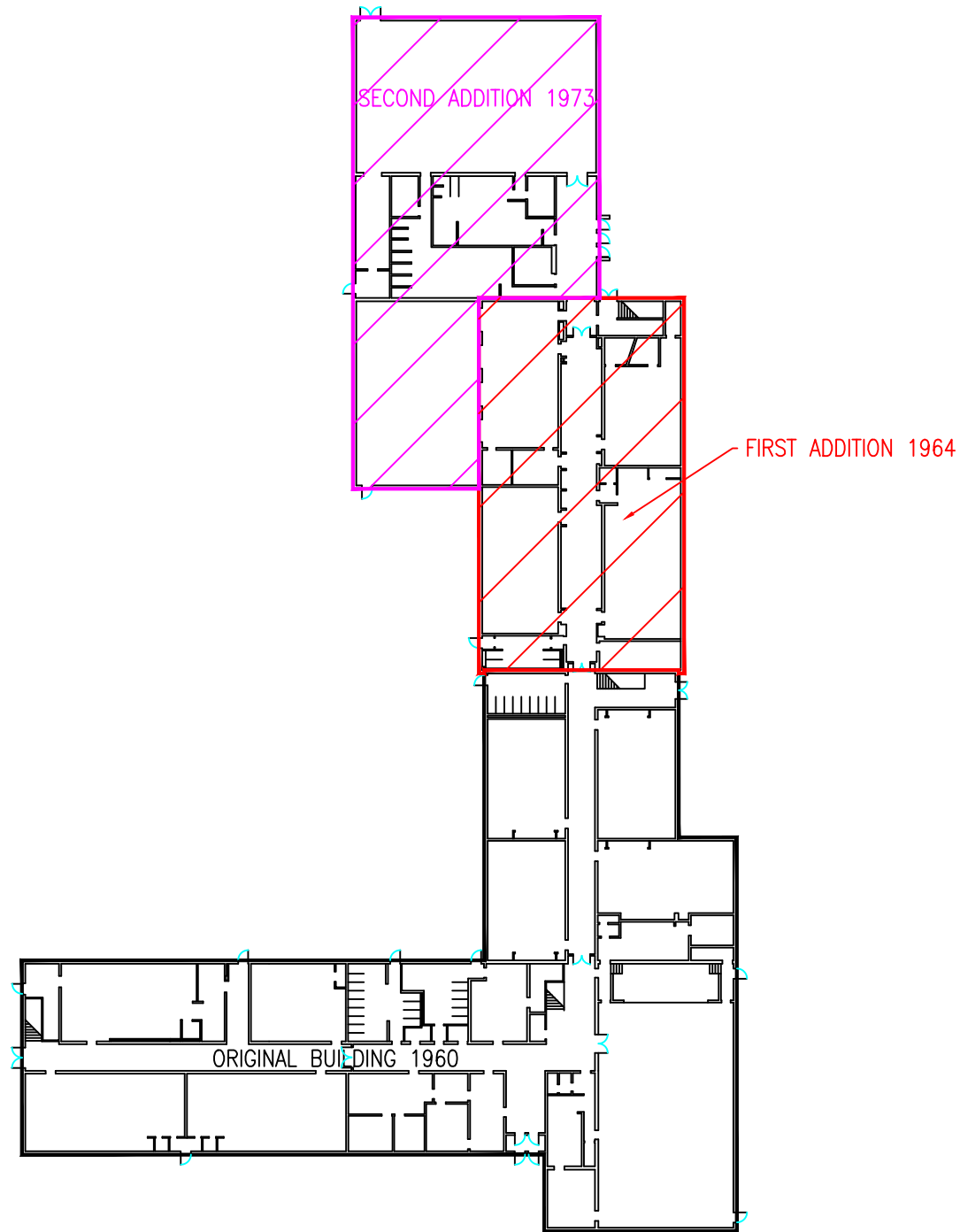
HALTON DISTRICT SCHOOL BOARD

#### PRE-RENOVATION DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY

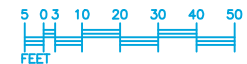
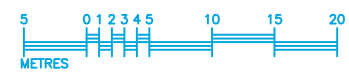
LOCATIONS OF ASBESTOS-CONTAINING  
MATERIALS AND STUDY AREAS

ROLLING MEADOWS PUBLIC SCHOOL  
1522 MOUNTAIN GROVE AVE, BURLINGTON, ON  
SECOND FLOOR

Drawn By: M.S	Approved By: A.N.	Project No: 30065539
Date: APRIL 2021	Scale: N.T.S	Drawing No: 30065539-2



Scale



NO.	DATE	REVISION

NO.	DATE	REVISION



**Rolling Meadows Public School**

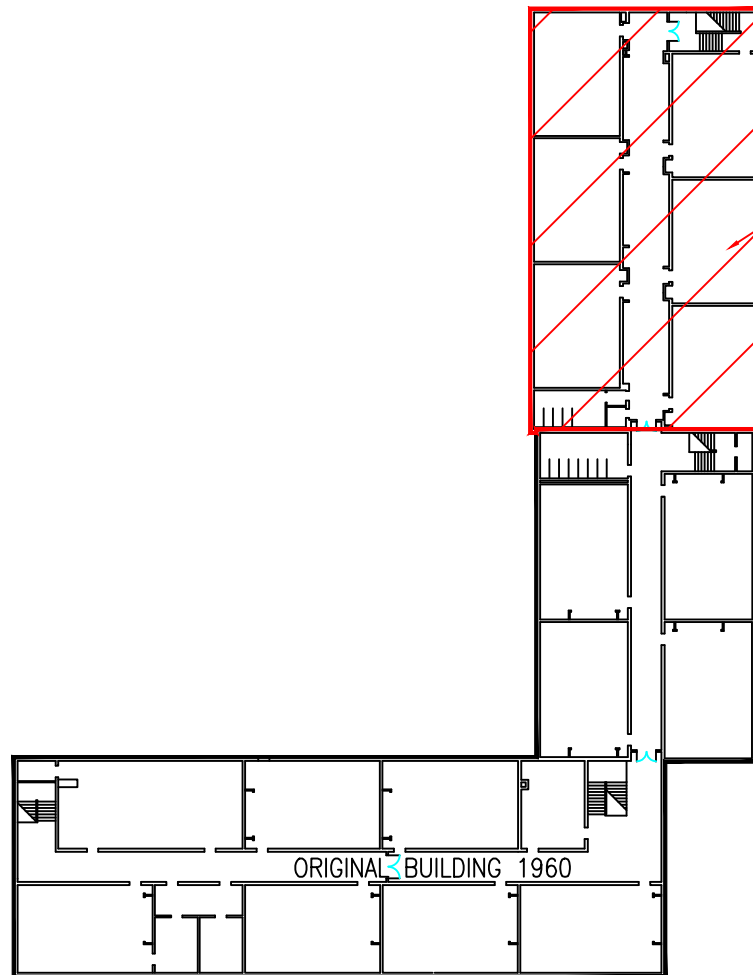
1000 MOUNTAIN GROVE AVE.  
BURLINGTON, ONTARIO

DATE: 15 APRIL 2014  
 PROJECT NO.: 17 JAN 2014  
 DRAWN BY: JC-B  
 SCALE: (TO FIT) 1"=60'-0"  
 CHECKED BY: RDC  
 DATE: 26 OCT 2011  
 DRAWN BY: 1000  
 AREA NO. 05374 (5144sq')  
 NO. FILE NO. RCMPS

**FIRST FLOOR PLAN**

**AREA**

B | 2



FIRST ADDITION 1964

ORIGINAL BUILDING 1960

Scale



**Rolling Meadows Public School**

1000 MOUNTAIN GROVE AVE.  
BURLINGTON, ONTARIO

DATE: 15 APRIL 2014  
 PROJECT: 17 JAN 2014  
 DRAWN: JC-B  
 SCALE: (TO FIT) 1"=60'-0"  
 DATE: 26 OCT 2011  
 DRAWN: JC-B  
 AREA: 1000  
 AREA: 05374 (5144sq')  
 NO. FILE: 1000

SECOND FLOOR PLAN

AREA  
 B 3

# APPENDIX B

Laboratory Reports





# EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3  
Phone/Fax: (289) 997-4602 / (289) 997-4607  
<http://www.EMSL.com> / [torontolab@emsl.com](mailto:torontolab@emsl.com)

EMSL Canada Order 552105607  
Customer ID: 55DCSL97  
Customer PO: 30065539  
Project ID:

**Attn:** Paul Smith  
ARCADIS Canada Inc.  
121 Granton Drive  
Unit 12  
Richmond Hill, ON L4B 3N4  
**Proj:** Rolling Meadows PS

**Phone:** (905) 882-5984  
**Fax:** (905) 882-8962  
**Collected:**  
**Received:** 4/07/2021  
**Analyzed:** 4/08/2021

## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

**Client Sample ID:** 1-A **Lab Sample ID:** 552105607-0001

**Sample Description:** Door at 920 - exterior black door frame caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	4/08/2021	Black	0.0%	98.0%	2% Chrysotile	

**Client Sample ID:** 1-B **Lab Sample ID:** 552105607-0002

**Sample Description:** Door at 920 - exterior black door frame caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	4/08/2021				Positive Stop (Not Analyzed)	

**Client Sample ID:** 1-C **Lab Sample ID:** 552105607-0003

**Sample Description:** Door at 920 - exterior black door frame caulking

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	4/08/2021				Positive Stop (Not Analyzed)	

### Analyst(s):

Taylor Jones PLM (1)

### Reviewed and approved by:

Matthew Davis or other approved signatory  
or Other Approved Signatory

None Detected = <0.1%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency or the U.S. Government

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 04/08/2021 04:01:07



# EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3  
 Phone/Fax: (289) 997-4602 / (289) 997-4607  
<http://www.EMSL.com> / [torontolab@emsl.com](mailto:torontolab@emsl.com)

EMSL Canada Order 552101093  
 Customer ID: 55DCSL97  
 Customer PO: 30065539  
 Project ID:

**Attn:** Paul Smith  
 ARCADIS Canada Inc.  
 121 Granton Drive  
 Unit 12  
 Richmond Hill, ON L4B 3N4  
**Proj:** Rolling Meadows PS

**Phone:** (905) 882-5984  
**Fax:** (905) 882-8962  
**Collected:**  
**Received:** 1/27/2021  
**Analyzed:** 2/01/2021

## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

Client Sample ID: 1-A

Lab Sample ID: 552101093-0001

Sample Description: Room 100/12" x 12" tan vinyl floor tile mastic only

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Black	0.0%	99.0%	1% Chrysotile	

Client Sample ID: 1-B

Lab Sample ID: 552101093-0002

Sample Description: Room 100A/12" x 12" tan vinyl floor tile mastic only

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021				Positive Stop (Not Analyzed)	

Client Sample ID: 1-C

Lab Sample ID: 552101093-0003

Sample Description: Room 102/12" x 12" tan vinyl floor tile mastic only

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021				Positive Stop (Not Analyzed)	

Client Sample ID: 2-A-Floor Tile

Lab Sample ID: 552101093-0004

Sample Description: Room 102A/9" x 9" red vinyl floor tile and mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	2/01/2021	Red	0.0%	93.9%	6.1% Chrysotile	
TEM Grav. Reduction	1/30/2021				Positive Stop (Not Analyzed)	

Client Sample ID: 2-A-Mastic

Lab Sample ID: 552101093-0004A

Sample Description: Room 102A/9" x 9" red vinyl floor tile and mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	2/01/2021	Black	0.0%	98.0%	2% Chrysotile	

Client Sample ID: 2-B

Lab Sample ID: 552101093-0005

Sample Description: Room 102A/9" x 9" red vinyl floor tile and mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021				Positive Stop (Not Analyzed)	

Client Sample ID: 2-C

Lab Sample ID: 552101093-0006

Sample Description: Room 102A/9" x 9" red vinyl floor tile and mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021				Positive Stop (Not Analyzed)	



# EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3  
Phone/Fax: (289) 997-4602 / (289) 997-4607  
<http://www.EMSL.com> / [torontolab@emsl.com](mailto:torontolab@emsl.com)

EMSL Canada Order 552101093  
Customer ID: 55DCSL97  
Customer PO: 30065539  
Project ID:

## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

**Client Sample ID:** 3-A **Lab Sample ID:** 552101093-0007

**Sample Description:** Room 215/9" x 9" gbs vinyl floor tile mastic only

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Black	0.0%	100.0%	None Detected	

**Client Sample ID:** 3-B **Lab Sample ID:** 552101093-0008

**Sample Description:** Room 219/9" x 9" gbs vinyl floor tile mastic only

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Black	0.0%	100.0%	None Detected	

**Client Sample ID:** 3-C **Lab Sample ID:** 552101093-0009

**Sample Description:** Room 117/9" x 9" gbs vinyl floor tile mastic only

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Black	0.0%	100.0%	None Detected	

**Client Sample ID:** 4-A **Lab Sample ID:** 552101093-0010

**Sample Description:** Room 207/9" x 9" green vinyl floor tile mastic only

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Black	0.0%	95.0%	5% Chrysotile	

**Client Sample ID:** 4-B **Lab Sample ID:** 552101093-0011

**Sample Description:** Room 210/9" x 9" green vinyl floor tile mastic only

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021					Positive Stop (Not Analyzed)

**Client Sample ID:** 4-C **Lab Sample ID:** 552101093-0012

**Sample Description:** Room 211/9" x 9" green vinyl floor tile mastic only

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021					Positive Stop (Not Analyzed)

**Client Sample ID:** 5-A **Lab Sample ID:** 552101093-0013

**Sample Description:** Room 105/12" x 12" beige vinyl floor tile mastic only

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Black/Yellow	0.0%	97.0%	3% Chrysotile	

**Client Sample ID:** 5-B **Lab Sample ID:** 552101093-0014

**Sample Description:** Room 127A/12" x 12" beige vinyl floor tile mastic only

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021					Positive Stop (Not Analyzed)





# EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3  
 Phone/Fax: (289) 997-4602 / (289) 997-4607  
<http://www.EMSL.com> / [torontolab@emsl.com](mailto:torontolab@emsl.com)

EMSL Canada Order 552101093  
 Customer ID: 55DCSL97  
 Customer PO: 30065539  
 Project ID:

## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

**Client Sample ID:** 5-C **Lab Sample ID:** 552101093-0015  
**Sample Description:** Room 206/12" x 12" beige vinyl floor tile mastic only

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021					Positive Stop (Not Analyzed)

**Client Sample ID:** 6-A **Lab Sample ID:** 552101093-0016  
**Sample Description:** Room 136/carpet mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Yellow/Green	0.0%	100.0%	None Detected	

**Client Sample ID:** 6-B **Lab Sample ID:** 552101093-0017  
**Sample Description:** Room 136/carpet mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Yellow/Green	0.0%	100.0%	None Detected	

**Client Sample ID:** 6-C **Lab Sample ID:** 552101093-0018  
**Sample Description:** Room 136/carpet mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Yellow/Green	0.0%	100.0%	None Detected	

**Client Sample ID:** 7-A **Lab Sample ID:** 552101093-0019  
**Sample Description:** Room 116/ceramic tile grout

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	White/Beige	0.0%	100.0%	<1% Chrysotile	
400 PLM Pt Ct	1/30/2021	White/Beige	0.0%	100.0%	<0.25% Chrysotile	

**Client Sample ID:** 7-B **Lab Sample ID:** 552101093-0020  
**Sample Description:** Room 116/ceramic tile grout

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	White/Beige	0.0%	99.0%	1% Chrysotile	

**Client Sample ID:** 7-C **Lab Sample ID:** 552101093-0021  
**Sample Description:** Room 116/ceramic tile grout

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021					Positive Stop (Not Analyzed)

**Client Sample ID:** 8-A **Lab Sample ID:** 552101093-0022  
**Sample Description:** Room 212/ceramic tile grout

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	White/Beige	0.0%	99.0%	1% Chrysotile	



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EMSL Canada Order 552101093  
 Customer ID: 55DCSL97  
 Customer PO: 30065539  
 Project ID:

## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

Client Sample ID: 8-B

Lab Sample ID: 552101093-0023

Sample Description: Room 212/ceramic tile grout

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021		Positive Stop (Not Analyzed)			

Client Sample ID: 8-C

Lab Sample ID: 552101093-0024

Sample Description: Room 212/ceramic tile grout

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021		Positive Stop (Not Analyzed)			

Client Sample ID: 9-A-Baseboard

Lab Sample ID: 552101093-0025

Sample Description: Room 127A/vinyl baseboard and mastic - vinyl baseboard

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2021	Brown	0.0%	100%	None Detected	
TEM Grav. Reduction	2/01/2021	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 9-A-Mastic

Lab Sample ID: 552101093-0025A

Sample Description: Room 127A/vinyl baseboard and mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	2/01/2021	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 9-B-Baseboard

Lab Sample ID: 552101093-0026

Sample Description: Room 127A/vinyl baseboard and mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 9-B-Mastic

Lab Sample ID: 552101093-0026A

Sample Description: Room 127A/vinyl baseboard and mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 9-C-Baseboard

Lab Sample ID: 552101093-0027

Sample Description: Room 127A/vinyl baseboard and mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 9-C-Mastic

Lab Sample ID: 552101093-0027A

Sample Description: Room 127A/vinyl baseboard and mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Yellow	0.0%	100.0%	None Detected	



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EMSL Canada Order 552101093  
Customer ID: 55DCSL97  
Customer PO: 30065539  
Project ID:

## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

**Client Sample ID:** 10-A **Lab Sample ID:** 552101093-0028  
**Sample Description:** 1960 at Room 100/exterior brick mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 10-B **Lab Sample ID:** 552101093-0029  
**Sample Description:** 1960 at Room 104/exterior brick mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 10-C **Lab Sample ID:** 552101093-0030  
**Sample Description:** 1960 at Room 113/exterior brick mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 11-A **Lab Sample ID:** 552101093-0031  
**Sample Description:** 1964 at Room 117/exterior brick mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 11-B **Lab Sample ID:** 552101093-0032  
**Sample Description:** 1964 at Room 119/exterior brick mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 11-C **Lab Sample ID:** 552101093-0033  
**Sample Description:** 1964 at Room 121/exterior brick mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 12-A **Lab Sample ID:** 552101093-0034  
**Sample Description:** Library addition/exterior brick mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 12-B **Lab Sample ID:** 552101093-0035  
**Sample Description:** Library addition/exterior brick mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	



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EMSL Canada Order 552101093  
Customer ID: 55DCSL97  
Customer PO: 30065539  
Project ID:

## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

**Client Sample ID:** 12-C **Lab Sample ID:** 552101093-0036  
**Sample Description:** Library addition/exterior brick mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 13-A **Lab Sample ID:** 552101093-0037  
**Sample Description:** Room 105 (1960)/masonry mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 13-B **Lab Sample ID:** 552101093-0038  
**Sample Description:** Room 901 (1960)/masonry mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 13-C **Lab Sample ID:** 552101093-0039  
**Sample Description:** Room 921 (1960)/masonry mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 14-A **Lab Sample ID:** 552101093-0040  
**Sample Description:** Room 907 (1964)/masonry mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 14-B **Lab Sample ID:** 552101093-0041  
**Sample Description:** Room 908 (1964)/masonry mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 14-C **Lab Sample ID:** 552101093-0042  
**Sample Description:** Room 914 (1964)/masonry mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 15-A **Lab Sample ID:** 552101093-0043  
**Sample Description:** Room 136/masonry mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	



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Customer ID: 55DCSL97  
Customer PO: 30065539  
Project ID:

## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

**Client Sample ID:** 15-B **Lab Sample ID:** 552101093-0044  
**Sample Description:** Room 136/masonry mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 15-C **Lab Sample ID:** 552101093-0045  
**Sample Description:** Room 136/masonry mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 16-A **Lab Sample ID:** 552101093-0046  
**Sample Description:** 907 at 220 (1964)/yellow textured wall paint

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray/White	0.0%	100.0%	None Detected	

**Client Sample ID:** 16-B **Lab Sample ID:** 552101093-0047  
**Sample Description:** 908 at 216 (1964)/yellow textured wall paint

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray	0.0%	100.0%	None Detected	

**Client Sample ID:** 16-C **Lab Sample ID:** 552101093-0048  
**Sample Description:** 914 at 117 (1964)/yellow textured wall paint

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray/White	0.0%	100.0%	None Detected	

**Client Sample ID:** 17-A **Lab Sample ID:** 552101093-0049  
**Sample Description:** Room 100/white textures/d/shiny wall paint

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray/Beige	0.0%	100.0%	None Detected	

**Client Sample ID:** 17-B **Lab Sample ID:** 552101093-0050  
**Sample Description:** Room 100/white textures/d/shiny wall paint

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Beige	0.0%	100.0%	None Detected	

**Client Sample ID:** 17-C **Lab Sample ID:** 552101093-0051  
**Sample Description:** Room 100/white textures/d/shiny wall paint

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2021	Gray/Beige	0.0%	100.0%	None Detected	



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Customer ID: 55DCSL97  
Customer PO: 30065539  
Project ID:

### Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

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#### Analyst(s):

---

Kira Ramphal	PLM (30) 400 PLM Pt Ct (1) PLM Grav. Reduction (1)
Natalie D'Amico	PLM (2) PLM Grav. Reduction (1) TEM Grav. Reduction (1)
Taylor Jones	PLM (10)

#### Reviewed and approved by:

Matthew Davis or other approved signatory  
or Other Approved Signatory

None Detected = <0.1%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency or the U.S. Government

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 02/01/2021 09:52:22



Your P.O. #: 30065539  
Site Location: ROLLING MEADOWS PS  
Your C.O.C. #: n/a

**Attention: Paul Smith**

ARCADIS Canada Inc  
121 Granton Dr  
Unit 12  
Richmond Hill, ON  
CANADA L4B 3N4

**Report Date: 2021/02/04**  
Report #: R6505681  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BV LABS JOB #: C128404**

**Received: 2021/02/02, 09:55**

Sample Matrix: Paint  
# Samples Received: 8

Analyses	Date		Laboratory Method	Analytical Method
	Quantity	Date Extracted	Date Analyzed	
Metals in Paint	8	2021/02/04	2021/02/04	CAM SOP-00408 EPA 6010D m

**Remarks:**

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA. Where applicable, the analytical testing herein was performed in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act. Bureau Veritas is accredited by SCC (Lab ID 97) for all specific parameters as required by Ontario Regulation 153/04.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

\* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.



Your P.O. #: 30065539  
Site Location: ROLLING MEADOWS PS  
Your C.O.C. #: n/a

**Attention: Paul Smith**

ARCADIS Canada Inc  
121 Granton Dr  
Unit 12  
Richmond Hill, ON  
CANADA L4B 3N4

**Report Date: 2021/02/04**  
Report #: R6505681  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**BV LABS JOB #: C128404**

**Received: 2021/02/02, 09:55**

**Encryption Key**

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Marijane Cruz, Senior Project Manager

Email: Marijane.Cruz@bureauveritas.com

Phone# (905)817-5756

=====

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



BUREAU  
VERITASBV Labs Job #: C128404  
Report Date: 2021/02/04ARCADIS Canada Inc  
Site Location: ROLLING MEADOWS PS  
Your P.O. #: 30065539**ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)**

<b>BV Labs ID</b>		OTC417		OTC418		OTC419		
<b>Sampling Date</b>		2021/01/19		2021/01/19		2021/01/19		
<b>COC Number</b>		n/a		n/a		n/a		
	<b>UNITS</b>	<b>P-100-WHITE DOOR/FRAME PAINT</b>	<b>RDL</b>	<b>P-105-BEIGE RADIATOR PAINT</b>	<b>RDL</b>	<b>P-116-LIGHT BLUE WALL PAINT</b>	<b>RDL</b>	<b>QC Batch</b>
<b>Metals</b>								
Lead (Pb)	mg/kg	65	19	500	17	260	1.7	7184131
RDL = Reportable Detection Limit QC Batch = Quality Control Batch								

<b>BV Labs ID</b>		OTC420		OTC421		OTC422		
<b>Sampling Date</b>		2021/01/19		2021/01/19		2021/01/19		
<b>COC Number</b>		n/a		n/a		n/a		
	<b>UNITS</b>	<b>P-119-BLACK WALL PAINT</b>	<b>RDL</b>	<b>P-127A-GREY WALL PAINT</b>	<b>RDL</b>	<b>P-208-YELLOW WALL PAINT</b>	<b>RDL</b>	<b>QC Batch</b>
<b>Metals</b>								
Lead (Pb)	mg/kg	16	8.2	4.3	2.4	250	1.3	7184131
RDL = Reportable Detection Limit QC Batch = Quality Control Batch								

<b>BV Labs ID</b>		OTC423		OTC424		
<b>Sampling Date</b>		2021/01/21		2021/01/19		
<b>COC Number</b>		n/a		n/a		
	<b>UNITS</b>	<b>P-219-YELLOW WALL PAINT</b>	<b>RDL</b>	<b>P-923-BEIGE WALL PAINT</b>	<b>RDL</b>	<b>QC Batch</b>
<b>Metals</b>						
Lead (Pb)	mg/kg	430	1.0	490	1.2	7184131
RDL = Reportable Detection Limit QC Batch = Quality Control Batch						



BUREAU  
VERITAS

BV Labs Job #: C128404  
Report Date: 2021/02/04

ARCADIS Canada Inc  
Site Location: ROLLING MEADOWS PS  
Your P.O. #: 30065539

## TEST SUMMARY

**BV Labs ID:** OTC417  
**Sample ID:** P-100-WHITE DOOR/FRAME PAINT  
**Matrix:** Paint

**Collected:** 2021/01/19  
**Shipped:**  
**Received:** 2021/02/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	7184131	2021/02/04	2021/02/04	Jolly John

**BV Labs ID:** OTC418  
**Sample ID:** P-105-BEIGE RADIATOR PAINT  
**Matrix:** Paint

**Collected:** 2021/01/19  
**Shipped:**  
**Received:** 2021/02/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	7184131	2021/02/04	2021/02/04	Jolly John

**BV Labs ID:** OTC419  
**Sample ID:** P-116-LIGHT BLUE WALL PAINT  
**Matrix:** Paint

**Collected:** 2021/01/19  
**Shipped:**  
**Received:** 2021/02/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	7184131	2021/02/04	2021/02/04	Jolly John

**BV Labs ID:** OTC420  
**Sample ID:** P-119-BLACK WALL PAINT  
**Matrix:** Paint

**Collected:** 2021/01/19  
**Shipped:**  
**Received:** 2021/02/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	7184131	2021/02/04	2021/02/04	Jolly John

**BV Labs ID:** OTC421  
**Sample ID:** P-127A-GREY WALL PAINT  
**Matrix:** Paint

**Collected:** 2021/01/19  
**Shipped:**  
**Received:** 2021/02/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	7184131	2021/02/04	2021/02/04	Jolly John

**BV Labs ID:** OTC422  
**Sample ID:** P-208-YELLOW WALL PAINT  
**Matrix:** Paint

**Collected:** 2021/01/19  
**Shipped:**  
**Received:** 2021/02/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	7184131	2021/02/04	2021/02/04	Jolly John

**BV Labs ID:** OTC423  
**Sample ID:** P-219-YELLOW WALL PAINT  
**Matrix:** Paint

**Collected:** 2021/01/21  
**Shipped:**  
**Received:** 2021/02/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	7184131	2021/02/04	2021/02/04	Jolly John



BUREAU  
VERITAS

BV Labs Job #: C128404  
Report Date: 2021/02/04

ARCADIS Canada Inc  
Site Location: ROLLING MEADOWS PS  
Your P.O. #: 30065539

## TEST SUMMARY

**BV Labs ID:** OTC424  
**Sample ID:** P-923-BEIGE WALL PAINT  
**Matrix:** Paint

**Collected:** 2021/01/19  
**Shipped:**  
**Received:** 2021/02/02

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	7184131	2021/02/04	2021/02/04	Jolly John



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BV Labs Job #: C128404  
Report Date: 2021/02/04

ARCADIS Canada Inc  
Site Location: ROLLING MEADOWS PS  
Your P.O. #: 30065539

### GENERAL COMMENTS

Sample OTC417 [P-100-WHITE DOOR/FRAME PAINT] : Metals: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample OTC418 [P-105-BEIGE RADIATOR PAINT] : Metals: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample OTC419 [P-116-LIGHT BLUE WALL PAINT] : Metals: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample OTC420 [P-119-BLACK WALL PAINT] : Metals: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample OTC421 [P-127A-GREY WALL PAINT] : Metals: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample OTC422 [P-208-YELLOW WALL PAINT] : Metals: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample OTC424 [P-923-BEIGE WALL PAINT] : Metals: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

**Results relate only to the items tested.**



BUREAU  
VERITAS

BV Labs Job #: C128404

Report Date: 2021/02/04

## QUALITY ASSURANCE REPORT

ARCADIS Canada Inc

Site Location: ROLLING MEADOWS PS

Your P.O. #: 30065539

QC Batch	Parameter	Date	Matrix Spike		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7184131	Lead (Pb)	2021/02/04	NC	75 - 125	<1.0	mg/kg	3.1 (1)	35	107	75 - 125

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

(1) Duplicate Parent ID



BUREAU  
VERITAS

BV Labs Job #: C128404  
Report Date: 2021/02/04

ARCADIS Canada Inc  
Site Location: ROLLING MEADOWS PS  
Your P.O. #: 30065539

### VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

---

Ewa Pranjić, M.Sc., C.Chem, Scientific Specialist

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BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

# APPENDIX C

Summary of Asbestos, Lead and Silica Work Classifications



**TABLE C-1**  
**SUMMARY OF CLASSIFICATION OF**  
**TYPE 1, 2 AND 3 OPERATIONS**  
**(Ont. Reg. 278/05)**

**TYPE 1 OPERATIONS**

- removing less than 7.5 m<sup>2</sup> asbestos-containing ceiling tiles;
- removing non-friable asbestos-containing material other than ceiling tiles, if the material is removed without being broken, cut, drilled, abraded, ground, sanded or vibrated;
- breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material if the material is wetted and the work is done only using non-powered, hand-held tools; and
- removing less than 1 m<sup>2</sup> of drywall in which asbestos-containing joint compounds have been used.

**TYPE 2 OPERATIONS**

- removing all or part of a false ceiling to obtain access to a work area, if asbestos-containing material is likely to be lying on the surface of the false ceiling;
- removal of one square metre or less of friable asbestos-containing material;
- enclosing friable asbestos-containing material;
- applying tape or a sealant or other covering to asbestos-containing pipe or boiler insulation;
- removing 7.5 m<sup>2</sup> or more asbestos-containing ceiling tiles (if removed without being broken, cut, drilled, abraded, ground, sanded or vibrated);
- breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material if the material is not wetted and the work is done only using non-powered, hand-held tools;
- removal of one square metre or more of drywall in which asbestos-containing joint compounds have been used;
- breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material if the work is done using power tools that are attached to dust-collecting devices equipped with HEPA filters;
- cleaning or removing filters used in air-handling equipment in a building that has asbestos-containing sprayed fireproofing.



**TABLE C-1 (Continued)**  
**SUMMARY OF CLASSIFICATION OF**  
**TYPE 1, 2 AND 3 OPERATIONS**  
**(Ont. Reg. 278/05)**

**TYPE 3 OPERATIONS**

- removal of more than one square metre of friable asbestos-containing material;
- spray application of a sealant to friable asbestos-containing material;
- cleaning or removing air-handling equipment, including rigid ducting but not including filters, in a building that has sprayed asbestos-containing fireproofing;
- repairing or demolishing a kiln, metallurgical furnace or similar structure that is made in part of asbestos-containing refractory materials;
- breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing materials, if the work is done using power tools that are not attached to dust-collecting devices equipped with HEPA filters.

**TABLE C-2**  
**SUMMARY OF CLASSIFICATION OF**  
**LEAD-CONTAINING CONSTRUCTION TASKS**  
**MOL GUIDELINE – LEAD ON CONSTRUCTION PROJECTS, APRIL 2011**

Type 1 Operations	Type 2 Operations		Type 3 Operations	
	Type 2a	Type 2b	Type 3a	Type 3b
<0.05 mg/m <sup>3</sup>	>0.05 to 0.50 mg/m <sup>3</sup>	>0.50 to 1.25 mg/m <sup>3</sup>	>1.25 to 2.50 mg/m <sup>3</sup>	>2.50 mg/m <sup>3</sup>

Note: The classification of Type 1, 2 and 3 operations is based on presumed airborne concentrations of lead, as shown above.

#### **TYPE 1 OPERATIONS**

- application of lead-containing coatings with a brush or roller;
- removal of lead-containing coatings with a chemical gel or paste and fibrous laminated cloth wrap;
- removal of lead-containing coatings or materials using a power tool that has an effective dust collection system equipped with a HEPA filter;
- installation or removal of lead-containing sheet metal;
- installation or removal of lead-containing packing, babbitt or similar material;
- removal of lead-containing coatings or materials using non-powered hand tools, other than manual scraping or sanding;
- soldering.

#### **TYPE 2 OPERATIONS**

##### **Type 2a Operations**

- welding or high temperature cutting of lead-containing coatings or materials outdoors. This operation is considered a Type 2a operation only if it is short-term, not repeated, and if the material has been stripped prior to welding or high temperature cutting. Otherwise it will be considered a Type 3a operation;
- removal of lead-containing coatings or materials by scraping or sanding using non-powered hand tools;
- manual demolition of lead-painted plaster walls or building components by striking a wall with a sledgehammer or similar tool.

##### **Type 2b Operations**

- spray application of lead-containing coatings.

**TABLE C-2 (Continued)**  
**SUMMARY OF CLASSIFICATION OF**  
**LEAD-CONTAINING CONSTRUCTION TASKS**  
**MOL GUIDELINE – LEAD ON CONSTRUCTION PROJECTS, APRIL 2011**

**TYPE 3 OPERATIONS**

**Type 3a Operations**

- welding or high temperature cutting of lead-containing coatings or materials indoors or in a confined space;
- burning of a surface containing lead;
- dry removal of lead-containing mortar using an electric or pneumatic cutting device;
- removal of lead-containing coatings or materials using power tools without an effective dust collection system equipped with a HEPA filter;
- removal or repair of a ventilation system used for controlling lead exposure;
- demolition or cleanup of a facility where lead-containing products were manufactured;
- an operation that may expose a worker to lead dust, fume or mist that is not a Type 1, Type 2, or Type 3b operation

**Type 3b Operations**

- abrasive blasting of lead-containing coatings or materials;
- removal of lead-containing dust using an air mist extraction system.

**TABLE C-3**  
**SUMMARY OF CLASSIFICATION OF SILICA-CONTAINING CONSTRUCTION TASKS**  
**MOL GUIDELINE, SILICA ON CONSTRUCTION PROJECTS, APRIL 2011**

	<b>Type 1 Operations</b>	<b>Type 2 Operations</b>	<b>Type 3 Operations</b>
Cristobalite and Tridymite	>0.05 to 0.50 mg/m <sup>3</sup>	>0.50 to 2.50 mg/m <sup>3</sup>	>2.5 mg/m <sup>3</sup>
Quartz and Tripoli	>0.10 to 1.0 mg/m <sup>3</sup>	>1.0 to 5.0 mg/m <sup>3</sup>	>5.0 mg/m <sup>3</sup>

Note: The classification of silica-containing construction tasks is based on presumed concentrations of respirable crystalline silica, as shown above.

#### **TYPE 1 OPERATIONS**

- The drilling of holes in concrete or rock that is not part of a tunnelling operation or road construction.
- Milling of asphalt from concrete highway pavement.
- Charging mixers and hoppers with silica sand (sand consisting of at least 95 per cent silica) or silica flour (finely ground sand consisting of at least 95 per cent silica).
- Any other operation at a project that requires the handling of silica-containing material in a way that may result in a worker being exposed to airborne silica.
- Entry into a dry mortar removal or abrasive blasting area while airborne dust is visible for less than 15 minutes for inspection and/or sampling.
- Working within 25 metres of an area where compressed air is being used to remove silica-containing dust outdoors.

#### **TYPE 2 OPERATIONS**

- Removal of silica containing refractory materials with a jackhammer.
- The drilling of holes in concrete or rock that is part of a tunnelling or road construction.
- The use of a power tool to cut, grind, or polish concrete, masonry, terrazzo or refractory materials.
- The use of a power tool to remove silica containing materials.
- Tunnelling (operation of the tunnel boring machine, tunnel drilling, tunnel mesh installation).
- Tuckpoint and surface grinding.
- Dry mortar removal with an electric or pneumatic cutting device.
- Dry method dust cleanup from abrasive blasting operations.
- The use of compressed air outdoors for removing silica dust.
- Entry into area where abrasive blasting is being carried out for more than 15 minutes.

**TABLE C-3 (Continued)**  
**SUMMARY OF CLASSIFICATION OF SILICA-CONTAINING CONSTRUCTION TASKS**  
**MOL GUIDELINE, SILICA ON CONSTRUCTION PROJECTS, APRIL 2011**

**TYPE 3 OPERATIONS**

- Abrasive blasting with an abrasive that contains  $\geq 1$  per cent silica.
- Abrasive blasting of a material that contains  $\geq 1$  per cent silica.

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**ASBESTOS ABATEMENT SPECIFICATIONS**  
**ROLLING MEADOWS SCHOOL**

## ASBESTOS ABATEMENT SPECIFICATIONS

### Rolling Meadows Public School

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#### At Rear:

Drawing No. 30065539-1 – Locations of Work Areas – First Floor Plan  
Drawing No. 30065539-2 – Locations of Work Areas – Second Floor Plan



## ASBESTOS ABATEMENT SPECIFICATIONS

### Rolling Meadows Public School

#### 1.0 PART 1 – GENERAL

##### 1.1 GENERAL

- .1 The requirements as set out in these specifications may, at times, exceed the procedures detailed in the various applicable regulations. All work shall be done in compliance with the specifications AND the regulations. Should there be any discrepancy or conflict between the documents, the most stringent shall apply.

##### 1.2 OUTLINE OF WORK

- .1 The intent of the work is to remove select asbestos-containing materials to the extent practicable, in designated areas in the facility prior to renovations.
- .2 Replacement of removed materials is not part of this contract unless otherwise noted.
- .3 Coordinate all work with the General Contractor and sub trades as required.
- .4 Refer to Architectural, Mechanical and Electrical drawings and specifications for additional details.
- .5 All mechanical, electrical, communication and life system isolations and disconnects required to facilitate asbestos removal operations, will be performed by the General Contractor's sub trades prior commencement of remedial work.
- .6 Florescent light tubes in light fixtures in ceilings slated for demolition by the Asbestos Contractor, will be removed by the General Contractor's sub trades prior commencement of remedial work.
- .7 Electrical hookups of GFI panels and temporary panels for power equipment (power grinders, etc.) will be performed by the General Contractor's licensed electrician in compliance to all regulatory requirements and codes.
- .8 Each negative pressure unit and HEPA vacuums shall be integrity tested at the work site prior to commencement of asbestos removal operations.
- .9 Provide all supervision, labour, equipment, tools, materials, waste management, haulage and disposal, and other services, as required, for undertaking and completing all the work, as detailed below.
- .10 **Work Area 1 – Rooms 116 and 212**
  - .1 Prepare the areas as indicated above for Type 2 enclosure and Glovebag asbestos removal operations.
  - .2 All toilet partitions and washroom fixtures except for urinals, will be removed by the General Contractor's sub trades prior to commencement of remedial work.
  - .3 Supply and install scaffolding, in accordance with all applicable regulations, in order to provide sufficient and safe access to the work areas.

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## ASBESTOS ABATEMENT SPECIFICATIONS

### Rolling Meadows Public School

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- .4 Erect a three-chamber decontamination facility at the entrance to the work areas using wood or steel plates and studs covered with rip-proof polyethylene sheeting and sealed with duct tape.
  - .5 Establish a measurable negative air pressure differential in the enclosure work areas using HEPA filter/fan units. HEPA filter/fan units are to be exhausted directly outdoors.
  - .6 Remove and dispose as clean demolition waste, entire ceiling assemblies, including but not limited to, light fixtures, acoustic ceiling tiles and associated mastics, gypsum board substrate materials and ceiling support systems.
  - .7 Remove and dispose as asbestos waste, all ceramic tile and associated asbestos-containing grout and mortar beds on floors and walls surrounding urinals. Mortar bed are to be completely removed from concrete substate materials. If power tools are used for removal operations, power tools must be attached to dust collecting devices equipped with HEPA filters.
  - .8 Using glovebags inside the enclosure work areas, remove and dispose as asbestos waste, all asbestos-containing thermal insulation applied to pipe fittings. For costing purposes, allow for the removal of thermal insulation from a total a total of thirty (30) pipe fittings.
- .11 **Work Area 2 – Rooms 115 and 214**
- .1 Prepare the areas as indicated above for Type 2 enclosure and Glovebag asbestos removal operations.
  - .2 All toilet partitions and washroom fixtures, will be removed by the General Contractor's sub trades prior to commencement of remedial work.
  - .3 Supply and install scaffolding, in accordance with all applicable regulations, in order to provide sufficient and safe access to the work areas.
  - .4 Remove and dispose as clean demolition waste, entire ceiling assemblies, including but not limited to, light fixtures, acoustic ceiling tiles and associated mastics, gypsum board substrate materials and ceiling support systems.
  - .5 Using glovebags inside the enclosure work areas, remove and dispose as asbestos waste, all asbestos-containing thermal insulation applied to pipe fittings. For costing purposes, allow for the removal of thermal insulation from a total a total of thirty (30) pipe fittings.
- .12 **Work Area 3 – Rooms 100, 100A, 100B, 102, 102A and 102B**
- .1 Prepare the areas as indicated above for a Type 2 enclosure asbestos removal operation.
  - .2 Wood panel partition walls and associated vinyl baseboards, doors and door frames in Rooms 102A and 102B, will be removed by the General Contractor's sub trades prior to commencement of remedial work.

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### Rolling Meadows Public School

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- .3 Erect a three-chamber decontamination facility at the entrance to the work area using wood or steel plates and studs covered with rip-proof polyethylene sheeting and sealed with duct tape.
- .4 Establish a measurable negative air pressure differential in the enclosure work area using HEPA filter/fan units. HEPA filter/fan units are to be exhausted directly outdoors.
- .5 Remove and dispose the following as clean demolition waste:
  - .1 All baseboards.
  - .2 Carpeting in Rooms 100B, 102A and 102B.
- .6 Remove and dispose the following as asbestos waste:
  - .1 All non-asbestos-containing vinyl floor tiles and associated asbestos-containing mastic in Rooms 100 and 100A.
  - .2 All asbestos-containing vinyl floor tiles and associated asbestos-containing mastic in Rooms 100B, 102, 102A and 102.
- .7 Using power tools (power grinders) that are attached to dust collecting devices equipped with HEPA filters, remove and dispose as asbestos waste, all asbestos-containing vinyl floor tile mastic from all concrete floors.
  - .1 Dust collecting devices with HEPA filters (HEPA vacuums) that are attached to power tools, must have adequate CFM capacity to properly collect mastic and residual dust generated by the power grinding operations.
  - .2 All power tools used to remove mastics, must have an integral shrouding system designed to properly contain dust and debris generated by the power grinding operations.
- .13 **Work Area 4 – Room 117**
  - .1 Prepare the areas as indicated above and on the attached floor plans for a Type 1 asbestos removal operation.
  - .2 Using hand tools, remove and dispose as asbestos waste, select sections of asbestos-containing vinyl floor tiles located on the raised wood platform. The General Contractor will clearly identify all areas of vinyl floor tile removals.
  - .3 For costing purposes allow for the removal of approximately five (6) square metres of vinyl floor tiles.
- .14 **Work Area 5 – Exterior Entrance Door to Vestibule 920**
  - .1 Prepare the areas as indicated above and on the attached floor plans for a Type 1 asbestos removal operation.
  - .2 Supply and install scaffolding, in accordance with all applicable regulations, in order to provide sufficient and safe access to the work areas.

## ASBESTOS ABATEMENT SPECIFICATIONS

### Rolling Meadows Public School

- .3 Remove and dispose as asbestos waste, all asbestos-containing caulking applied to the exterior side of the door frame. Caulking is located between the door frame and adjacent building materials.
- .15 **Work Area 6 – To be Determined**
- .1 Prepare locations pre-determined by the General Contractor for Type 2/glovebag asbestos removal operations.
- .2 Remove and dispose, as asbestos waste, accessible asbestos-containing thermal insulation from select pipe fittings to allow for modifications to mechanical systems and mechanical tie-ins. The General Contractor will clearly mark all locations for thermal insulation removals. For costing purposes, allow for two workers over a 10-hour shift (including travel time) to perform twelve glovebag removal operations of less than one square metre of asbestos thermal insulation per glovebag location per mobilization. Allow for two (2) separate mobilizations.
- .16 Vinyl floor tiles contain 1% to 6.1% chrysotile asbestos. Vinyl floor tile mastic contains 0.65% to 5% chrysotile asbestos. Ceramic tile grout and mortar beds contain 1% chrysotile asbestos. Caulking contains 2% chrysotile asbestos. Thermal insulation on pipe fittings contains 21% to 57% chrysotile asbestos.
- .17 All waste is to be removed from the site and disposed. Asbestos waste disposal bins are not to be left on School property unless fully enclosed with an integral metal roof system and locked. Disposal bins must be removed immediately on completion of work.
- .18 **Schedule**
- |    |                              |   |
|----|------------------------------|---|
| .1 | Mobilization                 | To be Coordinated with the General Contractor |
| .2 | Complete Work and Demobilize | To be Coordinated with the General Contractor |

### 1.3 GENERAL REQUIREMENTS

- .1 The location and availability of utilities including water, sewer and electrical power is to be determined on site. The Asbestos Contractor shall co-operate with all others on site. Should there be any disagreement, or should Contractors be unable to reach a satisfactory working arrangement, the Asbestos Consultant shall determine the manner for proceeding. The Asbestos Contractor shall not be entitled to any additional payment.
- .2. The Asbestos Contractor is responsible for making all arrangements, and for paying for the disposal of all waste materials in accordance to all applicable government laws and regulations including local, provincial and federal.
- .3 The Asbestos Contractor is advised that extended hours of work may be required to meet the schedules as detailed in the Scope of Work and shall allow for the cost thereof including shift premiums and overtime. The Asbestos Consultant shall be advised in writing at least four days in advance of the proposed working hours.
- .4 The Asbestos Contractor shall furnish and post on site the name and current phone number of an authorized representative(s) who can be contacted on a 24-hour basis in case of an emergency.

## ASBESTOS ABATEMENT SPECIFICATIONS

### Rolling Meadows Public School

- .5 All precautions will be taken to prevent the spread of contaminated material and to protect all parties including Asbestos Contractor's personnel, Owner's employees and the public from asbestos dust exposure during the course of the work. The documents outline the minimum levels of precaution to be taken.
- .6 **All work shall be done in compliance with the specifications and the Ontario Regulation 278/05 – Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations – made under the Occupational Health and Safety Act.** Should there be any discrepancy or conflict between the documents, the most stringent shall apply.
- .7 Contract conditions include, but are not limited to, complying with all Regulations, taking all precautions necessary to control the release of asbestos fibres within the work areas, preventing the release of asbestos fibres outside the work areas, and providing appropriate protection from exposure to asbestos fibres for all parties. Failure to meet any of these conditions will be considered a fundamental breach of the Contract.
- .8 The Asbestos Consultant will visit the site at his/her discretion to familiarize himself/herself with the progress and quality of the Work and to determine if the Work is proceeding in accordance with the Contract Documents.
- .9 The Asbestos Consultant shall have the authority to immediately stop the Work through a written instruction if, in his opinion, the Work does not conform to the requirements of the Contract Documents, or if continuance of the Work could subject the Owner, his employees or the public to a hazardous condition. The Work shall not recommence until such time as the deficiency or hazardous situation has been corrected and a written notice to proceed has been issued by the Asbestos Consultant.
- .10 If the Asbestos Contractor fails to comply with requirements dealing with the control of asbestos fibres and the health and safety of Asbestos Contractor employees, Asbestos Consultant and Owner personnel or the Public, the Owner, or the Owner's representative, may verbally instruct the Asbestos Contractor to cease work immediately with written confirmation to follow within two working days. If the Asbestos Consultant gives a written statement to the Owner and the Asbestos Contractor that sufficient cause exists, the Owner may notify the Asbestos Contractor in writing that he is in default of his contractual obligations.
- .11 Any employee shall be replaced, at the written request of the Asbestos Consultant, if working, or causing others to work, in violation of O.Reg. 278/05.
- .12 The Asbestos Contractor's insurance coverage limits, per occurrence, shall equal or exceed the following and shall name the Owner and Arcadis Canada Inc. as additional insureds:
  - .1 General Liability \$5 million;
  - .2 Automotive Liability \$2 million;
  - .3 Pollution Liability \$5 million including asbestos operations.
- .13 The supervisor must have proven experience and proficiency in the type of Work being undertaken under this Contract.
- .14 The supervisor shall be replaced, at the written request of the Asbestos Consultant, if found to be incompetent or inattentive to the needs of the project.

## ASBESTOS ABATEMENT SPECIFICATIONS

### Rolling Meadows Public School

- .15 Where standards of performance are specified or implied and the Work does not comply with the performance specified or implied, such deficiencies shall be corrected as directed by the Asbestos Consultant. Any subsequent testing shall be done at the Asbestos Contractor's expense.

#### 1.4 DEFINITIONS

.1 *HEPA Vacuum:*

- .1 High Efficiency Particulate Aerosol (HEPA) filtered vacuum equipment acceptable to Health and Welfare Canada and meeting U.S. Military Standard 282. This vacuum equipment shall have a filtering system capable of collecting and retaining asbestos fibres to an efficiency of 99.97% for fibres of 0.3 micrometer or larger.

.2 *Polyethylene sheeting sealed with tape:*

- .1 Polyethylene sheeting of thickness specified sealed with tape along all edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide a continuous polyethylene membrane to protect underlying surfaces from water damage or damage by sealants, and to prevent escape of asbestos fibres through the sheeting into a clean area.

.3 *Inspector:*

- .1 Representative of Arcadis Canada Inc. (Arcadis) designated by the owner to provide inspection and air monitoring of the Contractor's work.

.4 *Authorized Visitor:*

- .1 Representative of the building owner, Arcadis, and/or persons representing regulatory agencies.

.5 *Amended Water:*

- .1 Water with a non-ionic surfactant added to reduce water tension to allow thorough wetting of asbestos fibres.

.6 *Airlock:*

- .1 A system for permitting ingress or egress without permitting air movement between a contaminated area and an uncontaminated area typically consisting of two curtained doorways at least 1.5 m apart.

.7 *Curtained Doorways:*

- .1 An arrangement of closures to allow ingress and egress from one room to another while permitting minimal air movement between rooms, typically constructed by placing two overlapping sheets of polyethylene over an existing or temporarily framed doorway, securing each along the top of the doorway, securing the vertical edge of one sheet along one vertical side of the doorway and securing the vertical edge of the other sheet along the opposite vertical side of the doorway.

## ASBESTOS ABATEMENT SPECIFICATIONS

### Rolling Meadows Public School

- .2 All free edges of polyethylene shall be reinforced with duct tape and the bottom edge shall be weighted to ensure proper closing. Each polyethylene sheet shall overlap openings an additional 1/3 of the doorway width.
- .8 *Operating Area:*
  - .1 Area where no removal or repair Work is underway.
- .9 *Clean Area:*
  - .1 Either an operating area or an area in which removal Work has already been completed.
- .10 *Work Area:*
  - .1 Where the actual removal of asbestos-containing materials take place.
- .11 *Negative Pressure:*
  - .1 A system which extracts air from the work area and discharges this air directly outside the building, sufficient to maintain a minimum pressure differential of 0.5 mm (0.02 inch) of water column relative to adjacent areas outside of work areas. This air extraction system is to be equipped with a High Efficiency Particulate Aerosol filtering system before discharge.
- .12 *Confined Space:*
  - .1 A fully or partially enclosed space,
    - .1 that is not both designed and constructed for continuous human occupancy, and
    - .2 in which atmospheric hazards may occur because of its construction, location or contents or because of work that is done in it.

## 1.5 REGULATORY AGENCIES

- .1 Comply with Federal, Provincial, and local requirements pertaining to asbestos, provided that in any case of conflict among those requirements or with these Specifications the more stringent requirement shall apply. These include, but are not limited to, the following:
  - .1 Ontario Ministry of Labour, Occupational Health and Safety Division, *Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations*, O.Reg. 278/05 – made under the *Occupational Health and Safety Act*.
  - .2 Ontario Ministry of the Environment *Regulation 347* (previously 309) under the Environmental Protection Act (as amended by O.Reg. 175/83; O.Reg. 574/84; O.Reg. 322/85), June 17, 1985.
  - .3 Government of Canada *Regulations Respecting the Handling, Offering for Transport and Transporting of Dangerous Goods*. (Extract from the Canada Gazette Part II, dated February 6, 1985.)

## ASBESTOS ABATEMENT SPECIFICATIONS

### Rolling Meadows Public School

- .4 Government of Ontario *Occupational Health and Safety Act, 1978 and Regulations for Construction Projects.*
- .5 Office of the Fire Commissioner of Canada.
- .6 Ontario Electrical Safety Code.
- .7 Regulation 647 RRO '70 of the Plumbing Code.
- .2 *Patents:*
  - .1 It shall be the Contractor's responsibility to ensure that all applicable patent laws are complied with.

#### 1.6 FIRE SAFETY PLAN

- .1 Prior to initiating any work on the site, the Contractor shall prepare and submit in writing to the Engineer a Fire Safety Plan. The Plan shall be in accordance to the requirements set forth in Section 2.14, Construction and Demolition Sites, of the National Fire Code and shall include:
  - .1 the designation and organization of site personnel to carry out fire safety duties, including fire water services if applicable;
  - .2 the emergency procedures to be used in the case of fire, including:
    - .1 sounding the fire alarm;
    - .2 notifying the fire department;
    - .3 instructing site personnel on procedures to be followed when the alarm sounds; and
    - .4 fire fighting procedures;
  - .3 the control of fire hazards in and around the building;
  - .4 maintenance of fire fighting facilities; and
  - .5 special requirements as may be identified by the building owner.
- .2 Implementation of the Fire Safety Plan shall be the sole responsibility of the Contractor, and the above shall, in no way, limit the Contractor's statutory and regulatory obligations. During the work, the Fire Safety Plan shall be prominently displayed at the site and its requirements included in site safety training and awareness programs.

#### 1.7 SUBMITTALS

##### 1.7.1 Submittals Before Commencing Work

- .1 The following documentation shall be submitted to the Inspector with a dated covering letter listing attachments a minimum 48 hours prior to commencement of the Work:



## ASBESTOS ABATEMENT SPECIFICATIONS

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- .1 *Permits and Notifications:*
  - .1 All necessary permits for transporting and disposal of asbestos waste. Submit proof satisfactory to Inspector that suitable arrangements have been made to receive and properly dispose of asbestos waste. Copies of all Notifications required by Section 1.11.
- .2 *Material Safety Data Sheets:*
  - .1 Material Safety Data Sheets, or equivalent, for any sealant, surfactant or other material proposed for use. Include a separate attachment for each sheet indicating the specific worker protective equipment proposed for use with the material indicated.
- .3 *Supervisory Personnel:*
  - .1 Names of supervisory personnel who will be responsible for work area(s). **One of these supervisors must remain on site at all times asbestos removal or cleanup is occurring.** Submit proof that supervisory personnel have over 2000 hours experience on asbestos abatement projects, have performed supervisory functions on at least two other asbestos projects and have achieved the level of training as set out by the Regulation.
- .4 *Schedule:*
  - .1 Provide a bar chart indicating planned progress for critical activities as required under **Scope of Work** as well as additional information listed below a minimum of 48 hours prior to commencement of any preparatory work indicating:
    - .1 shifts to be worked;
    - .2 proposed workforce;
    - .3 starting date;
    - .4 estimated date of commencement of asbestos removal;
    - .5 estimated date of completion of asbestos removal;
    - .6 estimated completion date.
- .5 *Insurance:*
  - .1 Provide a Certificate signed by the insurance agency naming the Owner, the Architect and Arcadis Canada Inc. as co-insureds.
  2. The Asbestos Contractor's insurance coverage limits, per occurrence, shall equal or exceed the following:
    - .1 General Liability \$5 million;
    - .2 Automotive Liability \$2 million;
    - .3 Pollution Liability \$2 million including asbestos operations.

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- .3 The Asbestos Contractor must provide thirty (30) days notice of cancellation or amendment of coverage.
- .6 *Fire Safety Plan:*
  - .1 In accordance to Article 1.6 above.
- .7 *Confined Space:*
  - .1 If a work area, or part thereof, is a confined space, the contractor shall submit:
    - .1 a co-ordination document (see Section 1.13.1.1);
    - .2 a written program (see Section 1.13.1.2);
    - .3 a written plan (see Section 1.13.1.4).
- .8 *Asbestos Training:*
  - .1 A letter certifying that:
    - (a) *every worker involved in a Type 3 operation has successfully completed the Asbestos Abatement Worker Training Program approved by the Ministry of Training, Colleges and Universities; and*
    - (b) *every supervisor of a worker involved in a Type 3 operation has successfully completed the Asbestos Abatement Supervisor Training Program approved by the Ministry of Training, Colleges and Universities. O.Reg. 278/05, s. 20(1).*

#### 1.7.2 Submittals Before Commencing Asbestos Removal

- .1 Proposed Work Area emergency exit procedures.
- .2 Evidence (letter or other suitable documentation) of proper construction, inspection and installation of GFI panel by licensed electrician in compliance to all regulatory requirements and codes.

#### 1.7.3 Submittals Upon Completion of Work

- .1 Asbestos waste haulage and disposal documentations including Bills of Lading, waste transfer documents and dump receipts.
- .2 All documentation as specified in the contract General Conditions including, but not limited to, Workplace Safety and Insurance Board Certificate, Statutory Declarations and Proof of Publication of Substantial Performance.

## ASBESTOS ABATEMENT SPECIFICATIONS

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#### 1.8 EXISTING CONDITIONS

- .1 Vinyl floor tiles contain 1% to 6.1% chrysotile asbestos. Vinyl floor tile mastic contains 0.65% to 5% chrysotile asbestos. Ceramic tile grout and mortar beds contain 1% chrysotile asbestos. Caulking contains 2% chrysotile asbestos. Thermal insulation on pipe fittings contains 21% to 57% chrysotile asbestos.
- .2 Existing conditions are documented in a report prepared by Arcadis Canada Inc. for the Halton District School Board entitled *Pre-Renovation Designated Substances and Hazardous Materials Survey, Rolling Meadows Public School, 1522 Mountain Grove Avenue, Burlington, Ontario* dated May 6, 2021 which is included with the tender documents.
- .3 Masonry applications may contain silica. Paint applications may contain lead and mercury. Appropriate dust control procedures and respiratory protective equipment are to be used if disturbing these materials.

#### 1.9 RESTRICTIONS

- .1 Do not allow smoking, eating or drinking in the work area.
- .2 Do not allow entry to work area by unauthorized persons.
- .3 Compressed air shall not be used in the work area.
- .4 Open flames will not be permitted in the work area (including but not limited to torches and propane-fired heaters).

#### 1.10 WORKER PROTECTION

- .1 *Instructions:*
  - .1 Before commencing Work, instruct workers in all aspects of work procedures and protective measures.
- .2 *Respiratory Protection:*
  - .1 Provide workers with personally issued and marked respiratory equipment acceptable to the Occupational Health and Safety Division of the Ontario Ministry of Labour, suitable for the asbestos exposure in the work area.
  - .2 Ensure that suitable respiratory protective equipment is worn by every worker who enters the work area. A respirator provided by an employer and used by a worker:
    - .1 shall be in accordance to O.Reg. 278/05, Section 13, respirators.
    - .2 shall be fitted so that there is an effective seal between the respirator and the worker's face;
    - .3 shall be assigned to a worker for the worker's exclusive use;
    - .4 shall be used and maintained in accordance with the procedures specified by the equipment manufacturer;

## ASBESTOS ABATEMENT SPECIFICATIONS

### Rolling Meadows Public School

- .5 shall be cleaned, disinfected and inspected after use on each shift, or more often if necessary;
  - .6 shall have damaged or deteriorated parts replaced prior to being used by a worker; and
  - .7 when not in use, shall be stored in a convenient, clean and sanitary location.
- .3 *Protective Clothing:*
- .1 Provide workers with protective clothing which shall:
    - .1 be worn by every worker who enters the work area,
    - .2 be made of a material which does not readily retain nor permit penetration of asbestos fibres,
    - .3 consist of full body covering including head covering with snug fitting cuffs at the wrists, ankles and neck,
    - .4 include suitable footwear, and
    - .5 be repaired or replaced if torn.

#### 1.11 NOTIFICATIONS

- .1 Notify, in writing, the local Fire Department of the extent of the work, including a copy of the Fire Safety Plan detailed in Article 1.6 above.
- .2 Notify, orally and in writing, an inspector at the office of the Ministry of Labour nearest the work place of the operation. O.Reg. 278/05, Section 11.
  - .1 The written notice required by subsection (1) shall set out:
    - .1 the name and address of the person giving the notice;
    - .2 the name and address of the owner of the place where the work will be carried out;
    - .3 the municipal address or other description of the place where the work will be carried out sufficient to permit the inspector to locate the place, including the location with respect to the nearest public highway;
    - .4 a description of the work that will be carried out;
    - .5 the starting date and expected duration of the work; and
    - .6 the name and address of the supervisor in charge of the work.
- .3 Notify the Inspector a minimum of eight hours prior to initiation of the following phases of the project:
  - .1 commencement of asbestos removal;

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**ASBESTOS ABATEMENT SPECIFICATIONS**  
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- .2 commencement of sealant application;
- .3 dismantling of the enclosure; and
- .4 removing asbestos waste from the work area.

**1.12 PROTECTION, REPAIR AND REPLACEMENT OF EQUIPMENT AND MATERIALS**

- .1 All equipment within and surrounding the work area shall be suitably protected by the Contractor during the work periods.
- .2 All equipment damaged by the Contractor shall be replaced by the Contractor at no additional cost to the Owner.

**1.13 CONFINED SPACES**

Not Applicable

## ASBESTOS ABATEMENT SPECIFICATIONS

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## 2.0 PART 2 – PRODUCTS

### 2.1 MATERIALS

#### .1 *Polyethylene:*

- .1 In 0.15 mm (6 mil) minimum thickness unless otherwise specified; in sheet size to minimize joints.

#### .2 *Tape:*

- .1 Reinforced duct tape suitable for sealing polyethylene under both wet conditions using amended water, and dry conditions.

#### .3 *Wetting Agent:*

- .1 50% polyoxethylene ester and 50% polyglycol or polyxyethylene ether, or equivalent approved product, and shall be mixed with water to a concentration to provide adequate penetration and wetting of asbestos-containing material.

#### .4 *Asbestos Waste Receptors:*

- .1 0.15 mm (6 mil) minimum thickness appropriately labelled, sealable polyethylene bags and 0.15 mm (6 mil) minimum thickness sealable clear polyethylene bags.

#### .5 *Rip-Proof Polyethylene:*

- .1 0.20 mm (8 mil) fabric made up from 0.13 mm (5 mil) weave and 2 layers 0.04 mm (1.5 mil) poly laminate, in sheet size to minimize joints.

#### .6 *Sealant:*

- .1 Slow-drying sealant which remains tacky on surface for a minimum of 8 hours for purpose of trapping residual airborne fibre during settling period. Product must have flame spread and smoke development ratings both less than 50. **Product shall leave a clear finish when dry. Acceptable products “Childers Chil-Lock CP-240” or equivalent.**

### 2.2 EQUIPMENT

- .1 All equipment brought on site must be thoroughly clean and free of all fibre, asbestos or otherwise, to the satisfaction of the Field Inspector. The Contractor will be fully responsible for the replacement of equipment rejected by the Inspector and for all costs resulting from site contamination due to dirty or faulty equipment.

#### .2 *Airless Sprayer:*

- .1 Spray equipment for the application of amended water and sealant such as Graco Hydrospray or equivalent:
  - .1 Fine atomizing spray nozzle: Nozzle for airless sprayer capable of delivering not less than 4.5 L per minute of fine particle spray of amended water.

## ASBESTOS ABATEMENT SPECIFICATIONS

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.3 *Garden Sprayer:*

- .1 Hand pump-type pressure-can garden sprayer fabricated out of either metal or plastic equipped with a wand at the end of a hose that can deliver a stream or spray of liquid under pressure. **Only to be used on small removal and repair projects with the approval of the site inspector.**

.4 *HEPA Vacuum:*

- .1 High Efficiency Particulate Aerosol filtered vacuum equipment. Must have a filtering system capable of collecting and retaining asbestos fibres to an efficiency of 99.97% for fibres of 0.3 um or larger. HEPA filters must have been individually tested and certified by the manufacturer.
- .2 All HEPA vacuums brought onto the job site shall be visibly clean, shall be in a good state of repair and shall be maintained in such state through completion of the project.

.5 *Glovebag:*

- .1 Prefabricated, purposely made, 0.20 mm minimum thickness, polyvinyl chloride bag with integral 0.25 mm thick polyvinyl chloride gloves.
- .2 Bag equipped with reversible double-pull, double-throw zipper on top to facilitate installation on pipe and progressive movement along pipe, with straps for sealing ends of bag around pipe, and with plastic flap under zipper for strength on pipe and to provide effective seal and with "ziploc" feature. Bags shall be secured using manufacturer's prescribed securing devices. Approval must be obtained from the Inspector for use of Glovebags. Bag must be acceptable to the Inspector for use.
- .3 Bag must have valves to allow insertion of a vacuum hose and the nozzle of a water sprayer while maintaining the seal to the pipe, duct or similar structure.

.6 *Negative Pressure Units:*

- .1 Exhaust units fitted with High Efficiency Particulate Aerosol (HEPA) filters used to effect a negative pressure differential in the work area as compared to the immediate surrounding or clean area. The filtering system must be capable of collecting and retaining asbestos fibres to an efficiency of 99.97% for fibres of 0.3 um or larger. The HEPA filters must have been individually tested and certified by the manufacturer and bear a label certifying performance. The unit is to be fitted with instrumentation to indicate pressure differential across the HEPA filter with an audible alarm to sound at a preset low differential pressure.
- .2 Construction of HEPA filter/fan cabinet units shall be airtight and all joints shall be caulked. The gasket seal between the filter housing and the retaining frame inside the cabinet shall provide a zero-leakage seal to avoid filter bypassing.
- .3 **Each negative pressure unit shall be integrity tested at the work site prior to commencement of asbestos removal.** The procedure must include the testing of the integrity of the entire cabinet. Written confirmation of the test results are to be provided to the Inspector. Retesting may be requested by the Inspector and

## ASBESTOS ABATEMENT SPECIFICATIONS

### Rolling Meadows Public School

performed by the Contractor should the unit be damaged or modified during the work.

.7 *Differential Pressure Recorder:*

- .1 Instrument to monitor and record the differential pressure between the Work Area and Clean Area.

.1 sensitivity: 0.025 mm (0.001 inches) WC increments between +0.25 mm to -2.5 mm (+0.010 to -0.100 inches) WC

.2 accuracy: +/- 1 %

.3 pressure alarms: audible high and low level alarm programmable within operating range

.4 printout: minimum 24 hr period at 15 minute intervals

.8 *Ground Fault Panel:*

- .1 Electrical Panel equipped with ground fault circuit breakers of sufficient capacity to power all electrical equipment and lights in work area. All breakers shall have 5 mA ground fault protection. Panel should be complete with all necessary accessories including ground fault interrupter lights, test switch to ensure unit is working, and reset switch. Ground fault receptacles on extension cords shall not be used without written authorization by the Consultant.

- .2 The GFI Panel must be constructed under the direction of a licensed Electrician and inspected by a licensed Electrician on a regular basis. Evidence of such construction and inspection shall be submitted to the Consultant prior to installation of the Panel on site.



## ASBESTOS ABATEMENT SPECIFICATIONS

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### 3.0 PART 3 – EXECUTION

#### 3.1 MAJOR ASBESTOS WORK (TYPE 3 OPERATIONS)

Not Applicable.

#### 3.2 GLOVEBAG REMOVAL METHOD

- .1 The Glovebag Removal Method may only be used with the written approval of the on-site inspector and advance notification, orally and in writing, to an inspector at the office of the Ministry of Labour nearest the work place of the operation if more than one square metre or more of insulation is to be removed.

.2 Preparation

- .1 Separate the work place from the rest of the building by placing rope barriers at the boundary of the designated work area. The boundaries of the work area shall be a minimum of 3.0 m from the location of the insulation being removed. Identify the work area with clearly visible warning signs. The signs shall read in 35 mm (1 3/8") *sans serif* letters:

**“CAUTION  
ASBESTOS REMOVAL WORK IN PROGRESS.  
ACCESS RESTRICTED TO PERSONS WEARING  
PROTECTIVE CLOTHING AND EQUIPMENT”.**

- .2 Disable the mechanical ventilation system serving the work area and seal all openings or voids, including ventilation duct to and from the working area.
- .3 Ensure that all sources of heat for pipe systems have been shut off.
- .4 Vacuum surfaces of insulating material using a vacuum equipped with a HEPA filter. Ensure that all friable material that is lying on the surface of any article, thing or place in the work area is cleaned up and removed by damp wiping or by using a vacuum equipped with a HEPA filter.

.3 Worker Protection Procedures

- .1 Each worker shall remove street clothes and put on a respirator and disposable coveralls before proceeding to the work site.
- .2 Before leaving the work area, a worker shall decontaminate the protective clothing, boots, and respirator by using a HEPA vacuum or damp wiping prior to removing it.
- .3 Facilities for the washing of hands and face shall be made available and shall be used by every worker before leaving the work area. The outside of the respirator shall also be cleaned at this time.
- .4 Following completion of the work, HEPA vacuum or wet wipe any material from the disposable coveralls and boots, remove the used disposable coverall and dispose of as contaminated waste. Clean the outside of the respirator with soap and water, remove the respirator, remove the filters, if applicable, and wet the outside surfaces, wash and rinse the inside of the respirator.

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- .4 Asbestos Removal (Glovebag Method)
  - .1 Before performing work:
    - .1 Prepare site by placing new 0.15 mm (6 mil) polyethylene plastic drop sheets on all surfaces immediately below and within 3.0 m of the work area.
    - .2 Remove all obstructions from around pipes to allow access for repair work.
    - .3 Inspect all glovebags for defects before using. A defective bag shall not be used.
    - .4 Ensure that any knife to be used inside the glovebag has a retractable blade and that any saw used inside the glovebag is of the flexible wire type; and brush used inside a glovebag shall not have metal bristles.
  - .2 Perform removal operations using the following procedures (in accordance to the manufacturer's instructions):
    - .1 Place any tools necessary to remove insulation in bottom of the containment bag.
    - .2 Install the bag on the pipe or fitting using shoulder straps and zipper provided. **Duct tape is not to be substituted for shoulder straps.** Support bag as necessary to avoid damage to the piping system or the bag itself.
    - .3 Insert nozzle of spray pump prefilled and primed with water and surfactant mixture (amended water) into the bag through the valve provided. Place hands in gloves and relocate the tools to the tool pouch.
    - .4 Cut or remove exterior insulation jacket, where applicable, to expose asbestos pipe covering. Wet exposed pipe covering with sufficient amended water to suppress any dust. Remove insulation and arrange in bottom of bag to obtain maximum capacity for the bag. Wash down exposed portion of pipe and top section of bag ensuring that insulation in lower portion of bag as well as any exposed end of insulation is thoroughly saturated. Use one hand and a cloth or sponge to aid in washing process.
    - .5 Ensure that pipe and other surfaces are clean of visual residue, dirt or dust prior to removal of the containment bag and seal all surfaces with encapsulant. Seal exposed ends of remaining asbestos insulation with encapsulant.
    - .6 If the glovebag is ripped, cut or opened in any way, work that may disturb friable material shall cease immediately. If the rip, cut or opening is small and easy to repair then the glovebag shall be repaired immediately with tape. Work may continue once the repairs are complete. If the rip, cut or opening is not small and cannot be easily repaired, place the glovebag immediately within a suitable asbestos waste container. Any spilled material containing asbestos shall be cleaned up and removed by using a vacuum equipped with a HEPA filter.

## ASBESTOS ABATEMENT SPECIFICATIONS

### Rolling Meadows Public School

- .7 To remove bag after completion of stripping, wash top section and tools thoroughly. Put all tools in one hand (glove), pull hand out inverted, twist to create a separate pouch, double tape to seal ends, cut and place in the next glovebag or into a water bucket, open pouch under water and clean and then allow to dry. Tools may also be cleaned and handed out during the dismantling of the bag while taking all precautions to prevent release of asbestos.
- .8 Remove all air inside the glovebag by means of a vacuum equipped with a HEPA filter. Seal lower portion of bag and place bag into appropriate waste container.
- .9 After removal of bag, ensure pipe is clean of all residue. If necessary after removal of each section of asbestos, vacuum all surfaces of pipe, using HEPA Filtered Vacuum equipment.
- .10 Welds and folds of glovebags are to remain intact without modification to manufacturer's design.
- .11 Glovebags, disposal bags, cloth rags and any porous materials are to be handled and disposed as hazardous waste.
- .12 Frequently, and at regular intervals during the work and immediately upon completion of the work, glovebags containing asbestos-contaminated dust and waste shall be placed in a suitable waste container and shall be removed from the workplace.
- .13 Immediately after removal of asbestos, clean all surfaces and equipment within the work area using a HEPA vacuum and damp wiping.
- .14 Remove polyethylene floor covering, fold inward, and place in 6-mil polyethylene waste bags. Seal bags tightly.
- .15 Place sponges, brushes, etc., in double polyethylene bags and seal tightly.
- .16 Make arrangements for disposal of all asbestos-containing waste material.

### 3.3 TYPE 2 ENCLOSURE METHOD

- .1 Preparation
  - .1 Separate the work area from the rest of the building using rope barriers, signage and other appropriate means. The extent of the work area will depend on the amount of work to be done, potential for fibre release and the height of the work above floor level.
  - .2 Identify the work area with clearly visible warning signs.
  - .3 Construct a frame for the enclosure from 50 mm x 100 mm (2" x 4") studs or other suitable material (scaffolding, for example); if the potential exists for the disturbance of asbestos-containing material during the construction of the enclosure, wear a respirator and suitable protective clothing; ensure that the enclosure is of adequate size to permit the storage of equipment and waste.

## ASBESTOS ABATEMENT SPECIFICATIONS

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- .4 If the room where the work is to take place is small, the room itself may serve as an enclosure, provided that all openings are sealed, the mechanical ventilation system servicing the room is disabled and the ventilation ducts to and from the work area are sealed.
- .5 Shut off the source of heat for piping systems (i.e., boiler or steam line header), where possible.
- .6 Cover the walls, floor and ceiling of the enclosure with clear 0.15 mm polyethylene sheeting sealed with duct tape. Curtains of polyethylene sheeting must be fitted on each side of the entrance to the enclosure (curtain flaps may require weights at the bottoms to ensure proper closing).
- .7 Disable the ventilation system servicing the enclosure; seal ventilation ducts to and from the work area.
- .8 Shut off and lock out electrical power within the enclosure.
- .9 When specified, establish a measurable negative pressure differential in the work area enclosure by using fan/filter units equipped with High Efficiency Particulate Air (HEPA) filters. Units are to be integrity tested on site prior to commencement of asbestos removal operations and are to be exhausted directly outdoors where practicable.
- .10 Wear an appropriate respirator approved for use with asbestos and suitable protective equipment. Only persons wearing protective clothing and equipment shall be allowed to enter the work area. If the type of asbestos is other than chrysotile, a powered air purifying respirator shall be used.
- .11 Do not use compressed air.
- .12 Do not eat, drink, smoke or chew in the work area.
- .13 Vacuum surfaces of insulated material in the work area using a HEPA vacuum.
- .2 Asbestos Removal and Cleanup
  - .1 For thermal insulation removal: carefully cut the outer cover of thermal insulation on the section being worked on; thoroughly wet the asbestos-containing material with amended water using a garden sprayer. Remove wetted asbestos material and covering jackets in small sections directly into a waste receptor (polyethylene bag). **MAINTAIN ASBESTOS IN WET CONDITION AT ALL TIMES DURING REMOVAL AND/OR HANDLING. SEAL BAGS TIGHTLY.**
  - .2 For floor tile mastic removal using power tools: use only power tools (power grinders) that are attached to dust collecting devices equipped with HEPA filters. Dust collecting devices with HEPA filters (HEPA vacuums) attached to power tools, have adequate CFM capacity to properly collect mastic and residual dust generated by the power grinding operations. All power tools used to remove mastics, must have an integral shrouding system designed to properly contain dust and debris generated by the power grinding operations.
  - .3 Clean surfaces exposed by asbestos removal with a brush and wet sponge. Ensure that all surfaces of piping and other equipment are clean of all residue.

## ASBESTOS ABATEMENT SPECIFICATIONS

### Rolling Meadows Public School

- .4 Immediately after removal of asbestos, clean all surfaces and equipment within the work area, including polyethylene sheeting, using a HEPA vacuum or by damp wiping.
- .5 Seal all surfaces of pipe or other equipment, enclosure, and ends of exposed insulation with a suitable encapsulant.
- .6 After satisfactory completion of cleaning and before leaving the work area, decontaminate protective clothing (including boots) and equipment, etc., using a HEPA vacuum or by damp wiping.
- .7 Dismantle the enclosure and wet and dispose of all polyethylene sheeting, brushes and sponges as asbestos waste.
- .8 Dispose of protective clothing as asbestos waste.
- .9 Wash hands and face at the completion of the work (before leaving the work area); damp wipe the respirator and store in a proper place.
- .10 Make arrangements for disposal of all asbestos-containing waste material.

### 3.4 TYPE 1 OPERATION

#### .1 *Preparation*

- .1 Control the spread of dust from the work being performed by use of drop sheets, keeping doors closed, providing signage, etc. Ensure that appropriate equipment and materials are at hand.
- .2 Restrict access to the work area using rope barriers, barricades, and other appropriate measures.
- .3 Disable ventilation systems servicing the work area.
- .4 Provide and wear a non-powered air purifying respirator with high efficiency cartridges approved for use with asbestos and disposable coveralls including hood, elasticized cuffs and zipper over work clothes.

#### .2 *Asbestos Removal and Cleanup*

- .1 Do not eat, drink, chew or smoke within the work area.
- .2 For asbestos floor tile removal: disconnect all floor-mounted electrical fixtures and outlets and seal with duct tape. Seal other floor penetrations as required. Spray amended water on tiles to be removed to reduce dust. Remove tiles and immediately place into waste receptor. Double bag when removing debris from work area.
- .3 For asbestos caulking removal: place polyethylene sheet under work area to contamination to adjacent building materials. Apply amended water as required to reduce dust. Remove material by hand with minimal breakage and place immediately into waste receptor. Do not throw or allow the asbestos waste to fall

## ASBESTOS ABATEMENT SPECIFICATIONS

### Rolling Meadows Public School

from the work area. Ensure that all asbestos debris is removed including that on adjacent building materials, etc.

- .4 Do not allow waste to accumulate.
- .5 Clean dust and debris at regular intervals and at the end of each shift with a damp cloth or HEPA vacuum.
- .6 Ensure that there is no visible airborne dust in the work area during the removal and cleanup operation.
- .7 All duct tape, polyethylene sheets, disposable clothing and other consumables used for, and during the removal of asbestos shall be contained and disposed as asbestos waste.
- .8 Wash hands and face prior to taking breaks and at completion of the work before leaving the work area. Damp-wipe the respirator after use and store in an appropriate place.

### 3.5 WASTE DISPOSAL

- .1 Asbestos-containing wastes shall be disposed of in accordance with procedures established by the Ontario Ministry of the Environment *Regulation 347 (as amended) under the Environmental Protection Act* and the Government of Canada *Transportation of Dangerous Goods Regulations*.
- .2 Both sides of every vehicle used for the transportation of asbestos and every waste container must display in large easily legible letters that contrast in colour with the background the word "CAUTION" in letters not less than 10 cm in height and the words:

#### **CONTAINS ASBESTOS FIBRES**

Avoid Creating Dust and Spillage  
Asbestos May Be Harmful to Your Health  
Wear Approved Protective Equipment

- .3 Both sides of every waste container must display in large easily legible letters the words '**ASBESTOS, WHITE, PRODUCT IDENTIFICATION NUMBER 2590**' or '**ASBESTOS, BLUE, PRODUCT IDENTIFICATION NUMBER 2212**' in accordance with the type of asbestos being transported.
- .4 Every vehicle used for the transportation of asbestos waste shall display a Class 9 placard on the front, back and two sides of the vehicle.
- .5 The waste must be transported in a fully-enclosed truck, or alternatively, in a waste disposal skip. The driver must be familiar with cleanup and handling procedures and be trained to deal with spills or container breakage.
- .6 The truck must be equipped with a shovel and broom, wetting agent, protective clothing, respiratory protective equipment, polyethylene bags of at least 0.15 mm (6 mil) thickness, and bag closures and duct tape.
- .7 All waste must be transported with a **Bill of Lading** directly from the work area to the waste disposal site. The Bill of Lading is to indicate the source and type of asbestos, the Carrier, the amount, the destination (disposal site) and date all in accordance to applicable regulations. A copy of the Bill of Lading and disposal site receipt is to be provided to the Inspector.

## ASBESTOS ABATEMENT SPECIFICATIONS

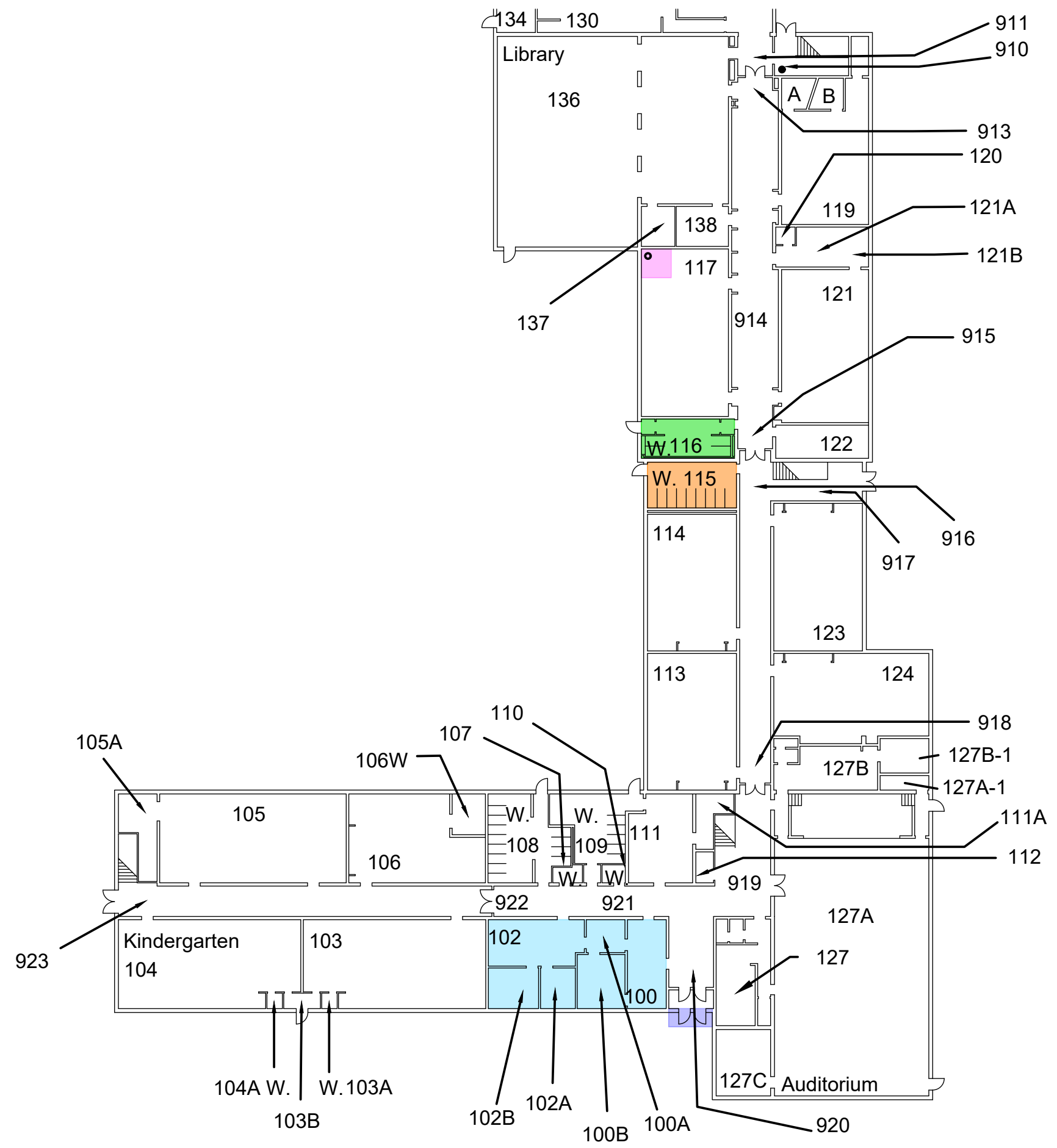
### Rolling Meadows Public School

#### 3.6 AIR MONITORING

- .1 Air tests will be taken at the discretion of the Asbestos Consultant using the Phase Contrast Microscopy (PCM) method from the time asbestos-containing materials may be disturbed until the final visual inspection of the work area(s).
  - .1 *Outside Asbestos Removal Work Areas:*
    - .1 The maximum allowable fibre concentration outside the Work Areas during asbestos removal or cleanup shall be 0.05 f/cc. Should readings exceed this value, the work shall stop at the discretion of the inspector and proceed only after the cause of the high fibre counts has been remedied.
    - .2 All costs associated with the cleaning, monitoring, and disruption caused by excessive fibre levels outside the Work Area and related to the work, are to be borne by the Asbestos Contractor including but not limited to:
      - .1 thorough cleaning with wet wiping and HEPA vacuuming by the Asbestos Contractor to the extent and satisfaction of the Inspector,
      - .2 all activities deemed necessary by the Inspector including area isolation, personnel relocation, additional visual inspections and air monitoring to confirm that the area has been adequately cleaned,
      - .3 disruption of plant production, office routine, and delays.
  - .2 *Final Clearance Test:*

Not Applicable.

**END OF SECTION**



LEGEND:

- 128 FUNCTIONAL SPACE
- WORK AREA 1
- WORK AREA 2
- WORK AREA 3
- WORK AREA 4
- WORK AREA 5

NOTES:

- 1.

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

- 1.



HALTON DISTRICT SCHOOL BOARD

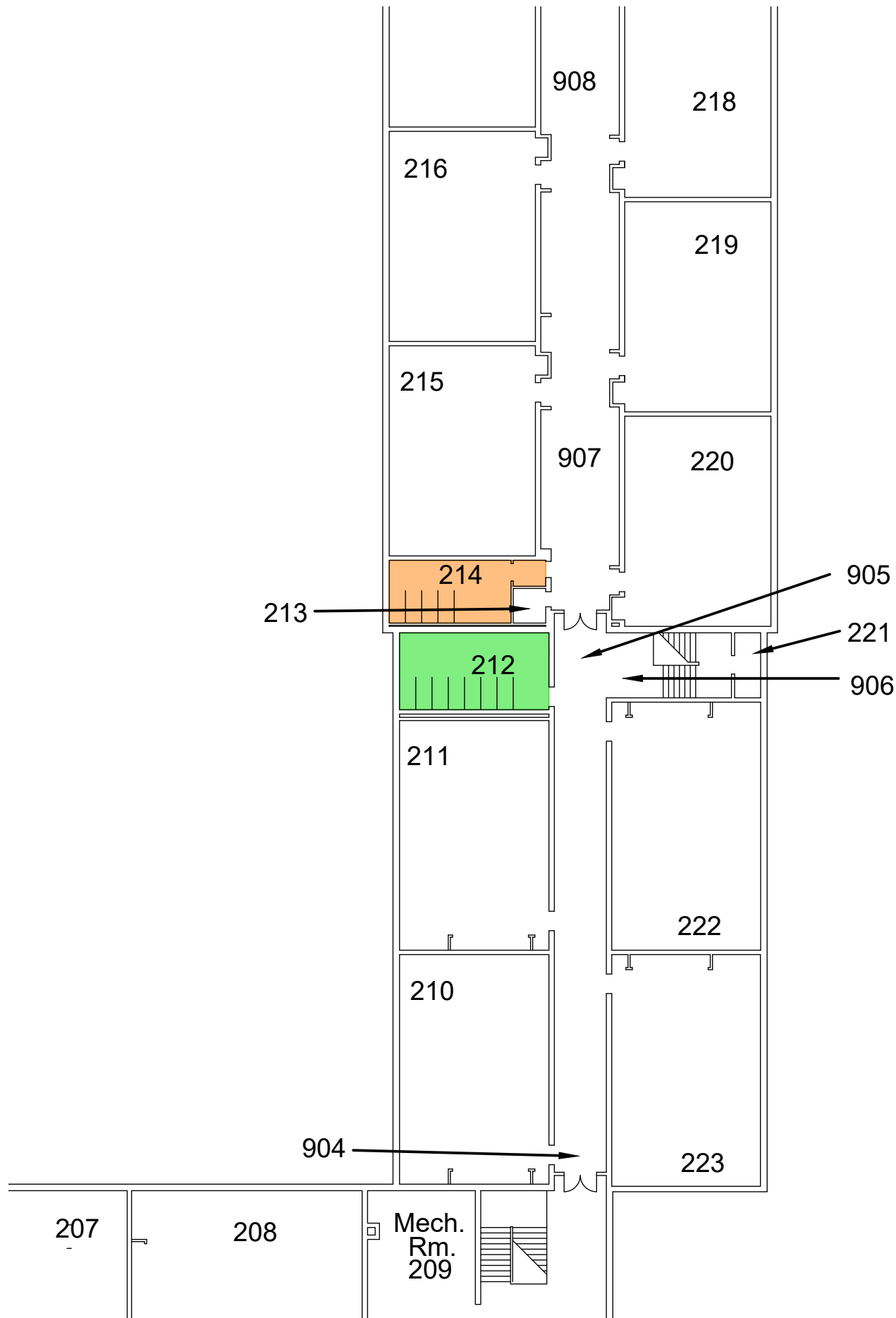
**ASBESTOS ABATEMENT SPECIFICATIONS**

LOCATIONS OF WORK AREAS  
FIRST FLOOR PLAN

ROLLING MEADOWS PUBLIC SCHOOL  
5122 MOUNTAIN GROVE AVE, OAKVILLE,  
ONTARIO

Drawn By: M.S	Approved By: J.D	Project No: 30065539
Date: MAY 2021	Scale: N.T.S	Drawing No: 30065539-1





LEGEND:

- 217 FUNCTIONAL SPACE
- WORK AREA 1
- WORK AREA 2

NOTES:

1.

REVISIONS:

No.	Date:	By:	Revisions

REFERENCE:

1.



HALTON DISTRICT SCHOOL BOARD

ASBESTOS ABATEMENT SPECIFICATIONS

LOCATIONS OF WORK AREAS  
SECOND FLOOR PLAN

ROLLING MEADOWS PUBLIC SCHOOL  
5122 MOUNTAIN GROVE AVE, OAKVILLE,  
ONTARIO

Drawn By: M.S	Approved By: J.D	Project No: 30065539
Date: MAY 2021	Scale: N.T.S	Drawing No: 30065539-2

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## **1. Definitions**

1. The following Section of this Specification are of the abbreviated type and include incomplete sentences. Definite and indefinite articles have often been omitted and sentences are written in the form of direct instructions to the Contractor without using the phrase 'the Contractor shall.' Standard specifications and other quality references inserted govern materials and workmanship without using phrases 'conform with,' 'conformity therewith,' etc. Omitted words and phrases to be supplied in the same manner as they are when a note appears on the Drawings.
2. The Specifications are separated into Sections for reference convenience only. Such separation must in no instance make Owner or his Consultants arbiter to establish subcontract limits between Contractor and Subcontractor.
3. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on Drawings and/or in Specifications, including all labour, materials, equipment, tools, services, and incidentals necessary and required to complete the work. Responsibility for breakdown into and extension of subcontracts, including co-ordination of same, rests entirely with the Contractor.
4. Standard Specifications referred to are editions in force at Tender Closing Date.

## **2. Terminology**

1. Consultants are the team of Architects, Engineers and other experts commissioned by the Owner, directly or indirectly, to execute design, contract documents and supervision for the project, including any of their agents or employees.
2. Prime Consultant is the Architect.
3. Contractor is the Firm or Corporation who, having signed the Agreement, has the sole legal responsibility to carry out the work shown or described in the Contract Documents for the Owner, whether contractually assigned to a Subcontractor or supplier, or not.

## **3. Minimum Standards**

1. Unless otherwise specified, work and material to conform or exceed the minimum standards set out in the editions of the Canadian Government Specification Board, Canadian Standards Associations, the Ontario Building Code, Underwriters' Laboratories of Canada, the Canadian Electrical Code, the Local Building Code in force, whichever is applicable.
2. Copies of Standard Specifications referred to in this Specification to be kept on the site.
3. The use of the name (or its abbreviation) of any of the following bodies, accompanied by the reference number of a specification of that body to mean that the entire specification of the body to apply as noted:

AISC: American Institute of Steel Construction;  
ASTM: American Society for Testing Materials;  
CEC: Canadian Electric Code;  
CGSB: Canadian Government Specification Board;  
CISC: Canadian Institute of Steel Construction;  
CRCA: Canadian Roofing Contractors' Association;  
CSA: Canadian Standards Association;  
OBC: Ontario Building Code;  
ULC: Underwriters' Laboratories of Canada;  
CLA: Canadian Lumbermen's Association.

#### **4. Cooperation**

1. Each trade to cooperate with the trades of adjacent or affected work. Supply in good time requirements effecting adjacent and underlying work in writing and items to be set or built in. Similarly, heed requirements and build-in items provided by other trades.
2. Take necessary precautions to protect work of other trades from contamination, marring or other damage due to application or installation processes, methods and activities.
3. General Contractor and each trade to cooperate with Contractors which may be assigned or selected by the Owner to perform work under Cash Allowances. Owner reserves the right to assign nonunionized labour to perform work under Cash Allowances, at Owners discretion.

#### **5. Coordination**

1. Coordinate the work of all trades in such a manner that each trade co-operates with the trade of adjacent work.
2. Organize weekly job site meetings and send out notices stating time and place to Consultants, subcontractors, Suppliers and all others whose presence is required at the meetings.
3. Take note of all persons attending these meetings and submit to Consultants and Owner, Minutes of these Meetings showing any major decisions made and instructions or information required.
4. Coordinate the Work in this Contract with the work of others awarded work under Cash Allowances.

#### **6. Building Dimensions and Co-ordination**

1. Ensure that all necessary job dimensions are taken and all trades are coordinated for the proper execution of the work. Assume complete responsibility for the accuracy and completeness of such dimensions, and for coordination.
2. Verify that all work, as it proceeds, is executed in accordance with dimensions and positions indicated which maintain levels and clearances to adjacent work, as set out by

requirements of the drawings, and ensure that work installed in error is rectified before construction resumes.

3. Check and verify all dimensions referring to the work and the interfacing of all services. Verify all dimensions, with the trade concerned when pertaining to the work of other trades. Be responsible to see that Subcontractors for various trades co-operate for the proper performance of the Work.
4. Avoid scaling directly from the drawings. If there is ambiguity or lack of information, immediately inform the Consultant. Be responsible for any change through the disregarding of this clause.
5. All details and measurements of any work which is to fit or to conform with work installed shall be taken at the building.
6. Advise Consultant of discrepancies and if there are omissions on drawings, particularly reflected ceiling plans and jointing patterns for paving, ceramic tile, or carpet tile layouts, which affect aesthetics, or which interfere with services, equipment or surfaces. **DO NOT PROCEED** without direction from the Consultant.
7. Ensure that each Subcontractor communicates requirements for site conditions and surfaces necessary for the execution of the Subcontractor's work, and that he provides setting drawings, templates and all other information necessary for the location and installation of material, holes, sleeves, insets, anchors, accessories, fastenings, connections and access panels. Inform other Subcontractors whose work is affected by these requirements and preparatory work.
8. Prepare interference drawings to properly co-ordinate the work where necessitated. Refer to Section 01340.

## **7. Use of Premises Before Substantial Performance**

1. The Owner shall have the right to enter and occupy the building, in whole or in part, for the purpose of placing fittings and equipment, or for other use, before completion of the Contract if, in the opinion of the Consultant, such entry and occupancy does not prevent or interfere with the Contractor in the performance of the Contract. Such entry shall in no way be considered as an acceptance of the Work in whole, or in part, nor shall it imply acknowledgment that terms of the Agreement are fulfilled.

## **8. Layout of Work**

1. Layout work with respect to the work of all trades. Arrange mechanical and electrical work such as piping, ducts, conduits, panels, equipment and the like to suit the architectural and structural details.
2. Alterations necessary due to conflict and interference between trades, to be executed at no cost to the Owner unless notification is given in writing before Tender Closing Date.

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**9. By-Laws and Regulations**

1. Nothing contained in the Drawings and Specifications are to be so construed as to be knowingly in conflict with any law, by-law or regulation of municipal, provincial or other authorities having jurisdiction.
2. Perform work in conformity with such laws, by-laws and regulations and make any necessary changes or deviations from the Drawings and Specifications subsequently required as directed and at no cost to the Owner unless notification is given in writing before Tender Closing Date.
3. Furnish inspection certificates and/or permits as may be applicable as evidence, that installed work conforms with laws, by-laws, and regulations of authorities having jurisdiction.

**10. Protection**

1. Take necessary precautions and provide and install required coverings to protect material, work and finishes from contamination, damage, the elements, water and frost.
2. Make good any damage or replace damaged materials, as directed. Repairs to be made by the trade having originally installed or fabricated the damaged material, finish or item. Protect electrical equipment from water and the elements.
3. Protect adjacent private and public property from damage and contamination.
4. Protect curbs and sidewalks from damage from trucking by means of boards and the like. Repair, or pay or repair of damage to existing roads and sidewalks.
5. Mark glass after glazing in an acceptable manner, and leave in place until final clean-up.
6. Protect floor finishes from construction traffic and transport of construction materials and equipment by means of 6 mm plywood panels.

**11. Delivery, Handling and Storage of Materials**

1. Schedule material delivery so as to keep storage at site to the absolute minimum, but without causing delays due to late delivery.
2. Store materials which will be damaged by weather in suitable dry accommodation. Provide heat, as required, to maintain temperatures recommended by material manufacturer.
3. Store highly combustible or volatile materials separately from other materials, and under no circumstances, within the building. Protect against open flame and other fire hazards. Limit volume of supply on the site to minimum required for one day's operations.
4. Handle and store material so as to prevent damage to material, structure and finishes. Avoid undue loading stresses in materials or overloading of floors.

5. Do not store material and equipment detrimental to finished surfaces within areas of the building where finishing has commenced or has been completed. All material storage within the building is subject to relocation, as directed.
6. Deliver package material in original, and Storage of unopened and undamaged containers with manufacturer's labels and seals intact.

## **12. Debris**

1. Assign clean-up duties to a crew with own Foremen which will be of sufficient size to prevent accumulation of debris and dirt in any part of the structure or on the site.
2. Remove construction debris on a daily basis and legally dispose of same.
3. Under no circumstances, should debris, rubbish or trash be burned or buried on the site.

## **13. Cutting, Fitting and Patching**

1. Required cutting to be done by General Contractor. Patching and painting of work to be executed by the General Contractor.
2. All sub-trades are to notify the General Contractors bidding as to the extent of the cutting, patching, and painting of their respective trades.
3. Drilling, cutting, fitting and patching necessary due to failure to deliver items to be built-in time, or installation in wrong location to be executed, as directed, at no cost to the Owner.
4. Give written notification prior to commencement of drilling and cutting of load bearing structural members and finished surfaces.
5. Cut holes with smooth, true, clean edges, after they are approved by applicable trade. Size holes and openings for hot water and steam pipes, so as to allow for expansion and contraction of such pipes.

## **14. Fastenings**

1. Supply all fastenings, anchors and accessories required for fabrication and erection or work.
2. Metal fastenings to be of the same material as the metal component they are anchoring, or of a metal which will not set up an electrolysis action which would cause damage to the fastening or metal component under moist conditions.
3. Exposed metal fastenings and accessories to be of the same texture, color, and finish as base metal on which they occur. Keep to a minimum; evenly space and lay out.
4. Fastenings to be permanent, of such a type and size and installed in such a manner to provide positive anchorage of the unit to be secured. Wood plugs are not acceptable. Install anchors at required spacing to provide required load bearing or shear capacity.

5. Power actuated fastenings not to be used without prior written approval for specific use.

### **15. Surplus Materials**

1. Surplus materials specifically so specified, to remain property of the Owner and be neatly stockpiled or stored, as directed.
2. All other surplus materials to become property of the Contractor; to be removed from the site and legally disposed of.

### **16. Documents Required and General Duties**

#### **1. At Commencement of Contract**

- .1 Supply Public Liability and Property Damage Insurance Certificates.
- .2 Supply Certificates of good standing from Workers' Compensation Board for the General Contractor and all Subcontractors.
- .3 Supply Contract Sum Breakdown of all sub-trades or parts of work and general expense items.
- .4 Supply Construction Schedule.
- .5 Supply Schedule of Shop Drawing Submissions.
- .6 The Owner has paid for the cost of the Building Permit. Mechanical Subcontractor will pay the cost of other Fees related to the Work Specified under Division 15. Electrical Subcontractor will pay the cost of all permits and fees related to the Work Specified under Division 16.
- .7 The General Contractor is to pay all other fees and refundable deposits if applicable.

#### **2. During Construction**

- .1 Adjust Allowances, as required.
- .2 Organize Job Meetings.
- .3 Supply Monthly Progress Reports and Construction Schedule.
- .4 Confirm that payments are being made to subcontractors and suppliers by submission of receipts with the second and subsequent Progress Payment Application. No payment will be made for unincorporated material on the site, unless Bill of Sale in proper format is provided.

#### **3. Upon Completion**

- .1 Upon completion of work before the Final Certificate of Payment is issued, the following to be observed, executed and submitted:
  - .1 All deficiencies to have been completed in a satisfactory manner.
  - .2 All final clean-up to have been executed.
  - .3 Finishing Hardware, Inspection and Verification.
  - .4 Organize a Final Inspection tour at which to be present:
    - the Owner's authorized representative;
    - the Architectural, Structural, Mechanical and Electrical Consultants, and their supervisory personnel, if any;
    - the Contractor and his superintendent.

- .5 Where the above procedure is impossible or where any deficiencies remain outstanding, the Owner's representative and the Consultant concerned, to inspect and accept the affected work and/or material upon notification by the Contractor, that all deficiencies involving this Consultant have been made good.
- .6 A complete release of all liens arising out of this Contract, other than his own. If a subcontractor or supplier refuses to furnish a release of such a lien, furnish a bond satisfactory to the Owner to indemnify him against any claim under such a lien.
- .7 Certificates of good standing from the Workers' Compensation board, for the General Contractor and all Subcontractors.
- .8 Certificate of Inspection from Mechanical and Electrical Engineers.
- .9 Copies of all Lists of Deficiencies with each Deficiency verified when complete by only this project's job Superintendent. The Final List of Deficiencies to be signed, completed by all concerned, if accepted.
- .10 Statement of Completion from General Contractor.
- .11 Final adjustment of all Allowances.
- .12 H.E.P.C. Inspection Certificate and all other Inspection Certificates required by Provincial, Municipal and other authorities having jurisdiction.
- .13 Balancing Reports.
- .14 As-Built Drawings - Hardcopy mark ups and digital pdf.
- .15 Two hard copies of Operation and Maintenance Manuals. A digital copy (pdf file) of all closeout documents to be provided on a CD or USB memory stick format.

### **17. Progress Reports**

1. Submit to the Architect, Monthly Progress Reports consisting of a concise narrative and a marked-up summary schedule showing physical percentage complete by item and in total. These progress calculations must agree with the Progress Payment Claims.
2. Keep permanent written daily records on the site on the progress of work. Record to be open to inspection at reasonable times and copies to be furnished upon request. Records to show notes of commencement and completion of different trades and parts of work; daily high and low temperatures and other weather particulars; number of men engaged on the site (including sub-trades) broken down in groups for each type of construction work, and particulars about excavation and shoring; erection and removal of form work; pouring and curing of concrete; floor finishing; placing and compaction of backfill, masonry work; roofing;
3. Daily progress to give particulars on commencement and completion of each trade or part of work; form work erections and removal; concrete pouring and curing; floor finishing; masonry work; roofing; waterproofing; finishing trades, tests and inspection and the like.

### **18. Inspection and Testing**

1. The contractor is responsible to provide his own quality control in order to meet or exceed the requirements of specified standards, codes, design criteria and referenced documents.

End of Section



### **1. Selection of Products**

1. If requested by the Consultant, provide the following services and/or information:
  - .1 Assist the Consultant in determining qualified suppliers.
  - .2 Obtain proposals from suppliers.
  - .3 Make appropriate recommendations for consideration of Consultant.
  - .4 Notify Consultant of any effect anticipated by selection of product or supplier under consideration, on construction schedule and contract sum.
2. On notification of selection, enter into purchase agreement with designated supplier.

### **2. Cash Allowance**

1. Expend cash allowance only on the Consultant's written instructions.
2. Include in Contract price the Contractor's charges for handling at site, including uncrating and storage, protection from elements and damage, labour, installation and finishing, testing, adjusting and balancing, and other expenses including overhead and profit on account of Cash Allowance in accordance with HDSB general conditions.
3. Credit the Owner with any unused portion of Cash Allowances in the statement for final payment.
4. If a test made under payment by a specific allowance proves that the material or system is not in accordance with the Documents, then the subsequent testing including Owner's testing of replacement materials or systems shall be Contractor's expense and not taken from Cash Allowance.
5. Add or deduct any variation in cost from the Cash Allowance. No adjustment will be made to Contractor's expense.
6. The amount of each allowance includes the net cost of the product or service, delivery and unloading at the site.
7. All refunds, trade and/or quantity discounts which the Contractor may receive in the purchase of goods under allowances, to be extended to the Owner.
8. Receipted invoices covering all disbursements made by the Contractor under Allowances, to be submitted to the Consultant for audit.
9. Where the Cash Allowance stipulates "Supply Only," the Contract Price and not the Cash Allowances include the installation and hook-up costs. The installation and hook-up of some equipment and materials are specified under other Sections of the Specifications. The General Contract includes the installation and hook-up not specified elsewhere.
10. Contractor's profit and overhead on all Cash Allowances to be carried in his lump sum amount, not in the Cash Allowances.

11. All Cash Allowances will be dealt with in accordance with HDSB General Conditions. All expenditures under Cash Allowances, must be approved by the Owner.
12. Include in the Stipulated Price quoted, a Cash Allowance in the amount of **Thirty-five Thousand dollars \$35,000.00**.  
To be allocated as follows:
  - .1 For supply only of Finish Hardware.
  - .2 Data and IT
  - .3 Security Access
  - .4 Interior Signage
13. H.S.T. Goods and Services tax is not included in Cash Allowance amount and is to be carried in the General Contractor's Stipulated Sum Amount.
14. Refer to Section 01005 for co-operation with others assigned to this Section.

### **3. Contingency Allowance**

1. Include in the Stipulated Price quoted, a Contingency Allowance in the amount of **One Hundred Thousand Dollars \$100,000.00**
2. Costs of Change Orders taken from Contingency Allowance will be issued in accordance to Section 00820 Supplementary Conditions (CCDC2).
3. Credit the Owner with any unused portion of the Contingency Allowance in the statement for final payment.

End of Section

### **1. Project Meetings for Coordination**

1. In consultation with the Consultant during the second week of construction, arrange for site meetings weekly or every 2 weeks as appropriate to the stage of construction, for project coordination. Such meetings shall fall at the same time each week the meeting is scheduled.
2. Responsible representatives of the Contractor's and Subcontractor's office and field forces and suppliers shall be obliged to attend.
3. Inform the Owner, Consultant, and those others whose attendance is obligatory, of the date of each meeting, in sufficient time to ensure their attendance.
4. Provide physical space for meetings, prepare an agenda, chair and record the minutes of each meeting. Relevant information must be made available to all concerned, in order that problems to be discussed may be expeditiously resolved. Identify "action by: \_\_\_\_\_".
5. Within three days after each meeting, distribute two copies of the minutes to each invited person.

### **2. Pre-construction Meeting**

1. Within 5 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
2. Include in the agenda the following:
  - .1 Appointment of official representative of participants in the Work.
  - .2 Scheduling of Work. Schedule to include a detailed breakdown of mechanical and electrical works.
  - .3 Interference with ongoing business.
  - .4 Work by other Contractors.
  - .5 Schedule of submission of shop drawings and samples.
  - .6 Requirements for temporary facilities, site sign, offices, storage sheds, utilities.
  - .7 Delivery schedule of specified equipment.
  - .8 Site security.
  - .9 Contemplated change notices, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
  - .10 Record drawings.
  - .11 Maintenance manuals.
  - .12 Take-over procedures, acceptance, warranties.
  - .13 Monthly progress claims, administrative procedures, photographs, holdbacks.
  - .14 Appointments of inspection and testing agencies or firms.
  - .15 Insurance, transcript of policies.
  - .16 Schedule for progress meetings.

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### **3. Project Meetings for Progress of Work**

1. Conduct progress meetings in accordance with the schedule and/or decisions made at Pre-construction meeting.
2. Inform the Owner, Consultant, project consultants, Subcontractors and suppliers and those whose attendance is obligatory, of the date of the meeting, in sufficient time to ensure their attendance.
3. Include in the agenda the following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, conflicts.
  - .4 Problems which impede construction schedule.
  - .5 Review of off-site fabrication delivery schedules.
  - .6 Corrective measures and procedures to regain projected schedule.
  - .7 Revisions to construction schedule.
  - .8 Progress during succeeding work period.
  - .9 Review submittal schedules: expedite as required.
  - .10 Maintenance of quality standards.
  - .11 Pending changes and substitutions.
  - .12 Review proposed changes for effect on construction schedule and on completion date.
  - .13 Other business.

### **4. Progress Records**

1. Maintain a permanent written record on the site of the progress of the work using standard OGCA form. This record shall be available to the Consultant at the site, and a copy shall be furnished to same on request. The record shall contain:
  - .1 Daily weather conditions, including maximum and minimum temperatures.
  - .2 Dates of the commencement and completion of stage or portion of the work of each trade in each area of the project.
  - .3 Conditions encountered during excavation.
  - .4 Dates of erection and removal of formwork, in each area of the project.
  - .5 Dates of pouring the concrete in each area of the project, with quantity and particulars of the concrete.
  - .6 Work force on project daily per trade.
  - .7 Visits to site by personnel of Consultant, Jurisdictional Authorities and testing companies.

End of Section

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### **1. General**

1. Submit to Architect, for review, shop drawings, product data and samples specified.
2. Until submission is reviewed, work involving relevant product must not proceed.

### **2. Shop Drawings**

1. Drawings to be originals prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate appropriate portion of work; showing fabrication, layout, setting or erection details as specified in appropriate Sections.
2. Identify details by reference to sheet and detail numbers shown on Contract Drawings.
3. Maximum sheet size 24" x 36" as PDF.

### **3. Project Data**

1. Certain specification Sections specify that manufacturer's standard schematic drawings, catalogue sheets, diagrams schedules, performance charts, illustrations and other standard descriptive data will be accepted in lieu of shop drawings.
2. Above will only be accepted if they conform to following:
  - .1 Delete information which is not applicable to project.
  - .2 Supplement standard information to provide additional information applicable to project.
  - .3 Show dimensions and clearances required.
  - .4 Show performance characteristics and capacities.
  - .5 Show wiring diagrams (when requested) and controls.

### **4. Coordination of Submissions**

1. Review shop drawings, product data and samples prior to submission.
2. Verify:
  - .1 Field measurements.
  - .2 Field construction criteria.
  - .3 Catalogue numbers and similar data.
3. Coordinate each submission with requirement of work and Contract documents. Individual shop drawings will not be reviewed until all related drawings are available.
4. Contractor's responsibility for errors and omissions in submission is not relieved by Architect's review of submittals.
5. Contractor's responsibility for deviations in submission from requirements of Contract documents is not relieved by Architect's review of submission, unless Architect gives written acceptance of specified deviations.

6. Notify Architect, in writing at time of submission, of deviations from requirements of Contract documents.
7. After Architect's review, distribute copies.

#### **5. Submission Requirements**

1. Schedule submissions at least fourteen (14) days before dates that reviewed submissions will be required to be returned.
2. Submit a digital copy (PDF) of shop drawings, product data to Architect for review.
3. Accompany submissions with transmittal letter, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Number of each shop drawing, product data and sample submitted.
  - .5 Other pertinent data.
4. Submissions must include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name of:
    - .1 Contractor.
    - .2 Subcontractor.
    - .3 Supplier.
    - .4 Manufacturer.
    - .5 Separate detailer when pertinent.
5. Identification of product or material.
  - .1 Relation to adjacent structure or materials.
  - .2 Field dimensions, clearly identified as such.
  - .3 Specification Section number.
  - .4 Applicable standards, such as CSA or CGSB numbers.
  - .5 Contractor's stamp, initialled or signed, certifying review of submission, verification of field measurements and compliance with Contract documents.
6. Interference Drawings
  - .1 Prepare interference drawings for all work in confined space ie: ceiling space.

End of Section

## **1. Construction Safety Measures**

1. Observe and enforce construction safety measures required by the National Building Code; the O.B.C.; The Provincial Government; Workers' Compensation Board; and, Municipal authorities.
2. In particular, the Occupational Health and Safety Act (Ont. Re. 213/91), the Occupational Health and Safety Act, the regulations of the Ontario Ministry of Labour and Ontario Hydro Safety requirements shall be strictly enforced.
3. Contractor shall ensure that copies of all applicable construction safety regulations, codes and standards are available on the jobsite throughout the period of construction. All workers are to be informed that these documents are available for reference at any time.
4. The Contractor shall ensure that all supervisory personnel on the job-site are fully aware of the contents of the Occupational Health and safety Act (Ontario Regulation 213/91 - Construction Projects) the Workers' Compensation Act" and, Bill 208 (Chapter 7, Standards of Ontario) "An Act to Amend the Occupational Health & Safety Act and the Workers' Compensation Act", and, that they comply with all requirements and procedures prescribed therein. These documents include, but are not limited to, the following construction safety requirements:
  - .1 Contractor to register with the Director of the Occupational Health and Safety Division before or within 30 days of the commencement of the project, (O.Reg. 213/91, sec 5).
  - .2 File a notice of project with a Director before beginning work on the project, (O.Reg. 313/91, sec 6).
  - .3 Notification prior to trenching deeper than 1.2m, (O.Reg. 213/91, sec 7).
  - .4 Accident Notices and Reports, (O.Reg. 213/91, sec 8 through sec 12).
  - .5 General Safety Requirements, (O.Reg. 213/91, sec 13 through sec 19).
  - .6 General Construction Requirements, e.g. protective clothing, hygiene practices, housekeeping, temporary heat, fire safety, access to the job-site, machine and equipment guarding and coverings, scaffolds and platforms, electrical hazards, roofing, et al, (O.Reg. 213/91, sec 20 through sec 221).
  - .7 Establish a Joint Health and Safety Committee where more than 19 workers are employed for more than 3 months, (Bill 208, S.8(2) to S.8(14).
  - .8 Establish a Worker Trades Committee for all projects employing more than 49 workers for more than 3 months, (Bill 208, S-8a(1) to S.8b(4).
  - .9 Ensure that all activities arising out of (.07) and (.08) above are recorded and that minutes are available to an inspector of the Ontario Ministry of Labour.
5. The Contractor shall be considered as the "Constructor" in consideration of the rights and responsibilities for all construction safety requirements, procedures, facilities and inspection of all work performed by the Contractor, Subcontractors/Sub-trades and other Contractors engaged on this project.
6. In the event of a conflict between any of the provisions of the above authorities the most stringent provisions are to be applied.

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## **2. Material Safety Data Sheet**

1. Material safety Data Sheets (MSDS) must be available at the jobsite for any product listed on the Hazardous Ingredients List prior to being used, installed or applied inside of the building.
2. A Material Safety Data Sheet is to be submitted to the Architect for any product which is known to create, or suspected of creating, a health hazard or discomfort during construction or upon commissioning of the project including, but not limited to, the following:
  - .1 adhesives
  - .2 solvents
  - .3 sealants, (caulking, vapour seals, etc.)
  - .4 sprayed-on fireproofing
  - .5 resilient flooring
  - .6 carpet, paint, varnish or other coatings
  - .7 exposed membrane waterproofing
  - .8 special coatings, (terrazo sealants, chafing coatings, etc.)
  - .9 solder, brazing and welding and other filler metal
  - .10 other products whose particles or vapours may become air borne after installation.
  - .11 any other product as directed by the Consultant.
3. Comply with WHMIS regulation, Workplace Hazardous Material Information System.

## **3. Fire Safety Requirements**

1. Comply with requirements for Building Construction, the Ontario Building Code, the Ontario Fire Code, the requirements of Local Fire Authorities and of the requirements of the Office of the Fire Marshal.

## **4. Overloading**

1. Ensure no part of Work is subjected to a load which will endanger its safety or will cause permanent deformation.

## **5. Falsework**

1. Design and construct falsework in accordance with CSA S269.1-1975.

## **6. Scaffolding**

1. Design and construct scaffolding in accordance with CSA S269.2-M1980.
2. Scaffolding to be designed by a Professional Engineer when required under the Occupational Health and Safety Act.

## **7. Materials Specifically Excluded**

1. Asbestos and/or asbestos-containing products are not permitted. Submit Material Safety Data Sheets for any product suspected of containing asbestos if so requested by



Consultant. Examples of some materials requiring close scrutiny and/or confirmation include:

- .1 Transite drainage pipe - whether buried or above grade - not permitted.
  - .2 Composite floor tile containing asbestos - not permitted.
  - .3 Lay-in ceiling tiles containing asbestos - not permitted.
  - .4 Insulation and/or jacketing for pipes, ducts, motors, pumps, etc. - not permitted if any asbestos is present.
2. Solder for all piping is to be lead-free.
- .1 "Lead Free" shall mean solder which contains less than 0.030% of lead when dissolved in fluoroboric and nitric acids and tested by inductively coupled argon plasma atomic emission spectroscopy. "Steelbond 281" and "Silverbrite" are acceptable solder products.
  - .2 The mechanical contractor shall provide an affidavit signed by the Principal of the company, on company letterhead, that all of the solder used on the project was either one of the two acceptable products or that the solder used (identified by brand name) meets or exceeds the testing criteria.
  - .3 The Owner shall undertake random testing of the soldered joints. Should testing prove that the solder used was not as specified, the Owner shall take action against the contractor to the full extent of the law.
3. All paint and finish coatings are to be lead and mercury-free. Submit Material Safety Data Sheets confirming that these products are free of all lead and/or mercury compounds.

End of Section

## **PART 1 - GENERAL**

### **1.1 Related Work**

1. These specifications apply to all 16 divisions of the project specification. It is the responsibility of the contractor to apply these provisions wherever practical within specification limits to all products and services used on this project.
2. It is recognized that currently specified materials and methods may conflict with the basic intention of this section. Where reasonable alternate materials and methods exist that are not specified here, and that do not compromise quality or create additional cost for the owner, notify the Architect of such alternate materials or methods. Do not proceed to use alternate materials or methods to those specified without the express approval of the Architect.
3. Elsewhere, apply the provisions of this section to all work. Exceptions can only be made when signed off by the Architect. Suitability of all products used is the responsibility of the contractor.

### **1.2 Compliance Specifications**

1. The contractor must comply with all applicable health, safety and environmental regulations.

### **1.3 Beyond Compliance Specifications**

1. These specifications apply in addition to all applicable health, safety and environmental compliance regulations. They are incorporated here to reflect the Owner's intention to develop a specification which maximizes environmentally "friendly" materials and methods wherever possible within current technical and budget limitations.
2. Beyond compliance specifications recognize that performance well beyond the minimum regulatory standard is often desirable, possible and affordable, often with no cost or low cost options. It also recognizes that application methods or protocols may be as important as the material specified. Therefore, these specifications cover both material and methods.
3. The primary goal of beyond compliance specification is to reduce the use of products or methods which have negative health and environmental impacts both during and after construction. These considerations may include full life cycle impacts, associated with raw materials, manufacturing, transport, deconstruction and their eventual fate.
4. These specifications will specifically address primary categories of readily identifiable products, ingredients and methods.
5. These provisions apply to both indoor and outdoor applications equally.

#### **1.4 Exceptions**

1. These specifications recognize that not all substitutes are equal and therefore exceptions can be made based on substantive evidence of necessary and superior performance. Special considerations may be given to restricted substances when secondary provisions are made such as sealed in place (contained) applications. All such exceptions must be approved in writing by the Architect.

### **PART 2 - MATERIALS**

#### **2.1 Products or Substances to be Avoided or Limited in Use**

1. No product containing the following substances may be used on this project when an equivalent product without or with a lower concentration of this substance is suitable and available. All products containing substances which are known to cause health effects including but not limited to cancer, mutagenic, neurological, or behavioral effects should be avoided if suitable substitutes not containing or containing lower concentrations are available. This provision shall be limited to information contained on Material Safety Data Sheets, therefore MSDS sheets must be reviewed for all products for which such sheets are required. Applications for exceptions must be accompanied by related MSDS and product application and performance sheets, clearly showing a need for the exception.

#### **2.2 Volatile Organic Compounds**

1. No product containing volatile organic compounds (in over simplified terms volatile petro chemical or similar plant derived solvents) may be used on this project when a suitable non-VOC or failing that a low VOC substitute is available. Manufacturers may refer to the U.S. EPA definition of VOC's for guidance or alternatively use the low molecular weight organic compound descriptor.

Example: Paints, Coatings, Primer, Adhesives, Chalks, Firestops, etc.

2. Waterborne equivalents are available for most of the solvent borne products used in construction and in most cases would be the preferred alternative. Waterborne products may in some instances have high VOC contents, therefore the fact that a product is waterborne does not automatically make it acceptable.

#### **2.3 Chlorinated Substances**

1. Poly Vinyl Chloride (vinyl) and other chlorinated products should be avoided if suitable substitutes are available.

#### **2.4 Plasticizers**

1. Plasticisers which offgass (low molecular weight) should be avoided.

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### **2.5 Man Made Mineral Fibres**

1. Products containing mineral fibres which can be emitted or abraded should be avoided.

Examples: duct liner, mineral fibre ceiling tiles, etc.

### **2.6 Radiation**

1. Products or methods which result in the lowest emission of Electro Magnetic Fields are preferred.

### **2.7 Biocides**

1. Products containing biocides (pesticides, miticides, mildewicides, fungicides, rodenticides, etc.) are not to be used if suitable alternatives are available. Highly stable, low human toxicity biocides such as Portercept may be acceptable substitutes. Biocide formulas which break down, emit powders or offgass should be avoided.

### **2.8 Heavy Metals**

1. Heavy metals such as lead, cadmium, mercury etc. should be avoided.

### **2.9 Aluminum**

1. Raw aluminum should be avoided, anodized or factory painted aluminum is acceptable. This is particularly applicable to surfaces which people can touch.

### **2.10 Ozone Depleting Substances**

1. Products which contain, or which use Ozone Depleting Substances such as Bromide, Chlorofluorocarbons (CFC) or Hydrofluorocarbons (HFC) etc. should be avoided if suitable substitutes are available.

### **2.11 Greenhouse Gasses**

1. Products which contain, use or generate Greenhouse gasses such as CO<sub>2</sub> should be avoided if suitable substitutes are available.

### **2.12 Bituminous (tar) Products**

1. Products containing tar compounds should not be used if suitable substitutes are available.

### **2.13 Chemical Compounds**

1. Products containing the following chemical compounds should not be used if suitable substitutes are available: Neoprene, Latex, Butyl, ABS, Formaldehyde.

#### **2.14 Adhesives**

1. Adhesives containing solvents or other non preferred ingredients should be avoided if suitable substitutes are available, including systems designs which do not need adhesives or can use mechanical etc. fastening alternatives

#### **2.15 Composite Products**

1. Some composite products contain adhesives such as formaldehyde which are not preferred, and some composites such as Fibre Reinforced Plastics are not practical for recycling. These products should be avoided if suitable substitutes are available.

#### **2.16 Cleaners and Solvents**

1. Products, equipment, and methods which require the use of cleaners and solvents are not preferred if suitable substitutes are available. Examples of preferred products would include No Wax floors, or primerless caulks and adhesives, or products not requiring caulks and adhesives.

End of Section

**1. Fires**

1. Fires and burning of rubbish on site is not permitted.

**2. Disposal of Wastes**

1. Do not bury rubbish and waste materials on site.
2. Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

**3. Asbestos and Hazardous Substances**

1. General Contractor is to inform Architect in the event of encountering material suspected of containing asbestos or hazardous substances.
2. Architect will notify owner of such findings and owner to engage directly a certified Asbestos Abatement Contractor.

End of Section

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**1. General**

1. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
2. Store volatile wastes in covered metal containers and remove from premises daily.
3. Prevent accumulation of wastes which create hazardous conditions.
4. Provide adequate ventilation during use of volatile or noxious substances.

**2. Materials**

1. Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
2. Provide on-site dump containers for collection of waste materials, and rubbish.

**3. Cleaning During Construction**

1. Maintain project grounds, and public properties free from accumulations of waste materials and rubbish.
2. Remove waste materials, and rubbish from site.
3. Vacuum clean interior building areas when ready to receive finish painting and continue vacuum cleaning on an as-needed basis until building is ready for substantial completion or occupancy.
4. Schedule cleaning operations so that resulting dust and other contaminants will not fall on wet, newly painted surfaces.

**4. Final Cleaning**

1. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all surfaces exposed to view; leave project clean and ready for occupancy.
2. Employ experienced workers, or professional cleaners, for final cleaning.
3. In preparation for Substantial Performance or Fitness for Occupancy status, whichever occurs first, conduct final inspection of interior and exterior surfaces exposed to view, and of concealed spaces.
4. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from all sight-exposed interior and exterior finished surfaces; polish resilient and ceramic surfaces so designated to shine finish. Vacuum carpet.
5. Clean and polish glass and mirrors.

6. Repair, patch and touch-up marred surfaces to specified finish, to match adjacent surfaces.
7. Broom-clean paved surfaces; rake clean other surfaces of grounds.
8. Clean exposed ductwork and structure.
9. Replace filters.
10. Clean bulbs and lamps and replace those burned out.
11. Clean diffusers and grilles.
12. Clean sinks, faucets, and water closets and controls.
13. Maintain cleaning until project, or portion thereof, is occupied by Owner.

End of Section



### **1. Requirements Included**

1. Record documents, samples, and specifications.
2. Equipment and systems.
3. Product data, materials and finishes, and related information.

### **2. Quality Assurance**

1. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

### **3. Format**

1. Organize data in the form of an instructional manual.
2. Binders: commercial quality, 8½" x 11" maximum 2½" ring size.
3. When multiple binders are used, correlate data into related consistent groupings.
4. Cover: Identify each binder with type or printed title "Project Record Documents", list title of Project, identify subject matter of contents.
5. Arrange content under Section numbers and sequence of Table of Contents.
6. Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
7. Drawings: provide with reinforced punched binder tab. Bind in with text, fold larger drawings to size of text pages.

### **4. Contents, Each Volume**

1. Table of Contents: Provide title of project; names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.
2. For each Product or System: list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
3. Product Data: mark sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
4. Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
5. Typed Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

## **5. Submission**

1. Submit one copy of completed volumes in final form 15 days prior to substantial performance. For equipment put into use with Owner's permission during construction, submit Operating and Maintenance Manuals within 10 days after start-up. For items of Work delayed materially beyond date of Substantial Performance, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.
2. Copy will be returned after inspection, with Consultant comments.
3. Revise content of documents as required prior to final submittal.
4. Submit two copies of revised volumes of data in final form within ten days after final inspection.
5. For contract drawings (architectural, landscaping, structural, mechanical, electrical), transfer neatly as-built notations onto second set and submit both sets.
6. Prepare digital pdf file for submission on USB of completed closeout documents.

## **6. Record Documents and Samples**

1. In addition to requirements in General Conditions, maintain at the site for Owner one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda
  - .4 Change Orders and other modifications to the Contract.
  - .5 Reviewed shop drawings, product data and samples.
  - .6 Field test records.
  - .7 Inspection certificates.
  - .8 Manufacturer's certificates.
2. Store Record Documents and Samples in Field Office apart from documents used for construction. Provide files, racks, and secure storage.
3. Label and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "Project Record" in neat, large, printed letters.
4. Maintain Record Documents in a clean, dry, and legible condition. Do not use Record Documents for construction purposes.
5. Keep Record Documents and samples available for inspection by Consultant.

## **7. Recording As-Built Conditions**

1. Consultant will provide two (2) complete sets of white prints of project drawings and two (2) complete sets of specifications for the purpose of recording as-built conditions. Mark and record one set on an on-going basis as construction proceeds. **Near the end of the**

**construction period transfer all marks neatly to second set for submission as project record documents.**

2. Refer to drawings/specifications for additional mechanical and electrical requirements.
3. Record information concurrently with construction progress. Do not conceal work until required information is recorded.
4. Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
  - .1 Measure depths of elements of foundation in relation to finish first floor datum.
  - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .4 Field changes of dimension and detail.
  - .5 Changes made by change orders.
  - .6 Details not on original Contract Drawings.
  - .7 References to related shop drawings and modifications.
5. Specifications: legibly mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalog number of each project actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and Change Orders.
6. Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
7. After the consultant has found the Redlined As-Built drawings to be acceptable, prepare digital pdf file of redlined Asbuilts Drawings to be included on USB with other closeout documents.

## **8. Equipment and Systems**

1. Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
2. Panelboard Circuit Directories: provide electrical service characteristics, controls, and communications.
3. Include installed colour coded wiring diagrams.
4. Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instruction. Include summer, winter, and any special operating instructions.

5. Maintain Requirements: include routine procedures and guide for troubleshooting; disassembly, repair and reassemble instructions; and alignment, adjusting, balancing, and checking instructions.
6. Provide servicing and lubrication schedule, and list of lubricants required.
7. Include manufacturer's printed operation and maintenance instructions.
8. Include sequence of operation by controls manufacturer.
9. Provide original manufacturer's parts lists, illustrations, assembly drawings, and diagrams required for maintenance.
10. Provide installed control diagrams by controls manufacturer.
11. Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
12. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
13. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
14. Include test balancing reports as specified in mechanical specifications.
15. Additional Requirements: As specified in individual specification sections.

## **9. Materials and Finishes**

1. Building Products, Applied Materials, and Finishes: include product data, with catalog number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
2. Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
3. Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommend schedule for cleaning and maintenance.
4. Additional Requirements: as specified in individual specifications sections.

## **10. Guarantees, Warranties and Bonds**

1. Separate each warranty or bond with index tab sheets keyed to the List of Contents listing.
2. List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principals. Use Guarantee/Warranty Form as provided in Section 01721 whenever standard preprinted trade or manufacturer's Guarantee/Warranty forms are not available.

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3. Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.
  4. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.
  5. Verify that documents are in proper form, contain full information, and are notarized.
  6. Co-execute submittals when required.
  7. Retain warranties and bonds until time specified for submittal.

End of Section

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## **1. Maintenance Manual**

1. On completion of project, submit to Architect two (2) copies of Operations Data and Maintenance Manual in English, made up as follows:
  - .1 Bind data in vinyl hard covered, 3 ring loose leaf binder for 8½" x 11" size paper.
  - .2 Enclose title sheet, labeled "Operation Data and Maintenance Manual", project name, date and list of contents.
  - .3 Organize contents into applicable sections of work to parallel project specification break-down. Mark each section by labeled tabs protected with celluloid covers fastened to hard paper dividing sheets.
  - .4 A digital copy of all documents in the operations and manuals must be provided on a CD or memory stick format to be PDF.
2. Include following information, plus data specified.
  - .1 Maintenance instructions for finished surface and materials.
  - .2 Copy of hardware and paint schedules.
  - .3 Description, operation and maintenance instructions for equipment and systems, including complete list of equipment and parts list. Indicate nameplate information such as make, size, capacity, serial number.
  - .4 Names, addresses and phone numbers of sub-contractors and suppliers.
  - .5 Guarantees, Warranties and bonds showing:
    - .1 Name and address of project.
    - .2 Guarantee commencement date (date of Final Certificate of Completion).
    - .3 Duration of guarantee.
    - .4 Clear indication of what is being guaranteed and what remedial action will be taken under guarantee.
    - .5 Signature and seal of Contractor.
    - .6 Additional material used in project listed under various Sections showing name of manufacturer and source of supply.
3. Neatly type lists and notes. Use clear drawings, diagrams or manufacturers' literature.
4. Include in the Manuals a complete set of final shop drawings indicating corrections and changes made during fabrication and installation.

End of Section

### **1. Standard Warranty**

1. Refer to HDSB Supplementary Conditions and to Standard Contract Document CCDC No. 2, 2008 for warranty requirements and conditions for the standard warranty which is required for the work of this contract.

### **2. Extended Warranties**

1. Refer to individual specifications sections for requirements of extended warranties required for particular sections or items of work.
2. Extended warranties are required to be issued by manufacturers, fabricators, suppliers and/or installers, sometimes jointly, due to their unique position in the construction process and their ability to guarantee a particular section of work. Refer to individual requirements of extended warranties requested.
3. Unless specifically noted otherwise, all extended warranties shall commence on the date of Substantial Performance of the Work as certified by the Consultant.
4. Listed below is a summary of extended warranties required for individual Sections. This list, if inconsistent with the specified requirements of individual extended warranties, shall be deemed correct with respect to length of extended warranties. Extended warranties required shall include, but not be limited to, the following:

Extended warranties (total warranty period listed, including entire building warranty)

Caulking (Section 07900)	5 years
Commercial Steel Doors and Frames (Section 08100)	refer to section
Glazing (Section 08800)	5 years
Wall Ceramic Tile (Section 09310)	3 years
Acoustic Unit Ceiling (09510)	2 years
Painting (Section 09900)	2 years

End of Section

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## **PART 1 - GENERAL**

### **1.1 Related Work Specified Elsewhere**

1. Not applicable

### **1.2 Existing Conditions**

1. Take over structures to be demolished based on their conditions (on date that tender is accepted).

### **1.3 Demolition Drawings**

1. Where required by authorities having jurisdiction, submit for approval drawings, diagrams or details clearly showing sequence of disassembly work or supporting structures.

### **1.4 Protection**

1. Prevent movement, settlement or damage of adjacent grades. Provide bracing, shoring as required.
2. Prevent debris from blocking surface drainage inlets which must remain in operation.
3. Protect existing items designated to remain and materials designated for salvage. In the event of damage to such items, immediately replace or make repairs to approval of Owner and at not cost to Owner.

## **PART 2 - PRODUCTS**

1. Not applicable.

## **PART 3 - EXECUTION**

### **3.1 Work**

1. Dispose of demolished materials except where noted otherwise.

### **3.2 Safety Code**

1. Unless otherwise specified, carry out demolition work in accordance with Canadian Construction Safety Code 1980.
2. Should material resembling spray or trowel-applied asbestos be encountered, notify Architect. Any asbestos encountered will be removed by the Owner's Contractor.

### **3.3 Preparation**

1. Disconnect electrical and telephone service lines entering areas to be demolished as per rules and regulations of authorities having jurisdiction. Post warning signs on electrical



lines and equipment which must remain energized to serve other areas during period of demolition.

2. Inspect site and rectify with Architect items designated for removal and items to remain.
3. Disconnect and cap mechanical services in accordance with requirements of local authority having jurisdiction.
4. Natural gas supply lines to be removed by gas company or by qualified tradesman in accordance with gas company instructions.

### **3.4 Demolition & Field Work**

1. Demolish areas as indicated on the drawings.
2. Remove existing equipment, services and obstacles, where required, for refinishing or making good of existing surfaces, and replace same as work progresses.
3. At end of each day's work, leave work in safe condition so that no part is in danger of toppling or falling. Protect interiors of parts not to be demolished from exterior elements at all times).
4. Demolish in a manner to minimize dusting. Keep dusty materials wetted.
5. Demolish masonry and concrete walls in small sections. Carefully remove and lower structural framing and other heavy or large objects.
6. Burning materials on site is not permitted.
7. Remove contaminated or dangerous materials from site and dispose of in safe manner.
8. Employ rodent and vermin exterminators to comply with health regulations.

### **3.5 Salvage**

1. Carefully dismantle items containing materials for salvage and stock pile salvaged materials at locations as directed by Architect.

### **3.6 Restoration**

1. Upon completion of work, remove debris, trim services and leave work site clean.
2. Reinstall areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.

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**3.7 Scheduling**

1. Demolition of areas adjacent to occupied spaces may not occur during occupancy of these spaces. Contractor to schedule the demolition of these areas to occur after school hours or weekends.

End of Section

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## **PART 1 - GENERAL**

### **1.1 Related Sections**

1. Section 03300 - Cast-in-Place Concrete

### **1.2 References**

1. American Concrete Institute (ACI)
  - .1 ACI 315R-96, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.
2. American National Standards Institute/American Concrete Institute (ANSI/ACI)
  - .1 ANSI/ACI 315-96, Details and Detailing of Concrete Reinforcement.
3. American Society for Testing and Materials (ASTM)
  - .1 ASTM A 775/A 775M-97e2, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
4. Canadian Standards Association (CSA)
  - .1 CAN/CSA-A23.1-04, Concrete Materials and Methods of Concrete Construction.
  - .2 CAN3-A23.3-04, Design of Concrete Structures for Buildings.
  - .3 CSA G30.3-M1991 (R1998), Cold Drawn Steel Wire for Concrete Reinforcement.
  - .4 CSA G30.5-M1991 (R1998), Welded Steel Wire Fabric for Concrete Reinforcement.
  - .5 CSA G30.14-M1991 (R1998), Deformed Steel Wire for Concrete Reinforcement.
  - .6 CSA G30.15-M1991 (R1998), Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
  - .7 CAN/CSA-G30.18-M92 (R2002), Billet-Steel Bars for Concrete Reinforcement.
  - .8 CAN/CSA-G40.20-04 / G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel.
  - .9 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .10 CSA W186-M1990 (R1998), Welding of Reinforcing Bars in Reinforced Concrete Construction.

### **1.3 Shop Drawings**

1. Submit shop drawings including placing of reinforcement in accordance with Contract Documents.
2. Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Structural Engineer, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacings and locations of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada.
3. Detail lap lengths and bar development lengths to CAN3-A23.3, unless otherwise indicated.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

1. Substitute different size bars only if permitted in writing by Structural Engineer.
2. Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
3. Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-30.18.
4. Cold-drawn annealed steel wire ties: to CSA G30.3.
5. Deformed steel wire for concrete reinforcement: to CSA G30.14.
6. Welded steel wire fabric: to CSA G30.5. Provide in flat sheets only.
7. Welded deformed steel wire fabric: to CSA G30.15. Provide in flat sheets only.
8. Epoxy coating: to ASTM A 775/A 775M.
9. Galvanizing of non pre-stressed reinforcement: to CSA G164.
10. Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
11. Mechanical splices: subject to approval of Structural Engineer
12. Plain round bars: to CAN/CSA-G40.21.

### **2.2 Fabrication**

1. Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, ANSI/ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada, unless indicated otherwise.
2. Obtain Structural Engineer's approval for locations of reinforcement splices other than those shown on placing drawings.
3. Upon approval of Structural Engineer weld reinforcement in accordance with CSA W186.
4. For epoxy coated bars, method of bundling and transportation should be in accordance with ASTM A 775/A 775M.
5. Ship bundles of bar reinforcement clearly identified in accordance with bar bending details and lists.

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**2.3 Source Quality Control**

1. Provide Structural Engineer with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to commencing reinforcing work.
2. Inform Structural Engineer of proposed source of material to be supplied.

**PART 3 - EXECUTION**

**3.1 Field Bending**

1. Do not field bend or field weld reinforcement except where indicated or authorized by Structural Engineer.
2. When field bending is authorized bend without heat, applying a slow and steady pressure.
3. Replace bars that develop cracks or splits.

**3.2 Placing Reinforcement**

1. Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CAN/CSA-A23.1.
2. Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.
3. Prior to placing concrete obtain Structural Engineer's approval of reinforcing material and placement.
4. Ensure cover to reinforcement is maintained during concrete pour.
5. Protect epoxy and paint coated portions of bars with covering during transportation and handling.

**3.2 Field Touch-up**

1. Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

End of Section

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## **PART 1 - GENERAL**

### **1.1 Related Work**

1. The General Conditions and Supplementary General Conditions, and all other requirements of Division 00 and 01, shall apply to this Section of the Work.
2. Section 03200 - Concrete Reinforcement.
3. Supply of Sleeves for Mechanical and Electrical Works, Division 15 - Mechanical, Division 16 - Electrical.

### **1.2 References**

1. CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
2. CAN/CSA-A5-93, Portland Cement.
3. CAN3-A362-93, Blended Hydraulic Cements.
4. CSA-A23.1-94, Concrete Materials and Methods of Concrete Construction.
5. CSA-A23.2-94, Methods of Test for Concrete.
6. CAN/CSA-A23.5-M86(R1992), Supplementary Cementing Materials.
7. CAN3-A266.1-78, Air-Entraining Admixtures for Concrete.
8. CAN3-A266.2-78, Chemical Admixtures for Concrete.
9. CAN3-A266.4-78, Guidelines for the Use of Admixtures in Concrete.
10. CAN3-A-266.6-85, Superplasticizing Admixture for Concrete.
11. CAN/CSA A363-M88 (R1996), Cementitious Hydraulic Slag.
12. ASTM C309, Curing Compound.
13. ASTM D1751, Asphalt - Impregnated Fibre Board.

### **1.3 Samples**

1. Submit samples in accordance with Section 01340 - Submittals.
2. At least 4 weeks prior to commencing work, inform Consultant of proposed source of aggregates and provide samples.

3. At least 4 weeks prior to commencing work, submit to Consultant samples of following materials proposed for use:
  - .1 2 kg of each type of Portland cement.
  - .2 1 kg of each type of supplementary cementing material.
  - .3 2 kg of each type of blended hydraulic cement.
  - .4 1 L of each admixture.
  - .5 1 L of curing compound.
  - .6 1 m length of each type of joint filler such as expansion joint and water stop.

#### **1.4 Certificates**

1. Minimum 4 weeks prior to starting concrete work submit to Consultant manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
  - .1 Portland cement.
  - .2 Blended hydraulic cement.
  - .3 Supplementary cementing materials.
  - .4 Grout.
  - .5 Admixtures.
  - .6 Aggregates.
  - .7 Water.
  - .8 Waterstops.
  - .9 Waterstop joints.
  - .10 Joint filler.
  - .11 Expansion joints.
2. Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA-A23.1-94. Provide superplasticizer and retarder if required as approved by Consultant. Adding water on site will not be permitted.
3. Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1-94.
4. Submit detail drawings for anchor bolt setting.

#### **1.5 Quality Assurance**

1. Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures for Consultant's approval for following items:
  - .1 Hot weather concrete.
  - .2 Cold weather concrete.
  - .3 Sealing.
  - .4 Curing.
  - .5 Finishes.
  - .6 Formwork removal.
  - .7 Joints.

### **1.6 Preconstruction Meeting**

1. Prior to start of work, arrange for project Site meeting for all parties associated with work of this Section. Presided by Owner's Designee, meeting shall include the Contractor, Sub-Contractor performing work of the Section and Testing Company's Representative.
2. Meeting shall review Specification for work included under this Section and determine complete understanding of requirements and responsibilities relative to work included, storage and handling of materials to be used, installation of materials, sequence and quality control, project staffing, restrictions on areas of concrete placement and other matters affecting construction, to permit compliance with intent of this Section.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

1. Portland cement: to CAN/CSA-A5-93.
2. Blended hydraulic cement: to CAN3-A362-93 Type M.
3. Supplementary cementing materials: to CAN/CSA-A23.5-M86 (R1992).
4. Cementitious hydraulic slag: to CAN/CSA-A363-M88 (R1996).
5. Water: to CSA-A23.1-94.
6. Aggregates: to CSA-A23.1-94. Coarse aggregates to be normal density.
7. Air entraining admixture: to CAN3-A266.1-78.
8. Chemical admixtures: to CAN3-A266.2-78. Consultant to approve accelerating or set retarding admixtures during cold and hot weather placing.
9. Non shrink premix grout: Sealtight V-1 Non Metallic Grout by W.R. Meadows, compressive strength 30 MPa or approved equal.
10. Curing compound: to CSA-A23.1-94 white and to ASTM C309, Type Sealtight 1100 clear All Resin Concrete Curing Compound by W.R. Meadows or approved equal.
11. Cushion pads: tough, resilient, weather, moisture, and oil resistant material that will not corrode or cause corrosion, consisting of either layers of approved cotton duck saturated and bound together by approved rubber or synthetic compounds, or made from specially compounded synthetic materials.
12. Premoulded joint fillers:
  - .1 Asphalt impregnated fiber board: to ASTM D1751. Sealtight fibre joint filler by W.R. Meadows or approved equal.
13. Dovetail anchor slots: minimum 0.6 mm thick galvanized steel with insulation filled slots.



14. Polyethylene film: 0.25 mm thickness (10 mils) to CAN/CGSB-51.34-M86
15. Water Stop: 102 mm, Type 6380 PVC. Water stop Sealtight by W.R. Meadows or approved equal.

## **2.2 Concrete Mixes**

1. Proportion normal density concrete in accordance with CSA-A23.1-94
  - .1 Mix design for footings:
    - .1 Cement: Type 10 Portland cement.
    - .2 Minimum compressive strength at 28 days: 25 MPa.
    - .3 Water Cement Ratio: 0.55 (Maximum)
    - .4 Class of exposure: N.
    - .5 Air content: 0%
    - .6 Nominal size of coarse aggregate: 20 mm
    - .7 Slump at time and point of discharge: 80 mm  $\pm$  30 mm.
  - .2 Mix design for foundation walls, retaining walls and piers.
    - .1 Cement: Type 10 Portland
    - .2 Minimum compressive strength at 28 days: 30 MPa
    - .3 Water/Cement Ratio: 0.50
    - .4 Class of exposure: F1
    - .5 Air Content: 5% – 8%
    - .6 Nominal size of coarse aggregate: 20 mm
    - .7 Slump at time and point of discharge: 80 mm  $\pm$  30 mm
  - .3 Mix design for interior slabs on grade:
    - .1 Cement: Type 10 Portland
    - .2 Minimum compressive strength at 28 days: 30 MPa
    - .3 Water/Cement Ratio: 0.55 (Maximum)
    - .4 Class of exposure: N
    - .5 Air Content: N/A
    - .6 Nominal size of coarse aggregate: 20 mm
    - .7 Slump at time and point of discharge: 80 mm  $\pm$  30 mm
  - .4 Mix design for exterior slabs on grade:
    - .1 Cement: Type 10 Portland
    - .2 Minimum compressive strength at 28 days: 35 MPa
    - .3 Water/Cement Ratio: 0.40 (Maximum)
    - .4 Class of exposure: C-1
    - .5 Air Content: 5% - 8%
    - .6 Nominal size of coarse aggregate: 20 mm
    - .7 Slump at time and point of discharge: 80 mm  $\pm$  30 mm
  - .5 Mix design for bond beams reinforced block cells and concrete topping.
    - .1 Cement: Type 10 Portland
    - .2 Minimum compressive strength at 28 days: 20 MPa
    - .3 Water/Cement Ratio: 0.55 (Maximum)

- .4 Class of Exposure: N
- .5 Air Content: 0
- .6 Nominal size of course aggregate: 10 mm.

## **PART 3 - EXECUTION**

### **3.1 Preparation**

1. Obtain Owner's approval before placing concrete. Provide 24 hr. notice prior to placing of concrete.
2. Pumping of concrete is permitted only after approval of equipment and mix.
3. Ensure reinforcement and inserts are not disturbed during concrete placement.
4. Prior to placing of concrete submit procedure and obtain Consultant's approval of proposed method for protection of concrete during placing and curing in adverse weather. Any concrete not backfilled to a minimum depth of 1200 mm must be protected against the possibility of freezing.
5. While curing concrete the maximum permissible temperature differential between the concrete surface and ambient must be maintained as per CSA A23.1-94.
6. Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
7. Do not place load upon new concrete until authorized by Consultant.

### **3.2 Construction**

1. Do cast-in-place concrete work in accordance with CSA-A23.1-94.
2. Cold and Hot Weather Concreting:
  - .1 Place, cure and protect all concrete as per CAN/CSA-A23.1-94.
3. Sleeves and inserts:
  - .1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Consultant.
  - .2 Where approved by Consultant, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Consultant.
  - .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Consultant before placing of concrete.
  - .4 Check locations and sizes of sleeves and openings shown on drawings and coordinate with Mechanical and Electrical work.
4. Anchor bolts, Ladder Rungs and Embedded Steel Plates:
  - .1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.

- .2 With approval of Consultant, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be minimum 100 mm diameter. Drilled holes to be minimum 25 mm larger in diameter than bolts used to manufacturer's recommendations.
  - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
  - .4 Set bolts and fill holes with shrinkage compensating grout.
  - .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
  - .6 Set ladder rungs in side sump pits.
  - .7 Set all steel plates, curb angles and any other miscellaneous embedded structural steel items prior to placing concrete.
5. Drainage holes and weep holes:
- .1 Form weep holes and drainage holes in accordance with Section 03100 - Concrete Formwork and Falsework. If wood forms are used, remove them after concrete has set.
  - .2 Install weep hole tubes and drains as indicated.
6. Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.
7. Finishing:
- .1 Finish concrete in accordance with CSA-A23.1-94.
  - .2 Use procedures acceptable to Consultant or those noted in CSA-A23.1-94 to remove excess bleed water. Ensure surface is not damaged.
  - .3 Use curing compounds compatible with applied finish on concrete surfaces.
  - .4 Provide screed float swirl-troweled finish unless otherwise indicated.
  - .5 Rub exposed sharp edges of concrete with Carborundum to produce 3 mm radius edges unless otherwise indicated.
  - .6 Finished top surface of floor slabs, to be smooth and level, ready to receive architectural floor finish directly to the slab top.
8. Joint fillers:
- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Consultant. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
  - .2 Locate and form construction joints as indicated. Install joint filler.
9. Install weep tile where shown on architectural drawings.

### **3.3 Site Tolerance**

1. Concrete tolerance including all embedded item setting tolerances in accordance with CSA-A23.1-94.

End of Section

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## **PART 1 - GENERAL**

### **1.1 Related Work**

1. Cast-In-Place Concrete: Section 03300

### **1.2 References**

1. CAN3-A23.1-M90, Concrete Materials and Methods of Concrete Construction.

### **1.3 Product and Maintenance Data**

1. Provide product and maintenance data for concrete floor hardener for incorporation into manual specified in Section (01730 - Operation and Maintenance Manual).
2. Include application instructions for liquid hardener in Operation and Maintenance Manual.

### **1.4 Environmental Requirements**

1. **Temporary Lighting:** minimum 1 200W light source, placed 2.5 m above floor surface, for each 40 m<sup>2</sup> of floor being finished.
2. **Temporary Heat:** Ambient temperature of 10°C minimum.
3. **Ventilation:** Sufficient to prevent carbon monoxide or high levels of carbon dioxide and other injurious gases from affecting concrete.
4. **Electrical Power:** Sufficient to operate equipment normally used.
5. **Work Area:** Water tight protection against rain and detrimental weather conditions.

### **1.5 Scope of Work**

1. Provide liquid sealer and hardener at interior concrete slab-on-grade areas where indicated as sealed concrete (SC) on architectural drawings /room finish schedule and exclusive of surfaces receiving polished concrete finishes.

## **PART 2 - PRODUCTS**

### **2.1 Curing–Sealing Compound (SC)**

1. Where concrete curing agent/sealer/hardener is specified on drawings, provide Shur-Seal as manufactured by Paul M. Wolff Co. Inc. (714) 974-0630 or Sure Hard manufactured by Dayton Superior's Canada limited.

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## **PART 3 - EXECUTION**

### **3.1 Examination**

1. Examine area and conditions under which the work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work and which do not conform to manufacturer's recommendations. Do not proceed until unsatisfactory conditions have been corrected.

### **3.2 Installation**

1. On freshly painted concrete surfaces, no additional surface preparation will be required.
2. On areas where forms are recently removed, remove all form oil and breaking compound residue to assure penetration of the product into the surface.
3. When applying near windows, mask the glass.
4. Avoid contact with plant life, glass, aluminum, and other finished surfaces. Where contact occurs, immediately wipe with a damp cloth or flush with water.
5. Avoid contact with asphaltic concrete.
6. On previously sealed existing concrete floors, completely strip floor of sealers and contaminants prior to application. Apply as for freshly painted surfaces.

### **3.3 Application Requirements**

1. Two applications are required. The first application at 200 ft<sup>5</sup>/gallon as the curing agent at the time of concrete placement. The second application at 400 ft<sup>5</sup>/gallon as final coat after final cleaning of the concrete.

### **3.4 Application**

#### **1. Curing Application:**

- .1 Application should be made immediately following the final concrete finishing operation as soon as the concrete is firm enough to work on. This will help prevent temperature and hairline cracking.
- .2 Application shall be made with low pressure spray. All concrete surfaces shall be kept wet for 30-45 minutes.
- .3 After this period, when the treated surfaces become slippery under foot, lightly sprinkle the surfaces with water to aid penetration.

#### **2. Finish Application:**

- .1 Apply sealer with low pressure sprayer at 400 ft<sup>5</sup>/gallon coverage rate.

- 
- .2 Lambs wool or fine bristle broom the sealer evenly across the concrete surface.  
Do not allow pudding.
  - .3 Allow sealer to dry into the surface after 30 minutes.
  - .4 Keep standing water off concrete surface for 30 days. Do not wet scrub for 30 days.

End of Section

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## **PART 1 - GENERAL**

### **1.1 Related Work**

- |   |               |
|---|---------------|
| 1. Cast-In-Place Concrete:  | Section 03300 |
| 2. Miscellaneous Metal Fabrication:   | Section 05500 |
| 3. Air Vapour Barrier Membrane:   | Section 07112 |
| Note: in order to maintain continuity and quality control, the supply and installation of the full project scope of vapour barrier membrane is to be carried by a single trade. |               |
| 4. Building Insulation:   | Section 07212 |

### **1.2 Reference Standards**

- |     |                         |   |
|-----|-------------------------|---|
| 1.  | CSA-S304.1-04           | Design of Masonry Structures  |
| 2.  | CSA- A370-04 (R2009)    | Connectors to Masonry.  |
| 3.  | CAN/CSA-A371-04 (R2009) | Masonry Construction for Buildings.   |
| 4.  | CSA A179-04 (R2009)     | Mortar and Grout for Unit Masonry   |
| 5.  | CSA-A82-06              | Fired Masonry Brick From Clay or Shale  |
| 6.  | CSA A165 Series-04      | CSA Standards for Concrete Masonry Units.   |
| 7.  | CSA G30.18-09           | Carbon Steel Bars for Concrete Reinforcement  |
| 8.  | CAN/CSA-A3000-08        | Cementitious Materials Compendium   |
| 9.  | ASTM A951/A951M-06      | Standard Specification for Steel Wire for Masonry Joint Reinforcement                                 |
| 10. | ASTM C216-07a           | Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)                 |
| 11. | ASTM C568-08a           | Standard Specification for Limestone Dimension Stone  |
| 12. | ASTM A1064/A1064        | Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete |
| 13. | ASTM C331-05            | Standard Specification for Lightweight Aggregates for Concrete Masonry Units                          |
| 14. | ASTM A153/A153M-09      | Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware                          |

### **1.3 Source Quality Control**

1. Submit laboratory test reports certifying compliance of masonry units (and mortar ingredients) with specification requirements.

2. For clay units, in addition to requirements set out in referenced CSA and ASTM Standards include data indicating initial rate of absorption for units proposed for use.
3. All masonry: mortar and grout is to be tested in accordance with CSA-S304.

#### **1.4 Product Delivery, Storage and Handling**

1. Ensure that materials are delivered to job site in dry condition.
2. Except where wetting of bricks is specified, keep materials dry until use.
3. Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.
4. Store cement under cover. Keep dry and unfrozen.
5. Pile sand on platforms. Exclude foreign matter.
6. Materials stacked on floors of building shall not exceed structural design loads.

#### **1.5 Cold Weather Requirements**

1. Comply with Clause 6.7.2 of CSA-A371.

#### **1.6 Hot Weather Requirements**

1. Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.

#### **1.7 Protection**

1. Until completed and protected by flashings or other permanent construction, keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain.
2. Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.
3. Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.
4. When air temperature has dropped below 0 degrees C (eg. Overnight), ensure that materials are above freezing and free from ice when installed.
5. Prevent work from freezing for at least 48 hours by enclosure, artificial heat, or other acceptable method.
6. Provide adequate bracing to walls during erection to prevent damage due to winds or other lateral loads.



7. Make good any damage to masonry work until completion of the work.
8. Build masonry in enclosures heated by approved smokeless means, when temperature remains below 0 degrees C. All materials shall be above 4 degrees when installed.
9. Demolish and replace masonry work damaged by freezing.
10. Supplement CSA-A371 as follows:
  - .1 Maintain temperature of mortar between 5° C and 50° C until used.

### **1.8 Job Mock-up**

1. Construct mock-up panel of exterior and interior masonry wall construction 2 m x 2 m showing masonry colours and textures, use of reinforcement, ties, through-wall flashing, weep holes, jointing, coursing, mortar, application of membrane air vapour barrier, insulation and workmanship. Mock-up may be part of construction.

### **1.9 Submittals**

1. Make submittals in accordance with Section 01340.
2. Submit samples of:
  - .1 Masonry units (each type).
  - .2 Veneer anchors.
  - .3 Masonry reinforcement.
  - .4 Mortar Colours.
  - .5 Each masonry accessory.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

#### **1. Concrete Masonry Units:**

Must be "Bubble Cure" or autoclave process, modular metric size conforming to CSA Standard A165 series.

Normal Weight - H/20/A/M, S/20/A/M.

Lightweight - H/20/C/M, S/20/C/M.

Use normal weight in below ground floor elevation. Use light weight for all above grade walls. All exposed corners to have bullnose units. All block to be uniform in color, shade and texture. Special shapes as required.

#### **2. Acoustical Concrete Masonry Units:**

N/A

#### **3. Architectural Concrete Masonry Units:**

N/A

**4. Manufactured Stone:**

N/A

**5. Clay Brick Masonry Units:**

- .1 **All units:** Clay Brick **Type-1**, match with existing brick veneer. Final selection to be confirmed by Architect.

**6. Precast Stone Caps:**

N/A

**7. Portland Cement:**

- .1 Type 10, in accordance with CSA A3001.

**8. Masonry Cement:**

- .1 Type "S" and shall comply with CSA A3002.

**9. Hydrated Lime:**

- .1 Type "S", in accordance with CSA A179.

**10. Aggregate:**

- .1 Fine grain aggregate, grading in accordance with CSA A179. When 6mm joints are specified, grain shall pass through a 1.18 mm sieve.

**11. Water:**

- .1 Ensure that water contains no salts which may cause efflorescence.

**12. Horizontal Masonry Reinforcing:**

Welded truss type or ladder type, as specified from wire to ASTM A951, hot dipped galvanized after fabrication to ASTM A153-05, Class B2, minimum coating 457 G/m2, wire size 4.76 mm diameter. Reinforcing as per the following:

- Single wythe walls Dur-O-Wal DW 100;
- Double wythe walls (up to 390 in width) Dur-O-Wal DW 120;
- Double wythe walls (greater than 390) Dur-O-Wal DW 220;
- Cavity Walls Blok-Lok- Blok truss II - BL37 to accommodate 95 mm cavity with 64 mm thick insulation. Use Blok-truss BL 30- or DW 100 if using Ferro slotted block ties. Similar reinforcing by Dur-O-Wal, Blok-Lok, and Hohmann & Barnard Inc. is acceptable.

**13. Reinforcing Bars:** billet steel to grade 400, deformed bars to CSA-G30.18.

**14. Brick Ties:**

- .1 Hook type box ties, 4.76 mm galvanized steel wire, to be used in conjunction with Block-Lok Block-Truss II BL 37 at concrete block back-up wall.

- .2 Ferro Slotted Rap-Ties 16 gauge sheet metal, hot tipped galvanized, with 4.76 mm hot tipped galvanized V-Ties – Use at concrete wall back-up, at wood parapet and where other ties are not practical.
- .3 Ferro slotted block ties, 16 gauge sheet metal, hot-dipped galvanized, with 4.76mm hot-dipped galvanized V-ties to accommodate 95 mm cavity with 64 mm thick insulation. To be used in conjunction with horizontal reinforcing as specified under paragraph 2.10.

15. **Dampproof Course:** Modified bitumen flashing membrane, Blueskin SA manufactured by Bakor, or approved equal.

16. **Lateral Support Anchors:**

.1 **Vertical:**

- .1 At intersection and abutting load bearing walls, use prefabricated corners and tees to match horizontal reinforcing.
- .2 At intersection of non-load bearing walls with load bearing or non-load bearing walls, use corrugated galvanized ties.
- .3 At wood parapet and similar conditions, use slotted Rap ties by Fero. Ensure ties extend a minimum of 50 mm into the brick or block outer wythe.
- .4 At connection with existing masonry, use joint stabilization anchors by Dur-O-Wall D/A 2200.
- .5 At control joints, use joint stabilization anchors by DUR-O-WALL D/A 2200.
- .6 At connection with steel structure use weld-on column assembly D/A 709 and D/A 701 by DUR-O-WALL. Supply welded anchor to steel trade for installation.

- .2 **Horizontal:** At underside of building structure use steel angles on both sides of partitions as specified in Section 05121 and detailed on structural drawings. Where not practical, use D/A 2200 joint stabilization anchors by DUR-O-WALL. Fasten to structure. Install at 800 mm O.C.

17. **Bolts and Anchors:** To CSA-A370.

18. **Natural Mortar:**

- .1 **Generally:** Use materials only as specified in CSA A179. Ensure that weather and aggregate used in mortar, other than in walls buried in earth, will not cause efflorescence.
- .2 **Mixes:** Mix mortars as specified in CSA A179 using the Proportion Specification.
- .3 **Mortar Types:**
  - .1 For masonry walls in contact with earth and bedding for bearing plates and lintels: Mortar Type “S”.
  - .2 For load-bearing walls: Mortar Type “S”.
  - .3 For brick: Mortar Type “N” (1:1:6) premixed “Betomix 1-1-6”, portland cement, “S” type, hydrated lime as supplied by Daubois Inc., Jiffy Mortar Systems; Maxi-Mix 1-1-6 silo mortar; or approved equivalent. Mix on site with sand, water, and colour pigment.
  - .4 For all other masonry walls, use regular Type “N” mortar.
- .4 **Grout:** To CSA A179 Table 5.

19. **Colour Pigments:** Pigments constituted of ground colored natural aggregates or metallic oxide pigments, color by architect, the ratio of coloring agent/density of portland/lime shall not exceed 10%.
20. **Mortar Dropping Control Device:** "Mor-Control" manufactured by Dur-O-Wal or Mortar-Net.
21. **Weepholes:** 90 mm x 90 mm x 10 mm purpose made PVC, designed to drain cavities to prevent insects from entering. Colour to be chosen by Architect from manufacturer's full range.
22. **Metal flashing at top of foundation wall and at exterior lintels:** 24 gauge prefinished sheet metal with Stelco or Dofasco series 8000 finish – color to match brick. With self adhering membrane flashing at underside (Blue Skin SA).

## **PART 3 - EXECUTION**

### **3.1 Workmanship**

1. Build masonry plumb, level, and true to line, with joints in proper alignment.
2. Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.
3. Set out and build masonry work to the respective dimensions called for on the drawings. Build and lay the block true to line, and level, align vertical joints. Keep angles, reveals, etc. square and plumb.
4. Assume complete responsibility for dimensions of this work.
5. Construct masonry fire rated assemblies in accordance with tested design specifications.
6. Make all joints uniform, in line, square and plumb, with mortar compressed to form joints as specified.
7. Course units to bring wall to required elevations using even, uniform, horizontal and vertical joints of maximum 10mm thickness. Horizontal joints brick soldier coursing to suit adjacent running bond.
8. Check and co-ordinate location of all anchors, connections and built-in items.
9. Bond units at intersection of walls by horizontal prefabricated "tee" or corner reinforcing units.
10. Lay each solid unit in full bed or mortar. Fill vertical joints. Slushing of joints not permitted.
11. Base course to be solid concrete masonry units laid in full mortar bed.
12. Lay each hollow unit in full bed or mortar for face shells. Butter vertical joints full. When laying closure units, butter vertical units already in place instead of units being placed.

13. Lay exposed masonry units using blocks having square, unbroken edges and corners.
14. Tolerances:
  - .1 Variation from mean plane: 6 mm when measured with 3000 mm straight edge.
  - .2 Variation from plumb: 6 mm on any vertical line up to 6000 mm high.
  - .3 Variation in wall opening sizes: 6 mm maximum.
  - .4 Variation of building lines from plan: in any bay or 6000 mm maximum – 12 mm or in 1200 mm or more, 20 mm.
15. Lay out masonry units carefully so as to run as often as possible in full and half unit dimensions. All exposed ends shall match the finish of the faces.
16. All units cut around pipes, ducts, openings, etc. shall be accurately and neatly cut with a power carborundum wheel, and remaining voids shall be slushed full with mortar.
17. Make joints flush and smooth on both sides excepts where they are to be exposed to view. When exposed to view, tool the joints concave, unless otherwise noted.
18. Lay and set up all units carefully so that both faces of the walls are true and even. Do not use chipped or cracked units where exposed to view, even where the defect would not impair strength or durability.
19. Take particular care to keep cavities, weep holes, vents and exposed faces of all units free of mortar.

### **3.2 Tolerances**

1. Clause 6.2 of CAN3-A371 applies except as follows: Walls to receive thinset ceramic tile: plumb within 1:600.

### **3.3 Exposed Masonry**

1. Remove chipped, cracked, and otherwise damaged units in exposed masonry and replace with undamaged units.

### **3.4 Jointing**

1. Concave joints, allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, compressed, uniformly concave joints.
2. Raked joints, where split rib blocks are used, allow joints to set just enough to remove excess water, then rake joints uniformly to depth of rib and compress with square tool to provide smooth, compressed, raked joints of uniform depth.
3. Where joints are concealed in walls and where walls are to receive plaster, tile insulation, or other applied material, except paint or similar thin finish coating, strike flush.

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### **3.5 Weepholes**

1. Install weepers at regular intervals at both top and bottom of walls as indicated on Drawings. Ensure weepers are clear and unblocked mortar.

### **3.6 Joining of Work**

1. Where necessary to temporarily stop horizontal runs of masonry, and in building corner, Step-back masonry diagonally to lowest course previously laid. Do not "tooth" new masonry. Fill in adjacent course before heights of stepped masonry reach 1200 mm.

### **3.7 Cutting**

1. Cut out neatly for electrical switches, outlet boxes, and other recessed or built-in objects.
2. Make cuts straight, clean, and free from uneven edges. Use masonry saw where necessary.

### **3.8 Building-In**

1. Build in items required to be built into masonry by other trades.
2. Prevent displacement of built-in items during construction. Check for plumbness, alignment, and correctness of position, as work progresses.
3. Brace door jambs to maintain plumbness. Fill door frame with concrete.

### **3.9 Wetting of Bricks**

1. Except during winter, wet clay brick having an initial rate of absorption exceeding  $1\text{g/min}/100\text{mm}^2$ ; wet to uniform degree of saturation, to 24 hours before laying, and do not lay until surface is dry.
2. Similarly, wet tops of walls built of bricks qualifying for wetting, when recommencing work on such walls.

### **3.10 Support of Loads**

1. Where concrete fill is used in lieu of solid units, use 20 MPa concrete to Section 03300.
2. Install building paper below voids to be filled with concrete; keep paper 25 mm back from faces of units.

### **3.11 Provision for Movement**

1. Leave 5 mm space below shelf angles.
2. Leave 6 mm space and do not use wedges between tops of non-load bearing walls and partitions and structural elements.

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### **3.12 Loose Steel Lintels**

1. Install loose steel lintels. Centre over opening width. Refer to Lintel Schedule on drawings.

### **3.13 Control Joints**

1. Except as noted following, control joints required at maximum of 6000 mm o.c. in continuous walls having no openings, intersections or column locations. Refer to elevations for locations on exterior walls and advise Consultant of variances prior to executing the work. Control joints are not shown for clarity on the drawings for interior walls. If in doubt, request assistance from the Consultant.
2. At doorway locations, unless indicated otherwise on elevation drawings, use one side of doorway beyond lintel. Use building paper to prevent that end of lintel to bond.
3. Use standard block with concrete filled end core to form key. Line one side of core with building paper before filling core to prevent bonding. Complete vertical separation, full height and thickness of wall are required.
4. Stop masonry reinforcing at each side of the joints. Caulking specified in Section 07900.
5. At expansion joints in brick and veneer, install Rapid Expansion joint DA 2015, to leave vertical joint free of mortar to allow for horizontal expansion.

### **3.14 Horizontal Reinforcing**

1. Horizontal reinforcing at 400 mm o.c. (every 2nd course), except solid walls greater than, or equal to 340 mm in width. At 340 mm, or greater, horizontal reinforcing at 200 mm o.c. (every course). Use prefabricated corners and tees at all intersecting load bearing walls.

### **3.15 Vertical Reinforcing**

1. Install vertical reinforcing to size and spacing as shown on Drawings. Fill voids with 20MPa concrete.

### **3.16 Brick Ties**

1. Install specified brick ties at maximum 800 mm horizontal and 400 mm vertical spacing.

### **3.17 Bonding**

1. Walls of two or more widths: bond using metal ties in accordance with subsection 9.4 of CSA-A371.
2. Procedure approval by Architect.
3. In cavity walls, keep all cavity spaces free of mortar and debris by placing a wood strip on the ties. Retain strip on a wire line and pull up level and clean off droppings prior to placing next course of ties. Install mortar control device at 300 mm o.c. horizontally, in a staggered pattern so as to overlap each other on each side. Install in every 2nd course above foundation and shelf angles.

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**3.18 Sound and Fire Separation**

1. All load bearing and non-load bearing partitions shall carry to the underside of structure above, except for allowing for deflection of structure.
2. All openings in partitions, even above ceilings shall be patched to maintain sound and fire separation.
3. In fire separations and sound separations, spaces between partition and structures to be firestopped or sound sealed under Section 07270.
4. Use U.L.C. labeled mortar for all patching in fire separations.

**3.19 Dampproof Course Flashing**

1. Install dampproof course flashing at ground floor elevation in all walls on foundations.

**3.20 Testing**

1. Masonry units to be tested in accordance with S304.1, Clause 15.1, for engineered masonry design, and in conformance with clause 15.1.2.
2. Mortar testing to be in accordance with S304.1, clause 15.2.
3. Grout testing to be in accordance with S304.1, clause 15.3.

**3.21 Blockwork - General**

1. Do not wet concrete block before laying.
2. Lay block with thicker end of face shell upward.
3. Lay interior block in running bond, concave tooled joints.
4. Use solid block or hollow block filled with concrete for top 2 courses under point bearing loads extending minimum 200 mm each side of bearing and where indicated.
5. Install special shaped units where indicated.
6. In block walls install continuous trussed wire reinforcement, as noted.
7. Where resilient base is indicated, tool the joints to within 100 mm of the floor. Cut joints flush behind the base.
8. Extend all walls/partitions to underside of steel/concrete deck unless shown otherwise on drawings and as required. Co-ordinate wall locations with structure above and prior to commencing work, advise Consultant of interference.
9. When masonry walls are not built at once, the ends of the walls are to be raked back at an angle, or terminated at a control joint. Toothing will not be permitted.



### **3.22 Mortar**

1. Measure loose damp ingredients accurately by volume. Place water in mixer, add half volume of sand, add cement, add remainder of sand, add water for plasticity. Mix for at least four minutes. Keep mixer clean.
2. Incorporate colour into mixes in accordance with manufacturer's instructions.
3. Use clean mixer for coloured mortar.
4. Prehydrate pointing mortar by mixing ingredients dry, then mix again adding just enough water to produce damp unworkable mix that will retain its form when pressed into a ball. Allow to stand for not less than 1 hour nor more than 2 hours then remix with sufficient to produce mortar of proper consistency for pointing.

### **3.23 Concrete Core Fill**

1. All concrete block walls shall have vertical grout core fill each side of openings and where shown and as detailed on the drawings.
2. Core fill in walls shall extend from bottom bearing surface to underside of bond beams or structure.
3. Grout core fill shall be placed with a trunk or chute in maximum lifts 2000 mm. Compaction shall be by interior mechanical vibrator. All fill shall be placed in accordance with CSA A23.1.
4. Fill minimum ½ block core each side of frame from foundation to underside of lintels of all door openings over 1 metre wide.
5. Provide inspection openings in base of walls to be grouted. Make good to match adjacent block work after inspection and approval by Engineer.

### **3.24 Reinforced Block Lintels**

1. Install reinforced concrete block lintels at all openings where steel lintels are not indicated in accordance with structural details.
2. Install shoring and bracing as required to openings prior to placing lintel units and concrete fill.

End of Section

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**PART 1 - GENERAL**

**1.1 Related Work**

1. Finish painting: Section 09900

**1.2 Scope**

1. Provide all miscellaneous metal items except those listed above Under Article 1.1.

**1.3 Reference Standards**

- |                        |  |
|------------------------|--|
| 1. ASTM A167-87        | Specification for Stainless and Heat-Resisting Chromium - Nickel Steel Plate, Sheet and Strip.   |
| 2. ASTM A325-90        | Specification for High Strength Bolts for Structural Steel Joints.   |
| 3. ASTM A143-74(1989)  | Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement. |
| 4. ASTM A307-90        | Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.   |
| 5. ASTM A563M-90       | Specification for carbon and Alloy Steel Nuts.   |
| 6. ASTM A780-90        | Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized coatings.  |
| 7. CAN/CSA-S16.1-M89   | Limit States Design of Steel Structures.   |
| 8. CSA W59-M1989       | Welded Steel Construction (Metal Arc Welding)  |
| 9. CAN/CSA-G40.20-M92  | General Requirements for Rolled or Welded Structural Quality Steel.  |
| 10. CAN/CSA-G40.21-M92 | Structural Quality Steels.   |
| 11. CAN/CSA-G164-M92   | Hot-Dip Galvanizing of Irregularly Shaped Articles   |
| 12. CISC/CPMA 2-75     | Canadian Institute of Steel Construction/Canadian Paint Manufacturers Association-A Quick Drying Primer for Use on Structural Steel.       |
| 13. CAN/CGSB-1.40-M89  | Primer, Structural Steel, Oil Alkyd Type.  |
| 14. CAN/CGSB-1.108-M89 | Bituminous Solvent Type Paint.   |

## **1.4 Shop Drawings**

1. Submit shop drawings in accordance with Section 01340 prepared and stamped by a Professional Engineer licensed to design structures in the Province of Ontario.
2. Clearly indicate materials, core thickness, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details and accessories.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

1. Metals
  - .1 **Steel sections and plates:** to CAN3 G40.21-M81, Grade 50W for tubes and Grade 44W for plates and flat shapes.
  - .2 **Welding Materials:** to CSA W59-M1989.
  - .3 **Bolts and anchor bolts:** to ASTM A307, A325, and A563 as applicable.
  - .4 **Stainless Steel:** Type 302 or 304 alloy conforming to ASTM A167, No. 4 finish.
2. Primers, Coatings and Shop Painting
  - .1 **Interior Steel in Dry Areas:** Quick drying oil alkyd conforming to CISC/CPMA 2.75.
3. Fastenings
  - .1 Use nuts and bolts conforming to ASTM A307, A325, and A563 as applicable.
    - .1 For interior work, use cadmium-plated fastenings where other protection is not specified.
    - .2 For exterior work, use Type 300 or 400 stainless steel.
4. Anchors and Shims
  - .1 For exposed anchorage of aluminum, if applicable, use stainless steel and otherwise to match metal anchored. For non-exposed work, anchors and shims may be galvanized steel.
5. Pipe
  - .1 To ASTM A53, extra strong steel pipe for bollards.
6. Bituminous Paint
  - .1 Alkali-resisting to meet specified requirements of CAN/CGSB-1.108, Type 2. Use to insulate contact between dissimilar metals.

## **2.2 Fabrication**

1. Build work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
2. Weld all connections where possible, and bolt where not possible unless indicated otherwise on drawings.
3. Use self-tapping shake-proof countersunk flat headed screws on items required to be assembled by screws or as indicated.
4. Where possible, work to be fitted and shop assembled, ready for erection.
5. Exposed welds to be continuous for length of each joint. File or grind exposed welds smooth and flush.
6. Weld all stainless steel by the Argon Arc Process. Grind smooth and polish joints, crevice-free, and flush without seams.

## **2.3 List of Miscellaneous Metal Fabrications**

1. This Section includes but is not limited to the following list. Note: **Galvanize all exterior items** and other items noted. Prime paint all interior items.
  - .1 Anchors, Bolts, Inserts, Sleeves for work in this Section.
  - .2 Hangers and Supports (for work in this Section).
  - .3 Lintels.

## **PART 3 - EXECUTION**

### **3.1 General**

1. Supply and install all miscellaneous metal work indicated on the Drawings and not indicated in work of other Sections in addition to items listed below.

### **3.2 Fabrication & Erection**

1. Erect metal work square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
2. Insulate metals, where necessary, to prevent corrosion due to contact between dissimilar metals and between metals and masonry or plaster. Use bituminous paint, butyl tape, building paper or other approved means.
3. Provide suitable and acceptable means of anchorage, such as dowels, anchor clips, bar anchors, expansion bolts and shields, toggles.
4. Make field connections with items specified in Articles 2.1.4 and 2.1.5 and 2.1.8 or weld to CSA S16-1969 and CSA S16S1-1975.

5. Hand items to be cast into concrete or built into masonry over to appropriate trades together with setting templates.
6. Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection.
7. Touch-up galvanized surfaces with zinc primer where burned by field welding. Spray or brush apply a minimum of three (3) coats of zinc-rich paint to achieve a dry film thickness of 8 mils. Apply a finish coat of aluminum paint to provide a colour blend with the surround galvanizing.

### **3.3 Railings and Guards**

1. Provide railings and handrails, as shown on Drawings.
2. Galvanize all exterior railings after fabrication.
3. Wall brackets, as shown, at 1200 mm o.c. maximum.
4. Set railing standards in concrete with heated liquid sulphur to fill hole. Remove overflow immediately.

### **3.4 Galvanized Steel**

1. Galvanize steel members, fabrications, and assemblies after fabrication by the hot dip process in accordance with CSA G164, minimum Z275 coating.
2. Galvanize bolts, nuts and washers and iron and steel hardware components in accordance with CSA G164.
3. Safeguard products against steel embrittlement in conformance with ASTM A143.
4. Design features which may lead to difficulties during galvanizing shall be pointed out prior to dipping.
5. The composition of metal in the galvanizing bath shall be not less than 98.0% zinc.

End of Section

---

## **PART 1 - GENERAL**

### **1.1 Related Work**

1. Not applicable.

### **1.2 Source Quality Control**

1. Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

1. **Wood Materials:** Material, straight, sawn square, true, dressed four (4) sides properly sized, shaped to correct dimensions from nominal sizes indicated or specified.
2. **Lumber: Use only grade marked lumber. Where left exposed, use best brand of lumber available.** Lumber and moisture content to conform to official grading rules of NLGA, for particular lumber and grade, and structurally conform to latest requirements of Ontario Building Code. Conform to Grading Standards, CSA Standard Softwood Lumber 2005. Moist content not greater than 19% at time of installation.
3. **Blocking, Cants, Bucks, Grounds and Nailing Strips:** Douglas fir Graded 122-C, construction or No. 2 Pine, pressure treated in accordance with CSA 080 Series - 08.
4. **Plywood:** Douglas fir plywood to CSA 0121-08, good one side with waterproof adhesive.
5. **Rough Hardware:** Nails, screws, bolts, lag screws, anchors, special fastening devices and supports required for erection of all carpentry components. Use galvanized components where exposed to exterior atmosphere.

## **PART 3 - EXECUTION**

### **3.1 General**

1. Do all wood framing in accordance with the Ontario Building Code, CSA 086-01 and Engineering Design in Wood.
2. Machine dressed work shall be slow fed using sharp cutters and finished members shall be free from drag, feathers, slivers or roughness of any kind.
3. Frame materials with tight joints rigidly held in place.
4. Design construction methods for expansion and contraction of the materials.
5. Erect work plumb, level, square and to required lines.

6. Be responsible for methods of construction for ensuring that materials are rigidly and securely attached and will not be loosened by the work of other trades.

### **3.2 Furring and Blocking**

1. Supply and install furring and blocking, required.
2. Align and plumb faces of furring and blocking to tolerance of 1:600.

### **3.3 Rough Bucks, Nailers**

1. Install wood bucks and nailers, as indicated, including wood bucks and linings around frames for doors and windows.
2. Except where indicated, otherwise, use material at least 1½" thick secured with 3/8" bolts located within 12" from ends of members and uniformly spaced at 48" between.
3. Countersink bolts where necessary to provide clearance for other work.

### **3.4 Pressure Treated Wood**

1. Use wood pressure treated in accordance with CSA 080 for all wood members in contact with exterior walls and roofs.
2. Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

### **3.5 Installation of Hollow Metal Frames**

1. Set frames plumb and square in their exact location and at correct elevation. Firmly block and brace to prevent shifting. Shim up where required to ensure proper alignment dimensions from finished floor to head of frame. Install temporary wood spreaders at mid-height.
2. Where pressed steel frames are installed in concrete walls, secure frames to concrete using lead expansion shields and anchor bolts through pipe sleeves. Perform drilling of concrete as required. Fill recessed bolt heads flush to frame face with approved metal filler and sand smooth.
3. Install fire rated doorframes in accordance with requirements of National Fire Code Volume 4, produced by The National Fire Protection Association (NFPA 80).

### **3.6 Wood blocking for steel stud partitions**

1. Supply and install ¾" plywood fastened to 2" x 4" wood studs (fastened to steel studs) to provide solid backing for fastening of toilet partitions, grab bars, millwork etc.

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**3.7 General**

1. Supply and install all other carpentry shown on drawings or as required for completion of work. Co-operate with other trades in installing items supplied by other sections, cut openings in woodwork when so required and make good disturbed surfaces.

End of Section



## **PART 1 - GENERAL**

### **1.1 Section Includes**

1. Note: in order to maintain continuity and quality control, the supply and installation of the full project scope of vapour barrier membrane is to be carried by a single trade.
2. Materials and installation methods of the primary air/vapour barrier membrane system.
3. Materials and installation methods of dampproof coursing and through-wall flashing membranes.
4. Materials and installation methods for the adhesion of rigid and semi-rigid insulating materials.

### **1.2 Related Sections**

- |                                 |               |
|---------------------------------|---------------|
| 1. Masonry:                     | Section 04200 |
| 2. Building Insulation:         | Section 07212 |
| 3. Firestopping and Smoke Seal: | Section 07270 |
| 4. Sealants:                    | Section 07900 |

### **1.3 Submittals**

1. Prior to commencing the Work, submit documentation from an approved independent testing laboratory certifying that the air leakage and vapour permeance rates of the air/ vapour barrier membranes, including primary membrane and transition sheets, exceed the requirements of the National Building Code.
2. Prior to commencing the Work submit copies of manufacturers' current ISO certification.  
Membrane, primers, sealants, adhesives and associated auxiliary materials shall be included.
3. Prior to commencing the Work submit references clearly indicating that the membrane manufacturer has successfully completed projects on an annual basis of similar scope and nature for a minimum of fifteen years. Submit references for a minimum of ten projects.
4. Prior to commencing the Work submit manufacturers' complete set of standard details for the air/vapour barrier membrane systems showing a continuous plane of air tightness throughout the building envelope.

#### **1.4 Quality Assurance**

1. Submit in writing, a document stating that the applicator of the primary air/vapour barrier membranes specified in this section is recognized by the manufacturer as suitable for the execution of the Work.
2. Perform Work in accordance with the manufacturer's written instructions of the air/vapour barrier membrane and this specification.
3. Maintain one copy of manufacturer's written instructions on site.
4. At the beginning of the Work and at all times during the execution of the Work, allow access to Work site by the air/vapour barrier membrane manufacturers' representative.
5. Components used in this section shall be sourced from one manufacturer, including sheet membrane, air/vapour barrier sealants, primers, mastics and adhesives.

#### **1.5 Mock-Up**

1. Construct mock-up in accordance with Section 01340 - Shop Drawings, Product Data & Samples.
2. Provide mock-up of air/vapour barrier materials under provisions of Division 1.
3. Where directed by consultant, construct typical exterior wall panel, 2 m long by 2 m wide, incorporating substrate, window frame, attachment of insulation, and; showing air/vapour barrier membrane application details.
4. Allow 24 h for inspection of mock-up by consultant before proceeding with air/vapour barrier work. Mock-up may remain as part of the Work.

#### **1.6 Pre-Installation Conference**

1. Convene one week prior to commencing work of this section, under provisions of Division

#### **1.7 Delivery, Storage and Handling**

1. Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.
2. Store roll materials on end in original packaging.
3. Store liquid air/vapour barrier material, adhesives and primers at temperatures of 5°C and above to facilitate handling.
4. Keep solvent away from open flame or excessive heat.
5. Protect rolls from direct sunlight until ready for use.

### **1.8 Co-ordination**

1. Ensure continuity of the air/vapour barrier membrane system throughout the scope of this section.

### **1.9 Alternates**

1. Submit requests for alternates in accordance with Division 1.
2. Alternate submission format to include:
  - .1 Submit evidence that alternate materials meet or exceed performance characteristics of Product requirements and documentation from an approved independent testing laboratory certifying that the air leakage and vapour permeance rates of the air/ vapour barrier membranes, including primary membrane and transition sheets, exceed the requirements of the National Building Code.
  - .2 Submit copies of manufacturers' current ISO certification.
  - .3 Submit references clearly indicating that the membrane manufacturer has successfully completed projects on an annual basis of similar scope and nature for a minimum of fifteen years.
  - .4 Submit manufacturers' complete set of standard details for air/vapour barrier membrane systems showing a continuous plane of air tightness throughout the building envelope.
3. Submit requests for alternates to this specification a minimum of ten (10) working days prior to tender closing for evaluation. Include a list of ten projects executed over the past ten years.
4. Acceptable alternates will be confirmed by addendum. Substitute materials not approved in writing prior to tender closing shall not be permitted for use on this project.

## **PART 2 - PRODUCTS**

### **2.1 Membranes**

1. Transition and continuous wall envelope barrier membrane (Self-Adhering): Basis of design is Blueskin® SA as manufactured by Bakor, a SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film, or approved equal,. For application temperatures down to - 12°C use Blueskin® SA LT. Membrane shall have the following physical properties:
  - .1 Thickness: 1.0 mm (40 mils);
  - .2 Air leakage: <0.005 L/s•m² @ 75 Pa to ASTM E283-91;
  - .3 Water vapour permeance: 2.8 ng/Pa.m².s (0.05 perms) to ASTM E96;
  - .4 Low temperature flexibility: -30°C to CGSB 37-GP-56M;
  - .5 Elongation: 200% to ASTM D412-modified.

2. Through-wall flashing membrane and dampproof course (Self-Adhering): Blueskin® TWF as manufactured by Bakor, a SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film, having the following physical properties:
  - .1 Film Thickness: 0.225mm (9.0 mils);
  - .2 Puncture Resistance (film); 180N minimum;
  - .3 Tear Resistance (film); 58N MD;
  - .4 Air leakage: <0.005 L/s•m<sup>2</sup> @ 75 Pa to ASTM E283-91;
  - .5 Water vapour permeance: 2.8 ng/Pa.m<sup>2</sup>.s (0.05 perms) to ASTM E96;
  - .6 Low temperature flexibility: -30°C to CGSB 37-GP-56M.

Approved Equal: Air-Shield Thru-Wall Flashing by W.R. Meadows of Canada and AquaBarrier TWF by IKO Industries.

## **2.2 Primers**

1. Primer for self-adhering membranes: For all temperatures, Blueskin® Primer as manufactured by Bakor, a synthetic rubber based adhesive type, quick setting, having the following physical properties:
  - .1 Colour: Blue;
  - .2 Weight: 0.8 kg/l;
  - .3 Solids by weight: 35%;
  - .4 Drying time (initial set): 30 minutes.

Approved Equal: S.A.M. Adhesive / S.A.M. Adhesive LVC by IKO Industries

2. Primer for self-adhering membranes: For temperatures above -4°C, Aquatac™ Primer as manufactured by Bakor, or approved equal, a polymer emulsion based adhesive type, quick setting, having the following physical properties:
  - .1 Colour: Aqua;
  - .2 Weight: 1.0 kg/l;
  - .3 Solids by weight: 53%;
  - .4 Water based, no solvent odours
  - .5 Drying time (initial set): 30 minutes at 50%RH and 20°C.

## **2.3 Adhesive**

1. Liquid air seal mastic and insulation adhesive: Air-Bloc 21 or 230-21 Insulation Adhesive as manufactured by Bakor, a synthetic, trowel applied, rubber based adhesive type, having the following characteristics:
  - .1 Compatibility: With air/vapour barrier membrane, substrate and insulation.
  - .2 Air leakage: 0.013 L/s•m<sup>2</sup> @ 100 Pa.;
  - .3 Water vapour permeance: 1.7 ng/Pa.m<sup>2</sup>.s. (0.03 perms);
  - .4 Long term flexibility: CGSB 71-GP-24M;
  - .5 Chemical resistance: Alkalies and salt.

## **PART 3 - EXECUTION**

### **3.1 Examination**

1. Verify that surfaces and conditions are ready to accept the Work of this section. Notify in writing of any discrepancies. Commencement of the work or any parts thereof shall mean acceptance of the prepared substrate.

### **3.2 Preparation**

1. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants. Fill spawled areas in substrate to provide an even plane. Strike masonry joints flush.
2. New concrete should be cured for a minimum of 14 days and must be dry before air/vapour barrier membranes are applied.
3. Where curing compounds are used they must be clear resin based without oil, wax or pigments.

### **3.3 Primer for Transition and Through-wall Flashing Membrane (Self-Adhering Type only)**

1. Apply primer to poured concrete, metal and glass-faced wallboard substrates at rate recommended by manufacturer. Primer not required on concrete block.
2. Allow primer to dry prior to application of the membrane.

### **3.4 Transition Membrane (Self-Adhering Type)**

1. Align and position Blueskin, or approved equal, self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 50 mm overlap at all end and side laps.
2. Tie-in to window frames, aluminium screens, hollow metal doorframes, spandrel panels, roofing system and at the interface of dissimilar materials as indicated in drawings.
3. Promptly roll all laps and membrane with a counter top roller to effect seal.

### **3.5 Through-wall Flashing & Dampproof Coursing (Torch Applied)**

1. Where torch applied through-wall flashing & dampproof coursing are indicated on drawings, install Blueskin® TG membrane on primed and prepared surfaces in accordance with manufacturer's written instructions. Approved equal AquaBarrier TG by IKO Industries
2. For through-wall flashing ensure membrane extends fully to the exterior face of the exterior masonry veneer. Trim off excess as directed by the consultant.
3. Apply through-wall flashing membrane along the base of masonry veneer walls, over windows, doors and all other wall openings. Membrane shall form continuous flashing

and shall extend a minimum of 200 mm up the back-up wall.

### **3.6 Through-wall Flashing Membrane (Self-Adhering Type)**

1. Align and position the leading edge of Blueskin® TWF self-adhering through-wall flashing membrane with the front horizontal edge of the foundation walls or self angles, partially remove protective film and roll membrane over surface and up vertically.
2. Press firmly into place. Ensure minimum 50mm overlap at all end and side laps.
3. Promptly roll all laps and membrane to effect the seal.
4. Ensure all preparatory work is complete prior to applying Blueskin® TWF.
5. Ensure through-wall flashing membrane extends fully to the exterior face of the exterior masonry veneer. Trim off excess as directed by the consultant.
6. Apply through-wall flashing membrane along the base of masonry veneer walls, over windows, doors and all other wall openings. Membrane shall form continuous flashing and shall extend up a minimum of 200 mm up the back-up wall.

### **3.7 Heat Sensitive Transition Membrane (Self-Adhering Type)**

1. Align and position Blueskin® SA self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 50 mm overlap at all end and side laps.
2. Tie-in to window frames, aluminium screens, hollow metal doorframes, spandrel panels, roofing system and at the interface of dissimilar materials as indicated in drawings.
3. Promptly roll all laps and membrane with a counter top roller to affect seal.

### **3.8 Inspection**

1. Notify consultant when sections of work are complete so as to allow for review prior to installing insulation.

### **3.9 Protection of Finished Work**

1. Blueskin is not designed for exposure. Good practice requires covering as soon as possible.

End of Section

---

## **PART 1 - GENERAL**

### **1.1 Related Work Specified Elsewhere**

1. Masonry: Section 04200
2. Air Vapour Barrier Membrane: Section 07112  
Note: in order to maintain continuity and quality control, the supply and installation of the full project scope of vapour barrier membrane is to be carried by a single trade.

## **PART 2 - PRODUCTS**

### **2.1 Insulation**

1. **Cavity Wall Insulation - Masonry:** Expanded polystyrene insulation to CAN/CGSB-51.20-M87, Type 4 butt or ship lapped edges. For use in cavity wall construction above and below grade.
  - .1 Thickness 50 mm or as indicated.
  - .2 Acceptable Material: "Cavitymate" Type 3 as manufactured by Dow Chemical Canada Inc.
  - .3 Acceptable Material: "Celfort 300" as manufactured by Celfortec Inc. or approved equal.

### **2.2 Adhesive**

1. Type A: to CGSB 71-GP-24M plus Amdt-Nov.-83, compatible with respective rigid insulation, air, vapour and waterproofing membranes and recommended by manufacturer's. Use Bakor 230-21 rigid insulation adhesive with Blueskin air-vapour barrier.

## **PART 3 - EXECUTION**

### **3.1 Workmanship**

1. Install insulation after building substrata materials are dry, thoroughly clean and capable of providing a firm, uniform bonding surface.
2. Install insulation to maintain continuity of thermal protection to building elements and spaces.
3. Fit insulation closely around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
4. Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use longest possible lengths to reduce number of joints.
5. In multiple layer applications offset both vertical and horizontal joints.

6. Do not enclose insulation until it has been inspected.
7. Install semi rigid board to manufacturer's requirements.

### **3.2 Rigid Insulation**

#### **1. Cavity Walls Above Grade**

Press insulation in full contact with air/ vapour barrier membrane by installing plastic wedges "Wedge-Lok" between the masonry reinforcing and the insulation. Wedges at 400 mm o.c. vertically and horizontally. Apply adhesive on board edges and press boards tightly to prevent air infiltration between boards.

End of Section



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## **PART 1 - GENERAL**

### **1.1 Description of Work**

1. The work of this section shall include, but is not limited to: Interior fireproofing, concealed from view and direct contact

### **1.2 Related Work**

- |                                  |                              |
|----------------------------------|------------------------------|
| 1. Fire Stopping and Smoke Seals | Division 07270               |
| 2. Building Insulation           | Division 07212               |
| 3. Structural Metal Framing      | refer to Structural Drawings |
| 4. Mechanical Division 15        | Re: Patching                 |
| 5. Electrical Division 16        | Re: Patching                 |

### **1.3 Quality Assurance**

1. Installer: Contractor shall be approved by manufacturer, and be experienced in installing specified products, and is approved by the manufacturer of the fireproofing products. A manufacturer's willingness to sell products to an installer engaged by contractor, does not in itself confer qualification on the buyer.
2. Single Source: Obtain spray applied fireproofing products from a single source for each product required. Provide secondary materials, which are acceptable to the fireproofing manufacturer which, are included in the tested and/or listed designs.
3. Fire Resistance: Provide fireproofing materials that have been listed and classified by one or more of the following testing authorities: Underwriters Laboratories of Northbrook, IL and/or Underwriters Laboratories of Scarborough, Ontario; Warnock Hersey or other testing and inspecting agency acceptable to the architect and authorities having jurisdiction.
4. Packaging: All products must be packaged with proper identifications and approval indications acceptable to the testing and/or listing agency.
5. Asbestos: Manufacturer shall provide Certification that products supplied are 100% asbestos free.
6. Steel Surfaces: **Structural steel and steel decking shall be unprimed.**
7. Painted Steel Surfaces: Steel surfaces requiring fireproofing that are painted and/or primed, shall meet UL requirements for application and adhesion characteristics. Provide certifications from fireproofing manufacturer of compatibility of fireproofing and painted systems. Restrictions published by UL shall apply.
8. Remedial Work: Steel surfaces with incompatible primers or paint shall be either removed, lathed, or otherwise remedied within the requirements of UL, so that adequate and approved bonding can occur, acceptable to authorities having jurisdiction.

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### **1.4 Project Conditions**

1. Environmental Limitations: Do not apply sprayed fireproofing material when ambient or substrate temperatures are 40 deg. F. (4 deg C) or lower, unless temporary heat and protection is provided to maintain temperatures at or above this level for 24 hours before, during and 24 hours after application of fireproofing.
2. Ventilation: Ventilate building spaces during and after application of fireproofing at a rate of four (4) air changes per hour until fireproofing is dry. If natural ventilation is insufficient, employ mechanical means as necessary.
3. Surfaces to be sprayed: Surfaces to be sprayed must be free of any substance that would impair proper adhesion.
4. The contractor shall make available to the fireproofing contractor suitable area(s) for permanent locations for mixing and pumping fireproofing. This site must be:
  - .1 Convenient to the structure
  - .2 Be able to accommodate delivery of product
  - .3 Allow for space for truck storage and trailer parking, and for materials and Equipment
  - .4 Be well drained
  - .5 Be near a suitable source of potable water of quantity required
  - .6 Have a proper source of electrical power, if required.
  - .7 Provide temporary heat and ventilation to comply with manufacturers recommendations

### **1.5 Sequencing**

1. Sequence and coordinate application of sprayed fireproofing with other related work specified in other Sections to comply with the following requirements:
2. Provide temporary enclosure for interior applications to prevent deterioration of applied materials exposed to unfavorable environmental conditions.
3. Avoid exposure of fireproofing to unnecessary damage or abrasion.
4. Do not apply fireproofing until all hangers, clips and other necessary supports are in place, requiring penetration of fireproofing if installed after the application of fireproofing.
5. Ducts, piping and other items that would interfere with the application of fireproofing shall not be installed, until application is completed.

### **1.6 Application Parameters**

1. The fireproofing contractor shall be allowed to move freely to apply products as necessary. Materials stored on the floor, shall be protected by the contractor, or relocated if these materials prevent the proper application of fireproofing.

2. Patching, repairing and cleaning of fireproofing, due to damage done by others, shall be performed by the fireproofing applicator.
3. After completion of fireproofing, the fireproofing applicator shall remove all equipment, and broom sweep all floor areas of overspray materials.
4. Application of fireproofing shall not commence until the project is at a stage to allow the applicator to apply product continuously and efficiently, without undue interference and delay by other trades.
5. Conference: Convene a pre-installation conference to establish a procedure to maintain optimum working conditions and to coordinate this work with related an/or adjacent work.

### **1.7 Submittals, References and Applicable Standards**

1. Product Data: Submit manufacturer's product data, installation instructions, use and limitations for each material used, and applicable fire test designs, as listed by approved fire testing organization.
2. Performance Certification: Submit manufacturer's verification of performance criteria, fire performance and compliance with applicable standards.
3. Applicable Standards and Test Methods:

Products Submitted shall be tested in accordance with the following ASTM test methods:

- .1 E 119 Fire Test of Building Construction and Materials
- .2 E 84 Test for Surface Burning Characteristics of Building Materials
- .3 E 136 Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
- .4 E 605 Thickness and Density of Sprayed Fire Resistive Materials Applied to Structural Members
- .5 E 736 Cohesion/Adhesion of Sprayed Fire Resistive Materials Applied to Structural Members
- .6 E 759 Effect of Deflection of Sprayed Fire Resistive Materials Applied to Structural Members
- .7 E 760 Effect of Impact on Bonding of Sprayed Fire Resistive Materials Applied to Structural Members
- .8 E 761 Compressive Strength of Sprayed Fire Resistive Materials Applied to Structural Members
- .9 E 859 Air Erosion of Sprayed Fire Resistive Materials Applied to Structural Members
- .10 E 937 Corrosion of Steel By Sprayed Fire Resistive Materials Applied to Structural Members
- .11 AWCI "Inspection Procedure for Field Applied Sprayed Fire Protection Materials", and the current UBC Standard on: "Thickness and Density Determination for Spray Applied Fire Protection"
- .12 G 21 Determining Resistance of Synthetic Polymeric Materials to Fungi

### **1.8 Warranty**

1. General Warranty: Submit a written warranty, executed by the contractor and cosigned by the installer, agreeing to repair or replace sprayed fireproofing materials that fall within the specified warranty period.
  - .1 Failures include, but are not limited to cracking, flaking, eroding in excess of specified requirements, peeling and delaminating of sprayed fireproofing from substrates due to defective materials or installation. Not covered in this warranty are failures due to damage by others.
2. Warranty Period: 2 years, from date of substantial completion.

## **PART 2 - PRODUCTS**

### **2.1 Manufacturers**

1. Manufacturers of fire resistive materials having product considered acceptable for use:
  - .1 AD Fire Protection Systems
  - .2 Cafco Industries Inc.
  - .3 Grace Canada Inc.

### **2.2 MATERIALS**

1. **Concealed Cementitious Fireproofing:** meeting the below listed minimum physical properties, for use in locations not subject to physical contact or abuse; eg. Southwest Vermiculite Co. Inc. and licensed manufacturers of Type 5 GP (AD Fire Protection Systems).
  - .1 Physical Properties: Minimum values unless otherwise indicated, or higher values required to attain designated fire resistance ratings, measured per standard ASTM test methods referenced above in section 1.08, Part C.
    - .1 E 84: Flame Spread 0, and Smoke Developed 0.
    - .2 E 136: Passes, and is determined non-combustible
    - .3 E 605: Density shall be a minimum of 15 pcf.
    - .4 E 736: Cohesion/Adhesion shall be 200 psf , with 150 psf minimum acceptable level; if primed steel is used, comply with requirements published by U.L.I.
    - .5 E 759: No cracking, spalling or delamination
    - .6 E 760: Impact: No delamination, cracking or spalling
    - .7 E 761: Compression shall be 5.0 lb/sq. in.
    - .8 E 859: Erosion shall be 0.00 gr/sq.ft. maximum
    - .9 E 937: Corrosion: No evidence of corrosion allowed
    - .10 G 21: Mold Resistance: No evidence of growth
  - .2 Structural members not meeting minimum size requirements specified in a design shall receive a thickness of fireproofing consistent with the member's W/D ratio.

2. **Exposed Fireproofing:** For exposed applications of sprayed fire-resistive materials, provide manufacturers standard products complying with requirements for materials and composition having the following minimum physical properties measured per ASTM standard test methods referenced above; eg. Southwest Vermiculite Co. Inc. and licensed manufacturers of Type 5 GP (AD Fire Protection Systems).

.1 Physical Properties:

- .1 E 84: Flame Spread 0, and Smoke Developed 0
- .2 E 136: Passes, and is determined non - combustible
- .3 E 605: Density shall be a minimum of 22 pcf.
- .4 E 736: Cohesion/Adhesion shall be 500 psf for products with a minimum density of 22 pcf, and 1000 psf for products with density above 35 pcf.
- .5 E 759: No cracking or delamination
- .6 E 760: Impact: No delamination, cracking or spalling
- .7 E 761: Compression shall be 100 psi for products with a minimum density of 22 pcf, and 300 psi for products with densities over 35 pcf.
- .8 E 859: Erosion shall be 0.00 gr/sq.ft.
- .9 E 937: Corrosion: No evidence of corrosion allowed
- .10 G 21: Mold Resistance: No evidence of mold growth

3. **Refractory Mineral Wool Fire Protection:** Rigid boards of 9 pcf nominal density; produced from asbestos free materials by combining refractory mineral wool manufactured from slag with thermosetting resin binders to comply with ASTM C612 for Class 4 and as follows:

- .1 Thermal Conductivity (R Value): 4.35 at 75 degrees F (23.9 degrees Celsius).
- .2 Surface Burning Characteristics: Flame Spread and Smoke Developed ratings of 15 and 5, respectively.
- .3 Manufacturer and Product Name: eg. Cafco-board Mineral Wool Board Fire Protection by Cafco Industries Inc.

4. **Fastening Accessories:** For each fire resistive assembly in which mineral wool board fire protection serves as rigid fire protection, provide a board fastening system complying with the related UL design or other acceptable testing and inspecting organization's report.

5. **Miscellaneous Materials:** Provide the following materials as standard with each of the fireproofing systems, as recommended by the manufacturer for each condition and substrate.

- .1 Primers: It is not recommended that any structural steel primers are used on any steel surfaces, unless tested and listed by ULI in designs proposed to be used. Compatible primers may be used, providing the fireproofing manufacturer can verify such compatibility in accordance with UL requirements.
- .2 Adhesives: Provide adhesives as necessary, to comply with manufacturer requirements for adhesion of fireproofing. Acceptable adhesives are:
  - .1 TC 55 water based acrylic adhesive

- .2 Type DK Spatter Coat
- .3 Reinforcements: Provide fiberglass mesh or wire lath for areas where adhesion is not compatible and for application of fireproofing to steel joists.
- .4 Mold Inhibitor: Provide factory added mold inhibitor tested in accordance with ASTM G 21 for areas such as hospitals, testing laboratories, health facilities and other areas of hygienic requirements.
- .5 Top Coats: Use as required and recommended by fireproofing manufacturer or compatible products.

## **PART 3 – EXECUTION**

### **3.1 Pre-Installation Examination:**

The applicator and the contractor shall examine surfaces to be fire protected, and determined if the surfaces are satisfactory. Substrate conditions must comply with the following:

1. Substrates must be free of grease, oil, rolling compounds, incompatible primers, loose mill scale, dirt or any other foreign matter which would prevent proper bonding of fireproofing. Structural steel shall be unprimed. Steel roof and floor decking shall be galvanized only.
2. Any objects such as hangers, piping attachments, and other suspended retainer devices shall be properly secured.
3. Ducts, piping, and other equipment shall not be placed or suspended until the Fireprotection materials are in place.

### **3.2 Preparation:**

1. Clean any substrate not ready to receive fireproofing. Consult with manufacturer if conditions exist not easily remedied.
2. Apply adhesives as necessary.
3. Cover all work subject to oversprays during application. Provide temporary enclosure when necessary to temporarily confine fireproofing and protect the environment.
4. Assure maintenance of ambient temperatures, and/or heat and ventilation when required.

### **3.3 Installation, General**

1. Comply with manufacturers written application instructions and procedures for mixing, conveying and applying products, in accordance with the types of recommended equipment, admixtures and specific procedures regarding special conditions.
2. Coat substrates with adhesives if necessary.

3. Extend fireproofing materials in full thickness per approved design, to be protected. Unless otherwise recommended, install fireproofing complete in each area, prior to another.
4. Provide a uniform surface matching UL requirements for designs approved. Apply products at the minimum densities required, or greater.
5. Cure fireproofing to prevent premature drying; protect from freezing as listed in Section 1.05 of this specification.
6. Exposed to View Applications: Where exposed to view, provide appearance of Fireprotection as follows:
  - .1 Provide a troweled surface of appearance previously determined prior to installation
  - .2 Surfaces shall be within tolerances of 1/16 inch
  - .3 Mask edges of termination's so as to achieve neat and sharp edges.

### **3.4 Field Quality Control:**

1. Testing Agency: The owner shall engage and the contractor and applicator shall approve a qualified independent testing agency to perform field quality inspections of applied fireproofing, and prepare reports.
  - .1 Testing shall be done in accordance with the AWCI "Technical Manual 12 - A, Standard Practice for the Testing and Inspecting of Field Applied Sprayed Fire - Resistive Materials" and ASTM E 605.
  - .2 Tests shall be done on thickness, density and adhesion
  - .3 Variances shall be corrected with the testing agency present, and when the applicator is performing work in the same area, to allow for expedient corrections.
  - .4 A schedule of tests to be performed shall be agreed upon by applicator, contractor and testing agency.

### **3.5 Cleaning and Repair:**

1. After completion of each day's work, the applicator shall broom clean the area fireproofed. Areas not to receive fireproofing but are finished surfaces shall be masked.
2. All patching of damaged fireproofing shall be completed by applicator.

### **3.6 Protection:**

1. Provide final protection and maintain conditions in a manner acceptable to Consultant and authorities having jurisdiction.
2. Ensure fire protection is not damaged at time of Substantial Performance of the Work.

End of Section

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## **PART 1 - GENERAL**

### **1.1 Related Work**

1. Masonry: Section 04200
2. Rough Carpentry: Section 06100
3. Gypsum Board: Section 09250
4. Firestopping and Smoke Seals for Mechanical and Electrical Work: refer to drawings

### **1.2 Reference**

1. ASTM E814 - Test Method of fire tests of through-penetration firestops, factory mutual.
2. CAN4-S101M - Standard Methods of Fire Endurance Tests of Building Construction and Materials.
3. CAN4-S115M - Standard Method of Fire Tests of Firestop Systems.
4. ULC - List of Equipment and Materials.

### **1.3 System Description**

1. Firestopping Materials: CAN4-S115M ASTM E814 to achieve a fire protection rating as noted on Drawings.
2. It is the intent of this Section that in conjunction with Divisions 15 and 16 a competent, single source be responsible for the firestopping and smoke seals of the entire project.

### **1.4 Submittals**

1. Submit a product data to requirements of Section 01340.
2. Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site. Include manufacturer's printed instructions for installation, ULC design references.
3. Submit proposed type of fireproofing system for each location for approval by Architect. Fireproofing System must be appropriate to achieve expected appearance and finish.

### **1.5 Quality Assurance**

1. Manufacturer: Company specializing in manufacturing products of this Section with minimum five years documented experience.
2. Applicator: Approved, licensed and supervised by the manufacturer of firestopping materials. Company with minimum five years documented experience.
3. Product: Manufactured under ULC Follow-up Program. Each container or package shall bear ULC label.



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### **1.6 Regulatory Requirements**

1. Conform to applicable code for fire protection ratings.
2. Provide certificate of compliance for authority having jurisdiction indicating approval.

### **1.7 Delivery, Storage & Handling**

1. Deliver and store materials in a dry, protected area, off ground in original, undamaged, sealed containers with manufacturer's labels and seals intact.

### **1.8 Project & Site Conditions**

1. Application temperature and ventilation as per Manufacturer's instructions.

### **1.9 Sequencing & Scheduling**

1. Sequence work to permit installation of firestopping and smoke seal materials to be installed after adjacent work is complete and before closure of spaces.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

1. A/D Fire-barrier Firestop Systems, by A/D Fire Protection Systems Inc., capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of CAN4-S115 and not to exceed opening sizes for which they are intended.
2. Mineral Wool Backing Insulation: ULC labeled, preformed non-combustible material (A/D Fire-barrier Mineral Wool) by A/D Fire Protection Systems Inc.
3. Retainers: Clips to support mineral wool.
4. Firestopping Sealant: ULC labelled, single component silicone bases, A/D Silicone Firebarrier Sealant by A/D Fire Protection Systems Inc.
5. Firestopping Seal: ULC labelled, single component water-bases seal, A/D Firebarrier Seal by A/D Fire Protection Systems Inc.
6. Firestopping Foam: ULC labelled, two components silicone foam, A/D Firebarrier RTV Foam by A/D Fire Protection Systems Inc.
7. Firestopping Mortar: ULC labelled, non-combustible fibre reinforced, foamed cement mortar, A/D Firebarrier Mortar by A/D Fire Protection Systems Inc.
8. Damming Material: In accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

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## **PART 3 - EXECUTION**

### **3.1 Examination**

1. Examine surfaces to receive work of this Section and report any defects which may affect the Work of this Section.
2. Verify that openings are ready to receive the Work of this Section.
3. Confirm compatibility of surfaces to receive firestopping and smoke seal materials.
4. Beginning of installation means acceptance of existing surfaces and substrate.

### **3.2 Preparation**

1. Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.
2. Prepare surfaces in contact with firestopping materials and smoke seals to manufacturer's instruction.

### **3.3 Application**

1. Install firestopping and smoke seal material and components in accordance with ULC listing and manufacturer's instructions.
2. Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
3. Apply in sufficient thickness to achieve rating to uniform density and texture.
4. Provide temporary forming if required.
5. Tool or trowel exposed surfaces to a neat finish where required.
6. Remove excess material promptly as work progresses and upon completion.
7. Protect installed material until cured or set.

### **3.4 Cleaning**

1. Clean adjacent surfaces of firestopping and smoke seal materials.

### **3.5 Field Quality Control**

1. Notify Consultant when ready for inspection and prior to concealing or enclosing firestopping materials and service penetration assemblies.

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**3.6 Scheduling**

1. Firestop and smoke seal at:
  - .1 Penetrations through fire-separations: masonry, concrete, and gypsum board partitions and walls.
  - .2 Edge of floor slabs at curtain wall and precast concrete panels.
  - .3 Top of fire-separations: masonry and gypsum board partitions.
  - .4 Intersection of fire-separations: masonry and gypsum board partitions.
  - .5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
  - .6 Penetrations through fire-separations: floor slabs, ceilings and roofs.
  - .7 Openings and sleeves installed for future use through fire separations.

End of Section

## **PART 1 - GENERAL**

### **1.1 Related Work Specified Elsewhere**

1. Not applicable.

### **1.2 Environmental Conditions**

1. Sealant and substrata materials to be minimum 5 deg. C.
2. Should it become necessary to apply sealants below 5 deg. C, consult sealant manufacturer and follow their recommendations.

### **1.3 Warranty**

1. Contractor hereby warrants that caulking work will not leak, crack, crumble, melt, shrink, run lose adhesion or stain adjacent surfaces in accordance with General Conditions, but for five (5) years total.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

1. Primers: type recommended by sealant manufacturer.
2. Joint Fillers:
  - .1 General: compatible with primers and sealants, outsized 30 to 50%.
  - .2 Polyethylene, urethane, neoprene or vinyl: extruded closed cell foam, Shore A hardness 20, tensile strength 140 to 200 kPa.
  - .3 Neoprene or butyl rubber: round solid rod, Shore A hardness 70.
  - .4 Polyvinyl chloride or neoprene: extruded tubing with 6 mm minimum thick walls.
  - .5 Bond breaker: pressure sensitive plastic tape which will not bond to sealants.
  - .6 Sealant Type A: One component, chemical curing, conforming to CAN2-19.13-M82, Class C-2-25-B-N; multi-component, chemical curing, conforming to CAN2-19.24-M80, Type 2, Class B.
  - .7 Sealant Type B: Multi-component, chemical curing mildew resistant conforming to CGSB 19-GP-22M.
  - .8 Sealant type C: Multi-component, acrylic emulsion base, conforming to CGSB 19-GP-17M.
  - .9 Sealant type D: One component, polyurethane base, chemical curing, conforming to CAN2-19.13-M82, Class C-1-25-B-N; or multi-component, chemical curing, conforming to CAN2-19.24-M80, type 1.
3. Color of Sealants: to be selected by Consultant. Allow for a total of three (3) colours for Type A, two colours for Type B, two colours for Type C and one colour for Type D. Locations as directed on site by Consultant.

4. Joint cleaner: xylol, methylethyl-ketone or non-corrosive type recommended by sealant manufacturer and compatible with joint forming materials.
5. Vent tubing: 6 mm inside diameter extruded polyvinyl chloride tubing.

## **PART 3 - EXECUTION**

### **3.1 New Work**

1. Caulk where specified and everywhere required.
2. Remove dust, paint, loose mortar and other foreign matter. Dry joint surfaces.
3. Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sandblasting.
4. Remove oil, grease and other coatings from non-ferrous metals with joint cleaner.
5. Prepare concrete, masonry, glazed and vitreous surfaces to sealant manufacturer's instructions.
6. Examine joint sizes and correct to achieve depth ratio 1/2 of joint width with minimum width and depth of 6 mm, maximum width 25mm.
7. Install joint filler to achieve correct joint depth.
8. Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.
9. Apply bond breaker tape where required to manufacturer's instructions.
10. Prime sides of joints to sealant manufacturer's instructions immediately prior to caulking.

### **3.2 Application**

1. Apply sealants, primers, joint fillers, bond breakers, to manufacturer's instructions. Apply sealant, using gun with proper size nozzle. Use sufficient pressure to fill voids and joints solid. Superficial pointing with skin bead is not acceptable.
2. Form surface of sealant with full bead, smooth, and free from ridges, wrinkles, sags, air pockets, and embedded impurities. Neatly tool surface to a slight concave joint.
3. In masonry cavity construction, vent caulked joints from cavity to 3 mm beyond external face of wall by inserting vent tubing at bottom of each joint and maximum to 1500 mm o.c. vertically. Position tube to drain to exterior.
4. Clean adjacent surfaces immediately and leave work neat and clean. Remove excess sealant and droppings using recommended cleaners as work progresses. Remove masking after tooling of joints.

5. Use sealants specified in the following locations:

Type A: Joints between windows or door frames and adjacent building components; control and expansion joints and all other locations where sealing is required, except in locations designated for Type B, C and D. Ensure that sealant chosen (from the several specified under "MATERIALS") for each location is recommended by manufacturer for use on surfaces encountered.

Type B: Joints between splash backs and walls.

Type C: Joints between interior metal doorframes and partitions.

**3.3 Work Included**

1. Work shall include but not limited to the following areas:
  - .1 Interior hollow metal frames; both sides;
  - .2 Exposed control and expansion joints in masonry walls, masonry corners, joints in front of steel lintels bearing on exterior brick jambs;
  - .3 Joints between masonry and concrete surfaces.
  - .4 Joints between gypsum board and masonry, or other materials. At all other locations on drawings, except as noted below.
2. Sealing of joints to the underside of exposed precast slab to be by precast installer.
3. Sealing of all joints at top of walls meeting exposed flat or sloped precast ceilings to be included in this section.

End of Section

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**PART 1 - GENERAL**

**1.1 General Notes**

1. Door Schedule heading "DC" refer to "Door Contacts" used in the security system. Refer to Electrical Drawings and Specifications for locations, zoning and description of system.
2. Refer to drawings for door and frame types.

**1.2 Door Schedule**

1. Refer to door schedule shown on drawings.

End of Section

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## **PART 1 - GENERAL**

### **1.1 Work Included**

1. A single manufacturer shall fabricate products included within the scope of this Section.
2. Manufacturer shall be a member in good standing of the Canadian Steel Door Manufacturers Association (CSDMA).
3. Supply only of steel frame products including frames, transom frames, sidelight and window assemblies with provision for glazed, paneled or louvered openings, fire labeled and non-labeled, as scheduled or detailed by the Architect.
4. Supply only of flush steel doors with provision for glazed, paneled or louvered openings, insulated and un-insulated, fire labeled, with or without temperature rise ratings and non-labeled, as scheduled or detailed by the Architect.
5. Supply only of steel panels, similar in construction to steel doors, with flush or abetted bottoms for steel frames, transom frames, sidelight and window assemblies, fire labeled and non-labeled, as scheduled or detailed by the Architect.
6. Doors and frames shall be prepared for, but not limited to, preparation for continuous hinges, heavy weight hinges, cylindrical locks, rim and concealed vertical rod/ mortise lock case exit devices, surface door closers and concealed overhead stops.

### **1.2 Related Work**

1. Building-in of frame product into unit masonry, previously placed concrete, structural or steel or wood stud walls.
2. Supply and installation of wood, plastic or composite core doors.
3. Supply and installation of builders' hardware except as specified for acoustic assemblies.
4. Drilling and tapping for surface mounted or non-templated builders' hardware.
5. Caulking of joints between frame product and other building components.
6. Supply and installation of gaskets or weather-strip.
7. Supply and installation of louvers or vents.
8. Supply and installation of glazing materials.
9. Site touch-up and painting.
10. Wiring for electronic or electric hardware.



11. Field measurements.
12. Fasteners for frame product in previously placed concrete, masonry or structural steel.
13. Steel lintels, posts, columns or other load-bearing elements.
14. Field welding.

### **1.3 Requirements of regulatory agencies**

1. Install fire labeled steel door and frame product in accordance with NFPA-80, current edition, unless specified otherwise.

### **1.4 References**

- |                      |  |
|----------------------|--|
| 1. ANSI A115.IG-1994 | Installation Guide for Doors and Hardware  |
| 2. ANSI A250.4-1994  | Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.                             |
| 3. ASTM A653-M97     | Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.    |
| 4. ASTM A924-M97     | Standard Specification for General Requirements for Sheet, Metallic-Coated by the Hot-Dip Process.                                   |
| 5. ASTM B117-95      | Method of Salt Spray (Fog) Testing.  |
| 6. ASTM C177-97      | Test Method for Steady-State heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus. |
| 7. ASTM C518-91      | Test method for Steady State Heat Flux Measurements and Thermal Transmission properties by means of the heat Flow Meter Apparatus.   |
| 8. ASTM C578-95      | Specification for Rigid, Cellular polystyrene Thermal Insulation   |
| 9. ASTM C665-95      | Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.                    |
| 10. ASTM D1735-92    | Practice for Testing Water Resistance of Coating Using Water Fog Apparatus   |
| 11. CAN4-S104-M80    | Fire Tests of Door Assemblies  |

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- |  |   |
|--|---|
| 12. CAN4-S105-M85                                      | Standard Specification for Fire Door Frames Meeting the performance required by CAN4-S104 |
| 13. CAN4-S106-M80                                      | Standard Method for Fire Tests of Window and Glass Block Assemblies                       |
| 14. CGSB 41-Gp-19Ma                                    | Rigid Vinyl Extrusions for Windows and Doors  |
| 15. CGSB 82.5-M88                                      | Insulated Steel Doors   |
| 16. CSA A101-M83                                       | Mineral Fiber Thermal insulation for Buildings  |
| 17. CSA W59-M89  | Welded Steel Construction (Metal Arc Welding)   |
| 18. ISO 9001:1994                                      | Quality Systems – Model for Quality Assurance   |
| 19. NFPA-80, 1999                                      | Fire Doors and Windows  |
| 20. CSDMA  | Dimensional Standards for Commercial Steel Doors and Frames                               |
| 21. Manufacturers Standard and Galvanized Sheet Gauges |   |
| 22. Fleming Fire Labeling Specifications               |   |
| 23. ULC List of Equipment and Materials, Volume 2      |   |

### **1.5 Testing and Performance**

1. Door constructions covered by this specification shall be certified as meeting Level "A" (1,000,000 cycles) and Twist Test Acceptance Criteria (deflection not to exceed 6.4 mm /13.6kg force, total deflection at 136.1kg force not to exceed 63.5 mm and permanent deflection not to exceed 3.2 mm) when tested in strict conformance with ANSI-A250.4-1994. Test shall be conducted by an independent nationally recognized accredited laboratory.
2. Fire labeled product shall be provided for those openings requiring fire protection and temperature rise ratings, as determined and scheduled by the Architect. Doors, frames, transom frames and sidelight assemblies shall be tested in strict accordance with CAN4-S106. Product shall be listed by Underwriters Laboratories of Canada under an active Factory Inspection Program and shall be constructed as detailed in Follow-Up Service procedures issued to the manufacturer.
3. Should any door or frame specified by the Architect to be fire rated, not qualify for labeling due to design, hardware, glazing or any other reason, the Architect shall be so advised before manufacturing commences.
4. Core materials for exterior doors shall attain a thermal resistance rating of RSI 1.06 (R6.0) when tested in accordance with ASTM C177 or ASTM C518.

5. Product shall be manufactured by a firm experienced in the design and production of standard and custom commercial steel door and frame assemblies, the integration of builders' or electronic hardware and glazing materials and their impact on the scope of work.
6. Manufacturer shall be assessed and registered as meeting the requirements of Quality Systems under ISO 9001.
7. Product quality shall meet standards set by the Canadian Steel Door Manufacturers Association.

### **1.6 Test Reports**

1. All alternates to this specification shall be submitted to the Architect for acceptance ten (10) days prior to bid date, complete with test reports from independent, nationally recognized testing authorities, certifying that:
  - .1 Steel door and frame assemblies furnished under this section meet the acceptance criteria of ANSI-A250.4-1994, Level "A".
  - .2 Insulated door cores furnished in exterior doors under this Section meet the specified thermal resistance rating.
2. All reports shall include name of testing authority, date of test, location of test facility, descriptions of test specimens, procedures used in testing and indicate compliance with acceptance criteria of the test.

### **1.7 Submittals**

1. Submit shop drawings in accordance with the General Conditions of the Contract.
2. Indicate each type of door, frame, steel, core, material thickness, mortises, reinforcements, anchorages, locations of exposed fasteners, openings (glazed, paneled or louvered) and arrangement of standard builders' hardware.
3. Include a schedule identifying each unit, with door marks or numbers referencing the numbering in Architect's schedules or drawings.
4. Provide confirmation in writing that all aspects to reinforcing, construction, and gauge of metal are met as written in this section.

### **1.8 Warranty**

1. All steel door and frame product shall be warranted from defects in workmanship for a period of two (2) years from date of shipment.
2. All steel door and frame product shall be warranted against rust perforation for a period of five (5) years when the installed and finish painted with a commercial quality paint to the manufacturers recommendations.

3. Finish paint adhesion on all door and frame product shall be warranted for a period of five (5) years when the product has been properly cleaned and finish painted with a commercial quality paint applied as recommended by the paint manufacturer. This warranty shall not exceed that provided by the paint manufacturer.

## **PART 2 - PRODUCTS**

### **2.1 Doors**

#### **1. Materials**

- .1 Doors shall be fabricated from tension leveled steel to ASTM A924-M97, galvanized to ASTM A653-M97, Commercial Steel (CS), Type B, coating designation ZF75, known commercially as paintable Galvanneal.
- .2 Door Cores:  
Honeycomb:  
Structural small cell (25.4 mm maximum) kraft paper "honeycomb". Weight: 36.3 kg per ream (minimum), density: 16.5 kg/m<sup>3</sup> (minimum), sanded to the required thickness.
  - .1 Polystyrene:  
Rigid extruded, fire retardant, closed cell board, density 16kg/m<sup>2</sup>, thermal values: RSI 1.06 minimum, conforming to ASTM C578.
  - .2 Temperature Rise Rated (TRR):  
Solid slab core of non-combustible, inorganic composite to limit temperature rise on the "unexposed" side of door to 250°C at 30 or 60 minutes, as required by governing building code requirements and determined and scheduled by the Architect.
- .3 Adhesives:
  - .1 Honeycomb Cores and Steel Components:  
Heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement or ULC approved equivalent.
  - .2 Interlocking Edge Seams:  
Resin reinforced polychloroprene (RRPC), fire resistant, high viscosity, sealant/adhesive or UL approved equivalent.
  - .3 Polystyrene Cores:  
Heat resistant, epoxy based, low viscosity, contact cement.
- .4 Primer:  
Rust inhibitive touch-up only.
- .5 Exterior Top Caps:  
Rigid polyvinylchloride (PVC) extrusion.

#### **2. Construction**

- .1 General:

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- .1 This section is based on doors and frames as manufactured by Fleming. Doors and frames by other manufacturers are acceptable subject to be similar to the one specified and meeting the terms of this section.
  - .2 Doors shall be swinging, 44.4 mm thick of the types and sizes indicated on the Architect's schedules or drawings.
  - .3 Exterior doors shall be lock seam, flush.
  - .4 Face sheets for exterior doors shall be fabricated from (16) gauge steel.
  - .5 Longitudinal edges of exterior doors shall be mechanically interlocked, fully welded, ground smooth with no visible seams. Do not fill seams.
  - .6 Face sheets of interior doors shall be fabricated from 18 gauge steel, except for heavy traffic doors (noted **HT** in Door Schedule) face sheet to be 16 gauge.
  - .7 Longitudinal edge of heavy traffic doors (noted **HT** in Door Schedule) shall be mechanically interlocked, fully welded, ground smooth with no visible seams. Do not fill seams.
  - .8 Interior doors shall be stiffened, insulated and sound deadened with honeycomb core laminated under pressure to each face sheet.
  - .9 Stiffened, insulated and sound deadened with Fleming's propriety core where Temperature Rise Rated (TRR) fire labeled doors are specified on the Architect's schedules.
  - .10 Longitudinal edges of interior doors shall be mechanically interlocked, adhesive assisted with edge seams visible.
  - .11 Door faces of all steel doors shall be fabricated without visible seams, free of scale, pitting, coil brakes, buckles and waves.
  - .12 Formed edges shall be true and straight with a minimum radius for the thickness of steel used.
  - .13 Lock and hinge edges shall be beveled 3 mm in 50 mm unless builders' hardware or door swing dictates otherwise.
  - .14 Top and bottom of doors shall be provided with inverted, recessed, 16 gauge steel end channels, welded to each face sheet at 150 mm on center maximum.
  - .15 Exterior doors shall be provided with factory installed flush PVC top caps. Fire labeled exterior doors shall be provided with factory installed flush steel top caps.
  - .16 Unless ineligible due to design, size, hardware or glazing specified on the Architects' or hardware Suppliers' schedules or details, fire labeled doors shall be provided for those openings requiring fire protection ratings and temperature rise ratings, as determined and scheduled by the Architect.
  - .17 Exterior doors shall be internally reinforced with 20 gauge continuous; interlocking steel stiffeners at 150mm O.C. max, with voids between stiffeners filled and insulated with 24kg/m<sup>3</sup> density loose batt type fiberglass material to suit fully welded design.
- .2 Hardware Preparations:
- .1 Doors shall be factory blanked, reinforced, drilled and tapped for fully templated mortised hardware only, in accordance with the final approved schedule and templates provided by the hardware supplier.
  - .2 Doors shall be factory blanked and reinforced only for mortised hardware that is not fully templated.

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- .3 Doors shall be factory reinforced only for surface mounted hardware.
  - .4 Templated holes 12.7mm diameter and larger shall be factory prepared, except mounting and through bolt holes, which shall be by the contractor responsible for installation on site, at the time of application. Templated holes less than 12.7mm diameter shall be factory prepared only when required for the function of the device (for knobs, levers, cylinders, thumb or turn pieces) or when these holes over-lap function holes.
  - .5 Drilling and tapping for surface mounted hardware or mortised hardware that is not fully templated shall be by the contractor responsible for installation on site, at the time of application.
  - .6 Hinge and pivot reinforcements shall be 10 gauge steel minimum high frequency type reinforcing.
  - .7 Hinge reinforcements for acoustic doors and doors in excess of 2450mm rabbet height shall be 10 gauge minimum with each cutout provided with 114.3mm heavy weight (4.6mm) high frequency type.
  - .8 Lock, strike and flush bolt reinforcements shall be 12 gauge steel minimum.
  - .9 Reinforcements for concealed closers and holders shall be 12 gauge steel minimum.
  - .10 For surface mounted hardware, reinforcements shall be 16 gauge steel minimum.
  - .11 All pairs of fire labeled doors shall be provided with 12 gauge steel surface mounted flat bar astragal, shipped loose for application on site, by the contractor responsible for installation.
  - .12 Pairs of doors up to 2450mm x 2450mm, to 1½ hour fire rating maximum shall be provided without astragals. Lock edge seam of such doors shall be tacked-welded and ground smooth. All other fire labeled pairs shall be provided with 12 gauge steel surface mounted flat bar astragal, shipped loose for application on site, by the contractor responsible for installation.
  - .13 Where electrically or electronically operated hardware is specified on the Architects' schedules or details of the final approved schedule and templates provided by the hardware supplier, hardware enclosures and/or junction boxes, where indicated on the templates, shall be provided and interconnected with CSA Approved 12.7mm diameter conduit and connectors.
  - .14 Prepare doors to receive security door contacts – refer to electrical drawings for locations. Door contacts to be installed at 100 mm from the latch side door edge.
  - .15 Doors and Frames shall be prepared for, but not limited to preparations for heavy weight Butt Hinges, Continuous Hinges, Cylindrical Locksets, Rim or Concealed Vertical Rod and Mortise Lock Case Exit Devices, Surface Door Closer and Concealed Overhead Stops.
- .3 Glazing:
- .1 Where 6mm thick glazing materials are specified on the Architects schedules or details, doors shall be provided with 20 gauge steel glazing trim and snap-in glazing stops.
  - .2 Where other than 6mm glazing is specified on the Architect's schedules or details, doors shall receive 20 gauge steel trim and screw fixed glazing stops.

Screws shall be #6 x 32mm oval head scrulox (self-drilling) type at 300mm on center maximum.

- .3 Glazing trim and stops shall be accurately fitted, butted at corners, with removable glazing stops located on the 'push' side of the door.
- .4 Louver Preparations:
  - .1 Where specified on the Architect's schedules or details, non-labeled doors shall be prepared on accordance with the louver manufacturer's details.
  - .2 Where specified on the Architect's schedules or details, fire labeled doors shall be prepared for UL listed sight-proof fusible link louvers in accordance with the louver manufacturer's details.
  - .3 Louvers shall be supplied and installed by others.
- .5 Finishing:
  - .1 Remove weld slag and splatter from exposed surfaces.
  - .2 All tool marks, abrasions and surface blemishes shall be filled and sanded to present smooth uniform surfaces.
  - .3 On exposed surfaces where zinc coating has been removed during fabrication, doors shall receive a factory applied touch-up primer.
  - .4 Primer shall be fully cured prior to shipment.

## **2.2 Panels**

- 1. Panels shall be fabricated from the same materials, construction and finished in the same manner as doors as specified in Section 2.1.

## **2.3 Frame Product**

### **1. Materials**

- .1 Steel:

Frame product shall be fabricated from tension leveled steel to ASTM A924-M97, galvanized to ASTM A653-M97, Commercial Steel (CS), Type B, coating designated ZF75, known commercially as paintable Galvanneal.
- .2 Primer:

Rust inhibitive touch up only.
- .3 Miscellaneous:
  - .1 Door Silencers:

GJ-64, Single Stud rubber/neoprene type
  - .2 Thermal Breaks:

Rigid polyvinylchloride (PVC) extrusion
  - .3 Fiberglass:

Loose batt type, density: 24kg/m<sup>3</sup> (minimum), conforming to ASTM C665

### **2. Construction**

.1 General:

- .1 All steel frame product shall be as manufactured by Fleming of the types, sizes and profiles indicated on the Architects' schedules or details.
- .2 Exterior frames shall be thermally broken, Fleming *Therma-Frame* Series, fabricated from 16 gauge steel.
- .3 Exterior frame product shall be supplied profile welded (PW)
- .4 Interior and exterior sections of thermally broken frames shall be separated by a continuous PVC thermal break.
  - .1 Thermally broken sections shall not be assembled by means of screws, grommets or other fasteners and welds shall not cause thermal transfers between interior and exterior surfaces of the frame sections.
  - .2 Closed sections (mullions and center rails) of thermally broken frames shall be factory insulated with 24kg/m<sup>3</sup> loose batt type fiberglass material.
- .5 Insulation of open sections (jambs, heads and sills) on exterior frame product shall be provided and installed by the contractor responsible for installation.
- .6 Interior frames shall be Fleming F-Series, fabricated from 16 gauge steel.
- .7 Interior frame product shall be supplied profile welded (PW)
- .8 Knocked-down and knocked-down drywall frames shall not be acceptable.
- .9 Jambs, heads, mullions, sills and center rails shall be straight and uniform throughout their lengths.
- .10 Frame product shall be square, free of defects, wraps or buckles.
- .11 Corner joints shall be profile welded (PW) (continuously welded on the inside of the profiles' faces, rabbets, returns and soffit intersections with exposed faces filled and ground to a smooth, uniform, seamless surface)"
- .12 Joints at mullions, transom bars, sills or center rails shall be coped accurately, butted and tightly fitted, with faces securely welded, matching corner joint faces.
- .13 All steel mullions will be fabricated from the same materials as specified for the steel frames. Steel mullions will be fabricated as a fully assembled three piece unit consisting of a front, back and full height one piece attachment clip as per Fleming F Series. The attachment clip will completely fill the stop area of the mullion on both sides and span the void between each side forming a grid channel like structure. Mullions used as hinge mullions or strike mullions between doors will be filled with grout by the general contractor either prior to or following installation of the frame. The head of the frame shall have an opening sufficient for the grout to be poured in to the mullion.
- .14 Mullions shall be fabricated with continuous 20 gauge galvanized steel internal reinforcing clips.
- .15 Frame product shall be fabricated with integral door stops having a minimum height of 16mm.
- .16 Glazing stops shall be formed 20 gauge steel, 16mm height channel, accurately fitted, butted at corners and fastened to frame sections with #6 x 32mm oval head scrulox (self-drilling) type screws at 300mm on center maximum.



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- .17 Where required due to site access, as indicated on the Architects' schedules or details, when advised by the contractor responsible for coordination or installation, or when shipping limitations so dictate, frame product shall be fabricated in sections for splicing in the field.
    - .1 Field spliced jambs, heads and sills shall be provided with 16 gauge steel splice plates securely welded into one section, extending 100mm minimum each side of splice joint.
    - .2 Field splices at closed sections (mullions or center rails) shall be 16 gauge steel splice angles securely welded to the abutting member. Face of splice angle shall extend 100mm minimum into closed sections when assembled.
    - .3 Field splice joints shall be welded, filled and ground to present a smooth uniform surface by the contractor responsible for installation after assembly.
  - .18 Each door opening shall be provided with two (2) temporary steel jamb spreaders welded to the base of the jambs or mullions to maintain proper alignment during shipping and handling. Spreaders shall be removed by the contractor responsible for installation prior to anchoring of frame to floor.
  - .19 Each door opening shall be prepared for GJ-64 or equivalent, single stud door silencers, three (3) for single door openings, two (2) for double door openings. Silencers shall be shipped loose for installation by the contractor after finish painting.
  - .20 Unless ineligible due to design, size, hardware or glazing specified on the Architects' or Hardware Suppliers' schedules or details, fire labeled frame product shall be provided for those openings required fire protection ratings as determined and scheduled by the Architect.
- .2 Hardware Preparations
- .1 Frame product shall be blanked, reinforced, drilled and tapped for fully templated mortised hardware only, in accordance with the final approved schedule and templated provided by the hardware supplier.
  - .2 Frame product shall be factory blanked and reinforced only for mortised hardware that is not fully templated.
  - .3 Frame product shall be reinforced only for surface mounted hardware.
  - .4 Drilling and tapping for surface mounted hardware or mortised hardware that is not fully templated shall be by the contractor responsible for installation on site, at the time of application.
  - .5 Frames shall be prepared for 114.3mm standard weight hinges (minimum).
  - .6 Hinge and pivot reinforcements shall be 10 gauge steel minimum reinforcing, high frequency type shall be provided.
  - .7 Hinge reinforcements for acoustic frames and frames in excess of 2450mm rabbet height shall be 10 gauge minimum with each cutout provided with 114.3mm heavy weight (4.6mm) high frequency type.
  - .8 Strike reinforcements shall be 16 gauge steel minimum.
  - .9 Reinforcements for surface mounted hardware, concealed closers and holders and flush bolts shall be 12 gauge steel minimum.
  - .10 Mortised cutouts shall be protected with 22 gauge steel minimum guard boxes.

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- .11 Where electrically or electronically operated hardware is specified on the Architects schedules or details or the final approved schedule and templates provided by the hardware supplier, hardware enclosures and/or junction boxes, where indicated on templates, shall be provided and inter-connected with CSA Approved 12.7mm diameter conduit and connectors.
  - .12 Prepare frames to receive security door contacts – refer to electrical drawings for locations. Door contacts to be installed at 100 mm from the latch side door edge.
  - .3 Anchorage:
    - .1 Frame product shall be provided with anchorage appropriate to floor, wall and frame construction.
    - .2 Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite on the strike jamb, except as indicated below.
    - .3 Frame product installed in unit masonry partitions shall be provided with 4.0mm diameter steel wire anchors, 18 gauge steel adjustable stirrup and strap or "T" type anchors as conditions dictate.
    - .4 Where frame product is installed prior to construction of the adjacent wall, each jamb shall be provided with 16 gauge steel floor anchors. Each anchor shall be provided with two (2) holes for mounting to the floor and shall be securely welded to the inside of the jamb.
    - .5 Floor anchors for thermally broken exterior frames shall be designed so as not to permit thermal transfers from exterior to interior surfaces of the frame sections.
    - .6 Frame product installed in drywall partitions shall be provided with 20 gauge steel snap-in or "Z" type stud type anchor.
    - .7 Jamb of frames in previously placed concrete, masonry or structural steel shall be punched and dimpled to accept machine bolt anchors, 6.4mm diameter, located not more than 150mm from the top and bottom of each jamb. Anchor preparations and guides shall also be located immediately above or below the intermediate hinge reinforcements and directly opposite on the strike jamb. Each preparation shall be provided with 16 gauge anchor bolt guides.
    - .8 Anchor bolts and expansion shell anchors for the above preparations shall be provided by the contractor responsible for installation.
    - .9 After sufficient tightening of the anchor bolts, the heads shall be welded do as to provide a non-removable application. Welded bolt head and dimple shall be filled and ground to present a smooth uniform surface by the contractor responsible for installation, prior to finish painting.
    - .10 Where indicated on the Architects' schedules or details, channel extensions shall be provided from the top of the frame assembly to the underside of the structure above. Extensions shall be fabricated from 12 gauge steel formed channel, mounting angles welded to inside of frame head and adjusting brackets. Formed channels, adjusting brackets and fasteners shall be shipped loose. Channels shall be mechanically connected to mounting angles and adjusting brackets with supplied fasteners, on site, by contractor responsible for installation.

.4 Finishing:

- .1 Remove weld slag and spatter from exposed surfaces.
- .2 All tool marks, abrasions and surface blemishes shall be filled and sanded to present smooth and uniform surfaces.
- .3 On exposed surfaces where zinc has been removed during fabrication, frame product shall receive a factory applied touch-up primer.
- .4 Primer shall be fully cured prior to shipment.

**2.4 Sizes and Tolerances**

1. All sizes and tolerances shall be in accordance with the Canadian Steel Door Manufacturers Association "Recommended Dimensional Standards for Commercial Steel Doors and Frames" as follows:
  - .1 Widths of door openings shall be measured from inside of frame jamb rabbet with a tolerance of +1.6mm, -0.8mm.
  - .2 Heights of door openings shall be measured from the finished floor (exclusive of floor coverings) to the head rabbet of the frame with a tolerance of  $\pm 1.2$ mm.
  - .3 Unless builders' hardware dictates otherwise, doors shall be sized so as to fit the above openings and allow a 3mm clearance at jambs and head. A clearance of 19mm between the bottom of the door and the finished floor (exclusive of floor coverings) shall be provided. Tolerances on door sizes shall be  $\pm 1.2$ mm.
  - .4 Manufacturing tolerances on formed frame profiles shall be  $\pm 0.8$ mm for faces, door stop heights and jamb depths. Tolerances for throat openings and door rabbet shall be  $\pm 1.6$ mm and  $\pm 0.4$ mm respectively. Hardware cutout dimensions shall be as per template dimensions, +0.4mm, -0.

**2.5 Hardware Locations**

1. Hardware preparations in frame product shall be as noted below and locations on doors shall be adjusted for clearances specified in 2.4.
2. Top of upper hinge preparation for 114.3mm hinges shall be located 180mm down from head, transom mullion or panel as appropriate. The top of the bottom hinge preparation for 114.3mm hinges shall be located 310mm from finished floor as defined in 2.4.3. Intermediate hinge preparations shall be spaced equally between top and bottom cutouts. For dutch door frames, top and bottom hinge locations shall be as above, with the tops of intermediate hinges located at 930mm and 1403mm from finished floor.
3. Strike preparations for unit, integral, cylindrical and mortise locks and roller latches shall be centered 1033mm from finished floor. Strikes for deadlocks shall be centered at 1200mm from finished floor. Strikes for panic or fire exit hardware shall be located as per device manufacturer's templates.
4. Push and/or pulls on doors shall be centered 1070mm from finished floor.
5. Preparations not noted above shall be as per hardware manufacturer's templates.
6. Hardware preparation tolerances shall comply with the ANSI A115 series standards.

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## **PART 3 - EXECUTION**

### **3.1 Site and Protection of Materials**

1. The contractor responsible for installation shall remove wraps or covers from door and frame product upon delivery at building site.
2. All materials shall be thoroughly inspected upon receipt and all discrepancies, deficiencies and/or damages shall be immediately reported in writing to the supplier. All damage shall be noted on the carriers' Bill of Landing.
3. Contractor responsible for installation shall ensure all materials are properly stored on planks or dunnage in a dry location. Product shall be stored in a vertical position, spaced with blocking to permit air circulation between them. Materials shall be covered to protect them from damage from any cause.
4. Contractor shall notify the supplier in writing of any errors or deficiencies in the product itself before initiating any corrective work.

### **3.2 Installation**

1. Install doors and frames in accordance with the Door and Hardware Institute "Installation guide for doors and hardware".
2. Set frame product plumb, square, aligned, without twist at correct elevation.
3. Frame Product Installation Tolerances:
  - .1 Plumbness tolerance, measured through a line from the intersecting corner of vertical members and the head to the floor, shall be  $\pm 1.6\text{mm}$ .
  - .2 Squareness tolerance, measured through a line  $90^\circ$  from one jamb at the upper corner of the product, to the opposite jamb, shall be  $\pm 1.6\text{mm}$ .
  - .3 Alignment tolerance, measured on jambs, through a horizontal line parallel to the plane of the wall, shall be  $\pm 1.6\text{mm}$ .
  - .4 Twist tolerance, measured at face corners of jambs, on parallel lines perpendicular to the plane of the wall, shall be  $\pm 1.6\text{mm}$ .
4. Fire labeled product shall be installed in accordance with NFPA-80.
5. Secure anchorages and connections to adjacent construction.
6. Brace frame product rigidly in position while building-in. Remove temporary steel shipping jamb spreaders. Install wood spreaders at mid points of frame rabbet height and at floor level to maintain frame widths. Provide vertical support at center of head for openings exceeding 1250mm in width. Remove wood spreaders after product has been built-in.
7. Frame product in unit masonry shall be fully grouted in place.

8. Install doors maintaining clearances outlined in Section 2.4.
9. Install louvers and vents.
10. Adjust operable parts for correct clearances and function.
11. Steel surfaces shall be kept free of grout, tar or other bonding materials or sealers.
12. Any grout or other bonding material shall be cleaned from products immediately following installation.
13. Exposed field welds shall be finished to present a smooth uniform surface and shall be touched-up with a rust inhibitive primer.
14. Exposed surfaces that have been scratched or otherwise marred during shipment, installation or handling shall be touched-up with a rust inhibitive primer.
15. Finish paint in accordance with Section 09900.
16. Install glazing materials and door silencers.

End of Section

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## **PART 1 - GENERAL**

### **1.1 Related Work**

1. Commercial Steel Doors and Frames

Section 08100

### **1.2 Submittals**

1. Submit a 12" x 12" sample of all glass products in accordance with Section 01340.

### **1.3 Warranty**

1. Contractor hereby warrants glass against defects and failure, including leakage, under normal conditions of use, in accordance with Division 1, but for five (5) years total

## **PART 2 - PRODUCTS**

### **2.1 Material**

1. Laminated Safety Glass (S6): Two ¼" laminated fully tempered clear, complete with 0.035 inch inter layer clear. Safety glass to be Sentry Glass® by Dupont or approved equal.
2. Interior Tempered Safety Glass: ¼" tempered clear float glass complete with etched tempered glass designation visible.
3. Polished Plate or Float Glass: To CAN/CGSB-12.3 clear.
4. Fire Rated Glass (FRG): Technical Glass Products - ¼" thick fire-rated glazing by FireLite. Model: FireLite NT – rated for 60 minutes. Each piece to be permanently labelled with logo and UL logo and fire rating. Approved equal by Pyran Platinum as manufactured by SCHOTT and SAFTI FIRST model SuperLite II-XL 60.

**NOTE: GEORGIAN WIRE GLASS IS NOT ACCEPTABLE AS EQUAL.**

5. Setting blocks: neoprene, 80 durometer hardness, 4" x ¼" width to suit glass.
6. Glazing tape: preformed butyl with continuous spacer, 10-15 durometer, hardness, paper release, black color, 1/8" x 3/8".
7. Gasket: black neoprene "U" cavity type with lock strip.

## **PART 3 - EXECUTION**

### **3.1 Installation**

1. Double Sealed Units
  - .1 Install glass as per aluminum window manufacturer's instruction to provide complete rain screen and air/ water barrier.
  - .2 All exterior entrance doors and screens will have double glazed sealed units in metal frames.

2. Other Glass

- .1 Clean and dry surfaces.
- .2 Apply glazing tape to fixed stops. Place setting blocks at 1/3 points.
- .3 Set glass on setting blocks against tape.
- .4 Apply glazing tape to glass.
- .5 Install stops.
- .6 Install glass in doors and screens with neoprene gasket.
- .7 Clean glass prior to building occupancy.

End of Section

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## **PART 1 - GENERAL**

### **1.1 General Finish Notes**

1. The Material and Colour Schedule will be issued by the Consultant after tender. It shall be read in conjunction with the Drawings, Specifications, Room Schedule and Door Schedule. Colour and material references named will be based on one manufacturer, as carried by the Contractor or, in the case that no specific manufacturer is carried, based on the Consultant's choice.
2. Approved alternative manufacturers will be acceptable only as indicated in the specifications. However, approved alternate products submitted must match the products named in the Specification to the Consultant's selection. Alternate products other than those named in the specifications will not be allowed unless previously approved by the Consultant.
3. Consult Architect prior to painting any surface not included in the formulae as listed.
4. Final colour for exterior painted surfaces and prominent interior areas shall be approved on the job site by the Architect.
5. Paint samples: Contractor to submit paint samples for all areas required to "Match Adjacent Finish".
6. All similar paint formulations are to be identical when dry. Variations in tone, texture or sheen shall not be accepted.
7. Submit two 300 mm x 300 mm paint samples of each colour required for approval by the Architect.
8. Exact locations of accent paint called for in the Material and Colour Schedule, to be issued after Contract award, not specifically identified on the drawings are to be verified on site with the Architect.

### **1.2 Exterior Finish Notes**

1. All exposed metal (doors, frames, lintels, stairs, handrails, mechanical equipment, etc.) to be painted except for prefinished metal louvers, stainless steel, and aluminum. Mechanical equipment is to be painted whether delivered to the site prepainted or not (exhaust fans, goosenecks, exhaust stacks, supports, HVAC units, HRU units, etc.). Colours to match adjacent material-generally either to match brick or tan to match flashing or siding material. Do not paint exposed white PVC pipe covers on interior. Architect will advise on jobsite which other items mentioned above, if any, do not require painting.

### **1.3 Interior Finish Notes:**

1. All heating units, recessed convectors, grilles, pipes, access panels, hangers and miscellaneous exposed metal work (except stainless steel or anodized aluminum) to be painted to match the surfaces on which they occur unless noted otherwise on the colour



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schedule, prefinished in suitable colour or directed by the Architect. If prefinished equipment is damaged, it shall be re-painted. Painting to be by formulations specified in Section 09900.

2. All interior fitments, casework, millwork, etc. to be melamine unless otherwise noted. Refer to Sections for specific requirements regarding materials, construction, finishes and hardware. Note that drawer and cupboard interiors are to be considered as exposed surfaces and will therefore be finished.
3. Do not paint over nameplates, identification tags, etc.
4. Make good all existing surfaces and finishes that are damaged during construction.

#### **1.4 Abbreviations Legend**

1. Refer to Room Finish Schedule for abbreviations Legend.

End of Section

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## **PART 1 - GENERAL**

### **1.1 Related Work**

- |                    |               |
|--------------------|---------------|
| 1. Gypsum Board:   | Section 09250 |
| 2. Rough Carpentry | Section 06100 |

### **1.2 Reference Standards**

1. Do work to CSA A82.31-1977, except where specified otherwise.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

1. Metal Studs: non-load bearing channel stud framing to ASTM C645-09a, roll formed from 0.59 mm thickness electro-galvanized steel sheet for screw attachment of gypsum lath and metal lath, and with service access holes.
2. Structural Metal Studs: CSA-S13-01 and hot-dipped galvanized to ASTM A525M-87, minimum 1.22 (18ga.) use thicker materials where required to suit structural requirements. Framing shall be designed by a licensed professional engineer registered in the province of Ontario. Follow fabrication standards ASTM C955.
3. Floor and ceiling tracks: to ASTM C645-09a in width to suit stud sizes, 30 mm legs for floor track, 50 mm for ceiling track.
4. Metal channel stiffener: 38 mm size, 2 mm thick cold rolled galvanized steel.
5. Furring channels (channels, hangers, tie wire, insert, anchor): CGSB 7.1-98-CAN/CGSB.
6. Touch-up Zinc Rich Paint: CAN/CGSB-1.181-92.

## **PART 3 - EXECUTION**

### **3.1 Stud Partitions**

1. Align partition tracks at floor and underside of structure above and secure at 24" o.c. maximum. All partitions to extend to underside of structure above.
2. Place studs vertically at 16" o.c. and not more than 2" from abutting walls and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs, as required, to provide rigid installation to manufacturer's instructions.
3. Erect metal studding to tolerance 1:1000.
4. Attach studs to bottom track using screws.

5. Coordinate simultaneous erection of studs with installation of service lines. When erecting studs, ensure web openings are aligned.
6. Install steel frames and anchor frames securely to studs using minimum of three (3) anchors per jamb for jambs up to 84" high and a minimum of four (4) anchors per jambs for jambs over 84" high.
7. Provide two (2) studs at each side of openings wider than stud centre specified.
8. Install, cut to length, piece of runner horizontally over door frames.
9. Provide 38 mm x 89 mm vertical and horizontal wood studs secured between metal studs for attachments of bathroom fixtures, accessories, cabinet work, and other fixtures, including grab bars, towel rails, attached to steel stud partitions.
10. Install steel stud or furring channel between studs for attaching electrical and other boxes.
11. Extend all partitions to underside of structure above for sound and fire separation.
12. Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.

### **3.2 Ceiling Furring**

1. Install runners level to tolerance of 1/8" over 11'-8". Provide runners at interruptions of continuity and change in direction.
2. Frame with furring channels, perimeter of openings to accommodate access panels, light fixtures, diffusers, grilles, etc.
3. Furring for bulkheads within or at termination or ceilings.
4. Install furring channels at 16" o.c. maximum.

### **3.3 Wall Furring**

1. Install steel furring, as indicated.
2. Frame opening and around built-in equipment on four (4) sides with channels.
3. Box-in beads, columns, pipes, and around exposed services.

### **3.4 Fire-rated Assemblies**

1. Where required, install Metal Stud System and Furring in accordance with appropriate ULC Design and with supplement to the National Building Code of Canada 1985.

End of Section

---

## **PART 1 - GENERAL**

### **1.1 Related Work**

- |                          |  |
|--------------------------|--|
| 1. Masonry               | Section 04200                              |
| 2. Metal Stud System:    | Section 09111                              |
| 3. Acoustic Unit Ceiling | Section 09510                              |
| 4. Painting:             | Section 09900                              |
| 5. Access Doors:         | refer to related mechanical and electrical |

### **1.2 Reference Standards**

1. Do work to CSA A82.31-1977, except where specified otherwise.

## **PART 2 - PRODUCTS**

### **2.1 Gypsum Board**

1. Plain: to CSA A82.27-M1977 standard, 5/8" thick or as indicated, tapered edges.
2. Plain: to CSA A82.27-M1977, Fire-rated Type X, 5/8" thick or as indicated, tapered edges.
3. Plain: to CSA A82.27-M1977, Washroom walls 5/8" dens-shield or as indicated, tapered edges.

### **2.2 Fastenings and Adhesives**

1. Screws: to CSA A82.31-1977.
2. Adhesive: to CGSB 71 GP 25M.
3. Laminating Compound: to CSA A82.31-1077.
4. Concrete Anchors: Phillips Red Head TW-614 or equivalent. Do not use powder activated fasteners for ceiling support.
5. Tie Wire: #16 ga. galvanized soft annealed steel wire.

### **2.3 Accessories**

1. Casing Beads and Corner Beads: 0.5 mm base thickness commercial sheet steel with G90 zinc finish to ASTM A 525-78 A.
2. Joint compound: to CSA A82.31-1977, asbestos-free.
3. Caulking: Acoustical sealant.

---

## **PART 3 - EXECUTION**

### **3.1 Gypsum Board Application**

1. Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are approved.
2. Apply single and double layers gypsum board to metal furring or framing, using screw fasteners and laminating adhesive. Maximum spacing of screw 12" oc.
3. Apply gypsum board to concrete block surfaces, where indicated, using laminating adhesive.
4. Apply type x gypsum board where indicated, in accordance with U.L.C. requirements and with supplement to the National Building Code of Canada to obtain the required fire protection, fire rating and fire separation.

### **3.2 Accessories**

1. Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces, where practical. Make joints tight, accurately aligned and rigidly secure. Mitre and fit corners accurately, free from rough edges.
2. Install casing beads around perimeter of suspended ceilings.
3. Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated.

### **3.3 Access Doors**

1. Install access doors to electrical and mechanical fixtures specified in respective Sections.
2. Rigidly secure frames to furring or framing systems.

### **3.4 Taping and Filling and Sound Seal**

1. Seal with acoustical sealant at ceilings, floors, wall intersections and all penetrations such as electrical outlets.
2. Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
3. Finish corner beads, control joints and trim as required with two (2) coats of joint compound and one (1) coat of taping compound, feathered out onto panel faces.
4. Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after painting is completed.

- 
5. Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
  6. Completed installation to be smooth, level or plumb, free from waves and other defects and ready for painting.

End of Section

---

## **PART 1 - GENERAL**

### **1.1 Related Work**

- |                 |               |
|-----------------|---------------|
| 1. Sealants     | Section 07900 |
| 2. Gypsum Board | Section 09250 |

### **1.2 Reference Standards**

1. Do tile work to Installation Manual 200-1979, "Ceramic Tile," produced by Terrazzo Tile and Marble Association of Canada (TTMAC).

### **1.3 Environmental Conditions**

1. Main minimum 13 deg. C air temperature at tile installation area for 24 hr. prior to, during and 48 hr. after installation. Do not proceed without the correct tiles or if substrate conditions are not suitable.

### **1.4 Maintenance Material**

1. Provide one full box of each type and color of tile required for project for maintenance use. Store where directed. Clearly identify each box.
2. Maintenance material to be of same production area as installed material.

### **1.5 Extended Warranty:**

1. Submit a warranty for entire wall tile installation, covering materials and labour and the repair or replacement of defective work for a period of three (3) years total.

## **PART 2 - PRODUCTS**

### **2.1 Thin-Set Mortar**

1. Mortarcrete Latex Mortar conforming to ANS1A118.4-1973, manufactured by L & M Ceramo Inc.

### **2.2 Wall Tile**

1. **Ceramic Wall Tile (CWT):** to CAN2-75, 1-M77, Type 5, Class MR-4, Colour & Dimension Collection, 75 x 150 x 6 mm size, cushion edges, glazed surface. Colours as selected by Consultant up to a maximum of two (2) colours; Olympia Tile.
  - .1 Acceptable Materials:  
Equal as supplied by Daltile – Semi-Gloss Group 1  
American Oleon equal and  
Centura – Beltile Rainbow Series; size 4x16 glossy full colours.

2. Tile walls – see drawings for extent. Patterns and accent stripes to be selected by Architect.
3. Tile colors to be selected by Architect from Standard Color List. Total of four (4) colours. Accent stripes colors to be selected separately by Architect from "Accent Color" List. Total of two (2) colours.

### **2.3 Grout**

1. Epoxy Grout: "Latapoxy SP-100" Stainless, chemical resistant epoxy grout by Laticrete International. Colour from manufacturer's full range.
2. Edging and trim by Schluter – Jolly for edges and outside corners.

## **PART 3 - EXECUTION**

### **3.1 Workmanship**

1. Apply tile to clean and sound surfaces.
2. Fit tile around corners, fitments, fixtures, drains and other built-in objects to maintain uniform joint appearance. Cut edges smooth, even and free from chipping. Edges resulting from splitting, not acceptable.
3. Maximum surface tolerance 1:800 for walls, floors.
4. Make joints between tile uniform, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.
5. Lay out tiles so perimeter tiles are minimum 1/2 size.
6. Sound tiles after setting and replace hollow-sounding units to obtain full bond.
7. Make internal angles square, external angles rounded.
8. Use round edged tiles at termination of wall tile panels, except where panel butts projecting surface or differing plane.
9. Install soap dishes into block recess. Fit tiles around soap dishes.
10. Allow minimum 24 h after installation of tiles, before grouting.
11. Clean installed tile surfaces after installation and grouting cured.

End of Section



---

## **PART 1 - GENERAL**

### **1.1 Reference Standards**

1. Fabrication: to ASTM 365-78 and CAN/GSB-92.1-M77.
2. Installation: to ASTM C636-76, except where specified otherwise.

### **1.2 Design Criteria**

1. Maximum deflection 1/360 of span to ASTM 365-78 deflection test.

### **1.3 Samples**

1. Submit two each 305mm x 305mm samples of each individual tile and grid type in accordance with Section 01340.

### **1.4 Warranty**

1. Submit an extended warranty covering materials and labour and the repair or replacement of defective work but for two (2) years total.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

#### **1. Acoustic Panel Type (ACT-1)**

- .1 **ACT-1:** 610 mm x 610 mm x 25mm, fine textured, square lay-in, Fine Fissured #1717 by Armstrong. Class A - UL fire resistive. To be used for rated assembly ULC G243  
Suspension system: 15/16" Prelude XL Fire Guard, white, by Armstrong.

#### **2. Acoustic Panel Type (ACT-2)**

- .1 **ACT-2:** 610 mm x 1220 mm x 25mm, fine textured square lay-in, Fine Fissured #1824 by Armstrong. Class A - UL fire resistive. To be used for rated assembly ULC G243  
Suspension system: 15/16" Prelude XL Fire Guard with steel clip, white, by Armstrong.

- .2 Acceptable equal as manufactured by Celotex and CGC.

3. **Exposed Tee Bar Grid Components:** Cold rolled steel, zinc coated, shop painted, satin sheen, white, interlocking, main and cross tee of double web with rectangular bulb, depth governed by span, 1" exposed face.
4. **Hangers:** 1/8" galvanized soft annealed steel wire. Maximum spacing as per ULC design.

- 
5. **Accessories:** splices, clips, retainers, etc., to complement suspension system components.

## **2.2 Installation**

1. Co-ordinate suspension system with related components.
2. Install acoustic units parallel to building lines with edge unit not less than 50% or unit width.
3. Scribe acoustic units to fit adjacent work. Butt joints tight, terminate edges with moulding.
4. Support suspension system main runners at 48" oc maximum with hangers from structure. Assembly shall support super-imposed loads. Maximum permissible deflection,  $1/360$  of span.
5. Attach cross member to main runner to provide rigid assembly.
6. Install suspension assembly to manufacturer's written instructions.
7. Install flush edge moulding at junction of acoustic unit ceiling and other materials around entire length of joint. Secure to construction. Butt joints neatly, square and true in alignment.
8. Set acoustic units in place.
9. Set all ceiling levels by the use of transit or laser level.
10. Provide for Owner one (1) complete carton of each type of ceiling tile.

End of Section

---

## **PART 1 - GENERAL**

### **1.1 Related Work**

1. Demolition

Section 02050

### **1.2 Maintenance Data**

1. Provide data for maintenance of resilient flooring for incorporation into Maintenance Manual.

### **1.3 Environmental Requirements**

1. Maintain minimum 20 deg. C air temperature at flooring installation area for three (3) days before, during and for seven (7) days after installation.

## **PART 2 - PRODUCTS**

### **2.1 Materials**

1. **Luxury Vinyl composition Tile (LVT):** wear layer: urethane aluminum oxide topcoat cured by UV process, 0.76 mm wear layer thickness. Tile size: 305 mm x 610mm, 2.5 mm overall thickness. ASTM F1700, Class III, Type B. To meet ASTM F-1514 and ASTM F-925. 15 Year Commercial Warranty. Basis of Design: Mannington Commercial, DIVERGENT LVT series, full selection. Allow for two (2) colour selections for each group.  
Acceptable equal:     Interface – Studio Set Collection  
                              Polyflor – Bevel Line – Stone Collection
2. **Resilient rubber base (RB):** top set coved, 3 mm thick, rubber, 100 mm high minimum 1200 mm long, including premoulded end stops and external corners. Acceptable materials: non-shrink Rubber Wall Base with toe as manufactured by Johnsonite. Colours: Three (3) from full Johnsonite "Coloright" colour line. Use straight base at carpet flooring.
3. **Base Accessories:** Pre-moulded end stops and external corners, of same material, size, and colour as base.
4. **Transition Strips:** thermoset vulcanized rubber, smooth, purpose made to accommodate wheeled traffic and prevent tripping; tapered designs to suit nature of transition; colour as selected by Consultant.
5. **Primers and adhesives:** waterproof, recommended by flooring manufacturer for specific material on applicable substrate, above, at or below grade. Use Johnsonite 990 Solvent Free Environmentally Safe White Acrylic Cove Base Adhesive for rubber base.

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## **PART 3 - EXECUTION**

### **3.1 Inspection**

1. Ensure concrete floors are dry, by using test methods recommended by tile manufacturer, and inspect for negative alkalinity, carbonization or dusting.
2. Commencement of work indicates acceptance of conditions by flooring installer.

### **3.2 Subfloor Treatment**

1. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with subfloor filler.
2. Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured.

### **3.3 Tile**

1. Apply adhesive uniformly using recommended notched trowel in accordance with Flooring Manufacturer's instructions. Do not spread more adhesive than can be covered by flooring before initial set takes place.
2. Lay flooring with joints parallel to building lines to produce symmetrical tile pattern. Border tiles - minimum half tile width or as indicated by drawings and Finish Schedule.
3. Cut tile and fit neatly around fixed or excessively heavy objects.
4. Install flooring in pan type floor access covers and all clean out covers, where applicable. Maintain floor pattern.
5. Terminate flooring at center line of door in openings where adjacent floor finish or color is dissimilar.
6. Install metal edge strips at unprotected or exposed edges where flooring terminates.

### **3.4 Base Application**

1. Set base in adhesive tightly against wall and floor surfaces. Use lengths as long as practicable and not less than minimum 500 mm long.
2. Install straight and level to variation of 1:1000.
3. Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.
4. Miter internal corners. Use premoulded corner pieces at all external corners and ensure full adhesion through to ends of corner pieces. See detail for termination at door frames.

5. Leave in the building one (1) complete carton of each of two (2) colours of floor tile and twelve (12) tiles of each of the remaining colours. Colours of extra tile to be specified by Architect.

### **3.5 Initial Maintenance after Installation**

1. Broom sweep or vacuum thoroughly.
2. Do not wet mop, wash, scrub, or strip the floor. These procedures will be done by the Owner.

### **3.6 Protection of Work**

1. Following broom sweeping, protect new floors with 0.15 mm thick Polyethylene cover and lay planking in all necessary traffic areas to minimize damage by other trades. Maintain until just before final inspection.

### **3.7 Preparation for Inspection**

1. Only if so notified by Architect, and in the presence of the Owner, scrub the floor using a neutral detergent and a floor machine of 170-250 rpm capability equipped with a scrub brush or a scrubbing pad (3M blue or equal).
2. Lightly rinse and allow to dry. Note: Do not flood the floor with rinse water, scrubbing, or stripping solutions. Final re-washing, if required, and waxing will be done by owner.

End of Section

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## **PART 1 – GENERAL**

### **1.1 Related Work**

- |  |               |
|--|---------------|
| 1. Resilient Tile Flooring and Rubber Base | Section 09660 |
| 2. Demolition                              | Section 02050 |

### **1.2 Samples**

1. Submit duplicate 1 m square pieces of each type of carpet specified, duplicate 125 x 75 mm pieces for each color selected, 150 mm lengths of binder bars, in accordance with Section 01340.

### **1.3 Maintenance Data**

1. Provide maintenance data for carpet maintenance for incorporation into Maintenance Manual specified in Section 01730.

### **1.4 Warranty**

1. Carpet manufacturer lifetime warranties: wear, static protection, delamination, tuftbind failure, edge ravel and zippering and dimensional stability. Provide one full box of carpet tile of each colour to Owner.

## **PART 2 – MATERIALS**

### **2.1 Modular Carpet (CPT-T)**

1. Fibre: 100% solution dyed nylon.
2. Construction: textured dense pattern loop
3. Standard Backing System: PVC modular – containing recycled content.
4. Pile Density: 5300 FHA minimum.
5. Gauge: 1/12; 47.2 rows/10 cm, minimum.
6. Stitches: 11.2 spi; 45.3 stitches/10 cm, minimum.
7. Flammability: Radiant Panel ASTM E648 – Class I
8. Protections: anti-microbial, anti-zipper, anti-static and stain protection
9. Modular Size: 610mm x 610mm
10. Manufacturers: Mohawk Group Carpet Tile - Caliber Series - BT282

Colours: By Architect allow for up to 2 colours

**Acceptable Alternate:** Mannington Googlie Collection same size.  
Tarkett: Aftermath II Collection same size.  
Interface: open Air 402 squares

## **2.2 Binder Bars**

1. As recommended by carpet manufacturer. Color to match carpet.
2. Use binder bars at exposed carpet edges. Install binder bars at doorways centered under doors.

## **2.3 Adhesive**

1. Full spread premium pressure sensitive adhesive as recommended by carpet manufacturer to suit carpet and subfloor conditions, and allow repositioning.

## **PART 3 - EXECUTION**

### **3.1 Examination**

1. New concrete must be fully cured and free of moisture. New concrete requires a curing period of approximately 90 days. Tests for moisture and alkalinity must be performed as detailed under moisture testing.
2. Work of others in areas where carpet is installed has been completed.

### **3.2 Preparation**

1. Dust, dirt, debris, and noncompatible adhesive must be removed before installation begins. Surfaces must be smooth and level with all holes and cracks filled with latex based Portland cement patching compound.

### **3.3 Installation**

1. Establish measurement and layout per manufacturer's recommendations. Follow manufacturer's pallet and box sequencing.
2. Install starting in the corner of one quadrant and in a pyramid fashion. Install by butting edges together evenly and do not compress modules compress modules. Fit carpet neatly around architectural, mechanical, electrical and furniture fitments.
3. Cut carpet modules at perimeters, floor electrical outlets, and door openings. Apply adhesive whenever modules are cut. Loop pile modules may require trimming or clipping of tufts.
4. Finish seams level, flat and inconspicuous.

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**3.4 Protection of Finished Work**

1. Vacuum carpets clean. Protect traffic areas of carpeted floor with polyethylene drop sheets. Tape joints to prevent shifting.
2. After installation, and until project completion, coordinate work to ensure that carpeting is not damaged by traffic or by subsequent work.

End of Section



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## **PART 1 - GENERAL**

### **1.1 Related Work**

- |   |                   |
|---|-------------------|
| 1. Shop painting miscellaneous metals:            | Section 05500     |
| 2. Door Schedule                                  | refer to drawings |
| 3. Shop priming of ferrous doors and door frames: | Section 08100     |
| 4. Room Finish Schedule                           | refer to drawings |

### **1.2 Reference Standard**

1. Ontario Painting Contractors Association (OPCA) Architectural Specification Manual - referenced as OPCA Manual, latest Edition. Paint formulations and methods referred to herein refer to this Manual. If contractor is unfamiliar with this reference standard, contact the OPCA.

### **1.3 Product Data**

1. Submit to Architect, for review, product data for all formulas, including manufacturer's trade names.
2. Paint Manufacturer will provide periodic reviews and reports to Architect regarding work in this Section and if Contractor is adhering to manufacturer's product specifications.

### **1.4 Environmental Requirements**

1. Do not apply paint finish in areas where dust is being generated.
2. Conform to requirements of OPCA Manual.
3. Comply with the requirements of Health and Environmental Specifications.

### **1.5 Extent of Painting**

1. For new construction, for rooms shown in room finish schedule to have painted walls, paint all non prefinished surfaces unless indicated otherwise, and repaint prefinished surfaces where indicated.
2. For existing construction, for rooms shown in room finish schedule to have repainted walls:
  - Paint all non prefinished new surfaces unless indicated otherwise.
  - Repaint prefinished surfaces where indicated.
  - Repaint all previously painted surfaces unless indicated otherwise.

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### **1.6 Finishes and Colours**

1. Review the requirements outlined in Finish and Colour Notes.  
A separate colour schedule will be issued after contract award.

### **1.7 Warranty**

1. Provide a two (2) year warranty on completion stating that the work has been performed with respect to the standards and requirements incorporated in the OPCA specification manual latest edition

## **PART 2 - PRODUCTS**

### **2.1 Materials**

1. Acceptable products: Per Chapter 5 OPCA Manual as listed.
2. Paint materials for each paint system to be products of a single manufacturer.
3. Use low-VOC and low-odour paints only.

## **PART 3 - EXECUTION**

### **3.1 Preparation of Surfaces in new Construction**

1. Prepare surfaces to receive paint per Chapter 3 OPCA Manual.
2. Prepare wood surfaces to CGSB 85-GP-1M.
  - .1 Use CGSB 1-GP-126M vinyl sealer over knots resinous areas.
  - .2 Apply wood paste filler to nail holes and cracks.
  - .3 Tint filler to match stains for stained woodwork.
3. Touch up shop paint primer on steel with CGSB 1-GP-40M to CGSB 85-GP-14M.
4. Prepare galvanized steel and zinc coated surface to CGSB 85-GP-16.
5. Prepare wallboard surfaces to CGSB 85-GP-33M. Fill minor cracks with plaster patching compound.

### **3.2 Preparation of Previously Painted Surfaces**

1. Remove screws, bolts, nails, etc. from all surfaces to be painted
2. Remove all peeling and scaling paint by scraping and sanding.
3. Remove loose and broken pieces. Fill all holes, cracks and crevices with appropriate patching compound and match surrounding texture. Touch-up with appropriate primer.

4. Remove all dirt, grease, oil, wax and other contaminants by scrubbing with a detergent solution such as trisodium phosphate. Rinse with clean water.
5. All metal surfaces must be washed with mineral spirits. Change solvent and rags frequently. Remove all rust by sanding. Prime with rust inhibitive paint.
6. Dull all glossy surfaces by sanding.
7. Wash with solvent surfaces that have been subject to writing with marking pens, crayons, or lipsticks. Prime to stop bleeding.
8. For joints within or adjacent to exterior areas to be painted or cleaned, remove old cracked and loose caulking and replace with a high quality caulking compound.

### **3.3 Application**

1. Sand and dust between each coat to remove defects visible from distance up to 60".
2. Finish closets and alcoves as specified for adjoining rooms.
3. Apply each coat at the proper consistency. Each coat of finish should be fully dry and hard before applying the next coat, unless the manufacturer's instructions state otherwise.

### **3.4 Mechanical and Electrical Equipment**

1. Paint exposed conduits, pipes, hangers and other mechanical and electrical equipment occurring in finished areas as well as inside cupboards and cabinet work. Colour and texture to match adjacent surfaces, except as noted otherwise. Coordinate with mechanical trades applying banding and labeling after pipes have been painted. Do not paint white PVC covers on exposed mechanical water, drain and other lines
2. Paint gas piping standard yellow where visible on roof or in service spaces.
3. Paint surfaces inside of ductwork and elsewhere behind grilles where visible using primer and one coat of matte black paint.
4. Paint both sides and edges of plywood backboards for equipment before installation.
5. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

### **3.5 Paint Systems**

1. System references listed are based on Chapters 4A and 4B of OPCA Manual and are OPCA Premium Grade, unless noted otherwise.

### **3.6 Interior Finishes**

1. Wood, where applicable: INT. 1-A, Alkyd Semi-Gloss Finish, Premium Grade.
2. Gypsum board - Ceilings and bulkheads - INT. 4-A, Alkyd Flat Finish, Premium Grade.
3. Gypsum board – walls: JNT4A, Alkyd eggshell, Premium Grade.
4. Concrete Block: INT. 8-B, Alkyd Semi-Gloss Finish, Premium Grade.
5. Galvanized metal: INT. 13-A, Alkyd Semi-Gloss Finish, Premium Grade.

### **3.7 Refinishing of Previously Painted Surfaces**

1. Apply two (2) finishing coats of paint materials listed in Section 3.5 and 3.6 for the type of surface considered.
2. When satisfactory coverage can be achieved by only one (1) coat, the second coat is not required.
3. Apply additional coats if necessary to cover accent colours, graphics, etc.

End of Section

## **PART 1 - GENERAL**

### **1.1 Shop Drawings**

1. Submit shop drawings in accordance with Section 01340.

## **PART 2 - PRODUCTS**

### **2.1 Fixtures**

1. **White Board (WB)** - "Vit-Rite: Rite on, Wipe off" model as manufactured by Architectural School Products, Mississauga.
  - .1 Color: White. Flush trim No. 205, chalk tray No. 212, 89 mm deep, minimum, **Display Rail No. 200, KWIK Grip.**
  - .2 Provide all hardware and fasteners suitable for secure recessed mounting.
  - .3 Size, as per drawings.
  - .4 Acceptable alternates: Martack Specialties Limited.
2. **Corner Guards (SSG 'C' Type)**: Stainless Steel corner guard size 50mm wrap x 122mm wide x 50mm wrap and manufactured from type 304 alloy with a #4 satin finish. Height of corner guard is to be 1220mm. Design based on Acrovyn Stainless Steel corner guard model CO-8 by CS Construction Specialties.

## **PART 3 – EXECUTION**

### **3.1 Installation**

1. Install where indicated on drawings and as per manufacturer's instructions.

### **3.2 Demonstration and Training**

1. Provide demonstration of operation to the Owner and his representatives.
2. Provide training for operation, maintenance and repairs.

End of Section

## **PART 1 - GENERAL**

### **1.1 General Requirements**

1. Division One, General Requirements is part of this Section and shall apply as if repeated here.

### **1.2 Related Work**

1. Washroom Accessories: Section 10800

### **1.3 Submittals**

1. Shop Drawings: Submit shop drawings in accordance with Section 01340, for Consultant's review before fabrication, indicating material, finish, dimensions, details of connections and fastenings, elevations, plans, sections, thicknesses, hardware and other pertinent information.
2. Samples: Submit samples of finish hardware and powder-coated sample in selected colour and finish in accordance with Section 01340, for approval of Consultant.

## **PART 2 - PRODUCTS**

### **2.1 Material Description**

1. **Metal Toilet Partitions (MTP)**: Standard series, by Hadrian Manufacturing  
Acceptable alternatives: Bradley Corporation, Global Steel Products Corporation, Shanahan's
  - .1 **Divider Panels: 600mm wide x 1500mm high headrail braced**: 25 mm thick and 0.76 mm thick steel sheet faces with honeycomb core and internal reinforcing. Mounted 300mm from finished floor.
  - .2 Hardware: .67 institutional extra heavy duty, type 304 satin finish stainless steel, angle brackets, U-channels and spring-loaded, self-closing hinge run full height of panel and door; for emergency access, door lift from outside. All fasteners to be pin-head Torx screws.

## **PART 3 – EXECUTION**

### **3.1 Installation**

1. Install compartments in accordance with reviewed shop drawings and in a neat, rigid manner free of defects.
2. Install units secure, accurately positioned, plumb, level, square and free from sag and distortion.

3. Perform drilling of steel, masonry and concrete necessary to install this work.
4. Ensure spaces between panels and pilasters, between panels and walls and between pilasters and walls are of uniform consistent width and sized to ensure it is not possible to see persons using the compartments.
5. Coordinate installation with the work of trades providing ceilings, wall and floor finishes, shower accessories and other adjacent components and construction.

### **3.2 Adjustment**

1. Upon completion of the work or when directed, remove all traces of protective coating or paper.
2. Clean exposed surfaces and fittings.
3. Test hinges, locks and latches and where necessary, adjust and lubricate. Set hinges so that doors stand open maximum 30 degrees when compartment is not in use. Ensure that partitions are in working order.

End of Section

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## **PART 1 - GENERAL**

### **1.1 General Requirements**

1. Division One, General Requirements is part of this Section and shall apply as if repeated here.

### **1.2 Related Work Specified Elsewhere**

1. Electrical conduit and wiring to junction boxes and hand dryers: refer to Electrical

### **1.3 Referenced Standards**

1. ASTM A167-87: Specification for Stainless and Heat Resisting Chromium -Nickel Steel Plate, Sheet and Strip
2. ASTM A525: Standard Specification for General Requirements for Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process (Metric)
3. CAN/CSA-G164-M92: Hot Dip Galvanizing of Irregularly Shaped Articles.

### **1.4 Shop Drawings**

1. Submit shop drawings in accordance with Section 01340, for Consultant's review before fabrication. Shop drawings of units for use by the handicapped shall be distinctly marked and cross-referenced to the corresponding article in the specifications.

### **1.5 Quality Standard**

1. This specification section is based generally on Bobrick equipment. Similar equipment and accessories by ASI Group Watrous Inc. and American Specialties Inc. are also acceptable.

## **PART 2 - PRODUCTS**

### **2.1 Materials - Generally**

1. Ferrous Steel: Sheet, cold-rolled furniture steel, double annealed, mill stretched and leveled, and fully pickled. Otherwise, steel shall be hot-rolled or cold-rolled of alloy to suit needs of fabrication, use, and appearance.
2. Stainless Steel: Type 304, conforming to ASTM A167-87, No. 4 finish.
3. Galvanized Steel: For sheet, Z275 zinc coating designation in accordance with ASTM Specification A525. For irregular sections, hot dip galvanized to comply with CSA G164.
4. Anchors and Fastenings: Where exposed, use stainless steel and otherwise to match metal anchored. Where non-exposed, use the same as that specified for exposed, or



use galvanized steel. Anchors and fastenings shall be of the type appropriate for the substrate to which accessory unit is secured.

## **2.2 Products**

### **1. Mirrors**

- .1 **(MI):** B-290 series by Bobrick, stainless steel frame, vandal resistant mounting, 6 mm glass mirror with 15 year guarantee against silver spoilage.  
Size: 600 x 910 mm. Quantity: refer to drawings

### **2. Handicapped Grab Bars (GB): by Bobrick**

- .1 GB-1: B-5898 x 750 mm x 750 mm "L" shaped grab bar beside water closet mounted as per OBC requirements.  
GB-2: B-5806 x 600 mm long bar behind water closet. Installed as per drawing.  
GB-3: B-5806 x 450 mm long bar beside urinal. Installed as per drawing.
- .2 All bars to have concealed mounting hardware.
- .3 Quantity: refer to drawings.
- .4 All bars to withstand horizontal and vertical pull of 2.2 kN

### **3. Vandal Resistant Clothes Hooks (CH): Model B-983**

- .1 Stainless steel
- .2 Quantity: 1 per Barrier-free washroom stall. Mounting height to be 1200 max.

### **4. Toilet Tissue Dispenser (TPD): Jumbo single bathroom tissue dispenser R01566 by Flexo Products Ltd.**

### **5. Soap Dispensers (SD): model R0710A by Flexo Products Ltd.**

### **6. Sanitary Napkin Disposal (ND): Model R0620 by Flexo Products Ltd.**

- .1 Steel, surface mounted
- .2 Colour: White.
- .3 Quantity: refer to drawings

### **7. Hand Dryers (HD): refer to Electrical specifications.**

## **2.3 Component Minimum Requirements**

- 1. **Construction:** Fabricate with materials, component sizes, metal gauges, reinforcing, anchors and fasteners of adequate strength to withstand intended use.
- 2. Where specified as frameless, provide stainless steel accessories with one-piece fronts having 90 degree formed returns at their edges and openings.
- 3. Where accessory fronts are framed, frame edges, both inside and outside, with 90 degree formed returns continuously welded and ground smooth at the corners. Doors shall also have 90 degree formed returns as specified.

4. Unless otherwise specified, hinges shall be semi-concealed stainless steel piano hinges extending full-length of hinged element. Provide hinged elements with concealed, mechanically-retained rubber bumpers for silent closing, and shall close flush with faces of fronts or frames.
5. Ensure that work will remain free of warping, buckling, opening of joints and seams, distortion and permanent deformation.
6. No exposed fixings permitted. Cut edges and openings square and smooth. Chamfer corners of edges and cut-outs 1.6 mm.
7. **Assembly:** Accurately cut, machine and fit joints, corners, copes and mitres so that junctions between components fit together tightly and in true planes.
8. Fasten work with concealed methods, unless otherwise indicated on Drawings.
9. Weld all connections where possible, bolt where not possible and cut off bolts flush with nuts. Countersunk bolt heads, and provide method to prevent loosening of nuts. Ream holes drilled for fastening.
10. Welded joints shall be tight, flush, and in true planes with base metals. Make welds continuous at joints where entry of water into voids of members or assemblies is possible.
11. Provide for differential movements within assemblies and at junctions of assemblies with surrounding work.
12. Welds in exposed locations shall be ground and polished smooth.
13. **Finish Work:** Provide holes and connections for related work installed under other Sections of this specification, if applicable.
14. Cleanly and smoothly finish exposed edges of materials, including holes.

## **PART 3 - EXECUTION**

### **3.1 Inspection of Site**

1. Take site measurements to ensure that work is fabricated to fit surrounding construction around obstructions and projects in place, or as shown on drawings, and to suit service locations.

### **3.2 Installation**

1. Install all accessories in accordance with manufacturers' instructions at their recommended mounting heights unless noted otherwise on drawings.

2. Securely fasten accessories plumb, true, square, straight, level, and accurately and tightly fitted together and to surrounding work. Install in locations shown and specified herein. Mounting heights as shown or in accordance with the OBC in the case of barrier-free accessories.
3. Work shall include anchor bolts, bolts, washers and nuts, lag screws, expansion shields, toggles, straps, sleeve brackets, clips, and other items necessary for secure installation, as required by loading and by Jurisdictional Authorities.
4. Attach work at wood by screws through countersunk holes in metal.
5. Attach work to masonry with lead plugs and non-corrosive fastenings, to support load with a safety factor of 3. Perform all drilling necessary to install the work.
6. Insulate between dissimilar metals or between metals and masonry or concrete with bituminous paint, to prevent electrolysis.
7. Coordinate installation with the work of other trades adjacent to accessories to achieve the reveals or other edge conditions shown, where their front faces are flush with the finished wall surfaces.

### **3.3 Cleaning Up and Adjustment**

1. Upon completion of the work, or when directed, remove all traces of protective coatings or paper.
2. Test mechanisms, hinges, locks and latches, and where necessary, adjust and lubricate and ensure that accessories are in perfect working order.

End of Section

**1. GENERAL****1.1 Section Includes**

- 1.1.1 Shop drawings and product data.
- 1.1.2 Samples.
- 1.1.3 Certificates and transcripts.

**1.2 Administrative**

- 1.2.1 Work affected by submittal shall not proceed until review is complete.
- 1.2.2 Present shop drawings, product data, samples and mark-ups.
- 1.2.3 Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents.
- 1.2.4 Submittals not stamped, signed, dated, identified as to specific project, and attesting to their being reviewed will be returned without being examined and shall be considered rejected.
- 1.2.5 Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- 1.2.6 Verify field measurements and coordination with affected adjacent Work.
- 1.2.7 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
- 1.2.8 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
- 1.2.9 Keep one reviewed copy of each submission on site.

**1.3 Shop Drawings and Product Data**

- 1.3.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- 1.3.2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- 1.3.3 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- 1.3.4 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of any revisions other than those requested.
- 1.3.5 Accompany submissions with transmittal letter, containing:
  - .1 Date
  - .2 Project title and number
  - .3 Contractor's name and address
  - .4 Identification and quantity of each shop drawing, product data and sample
  - .5 Other pertinent data
- 1.3.6 Submissions shall include:
  - .1 Date and revision dates
  - .2 Project title
  - .3 Agency's project number
  - .4 Consultant's project number
  - .5 Name and address of:
    - .1 Subcontractor
    - .2 Supplier

- 
- .3 Manufacturer
  - .6 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .7 Details of appropriate portions of Work as applicable:
    - .1 Fabrication
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances
    - .3 Setting or erection details
    - .4 Capacities
    - .5 Performance characteristics
    - .6 Standards
    - .7 Operating weight
    - .8 Wiring diagrams
    - .9 Single line and schematic diagrams
    - .10 Relationship to other parts of the Work
  - 1.3.7 Submit one electronic copy of shop drawings for each requirement requested in specification Sections and as consultant may reasonably request.
  - 1.3.8 Submit electronic copies of product data sheets or brochures for requirements requested in specification sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.
  - 1.3.9 Delete information not applicable to project.
  - 1.3.10 Supplement standard information to provide details applicable to project.
  - 1.3.11 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, transparency will be returned and fabrication and installation of work may proceed.
  - 1.3.12 If shop drawings are rejected, noted copy will be returned and re-submission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
2. **PRODUCTS** NOT APPLICABLE
3. **EXECUTION** NOT APPLICABLE

END OF SECTION

**1. GENERAL****1.1 Section Includes**

- 1.1.1 Inspections and declarations.
- 1.1.2 Closeout submittals.
- 1.1.3 Operation and maintenance manual format.
- 1.1.4 Recording actual site conditions.
- 1.1.5 Record (as-built) documents and samples.

**1.2 Inspections and Declarations**

- 1.2.1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
- 1.2.2 Notify Consultant in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
- 1.2.3 Request Consultant's Inspection.

**1.3 Consultant's Inspection:**

- 1.3.1 Consultant and Contractor will perform inspection of Work to identify defects or deficiencies. Correct defective and deficient Work accordingly.

**1.4 Completion: submit written certificate that the following has been performed:**

- 1.4.1 Work has been completed and inspected for compliance with Contract Documents.
- 1.4.2 Defects have been corrected and deficiencies have been completed.
- 1.4.3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
- 1.4.4 Certificates required by authorities having jurisdiction have been submitted.
- 1.4.5 Operation of systems have been demonstrated to Agency's personnel.
- 1.4.6 Work is complete and ready for Final Inspection.

**1.5 Final Inspection:**

- 1.5.1 When items noted above are completed, request final inspection of Work by Agency, Consultant, and Contractor. If Work is deemed incomplete by the Agency and Consultant, complete outstanding items and request re-inspection.

**1.6 Declaration of Substantial Performance:**

- 1.6.1 When Agency and Consultant consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for Substantial Performance of the Work.

**1.7 Commencement of Warranty Periods:**

- 1.7.1 The date of Substantial Performance of the Work shall be the date for commencement of the warranty period.

**1.8 Closeout Submittals**

- 1.8.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- 1.8.2 Copy will be returned after final inspection, with Consultant's comments.
- 1.8.3 Revise content of documents as required prior to final submittal.
- 1.8.4 Two weeks prior to Substantial Performance of the Work, submit to the Consultant, four final copies of operating and maintenance manuals.
- 1.8.5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged and without defects, and of same quality and manufacture as products provided in Work.
- 1.8.6 If requested, furnish evidence as to type, source and quality of products provided.

- 1.8.7 Defective products will be rejected, regardless of previous inspections. Replace defective products at own expense.

1.9 **Operation and Maintenance Manual Format**

- 1.9.1 Organize data in the form of an instructional manual.  
1.9.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

1.10 **Certificate of Acceptance:**

- 1.10.1 Relevant certificates issued by authorities having jurisdiction, including code compliance certificate, and life safety systems performance certificate.

1.11 **Recording Actual Site Conditions**

- 1.11.1 Record information on set of black line opaque drawings, and within the Project Manual, provided by Consultant.  
1.11.2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information.  
1.11.3 Record information concurrently with construction progress. Do not conceal Work of the Project until required information is accurately recorded.

1.12 **Record Documents**

- 1.12.1 Prior to Substantial Performance of the Work, electronically transfer the marked up information from the as-built documents to a master set of drawing and specification files provided by the Consultant, as follows:  
.1 Drawings: AutoCAD Release 2013.  
.2 Specifications: Microsoft Word 2003.  
1.12.2 Mark revised documents as "RECORD DOCUMENTS". Include all revisions, with special emphasis on electrical and mechanical divisions.  
1.12.3 Employ a competent computer draftsperson to indicate changes on the electronic set of record drawings. Provide updated record drawings in Adobe Acrobat 6.0 and AutoCAD Release 2013.  
1.12.4 Employ a competent specification writer to indicate changes to the electronic set of record specifications. Provide updated record specifications in Adobe Acrobat and Microsoft Word on CD-ROM.

2. **PRODUCTS** NOT APPLICABLE

3. **EXECUTION** NOT APPLICABLE

END OF SECTION

**1. GENERAL****1.1 Summary**

- 1.1.1 This Section covers generally the requirements for bases, supports, and vibration isolation for all equipment specified.

**1.2 Related Sections**

Not applicable

**1.3 Submittals**

- 1.3.1 Provide required information in accordance with Section 01 00 00 – General Requirements.
- 1.3.2 Submit vibration isolation schedule indicating the tag number of the equipment isolated, the type of base selected, the type of isolator selected, and the isolator static deflection chosen.
- 1.3.3 Submit shop drawings for all mounted mechanical equipment that reflects the dimensional and installation requirements of the approved piece of equipment submitted under different Sections. Include electrical motor isolation.
- 1.3.4 Submit proposed mounting detail drawings for approval by the Consultant if manufacturer's drawings are not available or suitable.
- 1.3.5 Submit report prepared by the isolation supplier that certifies that the installation has been checked and corrected as necessary.
- 1.3.6 Provide inspection services by vibration isolation equipment and materials manufacturer's representative for final installation.

**1.4 Quality Assurance**

- 1.4.1 Mount mechanical equipment in accordance with approved drawings and literature provided by the manufacturer and with the electric motor on the same base or frame as the driven equipment. Equipment to be mounted true and level so that operation will not be affected by weight.
- 1.4.2 Mount mechanical equipment on vibration isolators to minimize the transmission of vibrations to building structure.
- 1.4.3 All vibration control equipment shall be the product of one manufacturer. An exception to this is the vibration isolation supplied as an integral part of packaged equipment.
- 1.4.4 When all equipment is in operation, the vibration isolator system shall be checked by the product supplier for effectiveness and proper installation. Any isolation which is not performing as intended or which is not properly installed shall be replaced at no additional cost.
- 1.4.5 Provide isolation that will maintain stability during starting and stopping of equipment without any traverse and eccentric movement of equipment that would damage or adversely affect the equipment or attachments.
- 1.4.6 Isolators shall be selected and located to produce uniform loading and deflection even when equipment weight is not evenly distributed.

**2. PRODUCTS****2.1 Elastomeric Isolation**

- 2.1.1 Provide neoprene pads of cross-ribbed or waffle design where concentrated load bearing is encountered.



**3. EXECUTION****3.1 General**

- 3.1.1 Provide vibration isolation for all rotating equipment.

**3.2 Metal Supports**

- 3.2.1 Design, construct and install metal supports, stands, platforms, and other metal structures including maintenance platforms required for and associated with the mechanical equipment. Ensure that structures are designed so that loads and impact loads are properly distributed into building structure.
- 3.2.2 Supports must be large enough to support the equipment along the entire length and width. Adequate provision must be made to install isolators if necessary either below the support or between support and the equipment.

**3.3 Vibration Control Installation**

- 3.3.1 Manufacturer is to supervise the installation of vibration control equipment and issue certified report that the units have been properly installed and are performing with maximum efficiency.
- 3.3.2 Supply to the Vibration Isolation Manufacturer approved drawings of all equipment to be isolated.
- 3.3.3 All equipment shall be adequately isolated to maintain acceptable noise levels in the occupied areas of the building.
- 3.3.4 When all equipment is in operation, the vibration isolation system shall be checked for efficiency and installation. Replace at no additional cost any isolation which is not performing as intended or that is not properly installed.

**END OF SECTION**

**1. GENERAL****1.1 General scope of work**

- 1.1.1 General scope of work includes HVAC improvement for classroom areas, retrofit of existing boiler room, related electrical work and Building Automation System (BAS) upgrade for entire school as outline in Tender drawings and specifications.
- 1.1.2 For BAS refer to BAS Scope of work.
- 1.1.3 This section covers items common to all sections of mechanical systems.

**1.2 Equipment List**

- 1.2.1 Complete list of equipment and materials to be used on this project and forming part of tender documents by adding manufacturer's name, model number and details of materials, and submit for approval.

**1.3 Equipment Installation**

- 1.3.1 Unions or flanges: provide for ease of maintenance and disassembly.
- 1.3.2 Space for servicing, disassembly and removal of equipment and components: provide as recommended by manufacturer or as indicated.

**1.4 Electrical**

- 1.4.1 Electrical work to conform to the requirements of Ontario Electrical Safety Authority:
  - .1 This contractor shall be responsible for providing all electrical services, equipment, wiring, etc. as indicated on the mechanical drawings.
  - .2 This contractor shall be responsible for relocating existing electrical services, lighting, etc. as required to accommodate installation of new equipment.

**1.5 Equipment Supports**

- 1.5.1 Equipment supports supplied by equipment manufacturer.
- 1.5.2 Equipment supports not supplied by equipment manufacturer: fabricate from structural grade steel meeting requirements of Section 05 12 23- Structural Steel. Submit structural calculations with shop drawings.
- 1.5.3 Mount base mounted equipment on chamfered edge housekeeping pads, minimum of 100 mm high and 50 mm larger than equipment dimensions all around. Concrete specified in Section 03 05 10 - Cast-in-Place Concrete.

**1.6 Sleeves**

- 1.6.1 Pipe sleeves: at points where pipes pass through masonry, concrete or fire rated assemblies and as indicated.
- 1.6.2 Schedule 40 steel pipe.
- 1.6.3 Sleeves with annular fin continuously welded at midpoint:
  - .1 Through foundation walls.
  - .2 Where sleeve extends above finished floor.
- 1.6.4 Sizes: minimum 6 mm clearance all around, between sleeve and uninsulated pipe or between sleeve and insulation.
- 1.6.5 Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25 mm above other floors.
- 1.6.6 Fill voids around pipes:
  - .1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof fire retardant non-hardening mastic.
  - .2 Where sleeves pass through walls or floors, provide space for firestopping. Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.
  - .3 Ensure no contact between copper tube or pipe and ferrous sleeve.
  - .4 Fill future-use sleeves with lime plaster or other easily removable filler.

- .5 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CGSB 1-GP-181M+Amdt-Mar-78.

1.7 **Preparation for Firestopping**

- 1.7.1 Firestopping material and installation within annular space between pipes, ducts, insulation and adjacent fire separation.
- 1.7.2 Uninsulated unheated pipes not subject to movement: no special preparation.
- 1.7.3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe to move without damaging fire-stopping material.
- 1.7.4 Insulated pipes and ducts: ensure integrity of insulation and vapour barrier at fire separation.

1.8 **Tests**

- 1.8.1 Give written notice of date for tests.
- 1.8.2 Insulate or conceal work only after testing and approval by Engineer.
- 1.8.3 Bear costs including retesting and making good.
- 1.8.4 Piping:
- .1 General: maintain test pressure without loss for 4 h unless otherwise specified.
- .2 Hydraulically test hydronic piping systems at 1-1/2 times system operating pressure or minimum 860 kPa, whichever is greater.
- .3 Test fire systems in accordance with authorities having jurisdiction and as specified elsewhere.
- 1.8.5 Equipment: test as specified in relevant sections.
- 1.8.6 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures or test medium.

1.9 **Painting**

- 1.9.1 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.
- 1.9.2 Prime and touch up marred finished paintwork to match original.
- 1.9.3 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.

1.10 **Access Doors**

- 1.10.1 Supply access doors to concealed mechanical equipment for operating, inspecting, adjusting and servicing.
- 1.10.2 Flush mounted 600 x 600 mm for body entry and 300 x 300 mm for hand entry unless otherwise noted. Doors to open 180°, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.
- 1.10.3 Material:
- .1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Engineer.
- .2 Remaining areas: use prime coated and painted steel to match existing finish.
- 1.10.4 Installation:
- .1 Locate so that concealed items are accessible.
- .2 Locate so that hand or body entry (as applicable) is achieved.
- .3 Read and follow Manufacturer's Installation instructions.

1.11 **Dielectric Couplings**

- 1.11.1 General:
- .1 To be compatible with and to suit pressure rating of piping system.
- .2 Where pipes of dissimilar metals are joined.

- 1.11.2 Pipes NPS 2 and under: isolating unions.
- 1.11.3 Pipes NPS 2-1/2 and over: isolating flanges.

1.12 **Drain Valves**

- 1.12.1 Locate at low points and at section isolating valves unless otherwise specified.
- 1.12.2 Minimum NPS 3/4 unless otherwise specified: bronze, with hose end male thread and complete with cap and chain.

1.13 **Existing Systems**

- 1.13.1 Connections into existing systems to be made at time approved by Engineer. Request written approval of time when connections can be made.
- 1.13.2 Be responsible for damage to existing plant by this work.

1.14 **Cleaning**

- 1.14.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.
- 1.14.2 In preparation for final acceptance, clean and refurbish all equipment and leave in operating condition including replacement of all filters in all air and piping systems.

2. **PRODUCTS** NOT APPLICABLE

3. **EXECUTION** NOT APPLICABLE

**END OF SECTION**

1. **GENERAL**
  - 1.1 **References**
    - 1.1.1 Canadian General Standards Board (CGSB)
      - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
  - 1.2 **Waste Management and Disposal**
    - 1.2.1 Separate and recycle waste materials.
    - 1.2.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
    - 1.2.3 Collect and separate for disposal packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.
    - 1.2.4 Divert unused metal materials from landfill to metal recycling facility approved by Consultant.
2. **PRODUCTS**
  - 2.1 **NOT APPLICABLE**
3. **EXECUTION**
  - 3.1 **Connections to Equipment**
    - 3.1.1 In accordance with manufacturer's instructions unless otherwise indicated.
    - 3.1.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
    - 3.1.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.
  - 3.2 **Clearances**
    - 3.2.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.
    - 3.2.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, and components.
  - 3.3 **Drains**
    - 3.3.1 Install piping with grade in direction of flow except as indicated.
    - 3.3.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.
    - 3.3.3 Pipe each drain valve discharge separately to above floor drain. Discharge to be visible.
    - 3.3.4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.
  - 3.4 **Air Vents**
    - 3.4.1 Install manual air vents at high points in piping systems.
    - 3.4.2 Install isolating valve at each automatic air valve.
    - 3.4.3 Install drain piping to approved location and terminate where discharge is visible.
  - 3.5 **Dielectric Couplings**
    - 3.5.1 General: Compatible with system, to suit pressure rating of system.
    - 3.5.2 Locations: Where dissimilar metals are joined.
    - 3.5.3 NPS 2 and under: isolating unions or bronze valves.
    - 3.5.4 Over NPS 2: Isolating flanges.
  - 3.6 **Pipework Installation**
    - 3.6.1 Screwed fittings jointed with Teflon tape.
    - 3.6.2 Protect openings against entry of foreign material.

- 3.6.3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
  - 3.6.4 Assemble piping using fittings manufactured to ANSI standards.
  - 3.6.5 Saddle type branch fittings may be used on mains if branch line is no larger than half the size of main.
    - .1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.
  - 3.6.6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
  - 3.6.7 Install concealed pipework to minimize furring space, maximize headroom, and conserve space.
  - 3.6.8 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
  - 3.6.9 Install, except where indicated, to permit separate thermal insulation of each pipe.
  - 3.6.10 Group piping wherever possible and as indicated.
  - 3.6.11 Ream pipes, remove scale and other foreign material before assembly.
  - 3.6.12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
  - 3.6.13 Provide for thermal expansion as indicated.
  - 3.6.14 Valves:
    - .1 Install in accessible locations.
    - .2 Remove interior parts before soldering.
    - .3 Install with stems above horizontal position unless otherwise indicated.
    - .4 Valves accessible for maintenance without removing adjacent piping.
    - .5 Install globe valves in bypass around control valves.
    - .6 Use gate, ball, or butterfly valves at branch take-offs for isolating purposes except where otherwise specified.
    - .7 Install butterfly valves between weld neck flanges to ensure full compression of liner.
    - .8 Install plug cocks or ball valves for glycol service.
    - .9 Use chain operators on valves NPS 2-1/2 and larger where installed more than 2400 mm above floor in Mechanical Rooms.
  - 3.6.15 Check Valves:
    - .1 Install silent check valves on discharge of pumps and elsewhere as indicated.
    - .2 Install swing check valves in horizontal lines on discharge of pumps and elsewhere as indicated.
- 3.7 **Sleeves**
- 3.7.1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.
  - 3.7.2 Material: Schedule 40 black steel pipe.
  - 3.7.3 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.
  - 3.7.4 Installation:
    - .1 Concrete, masonry walls, concrete floors on grade: Terminate flush with finished surface.
    - .2 Other floors: Terminate 25 mm above finished floor.
    - .3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.
  - 3.7.5 Sealing:
    - .1 Foundation walls and below grade floors: Fire retardant, waterproof non-hardening mastic.
    - .2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.
    - .3 Sleeves installed for future use: Fill with lime plaster or other easily removable filler.

- .4 Ensure no contact between copper pipe or tube and sleeve.

3.8 **Escutcheons**

- 3.8.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.
- 3.8.2 Construction: One piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.
- 3.8.3 Sizes: Outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

3.9 **Preparation for Firestopping**

- 3.9.1 Uninsulated unheated pipes not subject to movement: No special preparation.
- 3.9.2 Uninsulated heated pipes subject to movement: Wrap with non-combustible smooth material to permit pipe movement without damaging fire stopping material or installation.
- 3.9.3 Insulated pipes and ducts: Ensure integrity of insulation and vapour barriers.

3.10 **Flushing Out of Piping Systems**

- 3.10.1 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 11 - Cleaning supplemented as specified.
- 3.10.2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.11 **Pressure Testing of Equipment and Pipework**

- 3.11.1 Advise Consultant prior to performance of pressure tests.
- 3.11.2 Pipework: Test as specified in relevant sections of Division 15.
- 3.11.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant sections of Division 23.
- 3.11.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.
- 3.11.5 Pay costs for repairs or replacement, retesting, and making good. Consultant to determine whether repair or replacement is appropriate.
- 3.11.6 Insulate or conceal work only after approval and certification of tests Consultant.

3.12 **Existing Systems**

- 3.12.1 Connect into existing piping systems at times approved by Consultant.
- 3.12.2 Request written approval 10 days minimum, prior to commencement of work.
- 3.12.3 Be responsible for damage to existing plant by this work.
- 3.12.4 Ensure daily clean-up of existing areas.

**END OF SECTION**

**1 GENERAL****1.1 References**

- 1.1.1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
  - .1 ANSI/ASME B31.1-1998, Power Piping.
  - .2 ANSI/ASME B31.3-2000, Process Piping Addenda A.
  - .3 ANSI/ASME B31.3-2001, Process Piping Addenda B.
  - .4 ANSI/ASME Boiler and Pressure Vessel Code-1998:
    - .1 Section I: Power Boilers.
    - .2 Section V: Nondestructive Examination.
    - .3 Section IX: Welding and Brazing Qualifications.
- 1.1.2 American National Standards Institute/American Water Works Association (ANSI/AWWA)
  - .1 ANSI/AWWA C206-97, Field Welding of Steel Water Pipe.
- 1.1.3 American Welding Society (AWS)
  - .1 AWS C1.1-2000, Recommended Practices for Resistance Welding.
  - .2 AWS Z49.1-1999, Safety Welding, Cutting and Allied Process.
  - .3 AWS W1-2000, Welding Inspection Handbook..
- 1.1.4 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-48.2-92, Spot Radiography of Welded Butt Joints in Ferrous Materials.
- 1.1.5 Canadian Standards Association (CSA International)
  - .1 CSA W47.2-M1987(R1998), Certification of Companies for Fusion Welding of Aluminum.
  - .2 CSA W48 series-01, Filler Metals and Allied Materials for Metal Arc Welding.
  - .3 CSA B51-97, Boiler, Pressure Vessel and Pressure Piping Code.
  - .4 CSA-W117.2-01, Safety in Welding, Cutting and Allied Processes.
  - .5 CSA W178.1-02, Certification of Welding Inspection Organizations.
  - .6 CSA W178.2-01, Certification of Welding Inspectors.

**1.2 Qualifications**

- 1.2.1 Welders
  - .1 Welding qualifications in accordance with CSA B51.
  - .2 Use qualified and licensed welders possessing certificate for each procedure performed from authority having jurisdiction.
  - .3 Furnish welder's qualifications to Mechanical Consultant.
  - .4 Each welder to possess identification symbol issued by authority having jurisdiction.
  - .5 Certification of companies for fusion welding of aluminum in accordance with CSA W47.2.
- 1.2.2 Inspectors
  - .1 Inspectors qualified to CSA W178.2.

**1.3 Quality Assurance**

- 1.3.1 Registration of welding procedures in accordance with CSA B51.
- 1.3.2 Copy of welding procedures available for inspection.
- 1.3.3 Safety in welding, cutting and allied processes in accordance with CSA-W117.2.

**2 PRODUCTS****2.1 Electrodes**

- 2.1.1 Electrodes: in accordance with CSA W48 Series.



**3 EXECUTION****3.1 Workmanship**

- 3.1.1 Welding: in accordance with ANSI/ASME B31.1/B31.3, ANSI/ASME Boiler and Pressure Vessel Code, Sections I and IX and ANSI/AWWA C206, using procedures conforming to AWS B3.0, AWS C1.1, applicable requirements of provincial authority having jurisdiction.

**3.2 Installation Requirements**

- 3.2.1 Identify each weld with welder's identification symbol.
- 3.2.2 Backing rings:
- .1 Where used, fit to minimize gaps between ring and pipe bore.
  - .2 Do not install at orifice flanges.
- 3.2.3 Fittings:
- .1 NPS 2 and smaller: install welding type sockets.
  - .2 Branch connections: install welding tees or forged branch outlet fittings.

**3.3 Inspection and Tests – General Requirements**

- 3.3.1 Review weld quality requirements and defect limits of applicable codes and standards with mechanical consultant before work is started.
- 3.3.2 Formulate "Inspection and Test Plan" in co-operation with mechanical consultant.
- 3.3.3 Do not conceal welds until they have been inspected, tested and approved by inspector.
- 3.3.4 Provide for inspector to visually inspect welds during early stages of welding procedures in accordance with Welding Inspection Handbook. Repair or replace defects as required by codes and as specified.

**3.4 Specialist Examinations and Tests**

- 3.4.1 General
- .1 Perform examinations and tests by specialist qualified in accordance with CSA W178.1 and CSA W178.2 and approved by mechanical consultant.
  - .2 To ANSI/ASME Boiler and Pressure Vessels Code, Section V, CSA B51 and requirements of authority having jurisdiction.
  - .3 Inspect and test 90% of welds in accordance with "Inspection and Test Plan" by non-destructive visual.
- 3.4.2 Hydrostatically test welds to requirements of ANSI/ASME B31.1.
- 3.4.3 Visual examinations: include entire circumference of weld externally and [wherever possible] internally.
- 3.4.4 Failure of visual examinations:
- .1 Upon failure of welds by visual examination, perform additional testing as directed by mechanical consultant.

**3.5 Defects Causing Rejection**

- 3.5.1 As described in ANSI/ASME B31.1 and ANSI/ASME Boiler and Pressure Vessels Code.

**3.6 Repair of Welds Which Failed Tests**

- 3.6.1 Re-inspect and re-test repaired or re-worked welds at Contractor's expense.

**END OF SECTION**

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**1. GENERAL****1.1 Section Includes**

- 1.1.1 Materials and installation for thermometers and pressure gauges in piping systems.

**1.2 References**

- 1.2.1 American Society of Mechanical Engineers (ASME).
  - .1 ASME B40.100-01, Pressure Gauges and Gauge Attachments.
  - .2 ASME B40.200-01, Thermometers, Direct Reading and Remote Reading.
- 1.2.2 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB-14.4-M88, Thermometers, Liquid-in-Glass, Self Indicating, Commercial/Industrial Type.
  - .2 CAN/CGSB-14.5-M88, Thermometers, Bimetallic, Self-Indicating, Commercial/Industrial Type.

**1.3 Submittals**

- 1.3.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- 1.3.2 Submit shop drawings and product data.
- 1.3.3 Submit manufacturer's product data for following items:
  - .1 Thermometers.
  - .2 Pressure gauges.
  - .3 Stop cocks.
  - .4 Syphons.
  - .5 Wells.

**2. PRODUCTS****2.1 General**

- 2.1.1 Design point to be at mid-point of scale or range.
- 2.1.2 Ranges:
  - .1 Pressure: 0 to 100 psig
  - .2 Temperature: 0 to 200°F

**2.2 Direct Reading Thermometers**

- 2.2.1 Industrial, variable angle type, liquid filled, 125mm scale length: to CAN/CGSB14.4 and ASME B40.200.

**2.3 Remove Reading Thermometers**

- 2.3.1 100mm diameter mercury-free activated dial type: to CAN/CGSB-14.5 and ASME B40.200, accuracy within one scale division, brass movement, stainless steel capillary, stainless steel spiral armour, stainless steel bulb and polished stainless steel case for wall mounting.

**2.4 Thermometer Wells**

- 2.4.1 Copper pipe: copper or bronze.
- 2.4.2 Steel pipe: brass or stainless steel.

**2.5 Pressure Gauges**

- 2.5.1 112mm, dial type: to ASME B40.100, Grade 2A, phosphor bronze bourdon tube having 0.5% accuracy full scale unless otherwise specified.
- 2.5.2 Provide:
  - .1 Snubber for pulsating operation.
  - .2 Diaphragm assembly for corrosive service.
  - .3 Gasketed pressure relief back with solid front.
  - .4 Bronze stop cock.

**2.6 Tridicator**

- 2.6.1 75 mm, dial type that measures both pressure and temperature on the same dial. Temperature indicator shall be dual scale (°F & °C), Brass wetted parts, and be available in multiple pressure and temperature ranges. Accuracy shall be:
- .1 Pressure: +/- 2-3-2%
  - .2 Temperature: +/- 3% of full scale

**3. EXECUTION****3.1 General**

- 3.1.1 Install so they can be easily read from floor or platform. If this cannot be accomplished, install remote reading units.
- 3.1.2 Install between equipment and first fitting or valve.

**3.2 Thermometers**

- 3.2.1 Install in wells on piping. Provide heat conductive material inside well.
- 3.2.2 Install in locations as indicated and on inlet and outlet of:
- .1 Each Boiler and hot water tank.
- 3.2.3 Install wells as indicated only for balancing purposes.
- 3.2.4 Use extensions where thermometers are installed through insulation.

**3.3 Pressure Gauges**

- 3.3.1 Install in following locations:
- .1 Suction and discharge of pumps.
  - .2 Upstream and downstream of PRV's.
  - .3 Upstream and downstream of control valves.
  - .4 Inlet and outlet of coils.
  - .5 Inlet and outlet of liquid side of heat exchangers.
  - .6 Outlet of boilers.
  - .7 In other locations as indicated.
- 3.3.2 Install gauge cocks for balancing purposes, elsewhere as indicated.
- 3.3.3 Use extensions where pressure gauges are installed through insulation.

**END OF SECTION**

**1**      **GENERAL****1.1**      **References**

- 1.1.1 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME).
  - .1 ANSI/ASME B1.20.1-Latest Editions, Pipe Threads, General Purpose (Inch).
- 1.1.2 American Society for Testing and Materials (ASTM).
  - .1 ASTM A276- Latest Editions, Specification for Stainless and Heat Resisting Steel Bars and Shapes.
  - .2 ASTM B62- Latest Editions, Specification for Composition Bronze or Ounce Metal Castings.
  - .3 ASTM B283- Latest Editions, Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).
  - .4 ASTM B505- Latest Editions, Specification for Copper-Base Alloy Continuous Castings.
- 1.1.3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
  - .1 SP-25- Latest Editions, Standard Marking System for Valves, Fittings, Flanges and Unions.
  - .2 SP-80- Latest Editions, Bronze Gate Globe, Angle and Check Valves.

**1.2**      **Product Data**

- 1.2.1 Submit data for all valves specified this section.

**2**      **PRODUCTS****2.1**      **General**

- 2.1.1 Except for specialty valves, to be single manufacturer.

**2.2**      **End Connections**

- 2.2.1 Connection into adjacent piping/tubing:
  - .1 Steel pipe systems: Screwed ends.
  - .2 Copper tube systems: Solder ends.

**2.3**      **Gate Valves**

- 2.3.1 Requirements common to all gate valves, unless specified otherwise:
  - .1 Standard specification: MSS SP-80.
  - .2 Bonnet: with hex. shoulders.
  - .3 Connections: with hex. shoulders.
  - .4 Inspection and pressure testing: to MSS SP-80. Tests to be hydrostatic.
  - .5 Packing: high grade non-asbestos packing.
  - .6 Handwheel: non-ferrous. Nut: bronze to ASTM B 62.
- 2.3.2 NPS 2 and under, non-rising stem, solid wedge disc, Class 125:
  - .1 Body: with long disc guides, screwed bonnet with stem retaining nut.
  - .2 WP = 860 kPa steam, 1.4 MPa WOG.
  - .3 Operator: Handwheel.
- 2.3.3 NPS 2 and under, rising stem, solid wedge disc, Class 125:
  - .1 Body: with long disc guides, screwed bonnet.
  - .2 WP = 860 MPa steam, 1.4 MPa WOG.
  - .3 Operator: Handwheel.

**2.4**      **Circuit-Balance Valves (1/2" TO 2")**

- 2.4.1 Furnish and install, as shown on plans and in accordance to manufacturer's installation instructions, Armstrong Circuit Balancing Valves. Valves are to be of the 'Y' pattern, equal percentage globe-style and provide three functions: 1)

Precise flow measurement, 2) Precision flow balancing, 3) Positive drip-tight shut-off.

- 2.4.2 Valve shall provide multi-turn, 360° adjustment with micrometer type indicators located on the valve handwheel. Valves shall have a minimum of five full 360° handwheel turns. 90° 'circuit-setter' style ball valves are not acceptable. Valve handle shall have hidden memory feature, which will provide a means for locking the valve position after the system is balanced.
- 2.4.3 Valves shall be furnished with precision machined venturi built into the valve body to provide highly accurate flow measurement and flow balancing. The venturi shall have two, 1/4" threaded brass metering ports with check valves and gasketed caps located on the inlet side of the valve. Valves shall be furnished with flow smoothing fins downstream of the valve seat and integral to the forged valve body to make the flow more laminar. The valve body, stem and plug shall be brass. The handwheel shall be high-strength resin.

## 2.5 Check Valves

- 2.5.1 Requirements common to all check valves, unless specified otherwise:
  - .1 Standard specification: MSS SP-80.
  - .2 Connections: with hex. shoulders.
- 2.5.2 NPS 2 and under, swing type, bronze disc, Class 125:
  - .1 Body: Y-pattern with integral seat at 45°, screw-in cap with hex head.
  - .2 WP = 860 kPa steam, 1.4 MPa WOG.
  - .3 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.
- 2.5.3 NPS 2 and under, vertical lift type, bronze disc, Class 125:
  - .1 Body: with integral seat. WP = 860 kPa steam, 1.4 MPa WOG.
  - .2 Disc: rotating disc having guides top and bottom, disc guides, retaining rings.

## 2.6 Ball Valves

- 2.6.1 NPS 2 and under:
  - .1 Body and cap: cast high tensile bronze to ASTM B62.
  - .2 Pressure rating: Class 125, 860 kPa steam, WP = 1.4 MPa WOG.
  - .3 Connections: Screwed ends to ANSI B1.20.1 and with hex. shoulders or solder ends to ANSI.
  - .4 Stem: tamperproof ball drive.
  - .5 Stem packing nut: external to body.
  - .6 Ball and seat: replaceable stainless steel solid ball and teflon seats.
  - .7 Stem seal: TFE with external packing nut.
  - .8 Operator: removable lever handle.

# 3 EXECUTION

## 3.1 Installation

- 3.1.1 Install rising stem valves in upright position with stem above horizontal.
- 3.1.2 Remove internal parts before soldering.

**END OF SECTION**

**1. General****1.1 SUMMARY**

- 1.1.1 Section Includes:
  - .1 Valves, gate, globe, and check.
- 2.1.1 Related Sections:
  - .1 Section [01 33 00 - Submittal Procedures].
  - .2 Section [01 78 10 - Closeout Submittals].
  - .3 Section [23 05 05 - Installation of Pipework].

**1.2 REFERENCES**

- 2.2.2 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME).
  - .1 ANSI/ASME B16.1-[1998], Cast Iron Pipe Flanges and Flanged Fittings.
- 2.2.3 American Society for Testing and Materials International (ASTM).
  - .1 ASTM A49-[01], Specification for Heat-Treated Carbon Steel Joint Bars.
  - .2 ASTM A126-[95(2001)], Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
  - .3 ASTM B61-[93], Specification for Steam or Valve Bronze Castings.
  - .4 ASTM B62-[93], Specification for Composition Bronze or Ounce Metal Castings.
  - .5 ASTM B85-[03], Specification for Aluminum-Alloy Die Castings.
  - .6 ASTM B209-[04], Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- 2.2.4 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
  - .1 MSS SP-70-[1998], Cast Iron Gate Valves, Flanged and Threaded Ends.
  - .2 MSS SP-71-[1997], Grey Iron Swing Check Valves, Flanged and Threaded Ends.
  - .3 MSS SP-82-[1992], Valve Pressure Testing Methods.
  - .4 MSS SP-85-[2002], Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

**1.3 SUBMITTALS**

- 2.2.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures
- 2.3.2 Product Data:
  - .1 Submit shop drawings and product data in accordance with Section [01 33 00 - Submittal Procedures]
  - .2 Submit data for valves specified in this section.
- 2.3.3 Closeout Submittals:
  - .1 Submit maintenance data for incorporation into manual specified in Section [01 78 10 - Closeout Submittals]

**1.4 QUALITY ASSURANCE**

- 2.4.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section [01 35 30 - Health and Safety Requirements]

## **2 Products**

### **2.1 MATERIAL**

#### **2.1.1 Valves:**

.1 Except for specialty valves, to be of single manufacturer.

#### **2.1.2 Standard specifications:**

.1 Gate valves: MSS SP-70.

.2 Globe valves: MSS SP-85.

.3 Check valves: MSS SP-71.

#### **2.1.3 Requirements common to valves, unless specified otherwise:**

.1 Body, bonnet: cast iron to ASTM B209 Class B.

.2 Connections: flanged ends [plain face] [with 2 mm raised face with serrated finish] to ANSI B16.1.

.3 Inspection and pressure testing: to MSS SP-82.

.4 Bonnet gasket: non-asbestos.

.5 Stem: to have precision-machined Acme or 60 degrees V threads, top screwed for handwheel nut.

.6 Stuffing box: non-galling two-piece ball-jointed packing gland, gland bolts and nuts.

.7 Gland packing: non-asbestos.

.8 Handwheel: Die-cast aluminum alloy to ASTM B85 or malleable iron to ASTM A49. Nut of bronze to ASTM B62.

.9 Identification tag: with catalogue number, size, other pertinent data.

#### **2.1.4 All products to have CRN registration numbers.**

### **2.2 GATE VALVES**

#### **2.2.1 NPS 2 1/2 - 8, non rising stem, inside screw, [bronze] [iron] trim, solid wedge disc:**

.1 Body and multiple-bolted bonnet: with bosses in body and bonnet for taps and drains, full length disc guides designed to ensure correct re-assembly. Class 125.

.2 Disc: solid offset taper wedge, bronze to ASTM B62.

.3 Seat rings: renewable bronze to ASTM B62, screwed into body.

.4 Stem: bronze to ASTM B62.

.5 Disc: solid offset taper wedge, cast iron to ASTM A126 Class B, secured to wrought steel stem.

.6 Seat: Integral with body.

.7 Stem: wrought steel..

.8 Operator: per application

.9 Bypass: complete with union and NPS valve as Section 23 05 23.01 - Valves - Bronze

#### **2.2.2 NPS 10 - 24, non rising stem, inside crew, [bronze] [iron] trim, solid wedge disc:**

- 
- .1 Body and multiple-bolted bonnet: cast iron to ASTM A126 Class B for sizes up to NPS 14, Class C for sizes NPS 16 and over, with bosses in body and bonnet for taps and drains, full length disc guides designed to ensure correct re-assembly, body tie ribs between bonnet and end flanges.
  - .2 Pressure ratings: Class 125.
  - .3 Disc: solid offset taper wedge, with bronze rings to ASTM B62 rolled into cast iron disc, secured to stem.
  - .4 Seat rings: renewable bronze to ASTM B62 screwed into body.
  - .5 Stem: bronze to ASTM B62.
  - .6 Disc: solid offset taper wedge, cast iron secured to stem.
  - .7 Seat: integral with body up to NPS 14, renewable nodular iron on other sizes.
  - .8 Stem: wrought steel.
  - .9 Operator: per application
  - .10 Bypass: complete with union and NPS valve as Section 23 05 05 - Installation of Pipework,
- 2.2.3 NPS 2 1/2-8, outside screw and yoke (OS&Y), [bronze] [iron] trim, solid wedge disc:
- .1 Body and multiple-bolted bonnet: with bosses in body and bonnet for taps and drains, full length disc guides designed to ensure correct re-assembly, yoke, yoke hub, yoke sleeve and nut. Class 125.
  - .2 Disc: solid offset taper wedge, bronze to ASTM B62 up to NPS 3, cast iron with bronze disc rings on other sizes, secured to stem through integral forged T-head disc-stem connection.
  - .3 Seat rings: renewable bronze screwed into body.
  - .4 Stem: [nickel-plated steel] [manganese-bronze].
  - .5 Disc: solid offset taper all-cast iron, secured to stem through integral forged T-head disc-stem connection.
  - .6 Seat rings: integral with body.
  - .7 Stem: nickel-plated steel.
  - .8 Pressure-lubricated operating mechanism.
  - .9 Operator: per application
  - .10 Bypass: complete with union and NPS valve as Section 23 05 05 - Installation of Pipework
- 2.2.4 NPS 10 - 24, outside screw and yoke (OS&Y), [bronze] [iron] trim, solid wedge disc:
- .1 Body and multiple-bolted bonnet: NPS 10 - 14: cast iron to ASTM A126 Class B. With bosses in body and bonnet for taps and drains, full length disc guides designed to ensure correct re-assembly, body tie ribs between bonnet and end flanges, yoke, yoke hub, yoke sleeve and nut.
  - .2 Pressure ratings: Class 125.
  - .3 NPS 10-12: WP = 1.4 Mpa CWP.
  - .4 NPS 14-24: WP = 1.03 Mpa CWP.
  - .5 Disc: solid offset taper wedge, bronze disc rings to ASTM B62 rolled into cast iron disc, secured to stem through integral forged T-head disc-stem connection.
  - .6 Seat rings: renewable bronze to ASTM B62 screwed into body.



- .7 Stem: [nickel-plated steel] [manganese-bronze].
- .8 Disc: solid offset taper all-cast iron, secured to stem through integral forged T-head disc-stem connection.
- .9 Seat: integral with body up to NPS 14, renewable nodular iron on other sizes.
- .10 Stem: nickel-plated steel.
- .11 Pressure-lubricated operating mechanism.
- .12 Operator: per application
- .13 Bypass: complete with union and NPS valve as Section 23 05 23.01 - Valves - Bronze

### 2.3 UNDERWRITERS APPROVED GATE VALVE

#### 2.3.1 NPS 2 1/2 - 14, OS&Y:

- .1 Approvals: UL and FM approved for fire service.
- .2 UL and FM Label: on valve yoke.
- .3 Body, Bonnet: cast iron to ASTM A126 Class B. Wall thicknesses to ANSI B16.1 and ULC 262 (B).
- .4 Bonnet bushing, yoke sleeve: bronze, to FM requirements.
- .5 Packing gland: bronze.
- .6 Stem: manganese bronze. Diameter to ULC C-262 (B).
- .7 Stuffing box dimensions, gland bolt diameter: to ULC C-262 (B).
- .8 Bosses for bypass valve, drain: on NPS 4 and over.
- .9 Disc: solid taper wedge. Up to NPS 3: bronze. NPS 4 and over: cast iron with bronze disc rings.
- .10 Disc seat ring: self-aligning, Milwood undercut on NPS 3 - 12.
- .11 Pressure rating:
- .12 NPS 2-1/2 - 12: 1.7 Mpa CWP.
- .13 NPS 14-1.2: 1.2 MPa CWP.
- .14 Operator: handwheel.

### 2.4 GLOBE VALVES

#### 2.4.1 NPS 2 1/2 - 10, OSY:

- .1 Body: with multiple-bolted bonnet.
- .2 WP: 860 kPa steam, 1.4 MPa CWP.
- .3 Bonnet-yoke gasket: non-asbestos.
- .4 Disc: bronze to ASTM B62, fully guided from bottom, securely yet freely connected to stem for swivel action and accurate engagement with disc.
- .5 Seat ring: renewable, regrindable, screwed into body.
- .6 Stem: bronze to ASTM B62.
- .7 Operator: per application.

### 2.5 BYPASSES FOR GATE AND GLOBE VALVES

- 2.5.1 Locations: on valves as indicated.
- 2.5.1 Position of bypass valve on main valves: [\_\_\_\_].
- 2.5.2 Size of bypass valve:
  - .1 Main valve up to NPS 8: NPS 3/4.
  - .2 Main valve NPS 10 and over: NPS 1.
- 2.5.3 Type of bypass valves:

- .1 On gate valve: globe, to Section 23 05 23.01 - Valves - Bronze. Pressure rating to match main valve.
- .2 On globe valve: globe, to Section 23 05 23.01 - Valves - Bronze. Pressure rating to match main valve.

## 2.6 VALVE OPERATORS

### 2.6.1 Install valve operators as follows:

- .1 Handwheel: per application
- .2 Handwheel with chain operators: on valves installed more than 2400 mm above floor in boiler rooms and mechanical equipment rooms.

## 2.7 CHECK VALVES

### 2.7.1 Swing check valves, Class 125:

- .1 Body and bolted cover: with tapped and plugged opening on each side for hinge pin. Flanged ends: plain faced with smooth finish.
- .2 Up to NPS 16: cast iron to ASTM A126 Class B.
- .3 NPS 18 and over: cast iron to ASTM A126 Class C.
- .4 Ratings:
- .5 NPS 2 1/2 - 12: 860 kPa steam; 1.4 MPa CWP.
- .6 NPS 14 - 16: 860 kPa steam; 1.03 MPa CWP.
- .7 NPS 18 and over: 1.03 MPa CWP.
- .8 Disc: rotating for extended life.
- .9 Up to NPS 6: bronze to ASTM B 62.
- .10 NPS 8 and over: bronze-faced cast iron.
- .11 Seat rings: renewable bronze to ASTM B62 screwed into body.
- .12 Hinge pin, bushings: renewable bronze to ASTM B62.
- .13 Disc: A126 Class B, secured to stem, rotating for extended life.
- .14 Seat: cast iron, integral with body.
- .15 Hinge pin: exelloy; bushings: malleable iron.
- .16 Identification tag: fastened to cover.
- .17 Hinge: galvanized malleable iron.

### 2.7.2 Swing check valves, NPS 2 1/2 - 8 Class 250:

- .1 Body and bolted cover: cast iron to ASTM A126 Class B with tapped and plugged opening on each side for hinge pin.
- .2 Flanged ends: 2 mm raised face with serrated finish.
- .3 Rating: 250 psi steam; 500 psi CWP.
- .4 Disc: rotating for extended life.
- .5 Up to NPS 3: bronze to ASTM B61.
- .6 NPS 4 - 8: Iron faced with ASTM B61 bronze.
- .7 Seat rings: renewable bronze to ASTM B61, screwed into body.
- .8 Hinge pin, bushings: renewable, bronze to ASTM B61.
- .9 Hinge: galvanized malleable iron.
- .10 Identification tag: fastened to cover.

## 2.8 SILENT CHECK VALVES

### 2.8.1 Construction:

- .1 Body: [malleable] [or] [ductile iron] with integral seat.

23.2

- .2 Pressure rating: class 125, WP = 860 kPa.
- .3 Connections: grooved ends.
- .4 Disc: [bronze] [or] [stainless steel] renewable rotating disc.
- .5 Seat: renewable, EPDM.
- .6 Stainless steel spring, heavy duty.

### **3 Execution**

#### **3.1 INSTALLATION**

- 3.1.1 Install rising stem valves in upright position with stem above horizontal.

#### **3.2 VERIFICATION**

- 3.2.1 Verification requirements, include:
  - .1 Materials and resources.
  - .2 Storage and collection of recyclables.
  - .3 Construction waste management.
  - .4 Resource reuse.
  - .5 Local/regional materials.
  - .6 Low-emitting materials.

**END OF SECTION**

**1. GENERAL****1.1 References**

- 1.1.1 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME)
  - .1 ANSI/ASME B31.1-1989, Power Piping, (SI Edition).
- 1.1.2 American Society for Testing and Materials (ASTM)
  - .1 ASTM A 125-81(1988), Specification for Steel Springs, Helical, Heat-Treated.
  - .2 ASTM A 307-94, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .3 ASTM A 563-94, Specification for Carbon and Alloy Steel Nuts.
- 1.1.3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
  - .1 MSS SP-58-1988, Pipe Hangers and Supports - Materials, Design and Manufacture.
  - .2 MSS SP-69-1983, Pipe Hangers and Supports - Erection and Application.

**1.2 Design Requirements**

- 1.2.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
- 1.2.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP-58.
- 1.2.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
- 1.2.4 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
- 1.2.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP-58.

**1.3 Shop Drawings and Product Data**

- 1.3.1 Submit shop drawings and product data for following items:
  - .1 All bases, hangers and supports.
  - .2 Connections to equipment and structure.
  - .3 Structural assemblies.

**1.4 Maintenance Data**

- 1.4.1 Provide maintenance data for incorporation into manual (Operation and Maintenance Manual).

**2. PRODUCTS****2.1 General**

- 2.1.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS-SP-58.
- 2.1.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

**2.2 Pipe Hangers**

- 2.2.1 Finishes:
  - .1 Pipe hangers and supports: galvanized painted with zinc-rich paint after manufacture.
  - .2 Use electro-plating galvanizing process or hot dipped galvanizing process.
  - .3 Ensure steel hangers in contact with copper piping are copper plated.
- 2.2.2 Upper attachment structural: Suspension from lower flange of I-Beam.

- 
- .1 Cold piping HPS 2 maximum: Ductile iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.
        - .1 Rod: 9 mm UL listed.
      - .2 Cold piping NPS 2 1/2 or greater, all hot piping: Malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed and FM approved to MSS-SP-58 and MSS-SP-69.
    - 2.2.3 Upper attachment structural: Suspension from upper flange of I-Beam.
      - .1 Cold piping NPS 2 maximum: Ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed and FM approved to MSS-SP-69.
      - .2 Cold piping NPS 2 1/2 or greater, all hot piping: Malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed and FM approved.
    - 2.2.4 Upper attachment to concrete.
      - .1 Ceiling: Carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.
      - .2 Concrete inserts: wedge shaped body with knockout protector plate UL listed and FM approved to MSS-SP-69.
    - 2.2.5 Shop and field-fabricated assemblies.
      - .1 Trapeze hanger assemblies
      - .2 Steel brackets
    - 2.2.6 Hanger rods: threaded rod material to MSS SP-58.
      - .1 Ensure that hanger rods are subject to tensile loading only.
      - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
      - .3 Do not use 22 mm or 28 mm rod.
    - 2.2.7 Pipe attachments: material to MSS SP-58.
      - .1 Attachments for steel piping: carbon steel galvanized.
      - .2 Attachments for copper piping: copper plated black steel.
      - .3 Use insulation shields for hot pipework.
    - 2.2.8 Oversize pipe hangers and supports to accommodate thermal insulation and to avoid piercing vapour retarder.
    - 2.2.9 Adjustable clevis: material to MSS SP-69 UL listed and FM approved, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
      - .1 Ensure "U" has hole in bottom for riveting to insulation shields.
    - 2.2.10 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP-69.
    - 2.2.11 U-bolts: carbon steel to MSS SP-69 with 2 nuts at each end to ASTM A 563.
      - .1 Finishes for steel pipework: black.
      - .2 Finishes for copper, glass, brass or aluminum pipework: galvanized, with formed portion plastic coated.
    - 2.2.12 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP-69.
  - 2.3 **Riser Clamps**
    - 2.3.1 Steel or cast iron pipe: black carbon steel to MSS-SP-58, type 42, UL listed and FM approved.
    - 2.3.2 Copper pipe: carbon steel copper plated to MSS-SP-58, type 42.
    - 2.3.3 Bolts: to ASTM A 307.
    - 2.3.4 Nuts: to ASTM A 563.
  - 2.4 **Insulation Protection Shields**
    - 2.4.1 Insulated cold piping:

- 
- .1 64 kg/m<sup>3</sup> density insulation plus insulation protection shield to: MSS SP-69, galvanized sheet carbon steel. Length designed for maximum 3 m span.
    - 2.4.2 Insulated hot piping:
      - .1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP-69.
  - 2.5 **Constant Support Spring Hangers**
    - 2.5.1 Springs: alloy steel to ASTM A 125, shot peened, magnetic particle inspected, with +/- 5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.
    - 2.5.2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.
    - 2.5.3 Provide upper and lower factory set travel stops.
    - 2.5.4 Provide load adjustment scale for field adjustments.
    - 2.5.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.
    - 2.5.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.
  - 2.6 **Equipment Supports**
    - 2.6.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel. Submit calculations with shop drawings.
  - 2.7 **Equipment Anchor Bolts and Templates**
    - 2.7.1 Provide templates to ensure accurate location of anchor bolts.
  - 2.8 **Other Equipment Supports**
    - 2.8.1 From structural grade steel
    - 2.8.2 Submit structural calculations with shop drawings.
3. **EXECUTION**
- 3.1 **Installation**
    - 3.1.1 Install in accordance with:
      - .1 Manufacturer's instructions and recommendations.
    - 3.1.2 Vibration Control Devices:
      - .1 Install on piping systems at pumps, boilers, chillers, cooling towers, elsewhere as indicated.
    - 3.1.3 Clamps on riser piping:
      - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
      - .2 Bolt-tightening torques to be to industry standards.
      - .3 Steel pipes: Install below coupling or shear lugs welded to pipe.
      - .4 Cast iron pipes: Install below joint.
    - 3.1.4 Clevis plates:
      - .1 Attach to concrete with 4 minimum concrete inserts at each corner.
    - 3.1.5 Provide supplementary structural steelwork where structural bearings to not exist or where concrete inserts are not in correct locations.
    - 3.1.6 Use approved constant support type hangers where:
      - .1 vertical movement of pipework is 13 mm or more,
      - .2 transfer of load to adjacent hangers or connected equipment is not permitted.
    - 3.1.7 Use variable support spring hangers where:
      - .1 transfer of load to adjacent piping or to connected equipment is not critical.
      - .2 variation in supporting effect does not exceed 25% of total load.

**3.2 Hanger Spacing**

- 3.2.1 Plumbing piping: most stringent requirements of Canadian Plumbing Code, Provincial Code, or authority having jurisdiction.
- 3.2.2 Fire protection: to applicable fire code.
- 3.2.3 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.
- 3.2.4 Copper piping: up to NPS 1/2: every 1.5 m.
- 3.2.5 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.
- 3.2.6 Within 300 mm of each elbow.

Pipe Size: NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.1 m	1.8 m
1-1/2	2.7 m	2.4 m
2	3.0 m	2.7 m
2-1/2	3.6 m	3.0 m
3	3.6 m	3.0 m
3-1/2	3.9 m	3.3 m
4	4.2 m	3.6 m
5	4.8 m	
6	5.1 m	
8	5.7 m	
10	6.6 m	
12	6.9 m	

- 3.2.7 Pipework greater than NPS 12: to MSS SP-69.

**3.3 Hanger Installation**

- 3.3.1 Install hanger so that rod is vertical under operating conditions.
- 3.3.2 Adjust hangers to equalize load.
- 3.3.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

**3.4 Horizontal Movement**

- 3.4.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4° from vertical.
- 3.4.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

**3.5 Final Adjustment**

- 3.5.1 Adjust hangers and supports:
  - .1 Ensure that rod is vertical under operating conditions.
  - .2 Equalize loads.
- 3.5.2 Adjustable clevis:
  - .1 Tighten hanger load nut securely to ensure proper hanger performance.
  - .2 Tighten upper nut after adjustment.
- 3.5.3 C-clamps:
  - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- 3.5.4 Beam clamps:
  - .1 Hammer jaw firmly against underside of beam.

**END OF SECTION**

1. **GENERAL**
  - 1.1 **References**
    - 1.1.1 Canadian General Standards Board (CGSB).
      - .1 CAN/CGSB-1.60-Latest Edition, Interior Alkyd Gloss Enamel.
      - .2 CAN/CGSB-24.3-Latest Edition, Identification of Piping Systems.
    - 1.1.2 Canadian Gas Association (CGA).
      - .1 CAN/CGA B149.1-Latest Edition.
      - .2 CAN/CGA B149.2-Latest Edition.
  - 1.2 **Product Data**
    - 1.2.1 Product data to include paint colour chips, all other products specified in this section.
2. **PRODUCTS**
  - 2.1 **Piping Systems Governed by Codes**
    - 2.1.1 Identification:
      - .1 Natural gas: To CAN/CGA B149.1 and authority having jurisdiction.
      - .2 Propane gas: To CAN/CGA B149.2 and authority having jurisdiction.
      - .3 Sprinklers: To NFPA 13 and FM.
      - .4 Standpipe and hose systems: To NFPA 14 and FM.
  - 2.2 **Identification of Ductwork Systems**
    - 2.2.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.
    - 2.2.2 Colours: Black, or co-ordinated with base colour to ensure strong contrast.
3. **EXECUTION**
  - 3.1 **Installation**
    - 3.1.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
    - 3.1.2 Provide ULC and CSA registration plates as required by respective agency.
  - 3.2 **Location of Identification on Piping and Ductwork Systems**
    - 3.2.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: At not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
    - 3.2.2 Adjacent to each change in direction.
    - 3.2.3 At least once in each small room through which piping or ductwork passes.
    - 3.2.4 On both sides of visual obstruction or where run is difficult to follow.
    - 3.2.5 On both sides of separations such as walls, floors, partitions.
    - 3.2.6 Where system is installed in pipe chases, ceiling spaces, galleries, other confined spaces, at entry and exit points, and at each access opening.
    - 3.2.7 At beginning and end points of each run and at each piece of equipment in run.
    - 3.2.8 At point immediately upstream of major manually operated or automatically controlled valves, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.
    - 3.2.9 Identification to be easily and accurately readable from usual operating areas and from access points.
      - .1 Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

**END OF SECTION**



**1. GENERAL****1.1 General**

- 1.1.1 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do all other work as specified in this section.
- 1.1.2 The work may be tendered and contracted separately to appropriately divorce it from the mechanical construction contract.

**1.2 Qualifications of Tab Personnel**

- 1.2.1 Names of all personnel it is proposed to perform TAB to be submitted to and approved by Engineer within 90 days of award of contract.
- 1.2.2 Provide documentation confirming qualifications, successful experience.

**1.3 Purpose of Tab**

- 1.3.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads
- 1.3.2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with all other related systems under all normal and emergency loads and operating conditions.
- 1.3.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

**1.4 Exceptions**

- 1.4.1 TAB of systems and equipment regulated by codes, standards to be to satisfaction of authority having jurisdiction.

**1.5 Co-ordination**

- 1.5.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.
- 1.5.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

**1.6 Pre-Tab Review**

- 1.6.1 Review contract documents before project construction is started and confirm in writing to Engineer adequacy of provisions for TAB and all other aspects of design and installation pertinent to success of TAB.
- 1.6.2 Review specified standards and report to Engineer in writing all proposed procedures which vary from standard.
- 1.6.3 During construction, co-ordinate location and installation of all TAB devices, equipment, accessories, measurement ports and fittings.

**1.7 Start-Up**

- 1.7.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- 1.7.2 Follow special start-up procedures specified elsewhere in Section 23.

**1.8 Operation of Systems During Tab**

- 1.8.1 Operate systems for length of time required for TAB and as required by Engineer for verification of TAB reports.

**1.9 Start of Tab**

- 1.9.1 Notify Engineer 7 days prior to start of TAB.
- 1.9.2 Start TAB only when building is essentially completed, including:
  - .1 Installation of ceilings, doors, windows, other construction affecting TAB.

- .2 Application of weatherstripping, sealing, caulking.
- .3 All pressure, leakage, other tests specified elsewhere Section 23.
- .4 All provisions for TAB installed and operational.
- .5 Start-up, verification for proper, normal and safe operation of all mechanical and associated electrical and control systems affecting TAB including but not limited to:
  - .6 Proper thermal overload protection in place for electrical equipment.
  - .7 Liquid systems:
  - .8 Flushed, filled, vented.
  - .9 Correct pump rotation.
  - .10 Strainers in place, baskets clean.
  - .11 Isolating and balancing valves installed, open.
  - .12 Calibrated balancing valves installed, at factory settings.
- 1.10 **Application of Tolerances**
  - 1.10.1 Do TAB to following tolerances of design values:
    - .1 Hydronic systems: plus 5%, minus 5%.
- 1.11 **Accuracy Tolerances**
  - 1.11.1 Measured values to be accurate to within plus or minus 2% of actual values.
- 1.12 **Instruments**
  - 1.12.1 Prior to TAB, submit to Engineer list of instruments to be used together with serial numbers.
  - 1.12.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system.
  - 1.12.3 Calibrate within 3 months of TAB. Provide certificate of calibration to Engineer.
- 1.13 **Submittals**
  - 1.13.1 Submit, prior to commencement of TAB:
    - .1 Proposed methodology and procedures for performing TAB if different from referenced standard.
- 1.14 **Preliminary Tab Report**
  - 1.14.1 Submit for checking and approval of Engineer, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
    - .1 Details of instruments used.
    - .2 Details of TAB procedures employed.
    - .3 Calculations procedures.
    - .4 Summaries.
- 1.15 **Tab Report**
  - 1.15.1 TAB report to show all results in SI units and to include:
    - .1 Project record drawings.
    - .2 System schematics.
  - 1.15.2 Submit 6 copies of TAB Report to Engineer for verification and approval, in English, in D-ring binders, complete with index tabs.

1.16 **Verification**

- 1.16.1 All reported results subject to verification by Engineer.
- 1.16.2 Provide manpower and instrumentation to verify up to 30% of all reported results.
- 1.16.3 Number and location of verified results to be at discretion of Engineer.
- 1.16.4 Bear costs to repeat TAB as required to satisfaction of Engineer.

1.17 **Settings**

- 1.17.1 After TAB is completed to satisfaction of Engineer, replace drive guards, close all access doors, lock all devices in set positions, ensure sensors are at required settings.
- 1.17.2 Permanently mark all settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

1.18 **Completion of Tab**

- 1.18.1 TAB to be considered complete only when final TAB Report received and approved by Engineer.

1.19 **Hydronic Systems**

- 1.19.1 Definitions: for purposes of this section, to include domestic hot and cold water.
- 1.19.2 Standard: TAB to be to most stringent of this section or TAB standards of AABC or NEBB.
- 1.19.3 Do TAB of all systems, equipment, components, controls specified Division 23.
- 1.19.4 Qualifications: personnel performing TAB to be qualified to standards of AABC or NEBB.
- 1.19.5 Quality assurance: perform TAB under direction of supervisor qualified to standards of AABC or NEBB.
- 1.19.6 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: Flow rate, static pressure, pressure drop (or loss), temperature, specific gravity, density, RPM, electrical power voltage, noise, vibration.

2. **PRODUCTS** NOT APPLICABLE

3. **EXECUTION** NOT APPLICABLE

**END OF SECTION**

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**1. GENERAL****1.1 Related Sections**

- 1.1.1 Section 013300 - Submittal Procedures
- 1.1.2 Section 23 05 29 - Hangers and Supports

**1.2 References**

- 1.2.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
  - .1 ANSI/ASHRAE/IESNA 90.1-Latest Edition, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
- 1.2.2 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM B209M-Latest Edition, Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).
  - .2 ASTM C335-Latest Edition, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
  - .3 ASTM C411-Latest Edition, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
  - .4 ASTM C449/C449M-Latest Edition, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
  - .5 ASTM C547-Latest Edition, Specification for Mineral Fiber Pipe Insulation.
  - .6 ASTM C553-Latest Edition, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
  - .7 ASTM C612-Latest Edition, Specification for Mineral Fiber Block and Board Thermal Insulation.
  - .8 ASTM C795-Latest Edition, Specification for Thermal Insulation for Use with Austenitic Stainless Steel.
  - .9 ASTM C921-Latest Edition, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- 1.2.3 Canadian General Standards Board (CGSB)
  - .1 CGSB 51-GP-52Ma-Latest Edition, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- 1.2.4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (R1999).
- 1.2.5 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S102-Latest Edition, Surface Burning Characteristics of Building Materials and Assemblies.
  - .2 CAN/ULC-S701-Latest Edition, Thermal Insulation Polyotrene, Boards and Pipe Covering.

**1.3 Definitions**

- 1.3.1 For purposes of this section:
    - .1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
    - .2 "EXPOSED" - will mean "not concealed" as defined herein.
    - .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.
  - 1.3.2 TIAC Codes:
    - .1 CRD: Code Round Ductwork,
    - .2 CRF: Code Rectangular Finish.
-

**1.4 Shop Drawings**

- 1.4.1 Submit shop drawings in accordance with Section 013300 - Submittal Procedures.
- 1.4.2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

**1.5 Delivery, Storage, and Handling**

- 1.5.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- 1.5.2 Protect from weather and construction traffic.
- 1.5.3 Protect against damage from any source.
- 1.5.4 Store at temperatures and conditions recommended by manufacturer.

**2. PRODUCTS****2.1 Fire and Smoke Rating**

- 2.1.1 In accordance with CAN/ULC-S102:
  - .1 Maximum flame spread rating: 25.
  - .2 Maximum smoke developed rating: 50.

**2.2 Insulation**

- 2.2.1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.
- 2.2.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.
- 2.2.3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, [with] [without] factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).
- 2.2.4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced [with] [without] factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).
  - .1 Mineral fibre: to ASTM C553.
  - .2 Jacket: to CGSB 51-GP-52Ma.
  - .3 Maximum "k" factor: to ASTM C553.

**2.3 Jackets**

- 2.3.1 Canvas:
  - .1 220 gm/m<sup>2</sup> cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
  - .2 Lagging adhesive: Compatible with insulation.
- 2.3.2 Aluminum:
  - .1 To ASTM B209 with moisture barrier as scheduled in PART 3 of this section.
  - .2 Thickness: 0.50 mm sheet.
  - .3 Finish: Smooth.
  - .4 Jacket banding and mechanical seals: 12mm wide, 0.5 mm thick stainless steel.
- 2.3.3 Stainless steel:
  - .1 Type: 304
  - .2 Thickness: 0.25 mm sheet.
  - .3 Finish: Smooth.
  - .4 Jacket banding and mechanical seals: 12 mm wide, 0.5 mm thick stainless steel.

**2.4 Accessories**

- 2.4.1 Vapour retarder lap adhesive:
  - .1 Water based, fire retardant type, compatible with insulation.

- 2.4.2 Indoor Vapour Retarder Finish:
  - .1 Vinyl emulsion type acrylic, compatible with insulation.
- 2.4.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.
- 2.4.4 ULC Listed Canvas Jacket:
  - .1 220 gm/m<sup>2</sup> cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- 2.4.5 Outdoor Vapour Retarder Mastic:
  - .1 Vinyl emulsion type acrylic, compatible with insulation.
  - .2 Reinforcing fabric: Fibrous glass, untreated 305 g/m<sup>2</sup>.
- 2.4.6 Tape: self-adhesive, aluminum, plain 75 mm wide minimum.
- 2.4.7 Contact adhesive: quick-setting
- 2.4.8 Canvas adhesive: washable.
- 2.4.9 Tie wire: 1.5mm stainless steel.
- 2.4.10 Banding: 19mm wide, 0.5 mm thick stainless steel.
- 2.4.11 Facing: 25 mm stainless steel hexagonal wire mesh stitched on one face of insulation.
- 2.4.12 Fasteners: 4 mm diameter pins with 35 mm diameter clips, length to suit thickness of insulation.

### 3. **EXECUTION**

#### 3.1 **Pre-Installation Requirements**

- 3.1.1 Pressure testing of ductwork systems complete, witnessed and certified.
- 3.1.2 Surfaces clean, dry, free from foreign material.

#### 3.2 **Installation**

- 3.2.1 Install in accordance with TIAC National Standards.
  - 3.2.2 Apply materials in accordance with manufacturers instructions and as indicated.
  - 3.2.3 Use two layers with staggered joints when required nominal thickness exceeds 75 mm.
  - 3.2.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
    - .1 Hangers, supports to be outside vapour retarder jacket.
  - 3.2.5 Supports, Hangers in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
    - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
  - 3.2.6 Fasteners: At 300 mm oc in horizontal and vertical directions, minimum two rows each side.
-

### 3.3 Ductwork Insulation Schedule

#### 3.3.1 Insulation types and thicknesses: Conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and dual temperature supply air ducts	[C-1]	[yes]	[50]
Round cold and dual temperature supply air ducts	[C-2]	[yes]	[50]
Rectangular warm air ducts	[C-1]	[no]	[25]
Round warm air ducts	[C-1]	[no]	[25]
Supply, return and exhaust ducts exposed in space being served			[none]
Outside air ducts to mixing plenum	[C-1]	[yes]	[25]
Mixing plenums	[C-1]	[yes]	[25]
Exhaust duct between dampers and louvres	[C-1]	[no]	[25]
Rectangular ducts outside	[C-1]	[special]	[50]
Round ducts outside	[C-1]	[special]	[50]
Acoustically lined ducts	[none]		

#### 3.3.2 HERE Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:

- .1 Use TIAC code C-1 insulation, scored to suit diameter of duct.
- .2 Finishes: Conform to following table:

	TIAC Code	
	Rectangular	Round
Indoor, concealed	none	none
Indoor, exposed within mechanical room	CRF/1	CRD/2
Indoor, exposed elsewhere	CRF/2	CRD/3
Outdoor, exposed to precipitation	CRF/3	CRD/4
Outdoor, elsewhere	CRF/4	CRD/5

**END OF SECTION**

**1. GENERAL****1.1 References**

- 1.1.1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-51.2-M88, Thermal Insulation, Calcium Silicate, for Piping, Machinery and Boilers.
  - .2 CAN/CGSB-51.9-92, Mineral Fibre Thermal Insulation for Piping and Round Ducting.
  - .3 CAN/CGSB-51.11-92, Mineral Fibre Thermal Insulation Blanket.
  - .4 CAN/CGSB-51.12-M86, Cement, Thermal Insulating and Finishing.
  - .5 CAN/CGSB-51.40-M80, Thermal Insulation, Flexible, Elastomeric, Unicellular, Sheet and Pipe Covering.
  - .6 CGSB 51-GP-52Ma-89, Vapour Barrier Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
  - .7 CGSB 51-GP-53M-77, Jacketing, Polyvinyl, Chloride Sheet, for Insulating Pipes, Vessels and Round Ducts.
- 1.1.2 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S102-M88, Surface Burning Characteristics of Building Materials and Assemblies.
- 1.1.3 American Society for Testing and Materials (ASTM)
  - .1 ASTM B 209M-92a, Specification for Aluminum and Aluminum Alloy Sheet and Plate.
  - .2 ASTM C 335-95, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
  - .3 ASTM C 411-82(1992), Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
  - .4 ASTM C 449M-88, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
  - .5 ASTM C 795-92, Specification for Thermal Insulation for Use with Austenitic Stainless Steel.
  - .6 ASTM C 921-89, Practice for Determining the Properties Jacketing Materials for Thermal Insulation.
- 1.1.4 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
  - .1 ASHRAE Standard 90.1-1989
- 1.1.5 Manufacturer's Trade Associations
  - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.

**1.2 Shop Drawings**

- 1.2.1 Submit for approval manufacturer's catalogue literature related to installation, fabrication for pipe, fittings, valves and jointing recommendations.

**1.3 Samples**

- 1.3.1 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix typewritten label beneath sample indicating service.

**1.4 Installation Instructions**

- 1.4.1 Submit manufacturer's installation instructions.
- 1.4.2 Installation instructions to include procedures to be used, installation standards to be achieved.

**1.5 Qualifications**

- 1.5.1 Installer to be specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project, member of TIAC.



**1.6 Delivery, Storage, and Handling**

- 1.6.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- 1.6.2 Protect from weather, construction traffic.
- 1.6.3 Protect against damage from any source.
- 1.6.4 Store at temperatures and conditions required by manufacturer.

**1.7 Definitions**

- 1.7.1 For purposes of this section:
  - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
  - .2 "EXPOSED" - will mean "not concealed" as defined herein.

**2. PRODUCTS****2.1 Fire and Smoke Rating**

- 2.1.1 In accordance with CAN/ULC-S102:
  - .1 Maximum flame spread rating: 25.
  - .2 Maximum smoke developed rating: 50.

**2.2 Insulation**

- 2.2.1 Mineral fibre as specified herein includes glass fibre, rock wool, slag wool.
- 2.2.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 C mean temperature when n tested in accordance with ASTM C 335.
- 2.2.3 Domestic cold, hot and tempered water (TIAC Code A-3): Rigid moulded mineral fibre with factory applied vapour retarder jacket.
  - .1 Mineral fibre: to CAN/CGSB-51.9.
  - .2 Jacket: to CGSB 51-GP-52 Ma.
  - .3 Maximum "k" factor: to CAN/CGSB-51.9.

**2.3 Insulation Securement**

- 2.3.1 Tape: Self-adhesive, aluminum, plain, 50 mm wide minimum.
- 2.3.2 Contact adhesive: Quick setting.
- 2.3.3 Canvas adhesive: Washable.
- 2.3.4 Tie wire: 1.5 mm diameter stainless steel.
- 2.3.5 Bands: Stainless steel, 19 mm wide, 0.5 mm thick.

**2.4 Cement**

- 2.4.1 Thermal insulating and finishing cement:
  - .1 To CAN/CGSB-51.12.
  - .2 Air drying on mineral wool, to ASTM C 449.

**2.5 Vapour Retarder Lap Adhesive**

- 2.5.1 Water based, fire retardant type, compatible with insulation.

**2.6 Indoor Vapour Retarder Finish**

- 2.6.1 Vinyl emulsion type acrylic, compatible with insulation.
- 2.6.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m2.

**2.7 Jackets**

- 2.7.1 Polyvinyl Chloride (PVC):
  - .1 One-piece moulded type to CGSB 51-GP-53M with pre-formed shapes as required.
  - .2 Colours: w.
  - .3 Minimum service temperatures: -20 C.
  - .4 Maximum service temperature: 65 C.
  - .5 Moisture vapour transmission: 0.02 perm.
  - .6 Thickness: 20 mm.

- 2.7.2 Fastenings:
  - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
  - .2 Tacks.
  - .3 Pressure sensitive vinyl tape of matching colour.

### 3. **EXECUTION**

#### 3.1 **Pre-Installation Requirement**

- 3.1.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- 3.1.2 Surfaces to be clean, dry, free from foreign material.

#### 3.2 **Installation**

- 3.2.1 Install in accordance with TIAC National Standards.
- 3.2.2 Apply materials in accordance with manufacturers instructions and this specification.
- 3.2.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
- 3.2.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
  - .1 Hangers, supports to be outside vapour retarder jacket.
- 3.2.5 Supports, Hangers:
  - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

#### 3.3 **Removable, Pre-Fabricated, Insulation and Enclosures**

- 3.3.1 Application: At expansion joints, valves, flow measuring elements, flanges and unions at equipment.
- 3.3.2 Design: To permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.
- 3.3.3 Insulation:
  - .1 Insulation, fastenings and finishes: same as system.
  - .2 Jacket: Aluminum, PVC, high temperature fabric.

#### 3.4 **Piping Insulation Schedules**

- 3.4.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
- 3.4.2 TIAC Code: A-1.
  - .1 Securements: Tape @ 300 mm oc.
  - .2 Seals: lap seal adhesive, lagging adhesive.
  - .3 Installation: TIAC Code 1501-H.
- 3.4.3 TIAC Code: A-3.
  - .1 Securements: Tape @ 300 mm oc.
  - .2 Seals: VR lap seal adhesive, VR lagging adhesive.
  - .3 Installation: TIAC Code: 1501-C.
- 3.4.4 TIAC Code: C-2 with vapour retarder jacket.
  - .1 Insulation securements: Contact adhesive, quick setting.
  - .2 Seals: lap seal adhesive, lagging adhesive.
  - .3 Installation: TIAC Code: 1501-C.
- 3.4.5 Thickness of insulation to be as listed in following table.
  - .1 \*\* Run-outs to individual units and equipment not exceeding 4000 mm long.
  - .2 \*\* Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp °C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)					
			Run out	to 1	1 1/ 4 2	2 1/ 2 4	5 6	& over
Steam	up to 175	A-1	38	50	65	75	90	90
Steam Saturated and Superheated	Over 175	A-1	38	65	65	75	90	90
Condensate Return	60 - 94	A-1	25	38	38	38	38	38
Pumped Condensate Return	up to 94	A-1	25	38	38	38	38	38
Boiler Feed Water		A-1	25	25	25	25	25	25
Hot Water Heating	60 - 94	A-1	25	38	38	38	38	38
Hot Water Heating	up to 59	A-3	25	25	25	25	38	38
Domestic HWS		A-3	25	25	25	38	38	38
Chilled Water	4 -13	A-3	25	25	25	25	25	25
Chilled Water or Glycol	<4	A-3	25	25	38	38	38	38
Chilled Water Pump		A-3	25	25	25	25	25	25
Domestic CWS		A-3	25	25	25	25	25	25
Domestic CWS with vapour retarder		C-2	25	25	25	25	25	25
RWL and RWP		C-2	25	25	25	25	25	25
Cooling Coil Cond. Drain		C-2	25	25	25	25	25	25

## 3.4.6 Finishes:

- .1 Exposed indoors: PVC jacket, canvas for high-temp (>59°C)
- .2 Exposed in mechanical rooms: PVC jacket, canvas for high-temp (>59°C)
- .3 Concealed, indoors: No further finish, except for high-temp (>59°C) use canvas.
- .4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
- .5 Installation: To appropriate TIAC code CRF/1 through CPF/5.

**END OF SECTION**

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**1. GENERAL****1.1 Intent**

This Section includes requirements for a gas distribution system, including materials, installation of pipes, appurtenances and testing of the completed system.

**1.2 References**

- 1.2.1 American Society for Testing and Materials ([ASTM](#)):
  - .4 ASTM A53/A53M-02, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - .5 ASTM D2683-98 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
  - .6 ASTM D3261-03, Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
- 1.2.2 Canadian Standards Association ([CSA](#)):
  - .4 CGA 3.11-M88 (R1999), Lever Operated Pressure Lubricated Plug Type Gas Shut-Off Valves.
  - .5 CGA 3.16-M88 (R1999), Lever Operated Non-Lubricated Gas Shut-Off Valves.
  - .6 CAN/CSA B149.1-00, Natural Gas and Propane Installation Code
  - .7 CSA Z245.1-02, Steel Pipe.
  - .8 CSA Z245.20-02, External Fusion Bond Epoxy Coating for Steel Pipe/External Polyethylene Coating for Pipe.
  - .9 CSA Z245.11-01, Steel Fittings.
  - .10 CSA Z245.12-01, Steel Flanges .
  - .11 CSA Z662-03, Oil and Gas Pipeline Systems.

**1.3 Quality Assurance**

- 1.3.1 Comply with requirements of utility supplying natural gas and with authorities having jurisdiction for natural gas systems.
- 1.3.2 Install gas piping and fittings in accordance with guidelines contained in B149.1 HB-00, Natural Gas and Propane Installation Code Handbook.
- 1.3.3 Pipe installation shall be tested by the Contractor for detectable leaks and pressure drop as follows: No pipe installation will be accepted if leaks are detected or if pressure at end of test is less than 95 percent of original test pressure.
- 1.3.4 Duration: Fill piping with test medium for 24 hours prior to actual test.
- 1.3.5 Test Medium: Air, gas or inert gas such as carbon dioxide or nitrogen; if air or inert gas is used for testing, purge lines with natural gas before using.
- 1.3.6 Visual Test: "Soap Bubble" inspection of joints for leaks; repair joints immediately and retest.
- 1.3.7 Metered Test: Measurement of pressure at beginning of 24 hour time period and after 24 hour time period; repair installation where decrease in pressure is less than 95 per cent of original pressure measurement and retest for an additional 24 hour time period.
- 1.3.8 Pressure:
  - .4 Steel Pipe: 700 kPa.
  - .5 Polyethylene Piping: 350 kPa or 1.5 maximum operating pressure whichever is greater.

**1.4 Delivery, Storage, and Handling**

- 1.4.1 Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping; handle liquids to avoid spillage and ignition; notify gas supplier; do not leave flammable liquids on premises overnight.
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**2. PRODUCTS****2.1 Steel Pipe Materials**

- 2.1.1 Steel Pipe: CSA Z245 or ASTM A53/A53M, Type E or S, Grade B; Schedule 40, black.
- 2.1.2 Malleable Iron Fittings: ASME B16.3, Class 150, standard pattern, with threads complying with ASME B1.20.1.
- 2.1.3 Steel Fittings: CSA Z245.11 wrought-steel butt-welding type.
- 2.1.4 Steel Flanges and Flanged Fittings: CSA Z245.12
- 2.1.5 Unions: ASME B16.39, Class 150, black malleable iron; female pattern; brass-to-iron seat; ground joint.

**2.2 Joining Materials**

- 2.2.1 Components, Tapes, Gaskets, and Bolts and Nuts: Suitable for natural gas and as recommended by piping manufacturer.

**2.3 Shutoff Valves**

- 2.3.1 Shutoff Valves, General: Manual operation, suitable for natural gas service, and with 690 kPa (100 psig) minimum working-pressure rating.
- 2.3.2 Threaded Valves, DN 25 (NPS 1) and Smaller: Include listing by the Agency acceptable to authorities having jurisdiction.
- 2.3.3 Non-lubricated, Tapered Plug Valves: Brass or cast-iron body, with brass tapered plug; lever operation; in accordance with CGA 3.16; include lever and locking device.
  - .4 Acceptable materials:
    - .1 Essex Brass.
    - .2 Lyall, R. W. and Company, Inc.
    - .3 McDonald, A. Y. Mfg. Co.
    - .4 Mueller Company.
  - .5 Lubricated, Tapered Plug Valves: Cast-iron body, with lubricated, brass tapered plug; lever operation; in accordance with CGA 3.11; include lever and locking device:
  - .6 Acceptable materials:
    - .1 Mueller Company.
    - .2 National Meter.
    - .3 Nordstrom Valves, Inc.
  - .7 Ball Valves: Bronze body, with chrome-plated brass ball; lever handle; in accordance with CSA listing; including locking device:
  - .8 Acceptable materials:
    - .1 Conbraco Industries, Inc.
    - .2 Hammond Valve.
    - .3 Maxitrol Company.
    - .4 Milwaukee Valve Company.
    - .5 NIBCO.
    - .6 Stockham.
    - .7 Watts Industries, Inc.
  - .9 Lubricated Plug Valves: Cast-iron body, with lubricated, tapered, or cylindrical plug; lever operation; in accordance with CGA 3.11; including locking device.
  - .10 Acceptable materials:
    - .1 Milliken Valve Co., Inc.
    - .2 Nordstrom Valves, Inc.
    - .3 Olson Technologies, Inc.;
    - .4 Homestead Valve Div.
    - .5 R and M Energy Systems; Flow Control Div.
    - .6 The Walworth Company.

- .11 Non-lubricated Plug Valves: Cast-iron body, with resilient-coated eccentric plug; lever operation; in accordance with CGA 3.16; including locking device.
- .12 Acceptable materials:
  - .1 Milliken Valve Co., Inc.
  - .2 Olson Technologies, Inc.; Homestead Valve Div.
  - .3 Pratt, Henry Co.
  - .4 SPX Corporation; DeZURIK Unit.
- .13 Valve Boxes: Cast-iron, 2-section box. Include top section with cover with "GAS" lettering, bottom section with base to fit over valve and barrel 127mm in diameter, and adjustable cast-iron extension of length required for depth of bury; include tee-handle, steel operating wrench with socket end fitting valve nut or flat head and with stem of length required to operate valve.

## 2.4 **Pipe Sleeves**

- 2.4.1 Steel Pipe: In accordance with CSA Z662.

## 3. **EXECUTION**

### 3.1 **Pipe Laying, Generally**

- 3.1.1 Provide recesses on trench bottom for couplings, fittings and valves to ensure bearing will occur along barrel of pipe.
- 3.1.2 Install gas pipe in pipe sleeve 50mm greater in diameter than gas pipe diameter in accordance with CSA Z662 where gas pipes are laid under roads, streets, driveways, and parking areas.
- 3.1.3 Lay service line pipe on proper grade to drain from building to gas main.
- 3.1.4 Lay gas pipe on properly graded trench bottom to prevent sags and low points in piping.
- 3.1.5 Lay gas pipe to maintain a minimum of 1000mm distance between gas pipe and any underground structure that runs parallel to gas pipe.
- 3.1.6 Lay gas pipe to maintain a minimum of 100mm between gas pipe and any underground structure that crosses gas pipe.

### 3.2 **Laying Steel Pipe**

- 3.2.1 Lay pipe on 50mm cushion of compacted clay fill or on flat, undisturbed trench bottom. Backfill excavated material thoroughly tamped in place.
- 3.2.2 Lower pipe carefully into trench to prevent damage to coating.
- 3.2.3 Wrap couplings and fittings with polyethylene tape and heat shrink over pipe.

### 3.3 **Valve And Valve Box Installation**

- 3.3.1 Locate valves as shown on Drawings.
- 3.3.2 Set valves on solid bearing.
- 3.3.3 Centre and plumb valve box over valve. Set box cover flush with finished ground surface. Prevent shock or stress from being transmitted through valve box to valve.
- 3.3.4 Wrap valve and valve box with polyethylene tape and heat shrink, or paint valves and valve boxes with red anti-rust primer and one coat of epoxy paint for steel valves and cast iron valve boxes.

### 3.4 **Labeling and Identifying**

- 3.4.1 Equipment Nameplates and Signs: Install engraved plastic laminate equipment nameplates and signs on or near each service regulator and service meter.
  - 3.4.2 Text: Distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
-

3.5 **Painting**

3.5.1 Paint exposed metal piping, valves, service regulators, service meters and meter bars, and piping specialties with high performance rust resistance coating except units with factory-applied paint or protective coating.

3.5.2 Damage and Touch-up: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.6 **Pipe Schedule**

Material	Standard	Type	Joints	Sizes
Steel Pipe	CSA Z245.1	Schedule 40	Welded Flanged Threaded	13 to 50

3.7 **Valve Schedule**

Material	Standard	Type	Joints	Sizes
Building Regulator	Inlet pressure 860 kPa Outlet pressure 20 kPa to 3.7 kPa	Malleable Iron Body, Fisher Model S102		[20mm] [25mm]

**END OF SECTION**

## 1 **GENERAL**

### 1.1 **Summary**

#### 1.1.1 Section Includes.

- .1 Materials and installation for steel piping, valves and fittings for hydronic systems.

### 1.2 **References**

#### 1.2.1 American Society of Mechanical Engineers (ASME).

- .1 ASME B16.1-98, Cast Iron Pipe Flanges and Flanged Fittings.
- .2 ASME B16.3-98, Malleable Iron Threaded Fittings.
- .3 ASME B16.5-03, Pipe Flanges and Flanged Fittings.
- .4 ASME B16.9-01, Factory-Made Wrought Butt welding Fittings.
- .5 ASME B18.2.1-03, Square and Hex Bolts and Screws (Inch Series).
- .6 ASME B18.2.2-87(R1999), Square and Hex Nuts (Inch Series).

#### 1.2.2 American Society for Testing and Materials International, (ASTM).

- .1 ASTM A47/A47M-99, Standard Specification for Ferritic Malleable Iron Castings.
- .2 ASTM A53/A53M-02, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
- .3 ASTM A536-84(1999)e1, Standard Specification for Ductile Iron Castings.
- .4 ASTM B61-02, Standard Specification for Steam or Valve Bronze Castings.
- .5 ASTM B62-02, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .6 ASTM E202-00, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.

#### 1.2.3 American Water Works Association (AWWA).

- .1 AWWA C111-00, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

#### 1.2.4 Canadian Standards Association (CSA International).

- .1 CSA B242-M1980(R1998), Groove and Shoulder Type Mechanical Pipe Couplings.
- .2 CAN/CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding (Developed in cooperation with the Canadian Welding Bureau).

#### 1.2.5 Manufacturer's Standardization of the Valve and Fittings Industry (MSS).

- .1 MSS-SP-67-025, Butterfly Valves.
- .2 MSS-SP-70-98, Cast Iron Gate Valves, Flanged and Threaded Ends.
- .3 MSS-SP-71-97, Cast Iron Swing Check Valves Flanged and Threaded Ends.
- .4 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.
- .5 MSS-SP-85-02, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

### 1.3 **Delivery, Storage, and Handling**

#### 1.3.1 Waste Management and Disposal.

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .3 Fold up metal and plastic banding, flatten and place in designated area for recycling.

### 1.4 **Maintenance**

#### 1.4.1 Extra Materials.



- .1 Provide following spare parts:
- .2 Valve seats: one for every ten valves, each size. Minimum one.
- .3 Discs: one for every ten valves, each size. Minimum one.
- .4 Stem packing: one for every ten valves, each size. Minimum one.
- .5 Valve handles: two of each size.
- .6 Gaskets for flanges: one for every ten flanges.

## **2      PRODUCTS**

### **2.1      Pipe**

- 2.1.1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:
  - .1 Schedule 40.

### **2.2      Pipe Joints**

- 2.2.1 Welded.

### **2.3      Fittings**

- 2.3.1 Butt-welding fittings: steel, to ASME B16.9.

## **3      EXECUTION**

### **3.1      Piping Installation**

- 3.1.1 Install pipework in accordance with Section 23 05 01 - Installation of Pipe Work.

### **3.2      Circuit Balancing Valves**

- 3.2.1 Install flow measuring stations and flow balancing valves as indicated.
- 3.2.2 Remove handwheel after installation and when TAB is complete.
- 3.2.3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

### **3.3      Cleaning, Flushing, and Start-up**

- 3.3.1 In accordance with Section 23 08 02 - Cleaning and Start-Up of Mechanical Piping Systems.

### **3.4      Testing**

- 3.4.1 For glycol systems, retest with propylene glycol to ASTM E202, inhibited, for use in building system , after cleaning. Repair leaking joints, fittings or valves.

### **3.5      Balancing**

- 3.5.1 Balance water systems to within plus or minus 5% of design output.
- 3.5.2 Refer to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC for applicable procedures.

**END OF SECTION**

**1**      **GENERAL****1.1**      **Section Includes**

- 1.1.1      Materials, equipment selection, installation and start up for hydronic system pumps.

**1.2**      **References**

- 1.2.1      American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE).
  - .1          Standard 90.1-2001 Energy Standard for Buildings Except Low-Rise Residential Buildings.
- 1.2.2      Electrical Equipment Manufacturers Advisory Council (EEMAC).
- 1.2.3      Canadian Standards Association (CSA International).
  - .1          CAN/CSA-B214-Latest Edition, Installation Code for Hydronic Heating Systems.
- 1.2.4      National Electrical Manufacturers Association (NEMA).
  - .1          NEMA MG 1-Latest Edition, Motors and Generators.

**1.3**      **Submittals**

- 1.3.1      Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- 1.3.2      Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- 1.3.3      Submit manufacturer's detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories and controllers.
- 1.3.4      Submit product data of pump curves for review showing point of operation.
- 1.3.5      Indicate piping, valves and fittings shipped loose by packaged equipment supplier, showing their final location in field assembly.
- 1.3.6      Provide maintenance data for incorporation into manual specified in Section 01 78 10 - Closeout Submittals.

**1.4**      **Extra Materials**

- 1.4.1      Provide maintenance materials in accordance with Section 01 78 10 - Closeout Submittals.

**2**      **Products****2.1**      **Equipment**

- 2.1.1      Do component selection and sizing to: CAN/CSA-B214.

**2.2**      **In-Line Circulators**

- 2.2.1      As indicated on drawings.
- 2.2.2      Impeller: cast bronze.
- 2.2.3      Shaft: alloy steel with bronze sleeve bearing, integral thrust collar.
- 2.2.4      Seal assembly: mechanical for service to 135 degrees C.
- 2.2.5      Coupling: flexible self-aligning.
- 2.2.6      Motor: As Indicated on drawings.
- 2.2.7      Capacity: as indicated on drawings.
- 2.2.8      Design pressure: 860kPa.

**3**      **Execution****3.1**      **Installation**

- 3.1.1      Do Work in accordance with CAN/CSA-B214.
- 3.1.2      In line circulators: install as indicated by flow arrows. Support at inlet and outlet flanges or unions. Install with bearing lubrication points accessible.
- 3.1.3      Base mounted type: supply templates for anchor bolt placement. Furnish anchor bolts with sleeves. Place level, shim unit and grout. Align coupling in accordance with manufacturer's recommended tolerance. Check oil level and lubricate..

- 3.1.4 Ensure that pump body does not support piping or equipment. Provide stanchions or hangers for this purpose. Refer to manufacturer's installation instructions for details.
- 3.1.5 Pipe drain tapping to floor drain.
- 3.1.6 Install volute venting pet cock in accessible location.
- 3.1.7 Check rotation prior to start-up.
- 3.1.8 Install pressure gauge test cocks.

### 3.2 **Start-Up**

#### 3.2.1 General

- .1 In accordance with manufacturer's recommendations.

#### 3.2.2 Procedures:

- .1 Before starting pump, check that cooling water system over-temperature and other protective devices are installed and operative.
- .2 After starting pump, check for proper, safe operation.
- .3 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.
- .4 Check base for free-floating, no obstructions under base.
- .5 Run-in pumps for 12 continuous hours.
- .6 Verify operation of over-temperature and other protective devices under low- and no-flow condition.
- .7 Eliminate air from scroll casing.
- .8 Adjust water flow rate through water-cooled bearings.
- .9 Adjust flow rate from pump shaft stuffing boxes to manufacturer's recommendation.
- .10 Adjust alignment of piping and conduit to ensure true flexibility at all times.
- .11 Eliminate cavitation, flashing and air entrainment.
- .12 Adjust pump shaft seals, stuffing boxes, glands.
- .13 Measure pressure drop across strainer when clean and with flow rates as finally set.
- .14 Replace seals if pump used to degrease system or if pump used for temporary heat.
- .15 Verify lubricating oil levels.

### 3.3 **Performance Verification (PV)**

#### 3.3.1 General

- .1 In accordance with manufacturer's recommendations.

#### 3.3.2 Exclusions:

- .1 This paragraph does not apply to small in-line circulators.

#### 3.3.3 Assumptions: these PV procedures assume that:

- .1 Manufacturer's performance curves are accurate.
- .2 Valves on pump suction and discharge provide tight shut-off.

#### 3.3.4 Multiple Pump Installations - Series and Parallel:

- .1 Repeat PV procedures specified above for pump performance and pump BHP for combinations of pump operations.

#### 3.3.5 Mark points of design and actual performance at design conditions as finally set upon completion of TAB.

**END OF SECTION**

**1**      **GENERAL****1.1**      **Summary****1.1.1**      Section Includes:

- .1      Materials, components, equipment and chemicals for installation of complete HVAC water treatment system.

**1.2**      **References**

- 1.2.1      American Society of Mechanical Engineers (ASME)
- 1.2.2      ASME Boiler and Pressure Vessel Code, Section VII-[2004].
- 1.2.3      Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- 1.2.4      Material Safety Data Sheets (MSDS).

**1.3**      **Submittals****1.3.1**      Product Data:

- .1      Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
- .2      Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

**1.3.2**      Shop Drawings:

- .1      Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

**1.3.3**      Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

- .1      Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

**1.3.4**      Closeout Submittals:

- .1      Include following:
  - .1      Log sheets as recommended by manufacturer.

**1.4**      **Quality Assurance****1.4.1**      Health and Safety:

- .1      Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

**2**      **PRODUCTS****2.1**      **Manufacturer**

- 2.1.1      Equipment, chemicals, service provided by one supplier.

**2.2**      **Pot Feeder**

- 2.2.1      Welded steel, pressure rating 2,068 kPa. Temperature rating: 90 degrees C.

**2.3**      **Chemical Feed Piping**

- 2.3.1      Resistant to chemicals employed. Pressure rating: 2068kPa.

**2.4**      **Chemical Feed Pumps**

- 2.4.1      Top-mounted electronic metering diaphragm type: flow range 0-100%, adjustable, plus or minus 1.0% accuracy (repetitive), on-off operation, with pressure relief valve, check valve, foot valve, injection fitting.
- 2.4.2      Piston type: flow range 0-100%, adjustable, plus or minus 1.0% accuracy (repetitive), on-off operation, with stainless steel piston, pressure relief valve, double ball and check valves.

**2.5 Shipping/Feeding Chemical Containers**

2.5.1 High density moulded polyethylene, with liquid level graduations, cover.

**2.6 Water Treatment for Hydronic Systems**

2.6.1 Hot water heating system: pot feeder, 19 L, operating pressure 2000kPa.

2.6.2 Micron filter for each pot feeder:

- .1 Capacity 2% of pump recirculating rate at operating pressure.
- .2 Six (6) sets of filter cartridges for each type, size of micron filter.

**2.7 Chemicals**

2.7.1 Provide 1 years supply.

2.7.2 Obtain chemicals from manufacturer with existing valid contract with DND.

**2.8 Test Equipment**

2.8.1 Provide one set of test equipment for each system to verify performance.

2.8.2 Complete with carrying case, reagents for chemicals, specialized or supplementary equipment.

**3 EXECUTION****3.1 Manufacturer's Instructions**

3.1.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

**3.2 Installation**

3.2.1 Install HVAC water treatment systems in accordance with ASME Boiler Code Section VII, and requirements and standards of authorities having jurisdiction, except where specified otherwise.

3.2.2 Ensure adequate clearances to permit performance of servicing and maintenance of equipment.

**3.3 Chemical Feed Piping**

3.3.1 Install crosses at changes in direction. Install plugs in unused connections.

**3.4 Cleaning of Mechanical Systems**

3.4.1 Provide copy of recommended cleaning procedures and chemicals for approval by Engineer.

3.4.2 Flush mechanical systems and equipment with approved cleaning chemicals designed to remove deposition from construction such as pipe dope, oils, loose mill scale and other extraneous materials. Use chemicals to inhibit corrosion of various system materials that are safe to handle and use.

3.4.3 Examine and clean filters and screens, periodically during circulation of cleaning solution, and monitor changes in pressure drop across equipment.

3.4.4 Drain and flush system[s] until alkalinity of rinse water is equal to make-up water. Refill with clean water treated to prevent scale and corrosion during system operation.

3.4.5 Disposal of cleaning solutions approved by authority having jurisdiction.

**END OF SECTION**

1. **GENERAL**1.1 **General Requirements**

- 1.1.1 Conform to Sections of Division 1 as applicable.
- 1.1.2 Section 23 00 00 shall apply to and govern the work of this Section.
- 1.1.3 Provide labour, materials, products, equipment and service to complete the Ductwork - Low Pressure work.

1.2 **Work Included**

- 1.2.1 Work to be done under this section shall include the furnishing of labour, materials and equipment required for installation, testing, and putting into proper operation complete low pressure duct systems as shown, as specified and as otherwise required.

1.3 **Installers**

- 1.3.1 Sheet metal ductwork and specialties shall be provided by a firm having an established reputation in this field.

2. **PRODUCTS**2.1 **Classification**

- 2.1.1 Low pressure ductwork construction classification as follows:

Normal Operating		
Pressure Class PA (IN. W.G.)	Pressure PA (IN.W.G.)	Normal M/S (FPM)
125 (1/2)	up to 125 (1/2)	1.0 (2000)
250 (1)	between 125-250 (1/2 and 1)	12.5 (2500)
500 (2)	between 250-500 (1 and 2)	12.5 (2500)
750 (3)	between 500-750 (2 and 3)	15.0 (3000)
750+(3+)	Class set high-pressure ductwork specification.	

2.2 **Sealant And Tape**

- 2.2.1 : Oil resistant, polymer type flame resistant, high velocity duct sealing compound temperature range from minus 30°C to plus 93°C (minus 22°F to plus 200 °F).
  - .1 Standard of Acceptance: Foster 30-20, Durodyne 5-2, 3M Company EC800
- 2.2.2 Tape: Polyvinyl treated, open weave fiberglass tape, 50mm (2 in.) wide.
  - .1 Standard of Acceptance:Duro Dyne Ft-2

**2.3     Ductwork General**

- 2.3.1 Where a standard for ductwork fabrication fittings, joints or supports has not been described, work shall be done as described in current edition of the equipment Volume Handbook by the American Society of Heating Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE) and/or current edition of Duct Construction Standards published by Sheet Metal and Air Conditioning Contractor National Association, Inc.
- 2.3.2 Drawings for prior approval shall be submitted, if fittings, joints, supports, or seams different from those described and shown or specified are to be used. Submit actual samples or details.
- 2.3.3 Fabricate ductwork and fittings, (except as otherwise noted) from prime galvanized sheet metal. Quality of material shall be such that sample may be bent flat on itself without fracture of coating or base metal.
- 2.3.4 Refer to relevant section of SMACNA standards and specify pressure class for gauges reinforcement and construction details.
- 2.3.5 Duct elbows shall be unvaned with throat radius equal to duct width. Where shown or required through interference, fabricate with reduced throat radius or square throat both with turning vanes.
- 2.3.6 Transformations shall be gradual, maximum 20° angle between duct side and direction of flow, diverging maximum 30° angle converging.
- 2.3.7 Make offsets with full radius elbows or square elbows with full radius turning vanes.
- 2.3.8 Take branches from main duct with radius tap in, 90° tap in on with converging radius elbow. Provide hinged double thickness splitter damper at each branch in rectangular supply ductwork. Damper shall be constructed of same gauge material as branch duct and have length equal to 1-1/2 times branch duct width. Accessible adjusting rod and clamp.
- 2.3.9 Brace and stiffen ductwork to eliminate breathing, vibration and sagging and hung rigidly and permanently.
- 2.3.10 Variations to the given duct sizes will be permitted providing that the equivalent round duct cross sectional area is maintained and provided the revised duct aspect ratio is not greater than 4:1.
- 2.3.11 Water, steam or other pipes may pass through duct provided the pipe is covered by streamline duplicators and the free area of the duct is maintained.

**2.4     Fittings**

- 2.4.1 Fabrication: To SMACNA
  - 2.4.2 Radius elbows: Standard Radius and/or short radius with single thickness turning vanes.
  - 2.4.3 Square elbows: To 400mm (16 in.) with single thickness vanes.
  - 2.4.4 Square elbows: Over 400mm (16 in.) with double thickness vanes.
  - 2.4.5 Main supply duct branches with or without splitter damper. If splitter damper is not used provide branch and main duct balancing dampers.
  - 2.4.6 Provide sub branch duct with 45° entry and balancing damper on branch and/or sub branch duct with square connection, extractor and branch duct balancing damper.
  - 2.4.7 Transitions:
    - .1 diverging: (20o) maximum included angle
    - .2 converging: (30o) maximum included angle
  - 2.4.8 Offset: square elbows and full radius elbows as indicated.
  - 2.4.9 Obstruction deflectors: Maintain full cross section area. Maximum included angles as for transitions.
-

**2.5 Galvanized Steel**

- 2.5.1 Lock forming quality: To ASTM A525M-80, (Z90) zinc coating.
- 2.5.2 Thickness: To ASHRAE and SMACNA
- 2.5.3 Fabrication: To ASHRAE and SMACNA
- 2.5.4 Joints: To ASHRAE and SMACNA and/or proprietary manufactured duct joint. Proprietary manufactured flanged duct joint shall be considered to be a class A seal.
- 2.5.5 Standard of Acceptance: Ductmate Convata Ltd. system for proprietary joints. Exams Nexus for proprietary joints.

**2.6 Hangers And Supports**

- 2.6.1 Strap Hangers: of same material as duct but next sheet metal thickness heavier than duct.
- 2.6.2 Hangers configuration: To ASHRAE and/or SMACNA. Maximum duct supported by strap hanger: 500mm (20").
- 2.6.3 Hangers: galvanized steel angle with galvanized steel rods to ASHRAE and SMACNA following table:

<u>Duct Size</u> (mm)	<u>Angle Size</u> (mm)	<u>Rod Size</u> (mm)
up to 750	25x25x3	6
751 to 1050	40x40x3	6
1051 to 1500	40x40x3	10
1501 to 2100	50x50x3	10
2101 to 2400	50x50x5	10
2401 and over	50x50x6	10

**2.6.4 Upper hanger attachments:**

- .1 For concrete: Manufactured concrete inserts. Standard of Acceptance:
  - Myatt Figure 485
- .2 For steel joist: Manufactured joist or steel plate washer. Standard of Acceptance:
  - Grinnell fig. 61 or 86 for joist clamps
  - Grinnell fig. 60 for plate washer
- .3 For Steel beams: Manufactured beam clamps. Standard of Acceptance:
  - Grinnell fig.69
- .4 Ductwork shall be hung rigidly and permanently at 2.44m (8 ft.) on center as follows:
  - up to 1.35 width: 1.6 mm strap
  - 1.35 m to 1.52 m: 38 x 38 x 5 mm angle c/w 6 mm rods
  - 1.54 m to 2.13 m: 38 x 38 x 5 mm angle c/w 10 mm rods
  - 2.16 m and over: 50 x 50 x 6 mm angle c/w 12 mm rods



**3. EXECUTION****3.1 General**

- 3.1.1 Install ducts in accordance with ASHRAE and/or SMACNA unless otherwise indicated.
- 3.1.2 Do not break continuity of insulation vapour barrier with hangers or rods. Insulate strap hangers 100mm (4 in.) beyond insulated duct.
- 3.1.3 Support risers in accordance with ASHRAE and/or SMACNA unless otherwise indicated.
- 3.1.4 Hammer edges and slips to leave a smooth finished surface inside duct. Extend strap down side and turn duct 50mm (2 in.) fastening securely to side and underside of duct.
- 3.1.5 Support vertical ducts with angles riveted to duct and bearing on building structure.
- 3.1.6 Cap ends of unfinished sections of duct unless that particular section is actually being worked on. Continue this protection until plastering, drywall and other finishing operations are completed.
- 3.1.7 Close inactive ducts with a layer of 6 mil plastic secured by a metal band pulled tight around the duct by means of screws.
- 3.1.8 Cover open ends or registers of active exhaust ducts with 25mm (1 in.) of filter media secured by a metal band pulled tight around the duct by means of screws. Maintain this media until plastering, drywall and other finishing operations are completed.

**3.2 Hangers**

- 3.2.1 Strap hangers: install in accordance with SMACNA.
- 3.2.2 Angle hangers: complete with locking nuts and washers.
- 3.2.3 Hanger Spacing as follows:

<u>Duct Size</u>		<u>Spacing</u>	
mm	(IN)	mm	(IN)
To 1500	(60")	3000	(10 ft.)
1500	(61") and over	2500	(8 ft.-6 in.)

**3.3 Leakage Test**

- 3.3.1 Make trial leak test, as instructed on site to demonstrate workmanship.
- 3.3.2 Install no additional ductwork until trial test has been passed.
- 3.3.3 Test section minimum of 30m (100 ft.) long with not less than (3) branch takeoffs and (2) 90° elbows.
- 3.3.4 Conduct test in accordance with Associated Air Balance Council. (AABC).

**3.4 Sealing**

- 3.4.1 Apply sealant to outside of joints to manufacturer's recommendations.

**END OF SECTION**

**1. GENERAL****1.1 General Requirements**

- 1.1.1 Conform to sections of Division 1 as applicable.
- 1.1.2 Section 23 00 00 shall apply to and govern the work of this section.
- 1.1.3 Provide labour, materials, products, equipment and service to complete the Duct Accessories Work.

**2. PRODUCTS****2.1 Flexible Connections**

- 2.1.1 Frame shall be galvanized sheet metal, 1 mm thick, (20ga), with fabric clenched by means of double locked seams.
- 2.1.2 Material shall be neoprene, self-extinguishing, glass fabric coated. Temperature rate -40°C to plus 90°C (-40°F to plus 194°F), density of 1.3 kg/m<sup>2</sup> (0.26 lb/ft<sup>2</sup>)
- 2.1.3 Standard of Acceptance:
  - Duro-Dyne Canada Ltd. – Durolon
  - Dentfabric Inc. – Ventglas
  - Elgen Manufacturing Corp. - Neoprene
- 2.1.2 Connections for kitchen exhaust and fume hood exhaust systems shall be fabricated from heavy reinforced durable cloth.
- 2.1.5 Standard of Acceptance:
  - Duro-Dyne Canada Ltd.
  - Elgen Manufacturing Corp.

**2.2 Sealant And Tape**

- 2.2.1 Sealant shall be resistant polymer type flame resistant high velocity duct sealing compound. Temperature range of -30°C to plus 93°C (-22°F to plus 200°F).
- 2.2.2 Standard of Acceptance: Foster 30-02, Duro-Dyne S-2, 3M Company EC-800
- 2.2.3 Tape shall be polyvinyl treated open weave fibre glass tape, 50mm (2 in.) wide.
- 2.2.4 Standard of Acceptance: Duro-Dyne FT-2

**2.3 Access Doors**

- 2.3.1 Non-insulated sandwich construction shall be of same material as duct, one sheet metal thickness heavier, minimum 0.6mm (26ga.) thick complete with sheet metal angle frame.
  - 2.3.2 Insulated sandwich construction shall be of same material as duct, one sheet metal thickness heavier, minimum 0.6mm (26ga) thick complete with sheet metal angle frame and 25mm (1 in.) thick rigid fibre insulation.
  - 2.3.3 Gasket shall be neoprene or foam rubber.
  - 2.3.4 Hardware:
    - .1 Up to 300mm x 300mm (12 in.x12 in.): 2 sash locks.
    - .2 301mm x 450mm (13 in. x18 in.): 4 sash locks.
    - .3 451mm x 1000mm (19 in.x40 in.): piano hinge and minimum 2 sash locks.
    - .4 Doors over 1000mm (40 in.) piano hinge and 2 handles operable from both sides.
    - .5 Access doors in uninsulated plenums and high velocity ducts shall be galvanized sheet metal with door frames welded in place.
    - .6 Access doors in uninsulated low and medium pressure ducts shall be fabricated from 0.8mm (22ga.) galvanized sheet with riveted strap angle frames.
    - .7 In insulated plenums and ductwork access doors shall be 0.8mm (22ga.) for low and medium pressure ductwork and 1.2mm (18ga.) for plenums and high pressure ductwork and shall be constructed with an insulated liner, not less than 25mm (1 in.) thick, and shall be double wall construction.
    - .8 Access doors shall be fitted with neoprene gaskets.
-

- .9 Doors in ductwork shall be secured with sash type fasteners.
- .10 Doors in plenums shall be hinged and provided with two, two lever handle catches, for operation from both inside and outside of plenums.
- .11 Standard of Acceptance: Duro-Dyne SP-20
- .12 Where prefabricated duct access doors are proposed, submit shop drawings for approval.

2.4 **Turning Test Ports**

- 2.4.1 Factory or shop fabricated single or double thickness to recommendations of SMACNA.

2.5 **Instrument Test Ports**

- 2.5.1 1.6mm (16ga.) thick steel zinc plated as per manufacturer's recommendations.
- 2.5.2 Cam lock handles with neoprene expansion plug and handle chain.
- 2.5.3 28mm (1-3/32 in.) minimum inside diameter. Length to suit insulation thickness.
- 2.5.4 Neoprene mounting gasket.
- 2.5.5 Standard of Acceptance: Duro-Dyne IP1 or IP2

3. **EXECUTION**

3.1 **Flexible Connections**

- 3.1.1 Provide flexible connections between air handling equipment and ductwork as shown.
- 3.1.2 Securely anchor ductwork to building structure at the flexible connection and select length of flexible material to allow 100mm (4 in.) movement of supply air equipment and 50mm (2 in.) for other fans.

3.2 **Sealant And Tapes**

- 3.2.1 Apply sealant in accordance with SMACNA and to manufacturer's recommendations.
- 3.2.2 Bed tape in sealant and recoat with minimum one coat of sealant to manufacturer's recommendations.

3.3 **Access Doors**

- 3.3.1 Install access doors in ducts, casings and plenums as shown and as specified herein.
- 3.3.2 Access doors in ducts shall be maximum size possible with duct sizes up to and including 356mm (14 in.). With duct sizes 380mm (15 in.) and larger, access doors shall be 305mm x 380mm (12 in.x15 in.).
- 3.3.3 Access doors in casings and plenum shall be 1524mm (60 in.) high by 457mm (18 in.) wide or larger where required for removal of motors or other equipment located within plenum or casing.
- 3.3.4 Install access doors in ductwork before and after reheat coils, terminal coils and air monitoring devices, and at fire dampers, duct smoke detectors firestats and other control elements, or as otherwise indicated.

3.4 **Instrument Test Ports**

- 3.4.1 For traverse readings, install in accordance with recommendations of SMACNA.
- 3.4.2 For temperature readings, install in accordance with recommendations of SMACNA.
- 3.4.3 Locations of Transverse:
  - .1 At ducted inlets to roof and wall exhausters.
  - .2 At inlets and outlets of other fan systems.
  - .3 At main and sub-main ducts.
  - .4 And as indicated.

- 3.4.4 Temperature:
- .1 At outside air intakes.
  - .2 At mixed air locations.
  - .3 At inlet and outlet of coils.
  - .4 Downstream of junctions of two converging air streams of different temperatures.
  - .5 And as indicated.

3.5 **Turning Vanes**

- 3.5.1 Install in accordance with recommendations of SMACNA.

**END OF SECTION**

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**PART 1**      **GENERAL****1.1**      **SECTION INCLUDES**

- .1      Materials and installation for acoustic duct lining.

**1.2**      **RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 35 29.06 - Health and Safety Requirements.
- .3      Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**1.3**      **REFERENCES**

- .1      American Society for Testing and Materials International, (ASTM).
  - .1      ASTM C 423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
  - .2      ASTM C 916, Standard Specification for Adhesives for Duct Thermal Insulation.
  - .3      ASTM C 1071, Standard specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
  - .4      ASTM C 1338, Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
  - .5      ASTM G 21, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- .2      Department of Justice Canada (Jus).
  - .1      Canadian Environmental Protection Act (CEPA).
- .3      Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1      Material Safety Data Sheets (MSDS).
- .4      National Fire Protection Association (NFPA).
  - .1      NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems.
  - .2      NFPA 90B, Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
- .5      Thermal Insulation Association of Canada(TIAC).
  - .1      National Insulation Standards.
- .6      Sheet Metal and Air Conditioning Contractor's National Association (SMACNA).
  - .1      SMACNA, HVAC, Duct Construction Standards, Metal and Flexible.

- .2 SMACNA IAQ Guideline for Occupied Buildings Under Construction.
- .7 Transport Canada (TC).
  - .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .8 Underwriter's Laboratories of Canada (ULC).
  - .1 CAN/ULC-S102, Methods of Test for Surface Burning Characteristics of Building Materials and Assemblies.

#### **1.4 SUBMITTALS**

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 62 00.01 - Hazardous Materials.

#### **1.5 HEALTH AND SAFETY**

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Store and manage hazardous materials in accordance with Section 02 62 00.01 - Hazardous Materials.
- .2 Protect on site stored or installed absorptive material from moisture damage.

#### **1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Handle and dispose of hazardous materials in accordance with CEPA, TDGA , Regional and Municipal regulations.
- .6 Ensure emptied containers are sealed and stored safely.
- .7 Fold up metal banding, flatten and place in designated area for recycling.

**PART 2**      **PRODUCTS****2.1**      **DUCT LINER**

- .1 General:
  - .1 Mineral Fibre duct liner: air surface coated mat facing.
  - .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50 when tested in accordance with CAN/ULC-S102, NFPA 90A and NFPA 90B.
  - .3 Fungi resistance: to ASTM C 1338, ASTM G 21.
- .2 Rigid:
  - .1 Use on flat surfaces where indicated
  - .2 25 mm thick, to ASTM C 1071, Type 2, fibrous glass rigid board duct liner.
  - .3 Density: 48 kg/m<sup>3</sup> minimum.
  - .4 Thermal resistance to be minimum 0.76 (m<sup>2</sup>.degrees C)/W for 25 mm thickness, 1.15 (m<sup>2</sup>.degrees C)/W for 38 mm thickness, 1.53 (m<sup>2</sup>.degrees C)/W for 50 mm thickness when tested in accordance with ASTM C 177, at 24 degrees C mean temperature.
  - .5 Maximum velocity on faced air side: 20.3 m/sec.
  - .6 Minimum NRC of 0.70 at 25 mm thickness based on Type A mounting to ASTM C 423.
- .3 Flexible:
  - .1 Use on round or oval surfaces.
  - .2 25 mm thick, to ASTM C 1071 Type 1, fibrous glass blanket duct liner.
  - .3 Density: 24 kg/m<sup>3</sup> minimum.
  - .4 Thermal resistance to be minimum 0.37 (m<sup>2</sup>.degrees C)/W for 12 mm thickness, 0.74 (m<sup>2</sup>.degrees C)/W for 25 mm thickness, 1.11 (m<sup>2</sup>.degrees C)/W for 38 mm thickness, 1.41 (m<sup>2</sup>.degrees C)/W to 50 mm thickness when tested in accordance with ASTM C 177, at 24 degrees C mean temperature.
  - .5 Maximum velocity on coated air side: 25.4 m/sec.
  - .6 Minimum NRC of 0.65 at 25 mm thickness based on Type A mounting to ASTM C 423.

**2.2**      **ADHESIVE**

- .1 Adhesive: to NFPA 90A and NFPA 90B, ASTM C916.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 29 degrees C to plus 93 degrees C.
- .3 Water-based fire retardant type.

**2.3 FASTENERS**

- .1 Weld pins 2.0 mm diameter, length to suit thickness of insulation. Metal retaining clips, 32 mm square.

**2.4 JOINT TAPE**

- .1 Poly-Vinyl treated open weave fiberglass membrane 50 mm wide.

**2.5 SEALER**

- .1 Meet requirements of NFPA 90A and NFPA 90B.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 68 degrees C to plus 93 degrees C.

**PART 3 EXECUTION****3.1 GENERAL**

- .1 Do work in accordance with SMACNA HVAC DCS, TIAC, and as indicated except as specified otherwise.
- .2 Line inside of ducts where indicated.
- .3 Duct dimensions, as indicated, are clear inside duct lining.

**3.2 DUCT LINER**

- .1 Install in accordance with manufacturer's recommendations, and as follows:
  - .1 Fasten to interior sheet metal surface with 100 % coverage of adhesive to ASTM C 916
    - .1 Exposed leading edges and transverse joints to be factory coated or coated with adhesive during fabrication.
  - .2 In addition to adhesive, install weld pins not less than 2 rows per surface and not more than 425 mm on centres impact driven mechanical fasteners to compress duct liner sufficiently to hold it firmly in place.
    - .1 Spacing of mechanical fasteners in accordance with SMACNA HVAC DCS, TIAC.
- .2 In systems, where air velocities exceed 20.3 m/sec, install galvanized sheet metal noising to leading edges of duct liner.

**3.3 JOINTS**

- .1 Seal butt joints, exposed edges, weld pin and clip penetrations and damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's written recommendations, and as follows:



- .1 Bed tape in sealer.
- .2 Apply two coats of sealer over tape.
- .2 Replace damaged areas of liner at discretion of Owner's Representative.
- .3 Protect leading and trailing edges of duct sections with sheet metal nosing having 15 mm overlap and fastened to duct.

**END OF SECTION**

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**1. GENERAL****1.1 SUMMARY****1.1.1 Section Includes:**

- .1 Supply, return and exhaust grilles and registers, diffusers and linear grilles, for commercial and residential use.

**1.1.2 Related Sections:**

- .1 Section 01 33 00 – Submittal Procedure
- .2 Section 01 78 00 – Closeout Submittals
- .3 Section 23 05 01 – Mechanical General Requirements.
- .4 Section 23 05 54 – Mechanical Identification
- .5 Section 23 05 93 – Balancing of Mechanical Systems

**1.2 SYSTEM DESCRIPTION****1.2.1 Performance Requirements:**

- .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

**1.3 SUBMITTALS****1.3.1 Product Data:**

- .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section [01 33 00 - Submittal Procedures]. Include product characteristics, performance criteria, and limitations.
  - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures
- .2 Indicate following:
  - .1 Capacity.
  - .2 Throw and terminal velocity.
  - .3 Noise criteria.
  - .4 Pressure drop.
  - .5 Neck velocity.

**1.3.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures**

- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions.

**1.4 QUALITY ASSURANCE****1.4.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements****1.5 DELIVERY, STORAGE, AND HANDLING****1.5.1 Packing, shipping, handling and unloading:**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

**1.6 MAINTENANCE****1.6.1 Extra Materials:**

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals
- .2 Include:
  - .1 Keys for volume control adjustment.
  - .2 Keys for air flow pattern adjustment.

**2. PRODUCTS****2.1 GENERAL**

- 2.1.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.

- 
- 2.1.2 Frames:
    - .1 Full perimeter gaskets.
    - .2 Plaster frames where set into plaster or gypsum board.
    - .3 Concealed fasteners.
  - 2.1.3 Concealed manual volume control damper operators.
  - 2.2 **MANUFACTURED UNITS**
    - 2.2.1 Grilles, registers and diffusers of same generic type, products of one manufacturer.
  - 2.3 **RETURN AND EXHAUST GRILLES AND REGISTERS**
    - 2.3.1 General: as specified on drawings.
  - 2.4 **DIFFUSERS**
    - 2.4.1 General: as specified on drawings.
- 3 **EXECUTION**
- 3.1 **MANUFACTURER'S INSTRUCTIONS**
    - 3.1.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
  - 3.2 **INSTALLATION**
    - 3.2.1 Install in accordance with manufacturer's instructions.
    - 3.2.2 Install with screws in countersunk holes where fastenings are visible.
    - 3.2.3 Bolt grilles, registers and diffusers in place.
  - 3.3 **CLEANING**
    - 3.3.1 Proceed in accordance with Section 01 74 11 - Cleaning.
    - 3.3.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**1. GENERAL****1.1 Related Documents**

- 1.1.1 ANSI Z21.13 / CSA 4.9 (Gas Fired Low Pressure Steam and Hot Water Boilers)
- 1.1.2 ASME Section IV ("H" Stamp Heating Boilers)
- 1.1.3 ASME CSD-1 (Controls and Safety Devices)
- 1.1.4 NBIC - Part 1 (Installation)
- 1.1.5 NFPA 54/ANSI Z221.3 (National Fuel Gas Code)
- 1.1.6 NFPA 70 (National Electric Code)

**1.2 Summary**

- 1.2.1 This section includes gas-fired, high efficiency condensing hot water boilers with Stainless Steel heat exchangers.

**1.3 Submittals**

- 1.3.1 The contractor shall submit, in a timely manner, all submittals for approval to the engineer. Under no circumstances shall the contractor install any materials until the engineer has made final approval on the submittals.
- 1.3.2 Product data and/or drawings shall be submitted to the engineer for approval and shall consist of:
  - .1 General assembly drawing of the boiler including product description, model number, dimensions, clearances, weights, service sizes, etc.
  - .2 Schematic flow diagram of the boiler's gas valve train(s).
  - .3 Schematic wiring diagram of the boiler's control system that shows all components, interlocks, etc. and shall clearly identify factory wiring and field wiring.
- 1.3.3 Full Function Factory Fire Test must be performed and documented on the boiler's fire test label. A Factory Authorized Start-up must be completed prior to final acceptance by the engineer.
- 1.3.4 Operation and Maintenance Manuals shall be submitted prior to final acceptance by the engineer and shall contain shop drawings, product data, operating instructions, cleaning procedures, replacement parts list, maintenance and repair data, etc.

**1.4 Quality Assurance**

- 1.4.1 The equipment shall, at a minimum, be in strict compliance with the requirements of this specification, shall perform as specified and shall be the manufacturer's standard commercial product unless specified otherwise.
- 1.4.2 Electrically operated components specified are to be "Listed" and/or "Labeled" as defined by NFPA 70, Article 100.
- 1.4.3 Boiler shall bear an ASME "H" stamp in accordance with ASME Section IV.
- 1.4.4 Boiler shall be CSA certified to the ANSI Z21.13 / CSA 4.9 standard for Gas Fired Low Pressure Steam and Hot Water Boilers and shall bear an authorized CSA rating label.
- 1.4.5 Boiler shall be AHRI listed and certified in accordance with the Commercial Boiler program and the BTS-2000 testing standard.
- 1.4.6 Boiler shall be SCAQMD certified (relevant jurisdictions).
- 1.4.7 Boiler shall undergo a Full Function Factory Fire Test and bear a fire test label.
- 1.4.8 Boiler shall be registered through the National Board from the factory.
- 1.4.9 The manufacturer shall make available, upon request, all quality assurance documentation and results of Full Function Factory Fire Test based on the boiler's serial number.

**1.5 Coordination**

- 1.5.1 Equipment shall be handled, stored and installed in accordance with the manufacturer's instructions.
- 1.5.2 Factory Authorized Start-up must be completed after all appliance connections are completed, e.g. gas piping, hydronic piping, exhaust venting & electrical.

**1.6 Warranty**

- 1.6.1 The boiler manufacturer shall warrant each boiler, including boiler, trim, boiler control system, and all related components, accessories, and appurtenances against defects in workmanship and material for a period of twelve (12) months from date of startup, provided that startup is completed within six (6) months of shipment and the start-up report is furnished to the manufacturer within thirty (30) days of startup.
- 1.6.2 The boiler manufacturer shall warrant the boiler's fuel burner for a period of five (5) years from date of startup, provided that startup is completed within six (6) months of shipment and the start-up report is furnished to the manufacturer within thirty (30) days of startup.
- 1.6.3 The boiler manufacturer shall warrant the boiler's heat exchanger for a period of ten (10) years from date of startup, provided that startup is completed within six (6) months of shipment and the start-up report is furnished to the manufacturer within thirty (30) days of startup.
- 1.6.4 The boiler manufacturer shall also warrant the boiler's heat exchanger against failure due to thermal shock for a period of ten (10) years from date of startup, provided that startup is completed within six (6) months of shipment and the start-up report is furnished to the manufacturer within thirty (30) days of startup.

**1.7 Certification**

- 1.7.1 Manufacturer's Certification - The boiler manufacturer shall certify the following:
  - .1 The products and systems furnished are in strict compliance with the specifications.
  - .2 The boiler, burner and other associated mechanical and electrical equipment have all been properly coordinated and integrated to provide a complete and operable boiler.
  - .3 The boiler shall be in compliance with ANSI Z21.13 / CSA 4.9 (latest edition).
  - .4 The boiler shall be in compliance with ASME Section IV (latest edition).
  - .5 The boiler shall be in compliance with ASME CSD-1 (latest edition).
  - .6 The boiler's H-3 form shall be registered with the National Board.
  - .7 SC650, SC750 & SC850 Models:
    - .1 The boiler shall be CSA certified for at least 94% efficiency based on operating conditions specified for testing under ANSI Z21.13 / CSA 4.9.
    - .2 The boiler shall be AHRI certified for at least 94% efficiency based on operating conditions specified for testing under BTS-2000.
  - .8 SC1000 Model Only
    - .1 The boiler shall be CSA certified for at least 92% efficiency based on operating conditions specified for testing under ANSI Z21.13 / CSA 4.9.
    - .2 The boiler shall be AHRI certified for at least 92% efficiency based on operating conditions specified for testing under BTS-2000.
- 1.7.2 Contractor's Certification - The installing contractor shall certify the following:
  - .1 The products and systems installed are in strict compliance with the specifications and all applicable local and/or state codes.
  - .2 The specified field tests have been satisfactorily performed by a factory authorized startup agent.

- .3 The equipment furnished contains inter-changeable parts with the specified equipment so that all major equipment parts can be obtained from the specified manufacturer.

## 2. **PRODUCT**

### 2.1 **Manufacturers**

- 2.1.1 Furnish and install factory “packaged” low pressure hot water boiler(s) as manufactured by Patterson-Kelley or as approved and accepted by the Engineer as defined in the table below:
- 2.1.2 Each factory “packaged” boiler shall be complete with all components and accessories necessary for a complete and operable boiler as hereinafter specified. Each boiler shall be furnished factory assembled with the required wiring and piping as a self-contained unit. Each boiler shall be readily transported and ready for installation.
- 2.1.3 All “Approved Equal” or “Approved Alternate” boilers must demonstrate compliance with the requirements of this specification.

### 2.2 **Components**

#### 2.2.1 Cabinet Enclosure:

- .1 Each boiler shall feature a fully assembled cabinet enclosure fabricated from Carbon Steel or Aluminum sheet metal (minimum 18 Gauge) with powder coat finish.
- .2 The boiler’s cabinet enclosure shall not exceed 28” in width and the completed boiler shall fit through a standard 32” wide doorway.
- .3 The boiler’s cabinet enclosure shall feature removable access panels / doors with quarter-turn type latches that can be easily opened with a coin or flathead screwdriver.
- .4 The boiler’s cabinet enclosure shall eliminate the use of refractory or other insulating materials outside the heat exchanger and the enclosure’s surface temperature shall not exceed 20°F above ambient temperature.
- .5 The boiler’s cabinet enclosure shall prominently display all required safety, instruction, compliance and factory runout labels.

#### 2.2.2 Heat Exchanger:

- .1 Each water-tube boiler shall contain an ASME Section IV heat exchanger with an “H” stamp designed for a maximum allowable working pressure of 160 PSIG and a maximum allowable temperature of 210°F.
- .2 The completed heat exchanger shall consist of welded 316L SS helical water tubes and provide no less than the total fireside heating surface area defined in the table below:
- .3 Each completed heat exchanger shall include an integral stainless steel condensate pan/collector, condensate drain, removable burner assembly, inlet temperature sensor, outlet temperature sensor, flue gas temperature sensor, heat exchanger temperature sensor, automatic air vent, thermowell for high temperature limit capillary, low water cutoff probe or flow switch, and all necessary assembly hardware.
- .4 Each Stainless Steel heat exchanger shall be designed to maintain water turbulence at the full published range of acceptable flow rates at various boiler conditions as described below:
  - .1 The maximum allowable flow rate will generate a 20°F  $\Delta T$  when the boiler is operating at full capacity.
  - .2 The minimum allowable flow rate will generate a 60°F  $\Delta T$  when the boiler is operating at full capacity.
- .5 The boiler’s completed heat exchanger shall be capable of operating with a minimum outlet water temperature of 42°F.
- .6 Each heat exchanger must be hydrostatically tested by the manufacturer to a minimum of 1-1/2 times the maximum allowable working pressure

for a minimum of 5 minutes. During this hydrostatic pressure test, the operator will inspect the pressure gauge and visually verify there are no water leaks.

#### 2.2.3 Main Gas Train

- .1 Boilers configured for single fuel operation shall be equipped with an integral main gas valve train capable of burning either Natural Gas or Propane Gas.
- .2 Each single fuel gas valve train shall include at least the following:
  - .1 One (1) upstream manual shutoff valve for field-connection.
  - .2 One (1) combination Air-Gas ratio control and safety shutoff valve with dual solenoids (in-series) that can be independently energized for leak testing and integrated into a single body design. The combination gas valve shall operate as a “Zero Governor” and control to a neutral gas pressure inside the gas valve.
  - .3 One (1) low gas pressure switch (manual reset).
  - .4 One (1) high gas pressure switch (manual reset).
  - .5 Two (2) gas pressure test ports.
  - .6 One (1) downstream manual shutoff valve.
- .3 Boilers configured for dual fuel operation shall be equipped with two integral gas valve trains; the first capable of burning Natural Gas and the second capable of burning Propane Gas. Dual fuel boiler types shall feature a NG / LP toggle switch allowing the user to quickly change between the two fuel types. Operation of this switch shall not require the boiler to be powered off prior to changeover.
- .4 Each gas train shall be completely independent and include dedicated safety devices, shutoff valves, etc. Each gas train shall be individually identified by the manufacturer with labels and dedicated paint colors (Yellow = Natural Gas & Red = Propane Gas).
- .5 Each dual fuel gas valve train shall include at least the following:
  - .1 One (1) upstream manual shutoff valve for field-connection to Natural Gas.
  - .2 One (1) upstream manual shutoff valve for field-connection to Propane Gas.
  - .3 One (1) Natural Gas combination Air-Gas ratio control and safety shutoff valve with dual solenoids (in-series) that can be independently energized for leak testing and integrated into a single body design. The combination gas valve shall operate as a “Zero Governor” and control to a neutral gas pressure inside the gas valve.
  - .4 One (1) Propane Gas combination Air-Gas ratio control and safety shutoff valve with dual solenoids (in-series) that can be independently energized for leak testing and integrated into a single body design. The combination gas valve shall operate as a “Zero Governor” and control to a neutral gas pressure inside the gas valve.
  - .5 One (1) low gas pressure switch (manual reset) for Natural Gas.
  - .6 One (1) low gas pressure switch (manual reset) for Propane Gas.
  - .7 One (1) high gas pressure switch (manual reset) for Natural Gas.
  - .8 One (1) high gas pressure switch (manual reset) for Propane Gas.
  - .9 Two (2) gas pressure test ports for Natural Gas.
  - .10 Two (2) gas pressure test ports for Propane Gas.
  - .11 One (1) downstream manual shutoff valve for Natural Gas.
  - .12 One (1) downstream manual shutoff valve for Propane Gas.
- .6 The main gas valve train(s) shall be factory assembled, piped, and wired and allow for operation at full rated boiler capacity from 3.5” W.C. up to the maximum inlet gas pressure of 14.0” W.C.

- .7 If the supplied gas pressure exceeds 14" W.C., the contractor shall supply a suitable intermediate gas pressure regulator of the lock-up type to reduce the gas pressure to acceptable levels.
- 2.2.4 Power Burner
  - .1 The boiler manufacturer must furnish an integral power type fuel burner with each boiler. The complete power fuel burner assembly must consist of a gas burner, combustion air blower, main gas valve train, and ignition system. The burner manufacturer must fully coordinate the burner design with the boiler's heat exchanger and the boiler control system in order to provide the required capacities, efficiencies, and performance specified. Boilers shipped without a power burner and field-equipped with a 3rd party power burner are not acceptable.
  - .2 Each burner must be installed horizontally inside the combustion chamber with combustion gases flowing downward through the heat exchanger. The burner must consist of a stainless steel flange and woven fiber mesh cylindrical design.
  - .3 The burner must incorporate fuel/air ratio control system to preserve exhaust oxygen levels as per boiler schedule, maintaining consistent flue dew point.
  - .4 The system must be linkage-less without the use of electronic control loops and electronic oxygen sensors requiring calibration and renewal.
  - .5 Low NOx burner must be certified by SCAQMD for NOx levels listed on schedule when O2 is corrected to 3%. No additional setup or adjustment, such as increasing excess air, will be necessary to achieve level listed
  - .6 Each boiler must be equipped with direct spark ignition. Main flame must be monitored and controlled by a flame rod / ionization probe (rectification) system.
- 2.2.5 Boiler Safety and Trim Devices
  - .1 The boiler manufacturer shall furnish and test the following safety and trim devices with each boiler:
    - .1 Safety relief valve shall be provided in compliance with the ASME code. Contractor is required to pipe the relief valve discharge piping to an acceptable drain.
    - .2 Water pressure/temperature gauge.
    - .3 Low Water / Flow cutoff switch.
    - .4 Manual reset high limit water temperature controller.
    - .5 Operating temperature control to control the sequential operation of the burner.
    - .6 High and Low Gas Pressure switches.
    - .7 Flame rod / ionization probe flame detection.
  - .2 The boiler manufacturer shall provide a CSD-1 form identifying each safety and trim device.
  - .3 The boiler shall be capable of interfacing with the following external safety devices:
    - .1 Auxiliary Low Water Cutoff device.
    - .2 Combustion Air Damper End Limit Switch.
    - .3 Emergency Stop (E-Stop) switch.
    - .4 External Safety Device w/ contact closure.
- 2.2.6 Boiler Control System
  - .1 Each boiler shall be provided with all necessary controls, all necessary programming sequences, and all safety interlocks. Each boiler control system shall be properly interlocked with all safeties.
  - .2 Each boiler shall be provided with a "Full Modulating" firing control system whereby the firing rate is infinitely proportional at any firing rate between low fire and high fire as determined by the pulse width modulation input control signal. Both fuel input and air input must be



- sequenced in unison to the appropriate firing rate without the use of mechanical linkage.
- .3 The boiler's control system shall provide the minimum capabilities:
- .1 7" color touchscreen display with one or more USB ports.
  - .2 Standard on-board Ethernet port for wired internet connectivity and embedded wireless driver for optional wireless internet connectivity to remote monitoring and software update services.
  - .3 Parameter uploads and downloads via external USB flash drive.
  - .4 Software updates via external USB flash drive.
  - .5 Capture screen shots from the control's display by saving digital image files to external USB flash drive.
  - .6 Local Representative Screen can be programmed to provide contact information for the local boiler manufacturer's representative.
  - .7 Programmable Relay Outputs for direct control of pumps, control valves, dampers and other auxiliary devices.
  - .8 Multiple boiler "cascade" network up to 24 boilers without any external control panel. The installation of external sequencing control panels is not acceptable.
  - .9 Automatic hybrid system control for multiple boiler "cascade" systems with both condensing and non-condensing boilers. This control logic prioritizes condensing boilers at low water temperatures and prioritizes non-condensing boilers at high water temperatures.
  - .10 Auxiliary Boiler Relay for multiple boiler "cascade" systems which can be used to enable a 3rd party boiler platform in the event the "cascade" system is unable to satisfy the heating load.
  - .11 Programmable Boiler and System pump control for multiple boiler "cascade" systems installed in a Primary-Secondary piping arrangement.
  - .12 Programmable Control Valve logic for multiple boiler "cascade" systems installed in a Primary-Only piping arrangement.
  - .13 Integration with external Building Management Systems (BMS) via MODBUS® RTU protocol. NOTE: Optional Protocol Converter for communication via LONWORKS® and BACnet® must be available for purchase from the boiler manufacturer.
  - .14 Hardwire integration with Building Management Systems (BMS) via 4-20mA analog control signal for temperature or firing rate control.
  - .15 Intuitive "Setup Wizards" ask the user a series of questions and allow for step-by-step configuration of the boiler control.
  - .16 On-Screen error notifications with a comprehensive description of all alarm conditions and several troubleshooting steps.
  - .17 Automatic flue gas temperature and outlet (supply) temperature compensation to prevent over-firing of the boiler equipment.
  - .18 Automatic differential temperature compensation to prevent over-firing of the boiler equipment in a low flow condition.
  - .19 Automatically adjust the temperature set point and shutdown the boiler based on the outdoor air temperature conditions.
  - .20 Night Setback functionality via external point of closure (or BMS integration) for unique "Occupied" and "Unoccupied" temperature setpoint values.
  - .21 Maintain single temperature set point with a minimum outlet (supply) water temperature of 42°F up to a maximum outlet (supply) water temperature of 194°F.

- .22 On-Board DHW Priority capable of seamless transition between Comfort Heat (CH) and Domestic Hot Water (DHW) operation.
- .23 On-Board CH&DHW operation for simultaneous Comfort Heat (CH) and Domestic Hot Water (DHW) operation.
- .24 Alarm Relay Output to announce alarm conditions which require manual reset.
- .25 Programmable Low Fire Delay to prevent excessive short-cycling of the boiler equipment.
- .26 Local Manual Operation.
- .4 The boiler control system shall be capable of interfacing with the following external control devices:
  - .1 Building Management System (MODBUS®). NOTE: Optional Protocol Converter for communication via LONWORKS® and BACnet® must be available for purchase from the boiler manufacturer.
  - .2 Domestic Hot Water Break-on-Rise Aquastat (Normally Closed).
  - .3 Domestic Hot Water Tank Temperature Sensor (12kΩ).
  - .4 External Header Temperature Sensor (12kΩ).
  - .5 Outdoor Air Temperature Sensor (12kΩ).

### 3. **EXECUTION**

#### 3.1 **Installation**

- 3.1.1 Installation shall be performed by the contractor in accordance with the requirements of the applicable codes. Contractor shall review the boiler and installation for compliance with requirements and/or issues that may affect boiler performance. Installation should not proceed until unsatisfactory conditions have been corrected.
- 3.1.2 The contractor shall mount the equipment as described below:
  - .1 Install boilers on cast-in-place concrete equipment base in compliance with the requirements for equipment bases and foundation specified in Section 03 30 00 "Cast-in-Place Concrete."
  - .2 If required by the local code, install vibration isolation devices in compliance with Section 23 05 48 "Vibration and Seismic Controls for HVAC Piping and Equipment."
- 3.1.3 The contractor shall install gas-fired boilers in accordance with NFPA 54/ANSI Z223.1 (United States), or CAN/CSA B/149.1 (Canada).
- 3.1.4 The contractor shall install gas-fired boilers in accordance with NBIC – Part 1 (Installation), or another installation code having local jurisdiction.
- 3.1.5 The contractor shall assemble and install any external boiler safety/trim devices.
- 3.1.6 The contractor shall install any electrical devices furnished with the boiler, but not specified to be factory-mounted.
- 3.1.7 The contractor shall install control wiring to field mounted electrical devices in accordance with the requirements of NFPA 70.
- 3.1.8 The contractor shall install electrical (power) wiring to the boiler in accordance with the requirements of NFPA 70.

#### 3.2 **Connections**

- 3.2.1 Gas Piping
  - .1 Each boiler shall be provided with all necessary gas connections. Refer to the boiler's specification sheet or manual for connection sizes.
  - .2 Install gas piping in accordance with NFPA 54/ANSI Z223.1 (United States), or CAN/CSA B/149.1 (Canada).
  - .3 For boilers configured for Natural Gas or Dual Fuel, refer to the requirements of Section 23 11 23 "Facility Natural-Gas Piping".

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- .4 For boilers configured for Propane Gas or Dual Fuel, refer to the requirements of Section 23 11 26 "Facility Liquefied-Petroleum Gas Piping".
- 3.2.2 Hydronic Piping
- .1 Each boiler shall feature 2" steel piping inlet (supply) and outlet (return) connections. The steel piping shall terminate with 2" grooved connections.
- .2 Check manufacturer's installation manual for clearance dimensions and install piping that will allow for service and ease of maintenance.
- .3 Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection and adhere to proper codes for neutralization.
- .4 The hydronic piping and related components shall comply with the requirements of 23 21 00 "Hydronic Piping and Pumps".
- .5 All meters and gages in the hydronic piping shall comply with the requirements of Section 23 05 19 "Meters and Gages for HVAC Piping".
- .6 All instrumentation and controls in the hydronic piping shall comply with the requirements of Section 23 09 13 "Instrumentation and Control Devices for HVAC".
- .7 All valves in the hydronic piping shall comply with the requirements of Section 23 05 23 "General-Duty Valves for HVAC Piping".
- .8 All expansion fittings shall comply with the requirements of Section 23 05 16 "Expansion Fittings and Loops for HVAC Piping".
- .9 Any pipe hangers or supports shall comply with the requirements of Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment".
- .10 Any vibration isolation devices on the hydronic piping shall comply with the requirements of Section 23 05 48 "Vibration and Seismic Controls for HVAC Piping and Equipment."
- .11 The feedwater piping shall comply with the requirements of Section 23 53 00 "Heating Boiler Feedwater Equipment".
- .12 The hydronic piping shall be insulated in accordance with the requirements of Section 23 07 19 "HVAC Piping Insulation".
- .13 After insulation, all hydronic piping shall be identified in accordance with the requirements of Section 23 05 53 "Identification for HVAC Piping and Equipment".
- .14 Any water treatment of the hydronic system shall be in accordance with the boiler manufacturer's requirements and/or Section 23 25 13 "Water Treatment for Closed-Loop Hydronic Systems".
- 3.2.3 Exhaust Venting
- .1 The boilers shall be dual certified as Category II or IV appliances and are capable of operating with slightly negative to slightly positive exhaust vent pressure, and the vent gas temperature is likely to cause condensate production in the vent.
- .2 Install the exhaust/flue venting system in accordance with NFPA 54/ANSI Z223.1 (United States), or CAN/CSA B/149.1 (Canada) and per the manufacturer's recommendations in the installation manual.
- .3 All exhaust venting components shall comply with the requirements of Section 23 51 00 "Breechings, Chimneys and Stacks."
- 3.2.4 Air Inlet
- .1 The boilers shall be certified for Direct Vent / Sealed Combustion installations where the combustion air is supplied directly to the boiler through ductwork.
- .2 Install the air inlet system in accordance with NFPA 54/ANSI Z223.1 (United States), or CAN/CSA B/149.1 (Canada) and per the manufacturer's recommendations in the installation manual.

- .3 All air inlet components shall comply with the requirements of Section 23 37 00 "Air Outlets and Inlets".

3.3 **Electrical**

- 3.3.1 Install an external disconnect and overload protection for each boiler in accordance with the requirements of NFPA 70.
- 3.3.2 The voltage requirements for the boilers shall be 110-120VAC, Single Phase, 60Hz.
- 3.3.3 The amperage requirements for each boiler is described in the table below:

**END OF SECTION**

**1. General****1.1 SUMMARY****1.1.1 Section Includes:**

- .1 Materials and installation for self-contained packaged rooftop HVAC units.

**1.1.2 Related Sections:**

- .1 Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM).
- .2 Section 01 33 00 - Submittal Procedures.
- .3 Section 01 35 29.06 - Health and Safety Requirements.
- .4 Section 01 45 00 - Quality Control.
- .5 Section 01 78 00 - Closeout Submittals.
- .6 Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

**1.2 REFERENCES****1.2.1 American National Standards Institute (ANSI)/Air Conditioning and Refrigeration Institute (ARI)**

- .1 ANSI/ARI 210/240-Latest Edition, Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
- .2 ARI 270-Latest Edition, Sound Rating of Outdoor Unitary Equipment.

**1.2.2 ANSI/UL 1995 B-[1998], Standard for Heating and Cooling Equipment.****1.2.3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)**

- .1 Material Safety Data Sheets (MSDS).

**1.2.4 National Fire Protection Association**

- .1 NFPA 90A-Latest Edition, Standard for the Installation of Air Conditioning and Ventilating Systems.

**1.3 SUBMITTALS****1.3.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.****1.3.2 Product Data:**

- .1 Submit manufacturer's printed product literature, specifications and datasheet for packaged rooftop HVAC units.

**1.3.3 Shop Drawings:**

- .1 Submit shop drawings to indicate project layout and dimensions; indicate:
  - .5 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, mounting curb details, sizes and location of mounting bolt holes; include mass distribution drawings showing point loads.
  - .6 Detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices of ancillaries, accessories, and controllers.
  - .7 Pump and fan performance curves.
  - .8 Details of vibration isolation.
  - .9 Estimate of sound levels to be expected across individual octave bands in dB referred to A rating.

**1.3.4 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.****1.3.5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.****1.3.6 Instructions: submit manufacturer's installation instructions.****1.3.7 Manufacturer's Field Reports: manufacturer's field reports specified.****1.3.8 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include data as follows:**

- .1 Indicate: brief description of unit, indexed, with details of function, operation, control, and service for components.
- .2 Provide for units, manufacturer's name, type, year, number of units, and capacity.

## 2. **Products**

### 1. **GENERAL**

- 1.1. Air Handling Units shall be built to the level of quality as herein specified and to the description of the Air Handling Unit Schedule.
- 1.2. Substitution of any product other than that specified, must ensure no deviation below the stated capacities, air flow rate, heat transfer rate, filtration efficiency and air mixing quality. Power requirements must not be exceeded, and where specifically defined, sound power levels must not be exceeded. Applications for "equal" or "alternate" must address these factors.
- 1.3. Unless stated otherwise, air-handling units are to be shipped to the job in one piece, factory assembled. Modular units assembled to achieve a close proximation to the intent of this specification will not be considered equal. All equipment shall where specified and applicable, be pre-wired, and factory certified by an approved testing agency such as cETL, ETL<sub>US</sub>, UL, CSA prior to shipment.
- 1.4. Pre-wired air handling units shall bear an approved label with all the necessary identification marks, electrical data.
  - 1.4.1 Unit must conform to regulations set out in the Canadian Energy Efficiency Act for large air conditioners (condensing units). Packaged units shall be tested to CSA Standard C746-98 and must bear an EEV (energy efficiency verification) label provided by CSA.  
"Where specified as factory packaged air conditioning unit, factory assembled split systems do not conform to the Canadian Energy Efficiency Act and will not be considered."
- 1.5. All electrical circuits shall undergo a dielectric strength test, and shall be factory tested and checked as to proper function.
- 1.6. The air handling units and major components shall be products of manufacturers regularly engaged in the production of such equipment and with a minimum of fifteen continuous years of proven production experience.
- 1.7. Air Handling Units shall be as manufactured by Engineered Air and be base bid. Alternate products must show savings and clearly indicate all areas where they do not meet specified product.

**2. UNIT CONSTRUCTION**

- 2.1. Unit casing shall be of minimum 18 gauge (1.3mm) satin coat galvanized sheet metal. Surfaces shall be cleaned with a degreasing solvent to remove oil and metal oxides and primed with a two-part acid based etching primer. Finish coat shall be an electrostatically applied enamel, to all exposed surfaces. All unprotected metal and welds shall be factory coated.
- 2.2. All walls, roofs and floors shall be of formed construction, with at least two breaks at each joint. Joints shall be secured by sheet metal screws or pop rivets. Wall and floor joints shall be broken in and on all outdoor units roof joints broken out (exposed) for rigidity. All joints shall be caulked with a water resistant sealant.
- 2.3. The unit interior shall be provided with a 22 gauge (.85mm) solid, galvanized metal liner over insulated areas.
- 2.4. Units shall be provided with access doors to the following components: fans and motors, filters, dampers and operators, access plenums, electrical control panels, burner and compressor compartments. Access doors shall be large enough for easy access. Removal of screwed wall panels will not be acceptable.
- 2.5. Units shall be provided with hinged access doors, with e-profile gasket, fully lined, and a minimum of two lever handles, operable from both sides for all units.
- 2.6. All units shall be internally insulated with 2"(51mm) thick 1 1/2 lb./cu.ft. (24 kg./cu.m.) density insulation.
- 2.7. 1 1/2 lb./cu.ft. (24 kg/cu.m.)insulation shall be secured to metal panels with a fire retardant adhesive and welded steel pins at 16" (400mm) o/c. All longitudinal insulation joints and butt ends shall be covered by a sheet metal break to prevent erosion of exposed edges. Drain pans and all floor areas shall be insulated on the underside.
- 2.8. Cooling coil drain pans shall be fabricated of stainless steel and are an integral part of the floor paneling, a minimum of 2" (51mm) deep, with welded corners. Drain pans shall extend a minimum of 6" (152mm) downstream of coil face and be provided with a 1 1/2" (38mm) S.S. M.P.T. drain connection.
- 2.9. In air-to-air heat reclaim units, the exhaust section drain pans shall be an integral part of the floor paneling, a minimum of 2" (51 mm) deep, with welded corners. Drain pans shall extend over the full exhaust fan plenum and be connected with a 1 1/2"(38 mm) M.P.T. drain connection.
- 2.10. Air handling units shall be weatherproofed and equipped for installation outdoors. This shall include generally for the prevention of infiltration of rain and snow into the unit, louvers or hoods on air intakes and exhaust openings with 1"(25mm) galvanized inlet screens; rain gutters or diverters over all access doors; all joints caulked with a water resistant sealant; roof joints turned up 2" (51mm) with three break interlocking design; outer wall panels extend a minimum of 1/4"(6mm) below the floor panel; drain trap(s) connections for field supply and installation of drain traps.

**3. FANS**

- 3.1. Centrifugal fans shall be rated in accordance with AMCA Standard Test Code, Bulletin 210. Fan manufacturer shall be a member of AMCA. All fans and fan assemblies shall be dynamically balanced during factory test run. Fan shafts shall be selected for stable operation at least 20% below the first critical RPM. Fan shafts shall be provided with a rust inhibiting coating.
- 3.2. Supply fans shall be Airfoil type fans and shall be equipped with greaseable, self-aligning ball or roller type pillow block bearings.
- 3.3. Return/Exhaust fans shall be plenum type configuration where noted on drawings or schedules.

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- 3.4. Provide optional inlet screen and open wire mesh protective discharge screen on Return/Exhaust fans. Removable screens at access doors are not acceptable.
- 3.5. Drives shall be adjustable on fans with motors 7 1/2 HP (5.6 kW) or smaller. On fans with larger motors, fixed drives shall be provided. All drives shall be provided with a rust inhibiting coating. The air balancer shall provide for drive changes (if required) during the air balance procedure.
- 3.6. Provide full section return air fan(s) as scheduled. The use of power exhaust propeller or centrifugal fan arrangements will not be considered.
- 3.9. Provide variable air volume fan control for units, via Adjustable frequency drive shall be mounted in a NEMA 1 enclosure and shall be labeled by an approved testing agency such as UL.
- 3.9.1. Sine wave carrier input, PWM output. IGBT transistors. Adjustable acceleration and deceleration timing.
- 3.9.2. Keypad to be removable, with alphanumeric display able to provide output status monitoring, output frequency, output voltage, output RPM, and output current. Include fault log display with capacity for the recent 30 faults with a time stamp. Diagnostic display menus to include reference speed command, heat sink temp, bus voltage, active I/O command status, time from power up, and current setting.
- 3.9.3. Unit mounted manual VFD bypass switch locks out VFD, fan runs on maximum set volume. Bypass switch and all interlock contacts are factory mounted and pre-wired.
- 3.9.4. Line and load reactors required for 575 volt applications.
- 3.9.5. Drive shall be factory supplied and installed.
- 3.9.6. Minimum CFM of 60% on DX and gas fired heat exchanger systems.
- 3.11. Motor, fan bearings and drive assembly shall be located inside the fan plenum to minimize bearing wear and to allow for internal vibration isolation of the fan-motor assembly, where required. Motor mounting shall be adjustable to allow for variations in belt tension.
- 3.12. Fan-motor assemblies shall be provided with vibration isolators. Isolators shall be bolted to steel channel welded to unit floor, which is welded to the structural frame of the unit. The isolators shall incorporate vertical spring type isolators with leveling bolts, bridge bearing waffled pads with minimum 1" (25mm) static deflection designed to achieve high isolation efficiency. Fans shall be attached to the discharge panel by a polyvinyl chloride coated polyester woven fabric, with a sealed double locking fabric to metal connection.
- 3.13. Fan motors shall be ODP (open drip proof) Super-E high efficiency type.



**4. COILS**

- 4.1. Refrigerant evaporator type coils shall be equipped with distributors connected to the coil by copper tubes. Where a hot gas bypass is required, the inlet shall be at the refrigerant distributor. Solenoid valves, expansion valves, and related accessories are to be provided and installed by the refrigeration contractor.
- 4.2. Refrigerant coils with multiple compressors shall be alternate tube circuited in order to distribute the cooling effect over the entire coil face at reduced load conditions. Provision for use of thermal expansion valves must be included for variable air volume and/or make-up air applications.

**6. GAS HEAT SECTION (DJE ,DJS, DJX) - INDIRECT FIRED****6.1. General**

- 6.1.1. Heating units shall be indirect natural gas fired approved for both sea level and high altitude areas. The entire package, including damper controls, fan controls, and all other miscellaneous controls and accessories shall be approved by an independent testing authority and carry the approval label of that authority as a complete operating package.
- 6.1.2. All units must exceed the ASHRAE 90.1 requirement of steady state efficiency at low fire operation.
- 6.1.3. Operating natural gas pressure at unit(s) manifold shall be 7"w.c.(1750 Pa).

**6.2. Heat Exchanger/Burner Assembly**

- 6.2.1. Heat exchanger shall be a primary drum and multi-tube secondary assembly constructed of titanium stainless steel with multi-plane metal turbulators and shall be of a floating stress relieved design. Heat exchanger shall be provided with condensate drain connection. The heat exchanger casing shall have 1"(25mm) of insulation between the outer cabinet and inner heat reflective galvanized steel liner. Blower location shall be engineered to improve the required air flow pattern around the heat exchanger. Using duct type furnaces and closed coupled blowers are not acceptable.
- 6.2.2. Units with optional high efficiency heat exchangers (DJS) shall be tested and certified to ANSI/CSA standards to provide a minimum of 81% efficiency throughout the entire operating range as required by ASHRAE 90.1. The manufacturer shall be routinely engaged in the manufacture of this type of high efficiency equipment.
- 6.2.3. The heat exchanger/burner assembly shall be a blow through positive pressure type. Units incorporating the DJM module shall have an interrupted pilot ignition system to provide increased safety. Units using continuous or intermittent pilots are not acceptable.
- 6.2.4. Flame surveillance shall be from the main flame after ignition not the pilot flame. The burner and gas train shall be in a cabinet enclosure. Atmospheric burners or burners requiring power assisted venting are not acceptable.
- 6.2.5. The heat exchanger/burner assembly shall include 15:1 turndown for all input ranges from 100MBH to 1400MBH (29.3 kW to 410 kW). The high turn down heat exchanger/burner assembly minimum input shall be capable of controlling 6.7% of its rated input, excluding the pilot assembly, without on/off cycling and include built in electronic linearization of fuel and combustion air. Efficiency shall increase from high to low fire.

**6.3. Factory testing of indirect fired gas heating section.**

- 6.3.1.1. Tests shall be performed after complete final unit assembly, just prior to shipping to job site. The tests shall be performed in accordance with the equipment standard that the gas heating section is certified.
  - Heat exchanger shall be clocked with a dedicated calibrated gas meter to insure proper set up of the gas manifold.
  - High and Low input flue gas combustion analysis using a calibrated combustion analyzer including O<sub>2</sub> and CO to provide proper air fuel ratio throughout the entire operating range.
  - **(Option)** A copy of the combustion test report shall be provided.

6.3.2. Standard outdoor DJE, DJS, DJX provided with stainless steel flue extension.

6.4. Controls

- 6.4.1. **Electronic DJM module** (Modulating Fuel w/ Modulating Combustion Air) complete with proportional and integral control with discharge air sensor to maintain set point temperature and provide rapid response to incremental changes in discharge air temperature. Combustion air motor speed varies proportionally in response to the modulation of gas flow to provide optimum fuel/air mixture and efficiency at all conditions. Combustion blower RPM shall be proved using a hall effect speed sensor. Two speed or step speed combustion blowers are not acceptable.
- 6.4.2. Combustion efficiency of high efficiency heat exchangers shall increase by up to 1-3% from high fire to low fire while turning down on units incorporating 15:1 turndown (HT Burner). Heat exchangers shall provide a minimum of (80% DJE, DJS), (90%DJX) efficiency throughout the entire operating range.
- 6.4.3. Alternate manufacturers units that do not incorporate a variable speed combustion air blower shall have a modulating gas valve and a combustion air damper with a linear linkage connected to an actuator which has a minimum of 100 steps of control.
- 6.4.4. Heating control function shall be modulating discharge air with 0-10VDC, reset by Main controller.

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**12. FILTERS**

- 12.1. Filter sections shall be provided with adequately sized access doors to allow easy removal of filters. Filter removal shall be from one side as noted on the drawings.
- 12.2. The filter modules shall be designed to slide out of the unit. Side removal 1" (25mm) or 2" (50mm) filters shall slide into a formed metal track, sealing against metal spacers at each end of the track.
- 12.3. Bag or cartridge filters shall be inserted into a frame grid from the upstream side of the filter section. Associated prefilters shall slip into the same frame structure and all shall be secured with clips. Filter frame structure shall be reinforced to withstand a 6"w.c. (1500 Pa) differential pressure.
- 12.4. 2"(50mm) Pleated Panel Disposable Filters: An optimum blend of natural and synthetic fiber media with a rust resistant support grid and high-wet strength beverage board enclosing frame with diagonal support members bonded to the air entering and air exiting side of each pleat. Permanent re-usable metal enclosing frame. The filter media shall have a minimum efficiency of 30-35% on ASHRAE Standard 52.1-92, and a minimum of MERV 8 per ASHRAE 52.2. Rated U.L. Class 2.
- 12.5. Filter media shall meet UL Class 2 standards.

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**13. DAMPERS**

- 13.1. Damper frames shall be U-shaped galvanized metal sections securely screwed or welded to the air handling unit chassis. Pivot rods of 1/2" (13mm) aluminum shall turn in nylon or bronze bushings. Rods shall be secured to the blade by means of straps and set screws.
- 13.2. Blades shall be 18 gauge (1.3mm) galvanized metal with two breaks on each edge and three breaks on centerline for rigidity. The pivot rod shall "nest" in the centerline break. Damper edges shall interlock. Maximum length of damper between supports shall be 48"(1219 mm). Damper linkage brackets shall be constructed of galvanized metal.
- 13.3. Dampers shall be standard construction and include blade ends sealed with an adhesive backed foamed polyurethane gasketting. Outdoor air dampers also include an all weather PVC seal fastened with a positive lock grip and pliable overlap edge on entering air side of interlocking edges. Dampers are interlocked from the center.
- 13.4. Mixing dampers shall be parallel blade type.
- 13.5. Two position inlet dampers shall be parallel blade type.
- 13.6. Mixing Box Controls shall provide an adjustable high ambient set back thermostat, temperature controller, and relay to return the outside air damper to the minimum setting when the outdoor ambient temperature rises above 59°F(15°C).
- 13.7. Makeup Air Inlet Damper Control shall provide a two position, normally closed electric damper operator. This damper operator shall be interlocked so that when the unit is shut down, or on a power failure, the damper shall return to the closed position.

**14. MECHANICAL COOLING****14.1. Packaged Air Conditioning Units**

- 14.1.1. Packaged units shall be cETL, ETL<sub>US</sub> approved and operate down to 50°F(10°C) as standard. Where applicable, multiple refrigeration circuits shall be separate from each other. Refrigeration circuits shall be complete with liquid line filter-driers, and service ports fitted with Schraeder fittings. Units with over 6 Ton hermetic compressors and all units with semi-hermetic compressors shall also incorporate load compensated thermal expansion valves with external equalizers and combination sight glass moisture indicators. Semi-hermetic compressor units shall have condensers designed for 15°F (8°C) liquid subcooling and be equipped with suction line filters and liquid line manual shutoff valves. The complete piping system shall be purged and pressure tested with dry nitrogen, then tested again under vacuum. Each system shall be factory run and adjusted prior to shipment.
- 14.1.2. Packaged units shall be supplied with R-410 refrigerant.
- 14.1.3. Controls for hermetic compressor units shall include compressor and condenser fan motor contactors, supply fan contactors and overload protection, control circuit transformer, cooling relays, ambient compressor lockout, automatic reset low pressure controls, and manual reset high pressure controls on compressors over 6 tons. Head pressure actuated fan cycling control shall be provided on all multiple condenser fan units.
- 14.1.4. Provide five minute anti-cycle timers.
- 14.1.5. Provide interstage time delay timers.
- 14.1.6. Provide hot gas bypass on the lead compressor to maintain adequate suction pressure in the event of low loads. This feature shall be provided on all VAV and Make-Up Air applications with less than four stages of cooling control.
- 14.1.7. Make-up air and VAV units to have a minimum of 3 compressors.

**14.2. Cooling Control****14.2.1. C-TRAC3 Controller**

- 14.2.1.1. The controller shall automatically start in heating, economizer, or cooling mode based on continuously monitored ambient temperature and load requirements.
- 14.2.1.2. The controller shall include an adjustable low limit set point for freeze protection to cease equipment operation in the event of low discharge temperature. If the discharge air temperature falls below the adjusted set point, the blowers will shut down and the outside air dampers shall close. The low limit bypass timer shall vary automatically depending on the thermal coefficient of the style of heat exchanger.
- 14.2.1.3. If the discharge air temperature approaches the low limit set point, the controller shall automatically reduce the economizer minimum fresh air down to half of its original setting to compensate.
- 14.2.1.4. Dual sensors shall be used in the discharge air for precise temperature control.
- 14.2.1.5. As the ambient temperature falls, the C-TRAC3 controller shall automatically compensate for outside air thermal expansion by proportionally reducing the amount of outside air.

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- 14.2.1.5.1. When a DJM2 controller is used as a secondary controller, the C-TRAC3 shall automatically pre-heat and cool down the heat exchanger before enabling or disabling the supply blower.
- 14.2.1.5.2. (Control function)
- The heat/economizer/cool function shall be modulating discharge air complete with sensor and integral selector with optional modulating discharge air with 0-10 VDC reset. Minimum discharge air set point reverts to minimum set point if the BMS control fails.
- 14.2.1.5.3. The discharge air set point shall be adjusted from a 0-10VDC BMS signal.
- 14.2.1.5.4. (Cooling devices)
- The C-TRAC3 electronic temperature control system shall provide up to 5 stages of mechanical cooling control to maintain discharge (room) temperature. The minimum run and off time for the compressors shall be variable based on load requirements.
- 14.2.1.5.5. (Heating devices)
- When in heating mode, the C-TRAC3 shall provide a signal to the DJM2 programmed logic heating controller for series DJ commercial gas fired heater.
- 14.2.1.6. Mechanical cooling shall be disabled below an adjustable low ambient temperature set point.
- 14.2.1.7. The cooling function shall be disabled by a remote binary input contact.
- 14.2.1.8. The controller may initiate the economizer mode on an initial call for cooling with an adjustable minimum fresh air setting. If the calculated discharge temperature set point is higher than the ambient temperature, then the C-TRAC3 will maintain the economizer operation. .
- 14.2.1.9. The controller shall attempt up to 3 ignition attempts (DJ and DG up to 2500 MBH) in the event of loss of flame signal before disabling equipment operation.
- 14.2.1.10. Communication
- The C-TRAC3 shall have indication and troubleshooting LED lights, multi-meter set point and sensor temperature test points, and a common alarm contact in the event of equipment failure. Information can be accessed from a PDA (personal digital assistant) or laptop computer for improved access to control settings using Engineered Air SMC software.

**15. FACTORY SUPPLIED CONTROLS/WIRING**

- 15.1. Provide a system of motor control, including all necessary terminal blocks, motor contactors, motor overload protection, grounding lugs, control transformers, auxiliary contactors and terminals for the connection of external control devices or relays.
- 15.2. Gas fired units shall also include high limit and combustion airflow switch.
- 15.3. Factory installed and wired non-fused disconnect switch in CEMA/NEMA 3 weatherproof) configuration, or disconnect with integral door closure mounted on face of control panel.
- 15.4. Automatic controls shall be housed in a control panel mounted in or on the air handling unit, which will meet that standard of the specific installation.
- 15.5. Provide a discharge air low limit equipped with an automatic by-pass time delay to allow for cold weather start-up. On a heating system failure, this device will shut down the fan and close the outdoor air damper.



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## 20. HRP (QDT) HEAT PIPES

### 20.1 GENERAL

- 20.1.1 The heat pipe shall be the sole responsibility of the unit manufacturer. The manufacturer shall guarantee the performance of the pipe as to its total heat transfer capacity, and its operation. Alternate reclaim devices shall meet or exceed the performance noted in the schedules, without exceeding the fan power requirements specified.

### 20.2 HEAT EXCHANGER DESIGN

- 20.2.1 The heat recovery device shall be an air-to-air heat pipe heat exchanger. The basis of design shall be the Engineered Air HRP (QDT) heat pipe.

The heat exchanger core shall be of 5/8" or 1" seamless aluminum tubing permanently expanded into aluminum fins. Each tube shall be an individually sealed heat pipe filled with a working fluid conforming to Group 1 in the American National Standard Safety Code for Mechanical Refrigeration. Serpentine coils or headered tubes will not be considered equal and shall be bid as an alternate.

The secondary surface shall be continuous plate aluminum fins of corrugated design to produce maximum heat transfer efficiency, and reduce the frost threshold of the unit.

### 20.3 TUBE CONSTRUCTION

- 20.3.1 Heat pipe tubes must be wicked. The capillary wick of each heat pipe shall be an integral part of the inner wall of the tube to provide a completely wetted surface for maximum heat pipe capacity with minimum heat transfer resistance. Non wicked heat pipes will not be considered as an equal, unless they have a minimum of 20% additional rows, and are increased in face area to provide a pressure drop equal to or less than that specified for the QDT heat pipes.

### 20.4 AIR STREAM PARTITION

- 20.4.1 A partition shall be provided to isolate the exhaust and supply air streams from each other to prevent cross-contamination. The partition shall be:
- 20.4.1.1 Standard single piece sheet metal divider. Tubes are expanded into this divider to form a positive seal against air leakage.

### 20.5 TEMPERATURE AND FROST CONTROL

- 20.5.1 Standard control for a QDT coil is the combination of a tilt mechanism and an Engineered Air Q-TRAC controller.

### 20.6 TILT MECHANISM

- 20.6.1 The HRP (QDT) heat pipe shall be mounted on a cradle with accompanying linkage, fulcrum, actuator, and controls. Flexible connectors shall be installed to permit the necessary tilting movement of the reclaim coil. The flexible connector shall be a polyester reinforced membrane containing an anti-fungal, anti-bacterial treatment.

20.7 Q-Trac CONTROLLER

- 20.7.1 The controller shall be a solid-state dedicated device manufactured by Engineered Air. Operation shall be to effectively tilt the heat pipe to achieve the following:
- 20.7.2 Accurate supply air temperature control
- 20.7.3 Summer/winter operation changeover
- 20.7.4 Frost prevention on the exhaust leaving side of the reclaim coil during cold weather. In conditions when the exhaust air could provide more heat than is required to achieve supply air setpoint. The tilt angle of the heat pipe is varied by the controller in order to limit heat transfer, and maintain supply air at setpoint.
- When the exhaust temperature is below the supply air setpoint, the tilt angle is reversed in order to cause heat transfer from supply air to exhaust air and pre-cool the supply air.
- When outside air is cold enough to extract heat from the exhaust air to the point where frost will form on the exhaust side of the heat pipe, the Q-Trac will reduce the tilt angle to limit heat transfer and keep the exhaust air above the frost threshold.

3. **Execution**

3.1 **MANUFACTURER'S INSTRUCTIONS**

Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 **INSTALLATION**

Install as per manufacturers' instructions on roof curbs for down flow applications. Install on sleepers for horizontal discharge units

Manufacturer to certify installation, supervise start-up and commission unit.

3.3 **FIELD QUALITY CONTROL**

3.3.1 Manufacturer's Field Services:

- .1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, and protection and cleaning of its product, and submit written reports, in acceptable format, to verify compliance of work with Contract.
  - .2 Provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.
- 3.3.2 Verify accessibility, serviceability of components including motorized dampers, filters coils, fans, motors, operators, electrical disconnects.
- 3.3.3 Verify accessibility, cleanability, drainage of drain pans for coils, humidifiers.
- 3.3.4 Performance Verification:

- .1 Rooftop Air Handling Units:

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- .5 Check for smooth, vibration less correct rotation of supply fan impeller.
  - .6 Measure supply fan capacity.
  - .7 Adjust impeller speed as necessary and repeat measurement of fan capacity.
  - .8 Measure DBT, WBT of SA
  - .9 Simulate maximum heating load and:
    - .1 Verify temperature rise across heat exchanger.
    - .2 Perform flue gas analysis. Adjust for peak efficiency.
    - .3 Verify combustion air flow to heat exchanger.
    - .4 Simulate minimum heating load and repeat measurements.
  - .6 Check capacity of unit.
  - .2 Start-Up:
  - .3 Verify accessibility, serviceability of components including motorized dampers, filters coils, fans, motors, operators, humidifiers, sensors, electrical disconnects.
  - .4 Verify accessibility, clean ability, drainage of drain pans for coils, humidifiers.
- 3.4 **CLEANING**
- 3.4.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- 3.5 **ALTERNATE EQUIPMENT**
- 3.5.1 Alternate manufacturers must ensure dimensions of their unit are no greater than Engineered Air's unit size or weight shown on drawings, **BEFORE BIDDING**. Contractor will be fully responsible on any changes to the base bid equipment.
  - 3.5.2 Acceptable alternate manufacturers include; Haakon or Racan.
  - 3.5.3 Manufacturers not shown must submit detailed unit design, 10 days prior to tender for review and approval by Engineer.

**END OF SECTION**

## **A. BAS - SCOPE OF WORK**

### **1. GENERAL REQUIREMENTS**

#### **1.1 PROJECT DESCRIPTION**

1. This Contract comprises removal of the existing Building Automation System and installation of a new design-build Building Automation System at the following site:

Rolling Meadows Public School

2. The Building Automation System Controls Contractor, referred to herein as the Contractor, shall be responsible for the removal and preservation of existing controls and accessories, and to engineer, permit, provide and install a fully functioning Building Automation System (BAS) which meets the performance requirements as detailed herein.

#### **1.2 BASE BID**

1. The base bid includes the project, in total, through to final acceptance. The Base Bid shall include all labor, materials, equipment, costs, overhead, profit, services, and incidentals necessary for the successful delivery of a complete and functional building automation system with the respective point count, sequences of operation, User Interface, programming and in accordance with Sections 23 09 23 and 23 09 93.

*Existing Equipment to remain and/or replaced (estimated from Drawings to be field verified)*

New Equipment (see schedule) to be installed by Others

2. The proponent is responsible to carefully examine drawings and (Owner to make available at time of Tender) review site conditions and existing systems such that the bid meets the requirements of Section 23 09 23.

Existing equipment to remain and/or to be replaced (estimated from drawings to be field verified):

- one (1) boiler
- domestic hot water heater and pump.
- one (1) roof top AC unit
- five (5) rooftop condensing units
- fifteen (15) entrance and washroom hydronic force flow heaters
- three (3) classroom unit ventilators with hydronic coil
- hot water radiators with new 1" control valves, new actuator and controls (estimate 40).

Existing equipment to be disconnected and removed (see demolition drawings)

- Entire BAS and pneumatic controls
- Classroom exhaust fans
- Hot water radiator controls

New equipment (see schedules)

- 9 (nine) Classroom unit ventilators with hydronic heating, and 2-stage cooling
- 2 (two) library unit ventilators with hydronic heating, and 2-stage cooling
- 2 (two) air handling units (AHU)
- 2 (two) energy recovery units (ERV)
- one (1) new boiler
- two (2) new pumps with ECM
- one (1) new boiler pump
- two (2) primary loop pumps
- one (1) 3-way zone control valves

- four (4) boiler room temperature sensors
- two (2) outside air temperature sensors

### 1.3 UNIT PRICING – ADDITION AND DELETION OF SCOPE

1. Base bid is inclusive of all mechanical and electrical equipment contained within drawings available at the time of this tender. Equipment to be controlled, as specified herein, will be added and/or deleted from scope by Change Order. Change Order amounts will be formulated using Unit Prices provided on Tender Form, and in accordance with below.
2. Peripheral(s), associated with specific equipment detailed in the Base Bid and contained in the Object Lists, shall not be deleted.
3. Unit price(s) are to meet the latest point requirement and sequence for a common instance and is inclusive of the all labor, materials, equipment, costs, programming of B-AAC controller, overhead, profit, services, and incidentals necessary for the addition or deletion of controls at the respective site.

Common Instance by device: Peripherals (CO2 Sensor, Temperature Sensor, Current Transformer, etc.) - reasonable proximity to controller, not to exceed 50 feet of wire length.

- Room Controller Unit Ventilator - hydronic heating with flow control valve, two (2) single stage cooling, discharge air temperature sensor and outdoor air damper, using Distech ECB 203 with Allure room sensor or Alerton VLC-550 with Microtouch room sensor
  - Room Controller Radiant Heater (where applicable) - single heater using Distech ECB 203 with Allure room sensor or Alerton VLC-550 with Microtouch room sensor
  - MAU Unit - Single exhaust air fan, single supply air fan, single modulating heat, 3 stages of cooling, ERV, outdoor air damper, and exhaust air damper
  - HVAC Unit - Single return air fan, single supply air fan, single modulating heat, 2 stages of cooling, outdoor air damper, return air damper, and exhaust air damper
  - Ancillary Heater - Single heater
  - Exhaust, Supply or Return Air Fan - Single fan
4. Where installation does not conform to “common instance” per Section 1.3 and/or requires additional material and/or labour, pricing is to be negotiated and approved prior to completion of additional scope.
  5. Equipment can be added to scope, in accordance with Section 1.3, anytime during the project, not to exceed date of final payment. Concluding shop drawing approval, deletion of equipment and subsequent reduction of scope is to be negotiated per instance, in accordance with these specifications.

### 1.4 CASH AND CONTINGENCY ALLOWANCES

1. Cash allowances will be covered under the scope of the General Contractor.
2. A contingency allowance due to unforeseen circumstances, that may have to be undertaken during the execution of this Contract will be under the scope of the General Contractor.

### 1.5 DETAILED PRICE BREAKDOWN

1. If requested by Owner, the Controls Contractor will provide, within 30 days of award of Contract, separate materials and labour breakdown. Progress payments shall not be processed until breakdown is received.
2. Contractor to provide materials and labour breakdown for each point listed on submission of Change Order. Contractor also to receive same from affected sub-trades and submit their breakdown.
3. Additional information regarding breakdown of price to be provided at Owner's request.

## 1.6 ACCESS TO SITE

1. Access to the site during the Tender period shall be during "Regular Hours".
2. For the purposes of this Contract, "Regular Hours" are considered to be from June 30<sup>th</sup> to September 1<sup>st</sup> between 8:00 A.M. and 4:00 P.M., Monday to Friday. If the Site is designated a Summer School, Regular Hours includes July 1<sup>st</sup> through to and including July 31<sup>st</sup>.
3. Work can take place around school hours, during un-occupied time up to 11:00pm, when the school, or respective area of the school, is not scheduled for use. And, any day on the weekends, PA Days, Stat Holidays and School Holidays from 7:00 am to 11:00 pm. Typical access to the site(s) during the execution of Work shall be during Regular Hours. Access to the site(s), outside of Regular Hours must be coordinated with the appropriate Area Field Supervisor and/or Head Caretaker. Refer to "Project Contacts" for contact information.
4. For any Work completed during Regular Hours, the Work is to be coordinated such that a Work Area, defined herein as an individual room which access and pollution from work can be isolated and secured i.e., a single classroom. The Work is to be completely finished and cleaned prior to commencement of the next Work Area. Work areas can be grouped with prior approval. Grouping is to be approved by site Administration and/or Custodial Staff, and the Area Field Supervisor.
5. In all cases, Contractors working on school board premises are required to inform either the Caretaker and/or the main office of their presence on site, and sign-in on the appropriate log book. Applicable identification must be worn at all times while on-site.
6. In the event the Contractor, his/her employees, or subcontractors fail to adhere to the requirements detailed herein, they will not be permitted on site.

## 1.7 EXISTING CONDITIONS

1. The BAS Controls Contractor is Responsible for examining existing site conditions and equipment condition. It is the Controls Contractor's responsibility to select all equipment necessary to meet the requirements as detailed in Section 23 09 23 and 23 09 93.
2. The Contractor shall verify operation and conformance of the equipment to be re-used with the codes, regulations and standards in effect at the time of awarding the Contract and is compliant with any law, by-law, or regulation of the municipal, regional, provincial, or other Authorities Having Jurisdiction.
3. Upon discovery of a deficiency affecting Work, the Contractor shall notify Owner.
4. Where Contract Documents do not contain sufficient information for proper selection of equipment for bidding, notify Owner during tendering period.
5. Asbestos:
  1. The Controls Contractor must examine carefully, the HDSB's Asbestos Register for each site, in addition to examining existing conditions for suspected Asbestos Containing Materials (ACM), on which completion of Work is dependent.
  2. Where there is uncertainty, the Controls Contractor shall be responsible, at no additional cost, retain the services of the HDSB's pre-qualified environmental engineering consultant Decommissioning Consulting Services Ltd. (DCS). Upon discovery of ACM affecting Work, Contractor shall notify Owner if work potentially requires disturbing the asbestos containing material (ACM). All ACM abatement requirements necessary to meet the requirements of this contract shall be the responsibility of the Owner.

## 1.8 HEALTH AND SAFETY

1. The Contractor, appointed to perform the work detailed herein, is wholly responsible for ensuring the health and safety as a result of the work, for all individuals on-site during work activities, and taking all necessary actions and precautions to protect the community and property outside of work activities.
2. Contractors must have a safety program and ensure they are hiring competent workers and sub-contractors that follow all applicable health and safety legislation and standards, are trained and qualified in the work they perform, are instructed in the safety procedures to be followed, and are working safely.
3. Where work, independent of the scope contained herein, is being performed at the same address, the Contractor will be responsible to work under the explicit direction and supervision

of the Board assigned Constructor.

4. All work performed under this contract must be carried out in accordance with the terms and conditions of the Ontario Occupational Health and Safety Act (OHSA or the Act), applicable Regulations, applicable standards, and other applicable legal requirements. Unless otherwise stated, the successful bidder, for the purposes of the Act, shall be designated as the 'Constructor' for all work which comprises this project as detailed herein.
5. The constructor has complete control of the work on behalf of The Board and is responsible for regulatory compliance and safe work procedures on the job site. Any requirement for a Notice of Project to be submitted to the Ministry of Labour (MOL) is the sole responsibility of the constructor.
6. The Constructor acknowledges and agrees that any breach or breaches of the Occupational Health and Safety Act, applicable Regulations, Standards, Environmental Protection Act, other legal requirements, and/or their own Health & Safety Policies and Procedures whether by the Constructor or any of its subcontractors may result in:
  1. the termination of the contract,
  2. the immediate removal of the Constructor and/or sub-contractor's equipment from the site,
  3. the forfeiture of all sums owing the constructor/or sub-contractor by The Board.
7. The Constructor's health and safety responsibilities will include the following:
  1. where hazardous materials, physical agents and/or designated substances are used in the performance of the required work, the successful bidder shall ensure that the requirements of the Occupational Health and Safety Act, applicable Regulations and environmental requirements are complied with,
  2. ensure workers are aware of the hazardous substances that may be in use at the workplace,
  3. ensure workers are provided with and wear the appropriate personal protective equipment required for the area when engineering controls aren't practicable,
  4. demonstrate the establishment and maintenance of health and safety program, with objectives and standards and will provide qualified workers and meet all applicable legislation,
8. The Constructor acknowledges that they are familiar with the Occupational Health and Safety Act, applicable Regulations, applicable Standards and other legal requirements that apply to the work being conducted,
  1. The Contractor agrees to observe strictly and faithfully the provisions of the Occupational Health and Safety Act, applicable Regulations, and rules circulated there under together with the Constructor's Health and Safety Policies and Procedures.
  2. The Constructor agrees to indemnify and hold The Board harmless for damages or fines arising from any breach or breaches of the Occupational Health and Safety Act and other applicable legal requirements.
  3. The Constructor agrees to have a competent supervisor on site at all times when work is in progress, and that this supervisor enforces safe work practices.
  4. The Constructor shall allow access to the work site on demand to representatives of The Board to inspect work sites.
  5. The Constructor agrees that any damages or fines that may be assessed against The Board by reason of a breach or breaches of the Occupational Health and Safety Act and applicable Regulations by the Constructor or any of its sub-contractors will entitle The Board to off-set the damages so assessed against any monies that The Board may from time to time owe the Constructor under this contract or under any other contract whatsoever.
  6. Where any portion of the work or services in this Contract is contracted to a sub-contractor, the Constructor agrees that the provisions of this section Health and Safety will apply to the subcontractor and the Constructor will enforce said provisions.
  7. The Board may consider previous Occupational Health & Safety Act violations as grounds for rejection and The Board may terminate any contract arising from this document if the Bidder is continuously in violation of Occupational Health & Safety Act requirements.

9. Proof of the above may be required by The Board at any time from tendering to project completion.

#### 1.9 ADDITIONAL WORK AND/OR SCOPE TO BE UNDERTAKEN UPON OWNER REQUEST

1. The Board reserves the right to negotiate additional services of a similar functional or technological nature from the successful Proponent without further competitive procurements.
2. The Controls Contractor may be requested by the Owner to act as "Constructor" for the site(s), as defined and required by the Ontario Ministry of Labour, if the HDSB has arranged for other contractors to perform work at the site concurrently. Additional Scope of Work, if required, shall be submitted as Notice of Change, or as directed by Owner.

#### 1.10 STANDARD OF ACCEPTANCE

1. Means that item named and specified by manufacturer and/or catalogue number forms part of Specification and sets standard regarding performance, quality of material and workmanship.
2. Acceptable product manufacturers are listed within section where they are specified or in Equipment Schedules provided.
3. Where two or more items of equipment and/or material, of the same type, are required, provide products of single manufacturer.
4. Visible manufacturer's nameplate shall indicate manufacturer's name, model number, serial number, capacity data, electrical characteristics and approval stamps.
5. Provide new materials and equipment not less than quality specified and of current models with published ratings and available replacement parts. Equipment shall have ULC, CSA or ASME nameplates as required by Authorities having jurisdiction.
6. Replace materials less than specified quality and relocate Work incorrectly installed as determined by Owner.

#### 1.11 ADDITION OF ACCEPTABLE MANUFACTURERS

1. Include in the Bid, the equipment named in the Specifications. This will form the Base Bid. Any number of alternative bids, as defined below, may be included in addition to the Base Bid. 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 Owner is not required on items submitted as alternative bids.
2. 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.
3. Addition of manufacturer's names to Specifications prior to close of Tender or Bid shall be by addendum only.

#### 1.12 SUB-CONTRACTORS AND SUB-STRADES

1. The Work of each Subcontractor shall be set forth in a written Subcontract agreement incorporating by reference this Contract; Subcontracts shall be made available to the Halton District School Board for review upon request of the Board. The Contractor is responsible to the Board for the acts, omissions and other conduct of subcontractors. Each Subcontractor shall maintain Workers Compensation/Employers Liability Insurance and Commercial General Liability Insurance as required by the Contract for Labor and Materials.
2. The Controls Contractor is permitted to use "in-house" trades. Where a sub-trade or sub-contractor is hired to meet the requirements detailed herein, local by-laws or any Authority Having Jurisdiction, the Contractor is required to use a qualified contractor from the Board's Vendor of Record.

#### 1.13 INSPECTION OF WORK

1. Owner, or Owner's Representative, shall be permitted to inspect Work prior to being concealed upon request.



2. Authorities having jurisdiction, prior to concealment, shall approve Work.

#### 1.14 COORDINATION OF THE WORK

1. Coordinate Work with trades and make changes to facilitate satisfactory installation.
2. Install distribution systems and equipment close to building structure and parallel to building lines, avoiding interference with other services or free space.
3. Work out interference problems on site with other trades and coordinate work before fabricating, or installing any material or equipment. Where necessary, produce interference drawings. Ensure materials and equipment fit into allotted spaces and equipment can be properly serviced and replaced. Extras for improper coordination and removal of equipment to permit remedial work shall not be considered.
4. The Controls Contractor shall provide following services:
  1. Coordinate all supply, installation, delivery, removal, mechanical, electrical, controls, builder's work, water chemical treatment, asbestos removal, and all additional services, as described in the Contract Documents.
  2. Electrical requirements for mechanical equipment and devices requiring electrical power or connection to fire alarm/annunciator panels.
  3. Follow up on material and equipment deliveries, review shop drawings and produce interference drawings.
  4. Ensure sub-trades are installing Work properly.
  5. Ensure interconnecting phases with mechanical and electrical Scope of Work contained herein are covered.
  6. Review cost breakdown, progress claims and cost submissions for mechanical and electrical work.
  7. Resolve and direct responsibility for warranty.

#### 1.15 CODES, REGULATIONS AND STANDARDS.

1. Work shall conform to the following codes, regulations and standards, and other Codes in effect at time of award of Contract, and any others having jurisdiction. The applicable version of each Code and standard shall apply unless otherwise specified in the Contract documents:
  1. The Ontario Building Code
  2. The Ontario Fire Code
  3. The Ontario Plumbing Code
  4. The Canadian Electrical Code, CSA C22.1
  5. The Construction Lien Act
  6. The Occupational Health and Safety Act (Construction Projects)
  7. The Workplace Hazardous Materials Information System Regulation (WHIMIS)
  8. Waste Audits and Waste Reduction Workplans; and
  9. Industrial, Commercial and Institutional Source Separation Programs
  10. Bylaws.
  11. Local Building Bylaws.
  12. Canadian Gas Association.
  13. National Standard of Canada CAN/CGA-B149.1-00. - Natural Gas Installation Code.
  14. National Research Council of Canada
  15. National Fire Code of Canada.
  16. Ontario Building Code
2. Nothing contained in the Contract Documents shall be so constructed as to be in conflict with any law, by-law, or regulation of the municipal, regional, provincial, or other Authorities Having Jurisdiction. Perform all work in conformity with all such regulatory requirements.
3. Where specifications specifically indicate requirements more onerous than aforementioned Codes, these requirements shall be incorporated.

#### **1.16 PERMITS**

1. The Contractor, or its "in house" Contractor, must have an Electrical Contractor's / ESA License in good standing. The Contractor shall be responsible for acquiring an Electrical Permit (Application for Inspection) for the project and be the named as the Permit holder.
2. Obtain required permits and pay fees, and comply with Provincial, Municipal and other legal regulations and bylaws applicable to work.
3. Arrange for inspection of Work by Authorities Having Jurisdiction. On completion of Work, furnish final unconditional certificates of approval by inspecting Authorities.

#### **1.17 PERFORMANCE VERIFICATION OF INSTALLED EQUIPMENT**

1. Installed equipment may be subject to performance verification as specified herein if required by Owner or Owner's Representative(s).
2. When performance verification is requested, equipment shall be tested to determine compliance with specified performance requirements.
3. If requested, Contractor shall arrange for services of independent testing agency.
4. Maintain building comfort condition when equipment removed from service or testing purposes.
5. Promptly provide Owner, or Owner's Representative(s) with test reports.
6. Should test results reveal that originally installed equipment meets specified performance requirements, Owner will pay costs resulting from performance verification procedure.
7. Should test results reveal equipment does not meet specified performance, equipment will be rejected and the following shall apply:
  1. Remove rejected equipment. Replace with equipment that meets requirements of Contract Documents, including specified performance requirements.
  2. Replacement equipment may be subject to performance verification as well; use same testing procedures as performed on originally installed equipment.
  3. Contractor shall pay costs resulting from performance verification procedure.

#### **1.18 WARRANTY**

1. Equipment and systems shall be warranted for one year. Provide written certifications to Owner. Provide extended warranty certificates on equipment as applicable and specified.
2. Use of equipment during construction shall not alter warranty period or represent acceptance of work or equipment.
3. Warranty coverage shall include labour and material to correct defective equipment, workmanship, material and building damage caused by failure of same.
4. Warranties shall be effective from date of Substantial Completion.

#### **1.19 SHOP DRAWINGS**

1. Submit shop drawings for the equipment indicated as an ACCEPTABLE PRODUCT in the section where they are specified or in the Equipment Schedule(s). A comprehensive listing of all equipment and materials complete with the expected submission dates shall be submitted to Owner within 30 days of Contract award. Owner reserves right to modify list.
2. Installed materials and equipment shall meet specified requirements whether or not Shop Drawings are reviewed by Owner or Owner's Representative(s).
3. Owner, or Owner's Representative review of shop drawings shall not relieve Contractor from compliance with specified requirements.

#### **1.20 DEFICIENCY HOLDBACKS AND DEFICIENCY INSPECTIONS.**

1. Work under this Contract, which is still outstanding when substantial performance is certified, will be considered deficient and a sum equal to minimum twice the estimated cost of completing that Work will be held back.

### **2. PRODUCTS**

### **3. EXECUTION**

#### **3.1 RESPONSIBILITIES**

### 1. Owner Responsibilities

1. Repair or Replace existing equipment to be re-used, pursuant to 1.7.2.
2. Asbestos abatement shall be performed as needed for all areas of work identified pursuant to 1.7.5

### 2. Controls Contractor Responsibilities

1. Responsibility for provision of equipment or materials rests solely with the Contractor. Extras shall not be considered based on difference in interpretation of Specifications as to which trade provides certain equipment or materials.
2. Visit site before tendering. Examine local and existing conditions on which Work is dependent. No consideration will be granted for any misunderstanding of Work to be done resulting from failure of the Contractor or the Contractor's Agents to carefully examine the site.
3. The Contractor shall include in the total stipulated tender price, all costs for overtime work which may be necessary to complete the various portions of Work, in accordance with the completion dates specified on the Form of Tender. Any additional payments requested in connection with overtime work that have not been authorized by the Owner or Owners Representative in writing, will be rejected.
4. Where Contract Documents do not contain sufficient information for proper selection of equipment for bidding, notify Owner during tendering period.
5. Complete all work in accordance with the drawings and specifications, including but not limited to: the removal and preservation of existing controls and accessories, and to engineer, permit, provide and install a fully functioning Building Automation System which meets the performance requirements as detailed herein.
6. Conflicts or additional Work not covered by Drawings and Specifications shall be brought to attention of the HDSB before start of Work.
7. On completion of Work, tools and surplus waste materials shall be removed and work left in clean and operating correctly.
8. Advise HDSB of specified equipment, material or installation, which violates laws, ordinances or regulations.

### 3.2 WORKMANSHIP

1. Workmanship shall be in accordance with established practice and standards accepted and recognized by Owner, Owner's Representative and Contractor.
2. Tradesmen engaged in installation of Work covered herein shall be qualified In accordance with Trades Qualification and Apprenticeship Act (TQAA) Ont. Reg. 572/99, Every employer who employs a worker in a Schedule 2 Trade shall ensure that the worker:  
  
holds a subsisting certificate of qualification in that trade,  
or  
is registered as an apprentice in that trade

### 3.3 BUILDING OPERATION DURING CONSTRUCTION

1. In order to minimize operation difficulties for building staff, trades must cooperate with Owner and Owner's Representatives throughout construction period and particularly ensure that noise is minimized.
2. Convenient access for staff and students to building must be maintained. Minor inconveniences and interruption of services will be tolerated, provided advance notice is given, but Contractor shall to coordinate his Work, in consultation with Owner's Representatives, so operation of facility can be maintained as nearly normal as possible.
3. Before interrupting major services, notify Owner and arrange acceptable schedule for interruptions.
4. Before interrupting services, complete preparatory work as far as possible and have materials on site and prefabricated (where practical) and work continuously to keep length of interruption to minimum.
5. Include for cost of work that may be required out of regular hours, to minimize period of service interruption when connecting into existing systems.

### 3.4 PROPER CONDUCT OF WORKERS

1. Ensure workers conduct themselves in a proper and civilized manner at all times.
2. Smoking or vaping is not permitted on Board property
3. The consumption of alcohol or the use of prohibited substances is not permitted at the Place of Work.
4. Workers using improper language, cat calls, lewd comments or improper behavior will be required to leave the site and will not be permitted to return to any site without authorization from the Board.
5. The relief of an employee from a job site as a result of improper conduct does not negate the Contractor's liability of meeting the agreed upon schedule.

### 3.5 NOISY WORK RESTRICTIONS

1. Schedule noisy work, or work requiring the use of pneumatic tools, in a manner to avoid disturbance to existing building occupants.
2. This may require portions of the Work to be performed outside normal working hours.

### 3.6 SPECIAL PROCEDURES FOR CONTRACTORS WORKING IN EXISTING BUILDINGS

1. Any required safety precautions such as signs, danger signals, lanterns, barricades, etc. shall be installed by the Contractor during construction operations.
2. Designated existing restrooms will be available for use by all workers, sub-contractors and the Contractor's employees. Workers, sub-contractors and Contractor's employees are prohibited from using student washrooms.

### 3.7 STORAGE OF SUPPLIES, MATERIALS, EQUIPMENT, ETC.

1. The Contractor shall obtain the prior approval of the site Area Field Supervisor or Head Caretaker for any space required for storage during construction operation. Materials, equipment, etc. shall not be piled or stored in any location that interferes with the conduct or normal functions of the building and/or facilities, and shall not constitute a hazard to persons or property.
2. Note that existing storage areas on site are limited. All tools, equipment and material shall either be removed from the site daily or stored in a locked box or container. The Halton District School Board is not liable for the theft of any tools, equipment and material left on site by the Contractors.

### 3.8 FIRE ALARMS

1. Fire and smoke sensors are installed throughout the existing facilities. These devices may be triggered by jarring either directly or indirectly while working in adjacent areas.
2. Determine nature and exact locations of existing fire and smoke sensors prior to the commencement of work.
3. Notify the Caretaker, Area Field Supervisor, or Administrative Staff prior to commencement of any part of the Work in the vicinity of fire and smoke sensor devices.
4. The Board reserves the right to charge the Contractor for costs incurred as a result of false fire alarms activated as a result of the execution of the Work.

### 3.9 EQUIPMENT ACCESSIBILITY

1. Install Work to be readily accessible for adjustment, operation and maintenance. Furnish access doors where required in building surfaces for installation by building trades.

### 3.10 PROTECTION OF WORK.

1. Protect equipment and materials, stored or in place, from weather, moisture, dust and physical damage.
2. Equipment showing signs of rusting, pitting or physical damage will be rejected.
3. Refinish damaged or marred factory finish.

### 3.11 SERVICE PENETRATIONS IN RATED FIRE SEPARATIONS.

1. Piping, tubing, ducts, wiring, conduits, etc. passing through rated fire separations shall be smoke and fire proofed with ULC approved materials in accordance with CAN4-S115- M85 and ASTM E814 standards and which meet requirements of Building Code in effect. This includes new

services, which pass through existing rated separations, and also existing services, which pass through new rated separation or existing separations whose rating, have been upgraded.

2. Fire resistance rating of installed fire stopping assembly shall not be less than fire resistance rating of surrounding assembly.
3. Smoke and fire stopping shall be installed by qualified Contractor who shall submit letter certifying that work is complete and in accordance with this applicable Codes and standards.
4. Install fire stopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions in formed sleeved or cored penetrations.

#### 3.12 SERVICE PENETRATIONS IN NON-RATED SEPARATIONS.

1. Piping, tubing, ducts, wiring, conduits, etc. passing through non-rated fire separations and non-rated walls and floors shall be tightly fitted and sealed on both sides of separation with silicon sealant to prevent passage of smoke and/or transmission of sound.

## 1.1 BUILDING AUTOMATION SYSTEM

1. Identify, Conceive, and Include in Contract Documents the necessary scope and selections for all components to be upgraded including but not limited to; hydronic valve(s) and actuator(s), damper(s) and actuator(s), starter(s), terminal unit(s) controls, radiant heater controls, and VRF Indoor system controls, necessary to meet the specification as detailed in Section 23 09 23 Direct Digital Control Systems for HVAC rev Oct82020, Section 23 09 93 Sequences of Operation for HVAC Control rev Feb82019, 23 09 23 Schedule A rev 04252019, Section 23 70 00 Central HVAC Equipment, and Section 23 80 00 Decentralized HVAC Equipment
2. Revise Sections 1.3, and 1.11 to 1.15 inclusive, of Section 23 09 23 Direct Digital Control Systems for HVAC rev Oct82020.
3. Ensuing document shall comprise Contract Documents.
4. Electrical as required
5. Make good areas impacted

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# HDSB

## Division 23

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Section 23 09 23

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Direct Digital Control  
System for HVAC

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Note to Specification Writer or Project Lead:

Sub-section 1.3, 1.11 through 1.15 inclusively must be edited accordingly to project scope and deliverables.

Modifications to these Specifications, beyond those detailed above, are to be approved by the Board's Building Automation Systems manager.

The contents of this document, not omitting any sub-sections, can be copied for the purposes of merging with other specifications.



## 1. General

### 1.1 Summary

1. The approved Building Automations System Contractor per 2.1, referred to herein as the Contractor, shall provide a Direct-Digital Control System as indicated on the project documents in accordance with the drawings and as described in these specifications.
2. Where existing legacy controls exist, the Contractor shall be responsible for the removal and preservation of existing controls and accessories, and to engineer, permit, provide and install a fully functioning Building Automation System which meets the requirements detailed herein.
3. Where an Owner or Owner's representative provided points / object and equipment list is not provided as part of the bid package, the Contractor shall be responsible to verify existing site conditions and/or review all available drawings so to ensure all existing and/or currently proposed equipment at the facility is identified in accordance with 1.3.2, and is made part of the complete Direct-Digital Control System.
4. The work administered by this Section of the technical specifications shall include all engineering, programming, labor, materials, special tools, equipment, enclosures, power supplies, software, software licenses, project specific software configurations and database entries, interfaces, wiring, tubing, installation, labeling, calibration, documentation, submittals, testing, verification, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, warranty, specified services and items required for a complete and fully functional Controls Systems.

### 1.2 Related Sections:

- A. General and Supplementary Conditions
- B. Division 01 General Requirements
- C. Section 23 08 00 Commissioning of HVAC Systems
- D. Section 23 09 00 Instrumentation and Controls for HVAC
- E. Section 23 09 93 Sequences of Operation for HVAC Control
- F. Section 23 70 00 Central HVAC Equipment
- G. Section 23 80 00 Decentralized HVAC Equipment
- H. Section 25 00 00 Integrated Automation
- I. Section 26 05 00 Common Work Results for Electrical
- J. Section 26 09 00 Instrumentation and Control for Electrical Systems
- K. Section 26 20 00 Low Voltage Electrical Distribution

### 1.3 Design Instructions

1. Design shall meet the functional intent of an "open", and interoperable Building Automation System, comprised of a network of stand-alone digital controllers. Incorporating the Niagara 4 Framework®.
2. The Building Automation System is to include, but not limited to, the monitoring and/or control of **ALL** of following equipment instances at each specified site:

SPECIFICATION WRITER TO EDIT ACCORDINGLY

1. Boilers
2. Make up air unit(s)

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3. HVAC Equipment
  4. Unit Ventilators
  5. Exhaust fans
  6. DX split systems
  7. Variable Frequency Drives
  8. Supply and Return Air Fans
  9. Pumps
  10. Motors
  11. Valves
  12. Unit Heaters
  13. Radiant Heaters
  14. Exterior Lighting
  15. Utility Consumption and Demand Metering
3. The system shall be modular in nature and designed for future flexibility so to accommodate the addition of functionality, control points or expansion of facility.
  4. The control systems shall be designed such that each mechanical system shall operate under stand-alone mode. The contractor administered by this Section of the technical specifications shall provide controllers for each mechanical system. In the event of a network communication failure, or the loss of any other controller, the control system shall continue to operate independently. Failure of the B-BC shall have no effect on the field controllers, including those involved with global strategies
  5. Coordinate the specifications and equipment schedules in related sections for manufacturer furnished DDC systems to ensure the minimal hardwired points and sequences can be met in accordance with Section 23 09 93. OEM DDC Systems, that meet the minimum hardwired points are preferred and approved for use with the following equipment ONLY; boilers, main air handling equipment and, chillers. The supplier of the equipment is responsible for the configuration, programming, start-up, and testing of that product to meet the sequence of operation and specifications. The supplier shall also provide any licensing, hardware, and software required for interface to the DDC system

#### **1.4 Definitions**

1. Definitions of terms used in this section may differ from those given in general and supplementary conditions and take precedence over them.

BAS	Building Automation System
B-BC	BACnet Building Controller
B-AAC	BACnet Advanced Application Controller
B-ASC	BACnet Application Specific Controller
BACnet / BACnet Standard	Building Automation and Controls Network - ANSI/ASHRAE Standard 135-2012
BACnet/IP	BACnet Annex J – describes how BACnet devices can make use of IP directly for communicating across IP-based terminals
BBMD	BACnet Broadcast Management Device, see BACnet Annex J
BIBB	BACnet Interoperability Building Blocks: A BIBB defines a small portion of BACnet functionality that is needed to perform a particular task
BTL	BACnet Testing Laboratory: A recognized, independent third party laboratory certified to test product for compliance to BACnet standards. BTL Certified products are indicated by a registered seal affixed to the product.
B/I	Binary Input
B/O	Binary Output
COV	Change of Value
cUL	Underwriters Laboratory Canada
DDC	Direct Digital Control
D/I	Digital Input
D/O	Digital Output
Embedded Control	Some OEM's (Original Equipment Manufacturer) equipment have a factory installed controller. These controllers must follow these standards. Examples can be found in chillers, boilers, variable frequency drives, etc. Proprietary communication protocols will not be allowed.
Gateway	A device, which contains two or more dissimilar networks/protocols, permitting information exchange between them (ASHRAE/ANSI 135-2004). Gateways are NOT to be included unless approved by the Owner.
GUI	Graphical User Interface
HVAC	Heating, Ventilation and Air-Conditioning
IEEE	Institute of Electrical and Electronics Engineers
I/O	Input / Output
LAN	Local Area Network (an individual school or site)
MS/TP	Master Slave Token Passing: Data link protocol as defined by the BACnet Standard. Operates over a serial field bus network (RS485)
NEMA	National Electrical Manufacturers Association
PICS	Protocol Implementation Conformance Statement: All devices conforming to the BACnet protocol shall have a documented statement that identifies all portions of BACnet that are implemented in the device.
P.I.D.	Proportional Integral Derivative
Shall	indicate a requirement that, in the view of the Board, must be complied with
UPS	Uninterruptible Power Supply Unit
VFD	Variable Frequency Drive
VLAN	Virtual Local Area Network: Dedicated for Facilities Services equipment

WAN	Wide Area Network (board wide)
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## 1.5 Reference Standards

1. Where edition date is not specified, consider that references to the manufacturer's data, and published codes, standards and specifications are made to the latest edition or revision, approved by the issuing organization.
2. Reference Standards and specifications are quoted to establish minimum standards. Work in which quality exceeds the specified minimum will be considered to conform.
3. The requirements of the Contract Documents govern over the requirements of reference standards and specifications.
4. Standards, specifications, associations and regulatory agencies are generally referred to throughout the Contract Documents by their abbreviated designations, as listed below:
  1. AMCA American Movement and Air Control Association
  2. ANSI American National Standards Institute
  3. ARI Air Conditioning and Refrigeration Institute
  4. ASME American Society of Mechanical Engineering
  5. ASTM American Society for Testing and Materials
  6. ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers
  7. CGA Canadian Gas Association
  8. CGSB Canadian General Standards Board
  9. CSA Canadian Standards Association
  10. NFPA National Fire Protection Association
  11. SMACNA Sheet Metal and Air Conditioning Contractors' National Association
  12. ULC Underwriters' Laboratories of Canada

## 1.6 System Architecture and Description

1. The Building Automation System as detailed in this Section shall be based on a hierarchical architecture incorporating the Niagara 4 Framework® through Tier 1 and 2 inclusive. Systems not developed on the Niagara 4 Framework® platform are unacceptable.
2. All Niagara 4 Framework® components shall have an unrestricted interoperability license with a Niagara Compatibility Statement (NiCS) following the Tridium Open NiCS Specification.
3. All devices supplied under this specification, excluding sensors, shall be connected to the site LAN and shall communicate natively using the following BACnet/IP, BACnet MS/TP, Peer to Peer, or Ethernet (ISO 8802-3), as defined in the ANSI/ASHRAE Standard 135, latest or Peer-to-Peer using Niagara's Fox Protocol or SNMP.
4. Program data-bases, data acquisition and all control sequence logic shall reside in the respective B-BC, B-AAC and B-ASC controller. Each device shall, to the greatest extent possible, perform its programmed sequence. Operation of each device shall not be dependent on a connection to a server or master controller.
5. The B-BC and any B-AAC or B-ASC shall be capable of updating firmware without the replacement of any hardware, microprocessors or chips.
6. Each school / site shall be furnished with a single B-BC, which is responsible for and capable of providing fully distributed control including user access control and all necessary site

computations at the site, independent of or under the Enterprise Management System and it must be stand-alone, multi-tasking, multi-user with a real-time digital processor. All controlled objects, sequences and associated operational parameters shall be both operator definable and modifiable through the embedded User Interface.

7. The B-BC shall provide a web-based graphical user interface for programming, monitoring, and control, independent of any Enterprise Management System, be accessible remotely from a central site(s) and locally. The web-enabled user interface shall operate on an industry standard web-browser without the requirement of additional plugins.
8. Each Mechanical or Electrical System and/or major piece of mechanical or electrical equipment shall have 1 dedicated B-AAC controller with sufficient I/O capacity such that it shall be connected to ALL field devices and points associated with that system, space and/or piece of equipment. B-ASC use shall be limited to VAV box applications provided the full functional intent can be met within the singular device.
9. Mechanical and Electrical Systems i.e., VFD's, chillers, boilers, unitary equipment, etc. units that are equipped with manufacturers furnished controls shall be BTL certified. Gateways are not to be used unless prior written approval has been acquired. A single B-AAC can be used in combination with the manufacturer supplied controls, only where the manufacturer's controls are unable to meet the functional intent, it shall be implemented in accordance with Section 23 09 93.
10. The use of multiple application controllers used to control a single piece of equipment is strictly prohibited, except those specifically noted in 1.6.9.
11. The system shall include real time monitoring of the following utilities; electricity (main feed), natural gas (main), and water (main). Meters supplied under this division shall communicate BACnet Natively. For existing meters, utility owned, coordinate integration requirements with the respective utility provider.
12. The B-BC shall be connected to the HDSB Facilities VLAN, in accordance with Section 25 00 00, to be supplied by the Owner at the Owners expense.
13. Site workstations, otherwise referred to as Caretaker PC, will be provided by the Board.

## **1.7 Hardware and Software Licensing**

1. The Owner shall be named license holder of all controllers and components, software and firmware supplied under this specification. The Owner shall receive ownership of all project specific configuration documentation, data files, and application-level software developed for the site.
2. The Owner shall have unrestricted access rights for all network management, operating system server, engineering and programming software required for the ongoing maintenance and operation of the building automation system
3. All software provided shall be full featured and not limited or trial version.

## **1.8 User Control Over Configuration**

1. The intent of this specification is to provide a system which shall allow the Board to independently do its own modifications to all objects, operational parameters and sequences.

## **1.9 Intellectual Property and Proprietary Material**

1. The Board shall sign a software and hardware licensing agreement, upon review and agreement of terms and conditions, as a condition of contract. Such license will grant use of all programs

and application software to the Board and it's representatives, as defined by the agreement, and shall protect the manufacturer's rights to disclosure of intellectual property contained within such software.

### 1.10 System performance

1. The System shall conform to the following minimum:

1. The system shall report values with minimum end-to-end accuracy listed in Table 1.

Table 1 - Reporting Accuracy	
Measured Variable	Reported Accuracy
Space Temperature	1% of range
Ducted Air Temperature	1% of range
Outside Air Temperature	±1°C (±2°F)
Water Temperature	1% of range
Water Flow	±2% of full scale
Airflow (terminal)	±10% of full scale (see note 1)
Airflow (measuring stations)	±5% of full scale
Airflow (pressurized spaces)	±3% of full scale
Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)
Air Pressure (space)	±3 Pa (±0.01 in. w.g.)
Water Pressure	±2% of full scale (see note 2)
Carbon Dioxide (CO <sup>2</sup> )	±50 ppm
Electrical (kW, kVA, kWh, A, V, pF)	±1% of reading (see note 3)

Note 1: 10% - 100% of scale

Note 2: For both absolute and differential pressure

Note 3: Not including utility-supplied meters

2. Control Stability and Accuracy shall maintain measured variable at set-point within tolerances listed in Table 2.

Table 2 – Control Stability and Accuracy		
Controlled Variable	Control Accuracy	Range of Medium Accuracy
Air Pressure	±50 Pa (±0.2 in. w.g.)	0-1.5 kPa (0-6 in. w.g.)
	±3 Pa (±0.01 in. w.g.)	-25 to 25 Pa (-0.1 to 0.1 in. w.g.)
Airflow	±10% of full scale	
Space Temperature	±1°C (±2°F)	
Duct Temperature	±1.5°C (±3°F)	
Fluid Pressure	±10 kPa (±1.5 psi)	MPa (1-150 psi)
	±250 Pa (±1 in. w.g.)	0-12.5 kPa (0-5 in. w.g.) differential

### 1.11 Work covered by the contract documents

SPECIFICATION WRITER TO EDIT ACCORDINGLY

1. The Scope of Work for the Building Automation Systems Contractor shall include, but is not limited to the following:
  1. Demolition; all existing Building Automation Control(s) and accessories being replaced shall be removed from site and disposed of in accordance with local regulations. Prior to disposal, provide a list of controllers and accessories to Owner, which will be

- salvaged and remitted to the Owner for the explicit use of maintaining existing legacy systems at other sites.
2. Furnish and install all necessary controllers, control and/or ancillary devices, sensors, wiring, pneumatic peripherals and tubing, software, licenses, and programming to deliver a complete and functional building automation system, which meets the functional intent of the systems design.
  3. The naming and addressing of all objects and devices to be in accordance with the specifications.
  4. Configure the web-based user interface embedded in the B-BC in accordance with the specifications.
  5. Coordinate equipment specifications for related sections necessary to meet the functional intent including: variable frequency drives, dampers, valves, actuators, and peripheral devices considered to have wet surfaces such as pressure taps, thermal wells, flow switches, flow meters, etc., Preference is given to these devices being furnished by the Original Equipment Manufacturer, where applicable.
  6. Review and coordinate with other related sections so to ensure all mechanical and electrical systems and components to be integrated have the necessary hardware and software to meet the points and sequences specified.
  7. Coordinate with the Owner, the setup and communication of the B-BC on the Owners supplied VLAN, in accordance with the specifications.
  8. Coordinate with the Owner and the respective utility provider, the installation and setup of utility metering equipment or the integration of any existing meters, in accordance with the specifications.
  9. Identify and label all controllers and associated devices including but not limited to connected I/O points, address', network id, etc.
  10. Verification of existing equipment operation, and notifying Owner of any deficiencies
  11. Attain, where required, all necessary permits and inspections
  12. Commissioning of new BAS
  13. Submit the required documentation as described herein, including, but not limited to submittals, project record, start-up, commissioning, testing, acceptance documentation and system warranty
  14. Operator Training

## **1.12 Products Furnished but not Installed by the Building Automation Contractor**

### **SPECIFICATION WRITER TO EDIT ACCORDINGLY**

Unless otherwise noted on Tender drawings and specifications, following equipment shall be furnished but not installed by BAS Contractor

1. Hydronic Piping:
  1. Control Valves
  2. Flow Switches
  3. Temperature Sensor Wells and Sockets
  4. Flow Meters.

- 2. Refrigerant Piping:
  - 1. Pressure Transducers
- 3. Ductwork Accessories:
  - 1. Automatic Dampers
  - 2. Air Flow Switches

**1.13 Products Installed but not Furnished by the Building Automation Contractor**

SPECIFICATION WRITER TO EDIT ACCORDINGLY

N/A

**1.14 Products not Furnished or Installed but Integrated by the Building Automation Contractor**

SPECIFICATION WRITER TO EDIT ACCORDINGLY

- 1. Fire Alarm Systems
- 2. Utility Monitoring Systems
- 3. Variable Frequency Drives



### 1.15 Responsibility Matrix by Division Contractor

Work / Item / System	Furnish	Install	Control Wiring	Power
Control Communication Wiring and conduits	23 09 23	23 09 23	23 09 23	n/a
Controls Equipment, panels, enclosures, and accessories	23 09 23	23 09 23	23 09 23	26
Interface to OEM furnished controllers supplied under Division 23	23	23	23 09 23	26
MAU, Air Handling, HVAC, VRF or Unitary Manufacturer furnished space mounted control (i.e., thermostat)	23	23	23	26
Cooling Tower Level, Make-up Water and Sump Heater Control Devices (local control only)	23	23	23	26
Starters, operator switches	23	23 09 23	23 09 23	26
Automatic Damper (not OEM installed)	23	23	23 09 23	n/a
Automatic Damper Actuators	23 09 23	23 09 23	23 09 23	
Hydronic Control Valves	23 09 23	23	23 09 23	n/a
Hydronic Valve Actuators	23 09 23	23 09 23	23 09 23	n/a
Thermo-wells (including accessories considered "wet")	23 09 23	23	n/a	n/a
Hydronic Flow Switches and Transducers	23 09 23	23	23 09 23	n/a
Variable Frequency Drives not OEM Furnished	23	26	23 09 23	26
Fire Alarm control monitoring relay	28	28	23 09 23	26
Power Distribution Monitoring System	Utility	Utility	23 09 23	26
Natural Gas Utility Monitoring System	Utility	26	23 09 23	n/a
Water Meter Monitoring System	Owner	23 09 23	23 09 23	n/a
Fume Hood Controls (to be local control only)	23	23	23	26
Refrigerant Monitor	23	23	23	26

### **1.16 Existing Equipment**

1. The re-use of existing Building Automation System materials, equipment and accessories is acceptable for the following ONLY:
  1. VFD's
  2. Non-ASC Actuators (excluding pneumatic)
  3. Control Valves (excluding pneumatic)
  4. Dampers
  5. Starters and Relays
  6. Low Voltage Wiring, except those identified in 2.3.2. below
  7. Conduit, Raceways, Boxes, Circuit breakers, Grounding, Panel boards, Switchgear Splitters, Field disconnect switches
  8. Thermowells
  9. Refrigeration Leak Monitoring
2. The re-use of any sensor is prohibited unless approved, in writing, by the Owner or the Owner's representative.
3. The re-use of Network Cabling or Signal Cabling (input/output control wiring) is strictly prohibited.

### **1.17 Quality assurance**

1. The Controls Contractor shall be responsible for inspection and quality assurance for all materials and workmanship provided
2. The Controls Contractor shall have an established working relationship with the proposed BAS manufacturer of not less than 3 years.
3. The Controls Contractor shall have successfully completed all control system training and certification as required by the manufacturer.

### **1.18 Permits, Inspections and Testing**

1. Contractor will arrange for submission to the Electrical Safety Authority (ESA) for review of this project, and pay all associated fees. Provide Certificate(s) of Acceptance from ESA and other Authorities having jurisdiction upon completion of the Work.
2. Where modification to mechanical or electrical equipment control wiring is necessary to meet the requirements of the specifications, the contractor is responsible for arranging any testing required by the Authority Having Jurisdiction to maintain the required certification and ensure the safe operation of the equipment modified.

### **1.19 Performance Verification of Installed Equipment**

1. Installed equipment may be subject to performance verification as specified herein if required by Owner or Owner's Representative(s).
2. When performance verification is requested, equipment shall be tested to determine compliance with specified performance requirements.
3. If requested, Contractor shall arrange for services of independent testing agency.
4. Maintain building comfort condition when equipment removed from service or testing purposes.

5. Promptly provide Owner, or Owner's Representative(s) with test reports.
6. Should test results reveal that originally installed equipment meets specified performance requirements, Owner will pay costs resulting from performance verification procedure.
7. Should test results reveal equipment does not meet specified performance, equipment will be rejected and the following shall apply:
  1. Remove rejected equipment. Replace with equipment that meets requirements of Contract Documents, including specified performance requirements.
  2. Replacement equipment may be subject to performance verification as well; use same testing procedures as performed on originally installed equipment.
  3. Contractor shall pay costs resulting from performance verification procedure.

## 1.20 Submittals

1. All submittals and documentation including complete BAS System Engineering Design Submittal & Drawings, Project Record Documents, Application Engineering Documents and Owner's & Maintenance Manuals shall be submitted electronically in the form of an Adobe Portable Document Format (.pdf). All Control Schematics, Wiring Diagrams, Riser Diagrams, &c. shall be formatted for A3 11" x 17". Floor Plans shall be submitted in CAD format (.dwg). All other documentation may be formatted for 8.5" x 11".
2. Submit in writing and so delineated at the beginning of each submittal, known substitutions and deviations from requirements of Contract Documents.
3. Complete BAS Engineering Design Submittal & Drawings shall be prepared in accordance with Section 1.20 using the following guidelines:
  1. Submittal documentation and drawings shall consistently use the same abbreviations, symbols, nomenclature and identifiers. Each control system element shall be assigned a unique identifier pursuant with the Contract Documents

Submit the following:

2. A complete bill of materials of all equipment, controllers, devices, sensors, actuators, valves, etc., necessary to meet the requirements detailed herein is to be provided, indicating unique equipment identifier/tag, unique device/controller identifier/tag, manufacturer and model number.
3. Riser diagram of Local Area Network (LAN) shall outline execution and details of all network cabling, BAS & Network Hardware including the following:
  - a. All BAS/DDC Hardware with controller number, MAC Addresses where required, unique identifier/tag, location, equipment and service
  - b. All Network Hardware with unique identifier, location and service
  - c. Network cabling configuration and execution specification
  - d. Location of all cabling termination points and End of Line (EOL) terminators
  - e. Location of all network interface jacks
  - f. A separate riser diagram shall be provided for each network segment
4. Provide manufacturers cut sheets for major system components. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Include for every BAS component including but not limited to the following:

- a. Gateways or BBMD associated networking peripherals
- b. Control Valves
- c. Dampers
- d. Actuators
- e. Variable Frequency Drives

### **1.21 Substantial Completion Requirements.**

1. Contractor shall provide checklist for completion before Substantial Completion Field Review. Provide written declaration that work is complete. The following items shall be complete before Substantial Completion Field Review:
  1. Mechanical and Electrical systems capable of operation with Building Automation System, in operation with alarms functional.
  2. Tests on systems and equipment completed and certificates of approval obtained from regulating Authorities.
  3. Fire stopping completed, if required.
  4. Valve tagging completed and equipment, ductwork and piping identified.
  5. Escutcheons installed.
  6. Extended warranty form mailed to manufacturer and copy provided to Owner.
  7. Ensure access doors suitable located and equipment accessible.
  8. Ensure electrical connections to mechanical equipment are complete and motor rotation correct.
  9. Equipment cleaned inside and out, lubricated and paint touched-up
  10. Commissioning, Testing, Demonstration and Acceptance
  11. Complete program back-up and system files provided and verified for functionality

### **1.22 Project Record**

1. Upon completion of installation and systems commissioning, submit record documents for review. "As-Built" Project Record Documents should include:
  1. Project Record Application Engineering Drawings shall include all BAS System Engineering Design Submittal with Drawings updated to reflect actual field conditions, architecture and execution
  2. Electronic Operating & Maintenance (O&M) Manual including:
    - a. Operator's Manual with Manufacturers' complete operating instructions.
    - b. Documentation of all project specific Application and DDC programs
    - c. All necessary system Administrator-Level passwords and/or required access credentials
    - d. Information required for programming BAS
    - e. Complete Final Point Schedule including all hardware and software data points and documentation of calibration and configuration values for all

- Inputs, Outputs, Variables and PID Loops at the conclusion of systems commissioning and functional testing.
- f. Routine preventative maintenance procedures, corrective diagnostic troubleshooting procedures and calibration processes
  - g. Final Bill of Material with all installed parts, manufacturers, manufacturers' part numbers and ordering information
3. Sequence of Operation shall be submitted for every piece of equipment being controlled by and/or associated with the BAS. No operational deviation from specified Sequences of Operation as outlined in Contract Documents shall be permitted without prior written approval. Sequences of Operation shall include and conform to the following:
- a. Refer to equipment and control devices by their specific unique identifiers/tags pursuant with the Contract Documents and BAS Submittal package.
  - b. Clearly represent actual Application Programming methodology and functional control operation. Do not merely provide a copy of Contract Document specified Sequence of Control.
  - c. Include description of functional system operation under normal and failure conditions.
4. BAS Control Schematics and Wiring Diagrams shall be submitted for every piece of equipment being controlled by and/or associated with the BAS. BAS Control Schematics and Wiring Diagrams shall include and conform to the following:
- a. Floor plan showing exact location, MAC addresses where required, including unique identifiers of all hardware supplied under this section.
  - b. Control Schematic flow diagram of each system (air, water, gas, & etc.) being controlled showing actual physical configuration and control device/sensor location of all fans, coils, dampers, valves, pumps, heat exchangers, control devices, &c. including each hardware point type, controller and associated ancillary devices.
  - c. Controller termination details showing every controller point termination.
  - d. Wiring Diagrams of all packaged equipment, motor starters, relay wiring, equipment interlock, safety circuits, & etc. clearly indicating all interconnecting wiring and termination of all conductors and cables including labels of all cables and points.
  - e. Control Enclosure details for every enclosure including panel identifier, location, physical lay-out, dimensions, instrumentation, labels, & etc. Also include detail wiring (I/O, network and power) and power source for each panel, transformer and controller.

## **2. Products**

### **2.1 Approved Manufacturers**

1. The following controls hardware and software, in no particular order of preference, are approved for use:

Manufacturer	Tier 2 Product Line	Manufacturer Assigned Vendor
Alerton	AIE Niagara 4	HTS Engineering Ltd (115 Norfinch Drive, North York, ON)
Distech Controls	EC-BOS Niagara 4	Energy Controls & Mechanical Services Inc. (Kitchener)

## 2.2 Sole Vendor Site Designation

1. A site or school with an existing B-BC meeting the specifications detailed in 2.3 shall determine the Approved Manufacturer for the respective site.
2. Any minor site additions or upgrades, requiring manufacturer specific products as detailed herein will be that of the Approved Manufacturer for the site, per 2.3.
3. The Board reserves the right to change the status of an Approved Manufacturer at any time should they not meet the performance or requirements detailed herein.

## 2.3 Building Controller (B-BC)

1. The B-BC shall be BTL certified, communicate BACnet Natively and incorporate the Niagara 4 Framework®.
2. The B-BC shall have an unrestricted interoperability license with a Niagara Compatibility Statement (NiCS) following the Tridium Open NiCS Specification and have a value of "\*", it shall be understood to mean that parameter is open to all possible values. Note that this will result in the following entries in the license.dat file:

Specific Feature	license.dat file entry value
Owner	"HDSB"
Project	"HDSB"
BrandId	"*" preferred, "Distech" or "Alerton" acceptable
accept.station.in	"*"
accept.station.out	"*"
accept.wb.in	"*"
accept.wb.out	"*"
<b>Expiration</b>	
All expiration instances	"never"
<b>Limit</b>	
<sup>1</sup> All .limit instances	"none"
<b>Export</b>	
BACnet	"true"
obix	"true"
<b>Import</b>	
rdbSqlServer	"true"
<b>web</b>	
ui	"true"
ui.wb	"true"
ui.wb.admin	"true"

<sup>1</sup> With the exception of limitations defined by hardware configuration

3. The B-BC shall function in a real-time, multi-tasking networked operating environment. It must complete all necessary site computations based on information from any object in the internetwork and locally execute global strategies and supervisory control for all field devices supplied under this specification, without additional hardware or software and independent of

or under a B-AWS. It shall be capable of executing application control programs to provide the following:

1. Calendar Functions
  2. Scheduling
  3. Trending and Data Management
  4. Alarm Monitoring and Routing
  5. Real-Time Clock and Network Time Synchronization
  6. Network and User Management functions for all devices on the LAN
4. The B-BC shall be equal to a JACE 8000 and be supplied with the following hardware features as a minimum
1. two (2) Ethernet ports
  2. one (2) RS-485 BACnet MS/TP port
  3. one (1) USB port
  4. Wi-Fi connectivity
  5. expansion capability
  6. a battery backup and/or non-volatile memory. If battery backup or non-volatile memory is not available an Uninterruptable Power Supply must be provided to maintain program file and data base for a minimum 24 hours.
5. The B-BC shall contain sufficient memory to support its own operating system, User Interface, all specified control strategies and objects, energy management applications, data storage and trending, alarm annunciation, and network management.
6. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Google Chrome™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacturer-specific browsers shall not be acceptable.
7. The B-BC must enable access to the complete BAS system installed under this section, via web-browser. Access includes but is not limited to comprehensive programming capabilities for all controllers and real-time operational values via an embedded web-browser Graphical User Interface (GUI). The GUI shall support the latest version of standard web-browsers, without the requirement of additional plugins or software, and must be configured in accordance with these specifications.
8. The B-BC shall provide alarm management to monitor, buffer, and direct alarms and messages to operator devices and memory files, to be assigned in accordance with these specifications. Each B-BC shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic, and prevent alarms from being lost.
9. The B-BC shall have the ability to collect and archive any data, for any property of any object on the LAN, in accordance with these specifications. The embedded UI shall be capable of configuring the collection of data. The data shall be accessible in either the following formats, XML or CSV from the WAN Server Supervisory Software or through a standard web-browser.
10. The B-BC shall be capable of maintaining an Audit log that tracks and archives all activities performed.
11. The B-BC shall provide, a minimum of four (5) levels of local access privileges. The highest level, Administrator Level, shall allow the BAS administrator to perform application, database, and user

management functions. Each login credentials shall be assigned to a pre-defined level of access.

12. The B-BC shall provide WAN access privileges, including a comprehensive list of accessibility/functionality items, to be enabled or disabled for each user according to the level of access granted. Operators shall be able to perform only those commands available for the access level assigned to their login credentials. Login credentials are to be looked up using the Lightweight Directory Access (LDAP) through the BAS server.

## **2.4 Advanced Application Controllers (B-AAC)**

1. B-AAC's shall be BTL Certified.
2. B-AAC objects, sequences and operational parameters must be configurable via the B-BC's embedded graphical user interface.
3. Each B-AAC shall contain sufficient memory to support its own operating system, data storage and programming requirements.
4. The B-AAC shall share and use data between all controllers on the network and shall manage the input and output communication signals to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms.
5. Controllers that perform scheduling shall have a real-time clock.
6. The B-AAC shall continuously check the status of its processor and memory circuits and in the event an abnormal operation is detected, the controller shall initiate a predetermined failure mode and generate an alarm notification.
7. Each B-AAC shall be supplied with a minimum 3 spare Universal I/O's.

## **2.5 Application Specific Controllers (B-ASC)**

1. B-ASC use is limited to VAV box and will not be accepted for use in any other application.
2. B-ASC's shall be BTL Certified.
3. B-ASC objects, sequences and operational parameters must be configurable via the B-BC's embedded graphical user interface.
4. Each B-ASC shall contain sufficient memory to support its own operating system, data storage and programming requirements.
5. The B-ASC shall share and use data between all controllers on the network and shall manage the input and output communication signals to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms.
6. Controllers that perform scheduling shall have a real-time clock.
7. The B-ASC shall continuously check the status of its processor and memory circuits and in the event an abnormal operation is detected, the controller shall initiate a predetermined failure mode and generate an alarm notification.
8. Each B-ASC shall be supplied with a minimum 3 spare Universal I/O's.

## **2.6 Room and Space Control Devices**

1. Room sensors, associated with each "Room Controller" detailed in Section 23 09 93, are to be communicating type complete with integral override button, configurable set-point / offset adjustment and without a display. Only the following room sensors, associated with occupant



comfort, are approved for use:

DisTech Controls - Allure EC-Smart-Comfort-SO  
Alerton - Microtouch Wall Sensor

### **3. Part 3 – Execution**

#### **3.1 Installation**

1. The BAS contractor is responsible to verify that equipment can be installed in accordance with the manufacturer's instructions and as detailed within these specifications, as such the contractor shall inspect the site and report any discrepancies, conflicts or omissions to the Owner or it's representative, for resolution prior to the commencement of work.
2. Unless otherwise specified, meet manufacturer's latest printed instructions for materials, planned maintenance and installation methods.

#### **3.2 Object and Point Naming**

1. Where the first four segments of the object / point name are configured by virtue of the Niagara Network Device Addressing, only the 5<sup>th</sup> segment shall be defined as the Object / Point Name herein and must be programmed in accordance with Schedule A of Section 23 09 93. It must be demonstrated, by way of the Niagara Enterprise Software instance, that the individual points are searchable by the School's Unique Identifier, or Controller/Equipment Identifier, or Point Name Abbreviation, or any combination of, across the Board's WAN, without interruptions and/or collisions.
2. All BACnet objects and points programmed under these specifications, shall conform to the following case sensitive convention:
  1. First five characters = School's unique identifier
  2. Sixth character = Network number
  3. Seventh and eighth characters = Device number
  4. Ninth up to required not to exceed nineteen characters = Controller / Equipment Identifier
  5. Last segment = Point name abbreviation

Example: S1156\_2\_15\_HP10\_RmTemp (S1156 = Forest Trail, 2 = Network 2, 15 = 15<sup>th</sup> device on network, HP10 = heat-pump 10, RmTemp = Room Temperature)
3. Object name segment shall be delimited by ( ) character, however must be consistent by Vendor across all Board sites
4. Where a BACnet object or point name is not explicitly detailed in Schedule A of these Specifications, the Owner shall supply the required information including, but not limited to, device name, instance number, point name, units, meta tag, etc.,

#### **3.3 Controller and Device Addressing**

1. Where the first four segments of the Controller and Device Addressing are configured by virtue of the Niagara Network Device Addressing, only the 4<sup>th</sup> segment shall be defined as the Object / Point Name herein and must be programmed in accordance with Schedule A of Section 23 09 93. It must be demonstrated, by way of the Niagara Enterprise Software instance, that the individual points are searchable by the School's Unique Identifier, or Controller/Equipment

Identifier, or Point Name Abbreviation, or any combination of, across the Board's WAN, without interruptions and/or collisions.

2. Each device or network installed and programmed under these specifications, shall be addressed and/or named as follows:

Device Instance

1. First five characters = School's unique identifier
2. Sixth character = Network number
3. Seventh and Eighth character = Device number
4. Ninth up to required not to exceed nineteen characters = Controller / Equipment Identifier

Example: S1156\_2\_15\_HP10 (S1156 = Forest Trail, 2 = Network 2, 15 = 15<sup>th</sup> device on network, HP10)

BACnet Network Number

1. First five characters = School's unique identifier
2. Sixth character = Network number
3. Seventh = Network and Type

Example: S1156\_2\_1 (S1156 = Forest Trail, 2 = Network 2, 1 = 1<sup>st</sup> MS/TP network)

MAC Addresses

0. B-BC
1. Maintenance Connection
2. Reserved
3. – 127. Master Range
128. – 254. Slave Range
255. Broadcast

2. Object name segment shall be delimited by ( ) character, however must be consistent by Vendor across all Board sites

### 3.4 Controller / Device Naming

1. Each device or network installed and programmed under these specifications, shall be addressed and/or named as follows:

Device Instance

1. First five characters = School's unique identifier
2. Sixth character = Network number
3. Seventh and Eighth character = Device number
4. Ninth up to required not to exceed nineteen characters = Controller / Equipment Identifier

Example: S1156\_2\_15\_HP10 (S1156 = Forest Trail, 2 = Network 2, 15 = 15<sup>th</sup> device on network, HP10)

BACnet Network Number

4. First five characters = School's unique identifier
5. Sixth character = Network number
6. Seventh = Network and Type

---

Example: S1156\_2\_1 (S1156 = Forest Trail, 2 = Network 2, 1 = 1<sup>st</sup> MS/TP network)

MAC Addresses

4. B-BC
  5. Maintenance Connection
  6. Reserved
  7. – 127. Master Range
  129. – 254. Slave Range
  255. Broadcast
2. Object name segment shall be delimited by (\_\_) character, however must be consistent by Vendor across all Board sites

### 3.4 School's Unique Identifier

1. The School's Unique Identifier will be provided by Owner and must be used in the first segment, for all device, network, object, and point names.

### 3.5 Controller / Equipment Identifier

1. The Controller / Equipment Identifiers are restricted to dedicated B-AAC and B-ASC controllers. Identifiers are limited those listed below. Where an identifier is not listed below the Owner shall supply the required information.
  1. AC# = Air Conditioning Unit
  2. AHU# = Air Handling Unit
  3. Blr# = Boiler
  4. BPB# = By-Pass Box (constant volume)
  5. Chiller# = Chiller
  6. CU# = Condensing Unit
  7. HVAC# = HVAC Unit
  8. HVAC#VAV# = HVAC Unit (associated with) Variable Air Volume Box
  9. HP# = Heat pump
  10. HWLoop# = Heating Water Loop
  11. HpLoop# = Heat-pump Loop
  12. HX# = Heat Exchanger
  13. MAU# = Make-up Air Unit
  14. Tower# = Cooling Tower
  15. UV# = Unit Ventilator
  16. VRF# = Variable Refrigerant Flow Condensing Unit
  17. VRF#AC# = Variable Refrigerant Flow Unit (associated with) Air Conditioning Unit
  18. VRF#AC# = Variable Refrigerant Flow Unit (associated with) Air Conditioning Unit
2. Where a dedicated B-AAC or B-ASC is not configured specific to a system or unit, controller identifier is to be approved by Owner.

### 3.6 Point Name Abbreviation

1. The Object / Point Name convention must be followed for the objects / points as listed in Schedule A of this Section, note abbreviations are case sensitive.

- 
2. Where an identifier is not listed below the Owner shall supply the required information.

### **3.7 Programming**

1. Sequences of Operation are to be programmed in accordance with Section 23 09 93
2. Programs for like equipment i.e, heat-pump, unit heater, etc. shall be consistent by controls vendor across the facility and all Board sites.

### **3.8 History and Trending**

1. A minimum of 7 days history shall be maintained within the B-BC for the points identified in Schedule A of this Section.
2. Data stored in the B-BC shall be uploaded to the B-AWS in accordance with Section 25 00 00.
3. Default Graphical trends, Navigation button per 3.9, shall be pre-configured.

### **3.9 Scheduling**

1. Scheduling feature shall include seven-day schedule, plus holiday or event schedule, each with start time and stop time. Schedules shall be individually editable for each day and holiday.
2. The scheduling feature shall allow for each individual equipment to be assigned to one of the Schedule Groups which includes, but is not limited to:
  1. Administration
  2. Gymnasium
  3. First Floor Classrooms
  4. Second Floor Classrooms
  5. Kindergarten
  6. Library
  7. Daycare
  8. Theatre
  9. Cafeteria
  10. Refuge
3. The Areas, associated schedule, and equipment grouping will be provided by Owner.
4. Timed override feature shall allow a temporary change of the scheduled equipment. An override command shall be selectable by an individual unit, all units assigned to a given schedule group, or to all units in a building. Timed override shall terminate at the end of the event. Timed override feature shall be allowed by a password level.

### **3.10 Demand Limiting**

1. Programming or schedules shall incorporate a delay such that there is a delay between the start-up of each Schedule Group.
2. Equipment within the Schedule Group shall incorporate a delay such that there is a delay between the start-up of individual equipment within the Schedule Group.

### **3.11 Alarms**

1. Logical and consistent alarm strategy must be used as defined within these specifications. The alarm strategy detailed herein applies to those objects identified in Schedule A of this section. It is expected that additional alarms be added when applicable, Owner to determine class.
2. Alarms, not classified as Emergency or Communication / Network, shall have the following values adjustable: threshold, limit and time delay.

3. Alarm actions, defined by Alarm Class, shall be annunciated as follows:
  1. Emergency (E): email, header button red, graphic with flashing alarm object, Alarm Portal B-BC record
  2. High Priority (H): graphic with flashing alarm object, header button red, Alarm Portal B-BC record
  3. General (G): Alarm Portal B-BC Record
4. The complete object / point name shall be included in every alarm message, refer to “Object and Point Naming” within this specification section.
5. The minimum shall be recorded by the B-BC for each alarm:
  1. Time and Date
  2. Complete object / point name
  3. Acknowledge time, date, and user who issued acknowledgement

### 3.12 User Access

1. Set up the following 5 password levels to include the specified capabilities.
  1. Level 1: (The Board’s BAS Administrator)  
Level 2 capabilities.  
All administrative rights  
View, add, change and delete user names, passwords, password levels.  
All unrestricted system capabilities including all network management functions.
  2. Level 2: (TBD)  
Level 3 capabilities. Configure system software. Modify control unit programs. Modify graphic software.  
Unrestricted except for viewing or modifying user names, passwords, password levels.
  3. Level 3: (Approved Facilities Staff and Board’s HVAC Maintenance Technicians)  
Level 4 capabilities.  
Temporary override of designated objects and/or points.  
Temporary set-point value change.  
Change selected equipment schedules.
  4. Level 4: (Approved Facilities Staff)  
Level 5 capabilities.  
Acknowledge alarms.  
Change selected equipment schedules.
  5. Level 5: (Read Only)  
Display all graphic data.  
Trend point data.
2. Level 1 and 5 will be accounts which reside locally within the B-BC.
3. Level 2 through 4 will be will use LDAP for login credential authentication.

### 3.13 Graphical User Interface

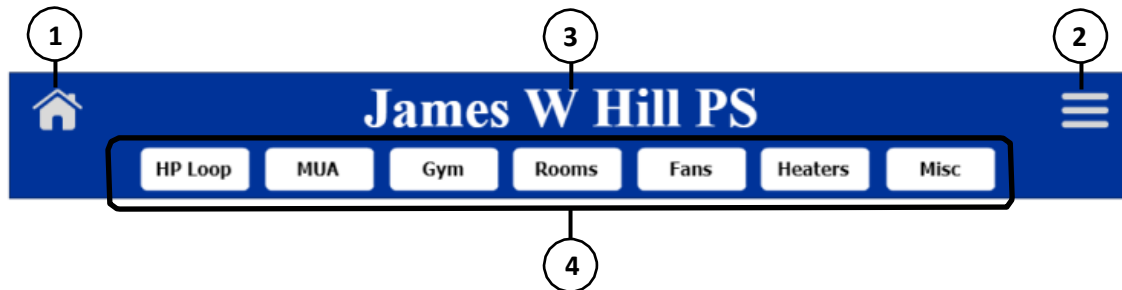
1. Provide a colour graphic home screen, floor plans, system flow diagrams for each system and summary screens, designed and sized for iPad, with all points indicated on the points list in Schedule A of this Section, and in accordance with these specifications.
2. All graphics shall be rendered as N4 HTML 5 views. Any graphic page that depends on JAVA

based animated widgets, or in any way depends on any browser-side-applet shall not be acceptable.

3. The Graphical User Interface shall not use Red as graphical representation for any of the following: stop, alarm, or fault. Red is used explicitly for graphical representation of heat command and/or enable, with the only exception in text format in charts, the word “fault” can be coloured red.
4. Graphics not explicitly detailed within this section shall be reviewed and approved by Owner.
5. Common for all Graphics:

1. Header

The Header is one PX file for the entire project. All links, labels, etc. shall be edited from only one instance of the Header. The following aspects of the Header should appear exactly the same across all Board Facilities: Dimensions, Font Size, Colour(s), Equipment Navigation Buttons’ Size, Font, and Colour(s). The following shall be exactly the same 1 - Home Button, 2 - Three Line Menu Navicon. The following aspects are dynamic: 3 - Page title, and 4 - Equipment Navigation Buttons (function and name)

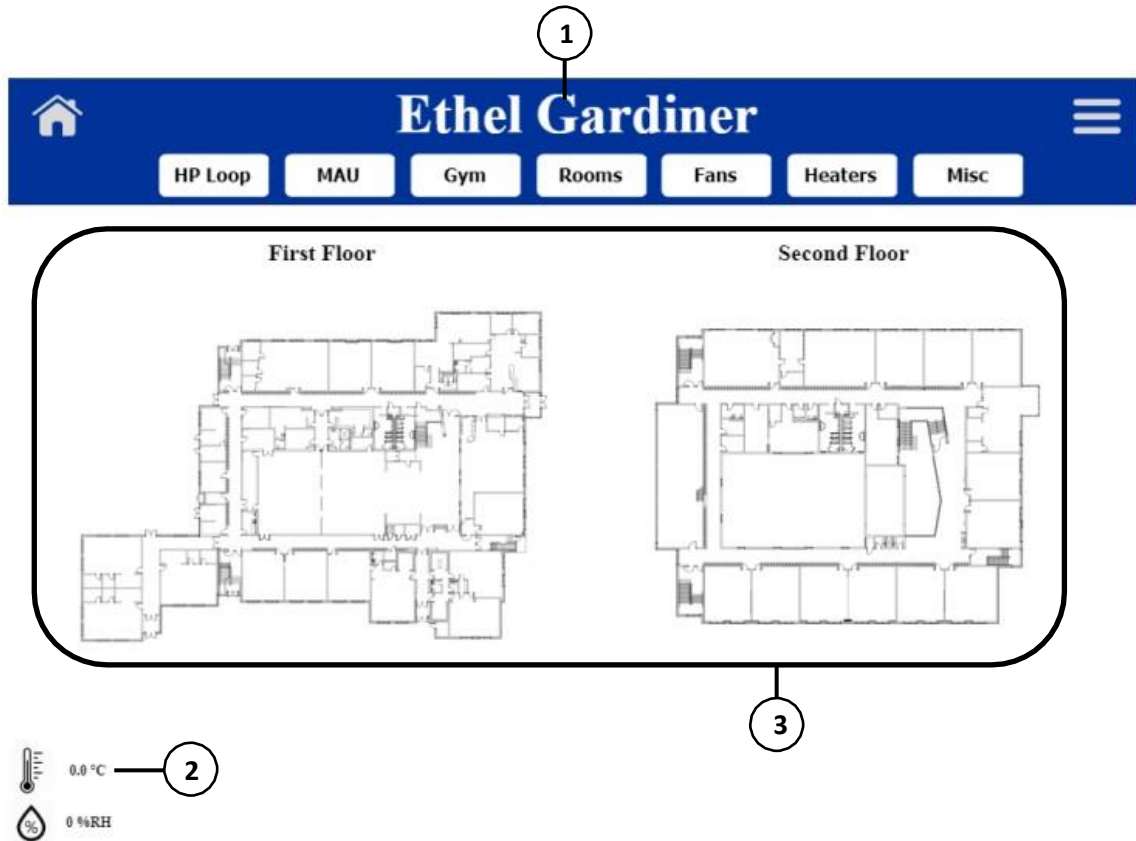


2. Flashing Alarm graphic (a standard Niagara graphic white triangle with red boarder and black exclamation mark) shall be consistent for all alarm annunciations, across all



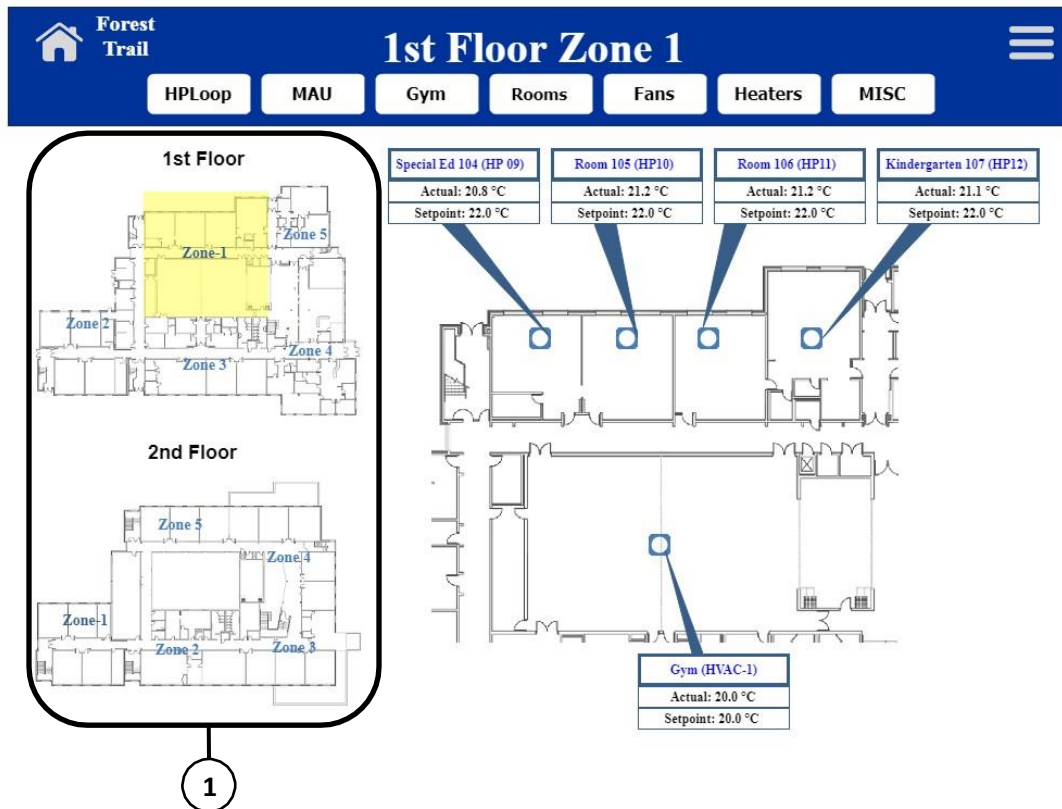
Board facilities, regardless of vendor.

3. Page Title shall be representative of the Navigation name used to link to the page and is to include information identifying area or equipment
5. Home Page  
The Home Page shall be comprised of the following: 1 – School / Facility name as page title, 2 - Outdoor Air Temperature, 3 - Complete Facility Floor Map (individual floors labelled accordingly).



6. Zone Page(s)

The Zone Page(s) which are scaled portions of the floor plan shall be comprised of 1 – Keyplan indicating respective zone, individual space temperatures and set-points, navigation button to respective equipment

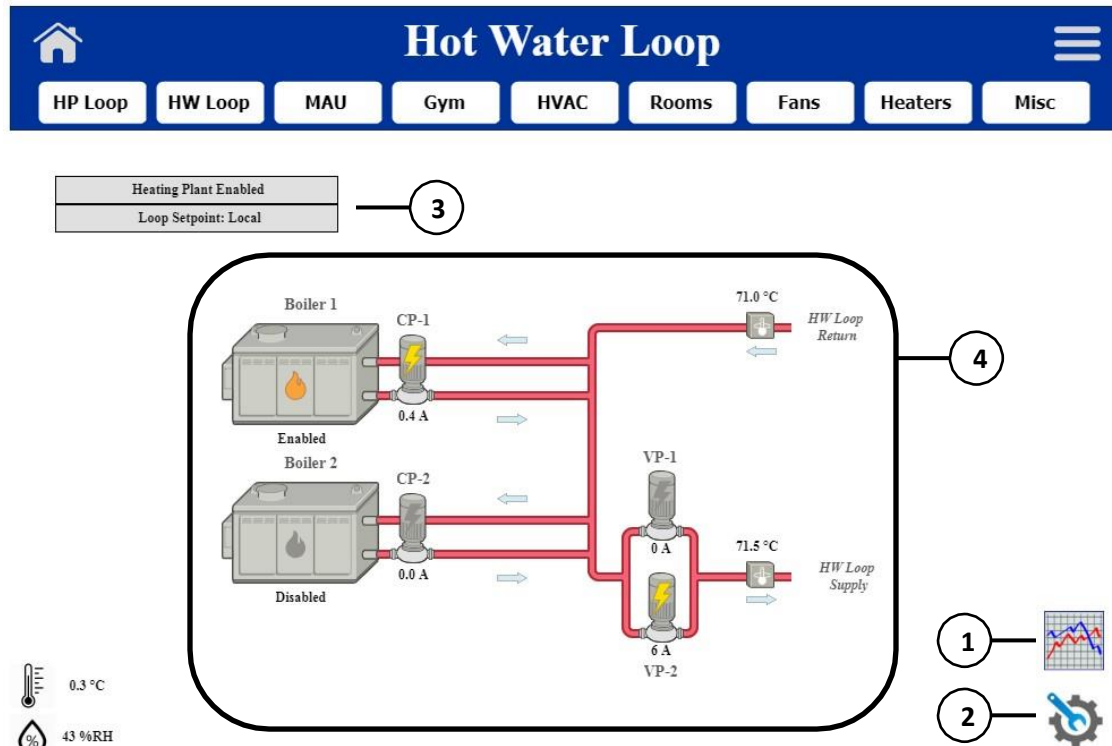


## 7. HWLoop Page

Only include HWLoop Navigation button on Header where Heating Water Loop is present at facility.

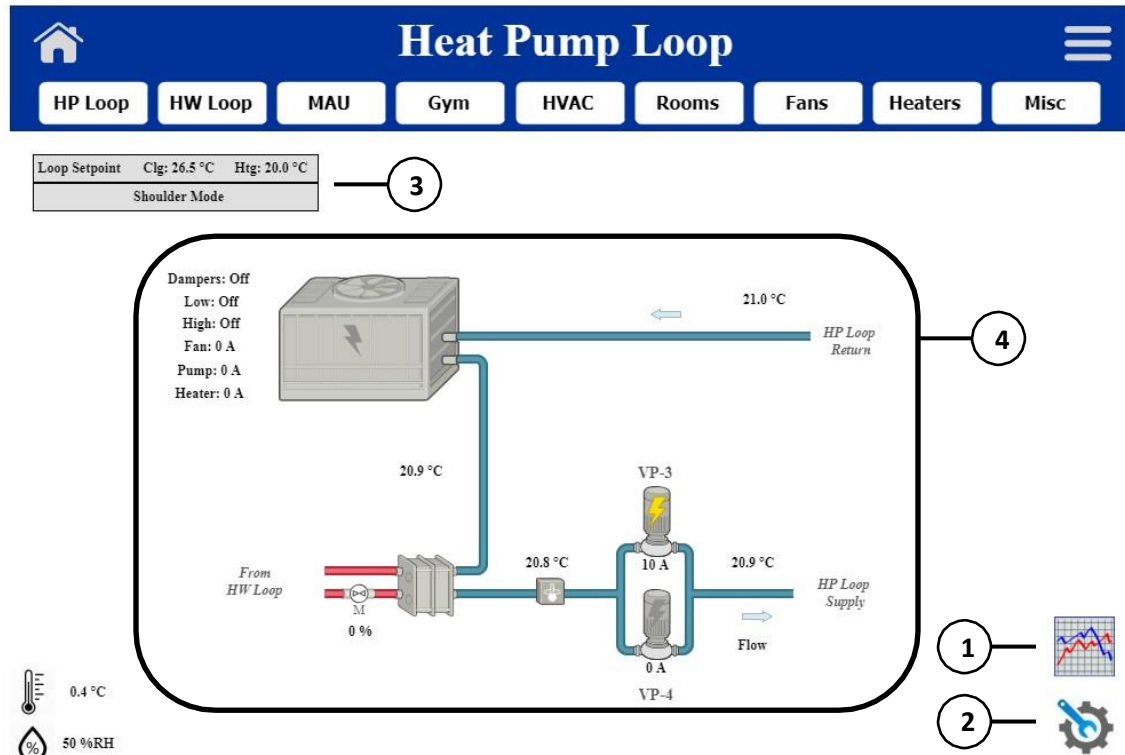
The HWLoop (Heating Water Loop) Page shall be comprised of the following: 1 - Trend navigation button (trend defaulted to include 7 days history of loop return water temperature (°C), loop supply water temperature (°C), boiler(s) supply water temperature (°C), and loop set-point (°C), 2 - Settings button to be linked to settings page, 3 - a chart with the loop water temperature set-point, and 4 – graphic depicting all associated the equipment and controlled zones. The following shall be graphically presented on the equipment: pump(s) command (green = on, white or no colour = idle), boiler command (red = on, white or no colour = idle). The following status values shall be presented: pump(s) status (amperage), valve(s) position, boiler command and reset signal value or status, boiler supply water temperature (°C), loop return water temperature (°C), loop supply water temperature (°C), zone supply water temperature (°C), zone return water temperature (°C),





#### 8. HPLoop Page

Only include HPLoop Navigation button on Header where Heat-pump Loop is present at facility. The HpLoop (Heat-pump Loop) Page shall be comprised of the following: 1 - Trend navigation button (trend defaulted to include 7 days history of loop return water temperature (°C), loop supply water temperature (°C), cooling tower leaving water temperature (°C), and set-point (°C), 2 - Settings button to be linked to settings page, 3 - a chart with the mode, and return water temperature set-point (°C), and 4 – graphic depicting all associated the equipment and controlled zones. The following shall be graphically presented on the equipment: pump(s) command (green = on, white or no colour = idle), boiler command for dedicated Heat-pump loop boilers only (red = on, white or no colour = idle), damper(s) position. The following status values shall be presented: fan status (Amperage), cooling tower pan heater status (Amperage), pump(s) status (Amperage), valve(s) position, boiler command and reset signal value or status, boiler supply water temperature (°C), loop return water temperature (°C), loop supply water temperature (°C), cooling tower leaving water temperature (°C), cooling tower damper(s) status (open or closed), cooling tower low speed fan command, cooling tower high speed fan command, cooling tower percentage speed command where VFD installed.



- 9.
10. Rooms Page

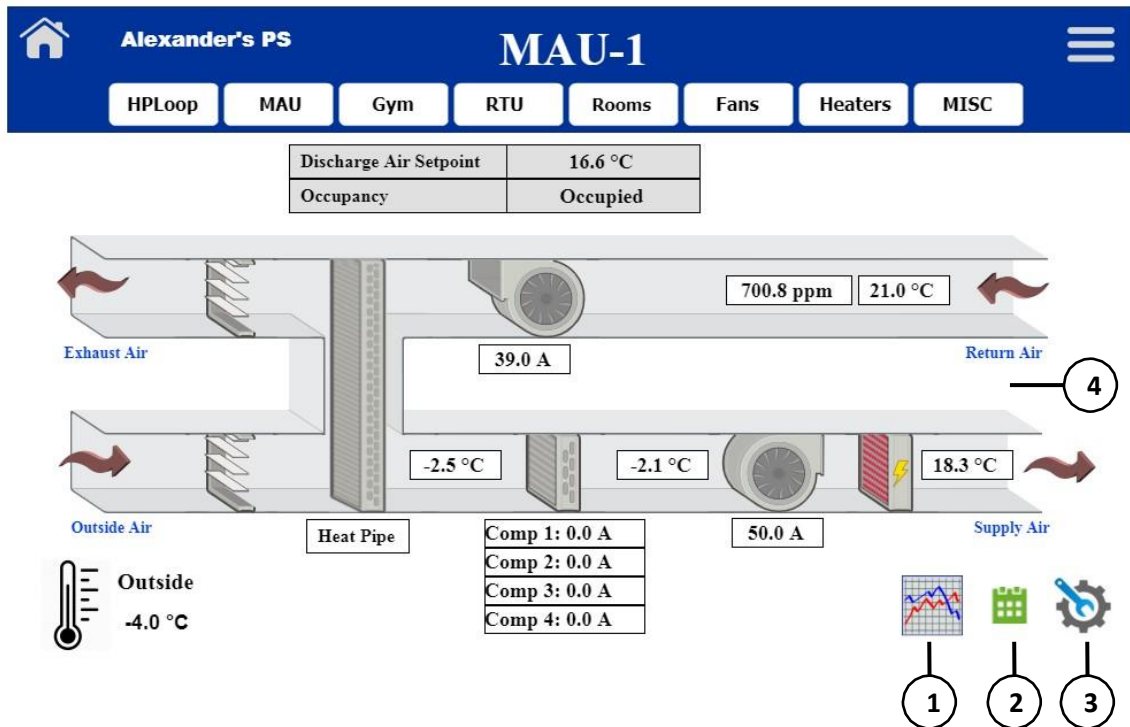
The Rooms page shall be comprised of the following: 1 - Navigation Buttons (left side of Chart) to include but not limited to: equipment by floor (example VAV Boxes 1<sup>st</sup> Floor), Comfort Heat, By-Pass Boxes, Unit Ventilators, HVAC Units. 2 – Navigation to respective equipment. Chart with live data under the following headers: Unit# (navigation to unit referenced), Area Served, Space Temp, Set-point, Offset, Status, DATemp, Mode, Occupancy, Fault

Forest Trail 1st Floor Heat Pumps										
HPLoop MAU Gym Rooms Fans Heaters MISC										
1st Floor Heat Pumps	Unit#	Area Served	Space Temp	Setpoint	Offset	Status	DATemp	Mode	Occupancy	Fault
2nd Floor Heat Pumps	HP01	Staff Room	21.3 °C	22.0 °C	0.0 °C	4.0 A	22.8 °C	Idle	Occupied	Normal
Bypass Boxes	HP02	Principal/Admin	21.0 °C	22.0 °C	0.0 °C	4.0 A	22.8 °C	Idle	Occupied	Normal
Comfort Heat	HP03	Meeting	22.0 °C	22.0 °C	0.0 °C	1.7 A	23.3 °C	Idle	Occupied	Fault
	HP04	Comp. 101	22.0 °C	23.8 °C	0.0 °C	11.5 A	22.3 °C	Heat	Occupied	Normal
	HP05	Room 102	23.2 °C	23.4 °C	0.0 °C	2.8 A	23.2 °C	Idle	Occupied	Normal
	HP06	Music Room 103	21.3 °C	22.0 °C	0.0 °C	5.7 A	22.1 °C	Idle	Occupied	Normal
	HP07	Counseling	20.3 °C	22.0 °C	0.0 °C	0.8 A	21.1 °C	Idle	Occupied	Normal
	HP08	Workroom	21.3 °C	22.4 °C	0.0 °C	1.5 A	21.3 °C	Idle	Occupied	Normal
	HP09	Special Ed 104	21.5 °C	22.0 °C	0.0 °C	2.5 A	22.8 °C	Idle	Occupied	Normal
	HP10	Room 105	21.5 °C	22.0 °C	0.0 °C	2.5 A	21.8 °C	Idle	Occupied	Normal
	HP11	Room 106	21.1 °C	22.0 °C	0.0 °C	2.8 A	21.7 °C	Idle	Occupied	Normal
	HP12	Kindergarten 107	21.6 °C	22.0 °C	0.0 °C	2.6 A	23.6 °C	Idle	Occupied	Normal
	HP13	Kindergarten 108	21.4 °C	22.0 °C	0.0 °C	10.7 A	39.9 °C	Heat	Occupied	Normal
	HP14	Kindergarten 109	21.8 °C	22.0 °C	0.0 °C	2.6 A	22.0 °C	Idle	Occupied	Normal
	HP15	Community	20.9 °C	22.0 °C	0.0 °C	2.4 A	21.6 °C	Idle	Occupied	Fault
	HP16	Forum	20.9 °C	22.0 °C	0.0 °C	2.2 A	21.8 °C	Idle	Occupied	Fault
	HP17	Room 110	21.5 °C	21.9 °C	0.0 °C	3.6 A	22.5 °C	Idle	Occupied	Normal
	HP18	Library	21.2 °C	21.2 °C	0.0 °C	4.0 A	21.9 °C	Idle	Occupied	Normal
	HP37	Room 116	21.9 °C	22.0 °C	0.0 °C	2.6 A	22.7 °C	Idle	Occupied	Normal
	HP38	Room 114	21.4 °C	22.0 °C	0.0 °C	2.7 A	22.4 °C	Idle	Occupied	Normal
	HP39	Room 115	22.3 °C	22.0 °C	0.0 °C	2.7 A	23.2 °C	Idle	Occupied	Normal
	HP40	Room 113	22.0 °C	22.9 °C	0.0 °C	2.6 A	23.3 °C	Idle	Occupied	Normal

#### 11. MAU Page

The MA (make-up air unit) page shall be comprised of: 1 - Trend navigation button (trend defaulted to include 7 days history of return air temperature, discharge air temperature, set-point), 2 - Calendar button to be linked to the respective calendar, 3 - Settings button to be linked to settings page, a chart with the discharge air set-point and occupancy, and 4 – template graphic depicting the equipment. The following shall be graphically presented on the equipment: fan(s) command (fan spinning = on, not spinning = idle), heat command (red coil = on, gray coil = idle), cooling command (blue coil = on, gray coil = idle), damper(s) position. The following status values shall be presented: fan(s) status (amperage), exhaust air temperature (°C), discharge air temperature (°C), downstream HRV/ERV air temperature (°C), heating command reset signal value or status, compressor(s) status (amperage), outdoor air damper position (where mechanically linked to return air and/or exhaust air damper(s) value to be outdoor air damper position), HRV/ERV command, HRV/ERV status

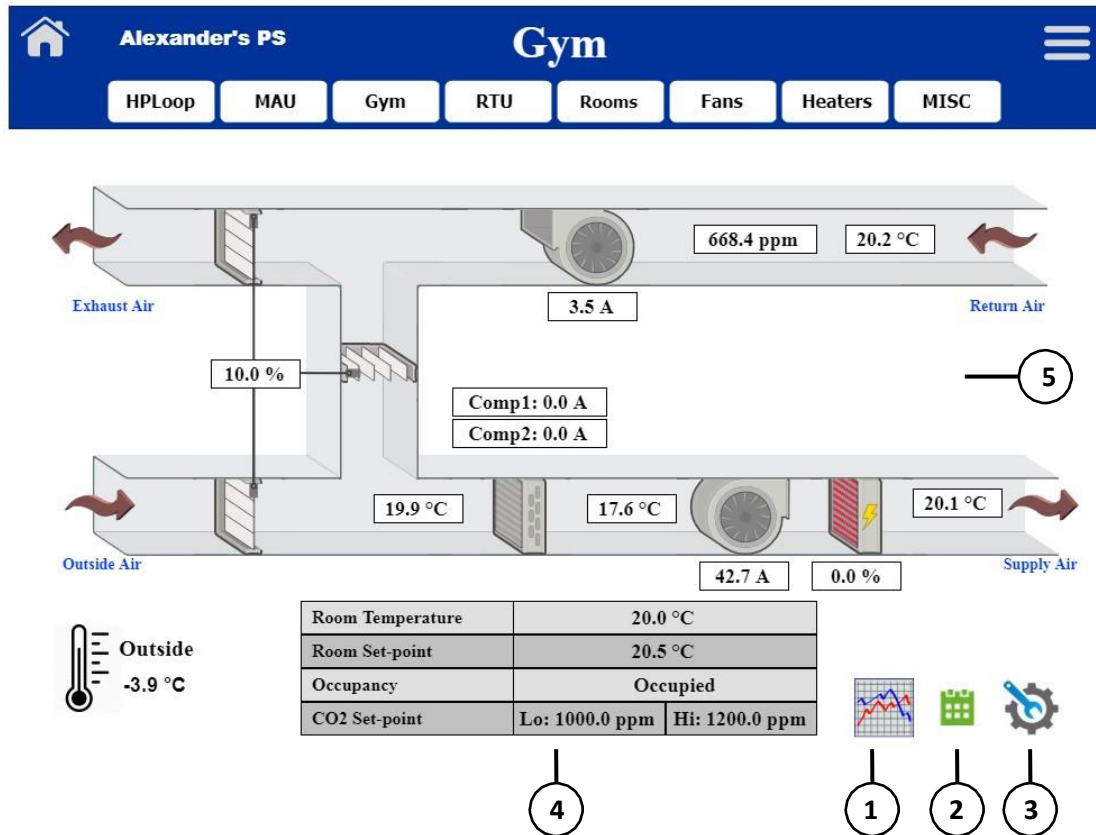
Where more than one make-up air unit exists in a facility, navigation buttons located on the left side of the graphic shall be incorporated, labelling to be determined by Owner.



#### 12. Gym Page

The Gym page shall be comprised of: 1 - Trend navigation button (trend to include 7 days history of return air temperature, discharge air temperature, set-point), 2 - Calendar button to be linked to the respective calendar, 3 - Settings button to be linked to settings page, 4 - a chart with the Room Temperature, Room Set-point and Occupancy, and 5 - template graphic depicting the equipment type servicing the space. The following shall be graphically presented on the equipment graphic: fan(s) command (fan spinning = on, not spinning = idle), heat command (red coil = on, gray coil = idle), cooling command (blue coil = on, gray coil = idle), damper(s) position. The following status values shall be presented: fan(s) status (amperage), return air temperature (°C), discharge air temperature (°C), mixed air temperature (°C), heating command reset signal value or status, compressor(s) status (amperage), outdoor air damper

position (where mechanically linked to return air and/or exhaust air damper(s) value to be outdoor air damper position), HRV/ERV command, HRV/ERV status, Where more than one piece of equipment conditions a single gymnasium, the Room Temperature, Room Set-point and Occupancy shall be a single object and programmed as such. Where more than one gymnasium exists in a facility, navigation buttons located on the left side of the graphic shall be incorporated, labelling to be determined by Owner.



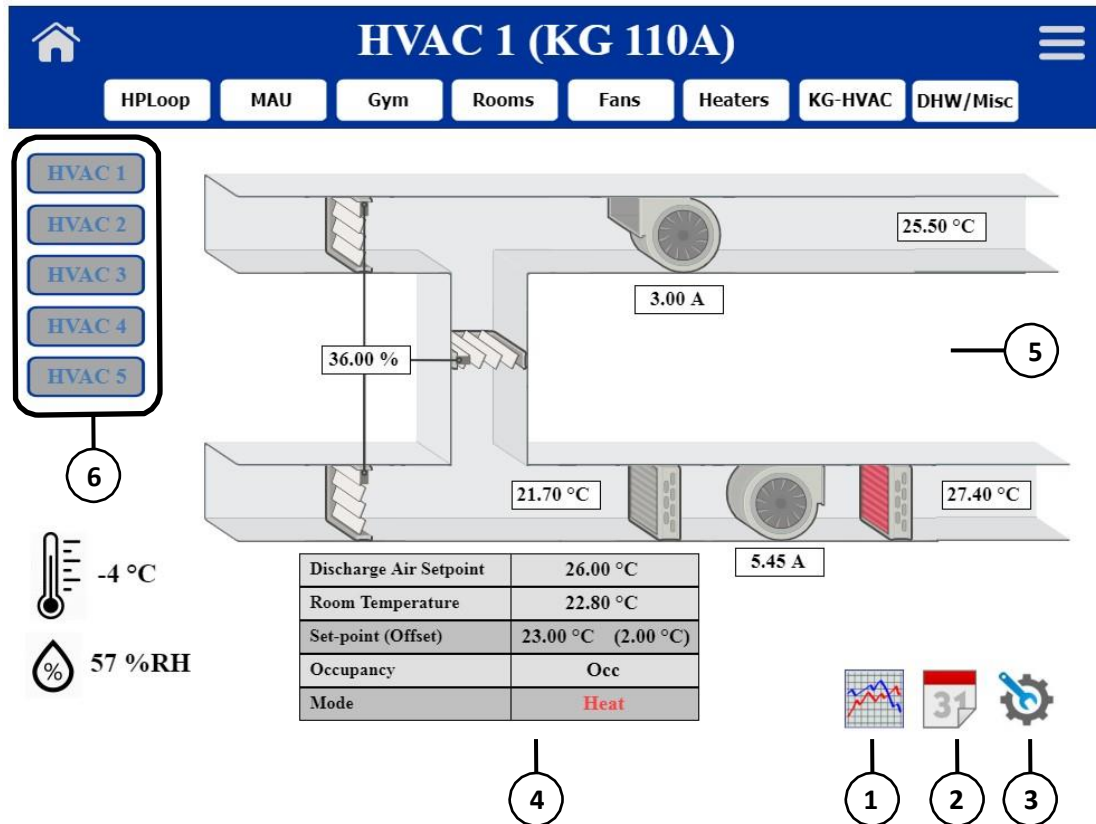
### 13. HVAC Page

Where an HVAC Unit serves a classroom or office (which can include 1 by-pass box), an HVAC Header navigation button is not required and the unit operational information can be presented on the Rooms Page. The individual unit, navigation from chart, is to be configured per below.

Where is more than one HVAC Unit serving multiple common spaces, i.e., Library, Shop, etc., there is to be a HVAC Header navigation button used.

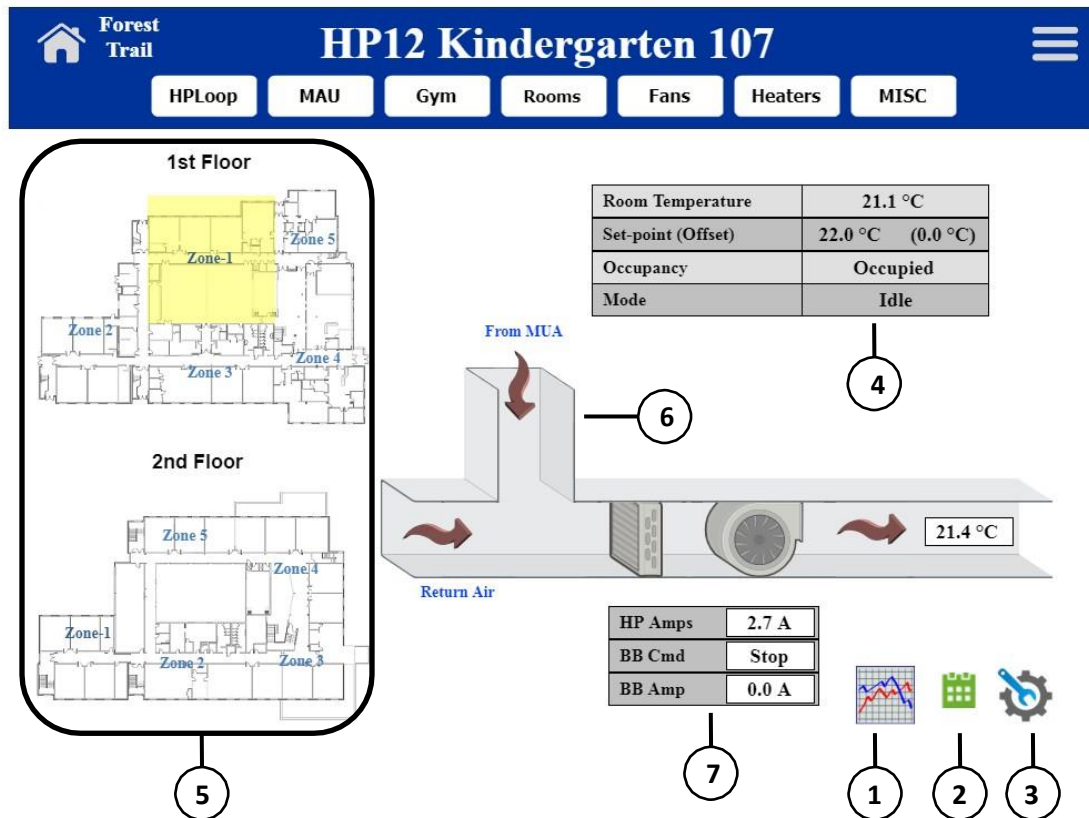
The HVAC page shall be comprised of: 1 - Trend navigation button (trend to include 7 days history of return air temperature, discharge air temperature, set-point, 2 - Calendar button to be linked to the respective calendar, 3 - Settings button to be linked to settings page, 4 - a chart with the Room Temperature, Room Set-point and Occupancy, and 5 - template graphic depicting the equipment type servicing the space. The following shall be graphically presented on the equipment graphic: fan(s) command (fan spinning = on, not spinning = idle), heat command (red coil = on, gray coil = idle), cooling command (blue coil = on, gray coil = idle), damper(s) position. The following status values shall be presented: fan(s) status (amperage), return air temperature (°C), discharge air temperature (°C), mixed air temperature (°C), heating command reset signal value or status, compressor(s) status (amperage), outdoor air damper

position (where mechanically linked to return air and/or exhaust air damper(s) value to be outdoor air damper position), HRV/ERV command, HRV/ERV status, Where more than one HVAC Unit exists in a facility, 6 - navigation buttons located on the left side of the graphic shall be incorporated, labelling to be determined by Owner.



#### 14. Heat-pump Page (individual equipment)

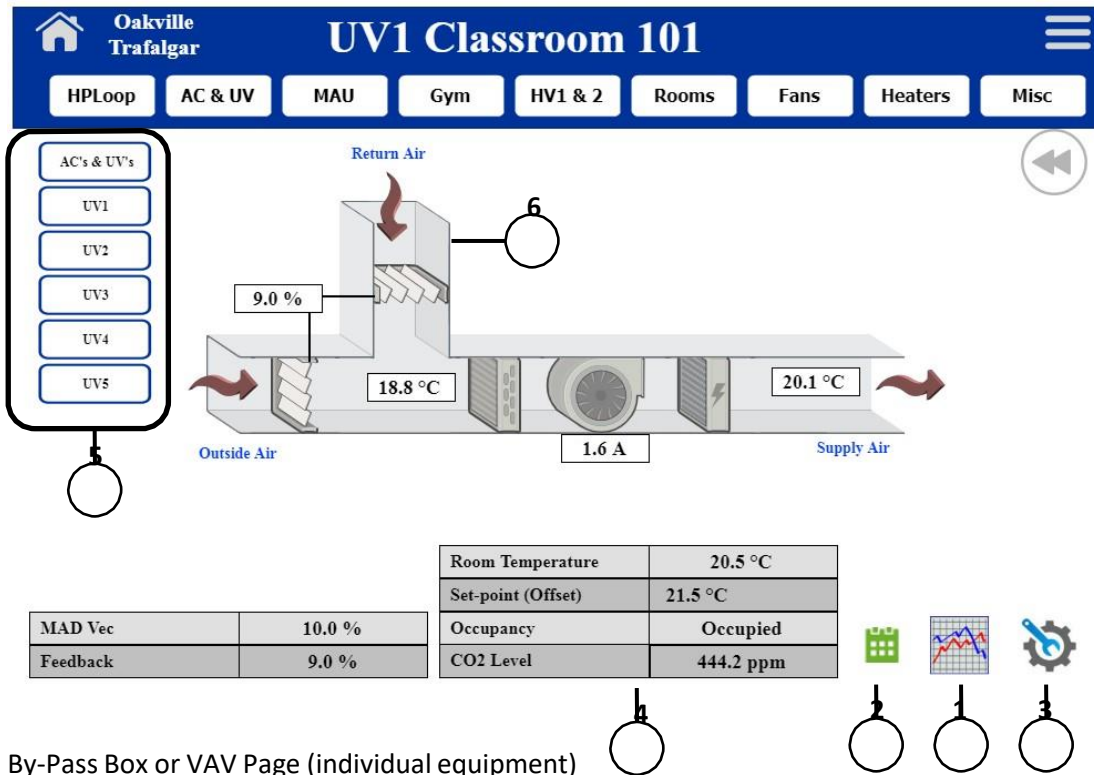
A Heat-pump page shall be comprised of: 1 - Trend navigation button (trend to include 7 days history of room temperature, set-point offset value, discharge air temperature (°C), and unit status (amperage), 2 - Calendar button to be linked to the respective calendar, 3 - Settings button to be linked to settings page, 4 - a chart with the Room Temperature, Set-point (offset), Occupancy, and Mode, 5 – keyplan indicating zone the respective unit is located, and 6 - template Heat-pump graphic. The following shall be graphically presented on the equipment graphic: fan(s) command (fan spinning = on, not spinning = idle), heat command (red coil = on, gray coil = idle), cooling command (blue coil = on, gray coil = idle). The following status values shall be presented: 7 - unit status including auxiliary heat (amperage), return air temperature (°C), discharge air temperature (°C), auxiliary heat status (amperage)



#### 15. Unit Ventilator Page (individual equipment)

A Unit Ventilator page shall be comprised of: 1 - Trend navigation button (trend to include 7 days history of room temperature, set-point offset value, discharge air temperature (°C), and unit status (amperage), outdoor air damper position, 2 - Calendar button to be linked to the respective calendar, 3 - Settings button to be linked to settings page, 4 - a chart with the Room Temperature, Set-point (offset), Occupancy, and Mode, 5 – navigation buttons located on the left side of the graphic, and 6 - template Unit Ventilator graphic. The following shall be graphically presented on the equipment graphic: fan(s) command (fan spinning = on, not spinning = idle), heat command (red coil = on, gray coil = idle), cooling command (blue coil = on, gray coil = idle). The following status values shall be presented: unit status (amperage), return air temperature (°C), discharge air temperature (°C), heating command reset signal value or status if hydronic, compressor(s) status (amperage) if remote condensing unit, outdoor air damper position (where mechanically linked to return air and/or exhaust air damper(s) value to be outdoor air damper position), HRV/ERV command and HRV/ERV status where applicable, auxiliary heat status (amperage).

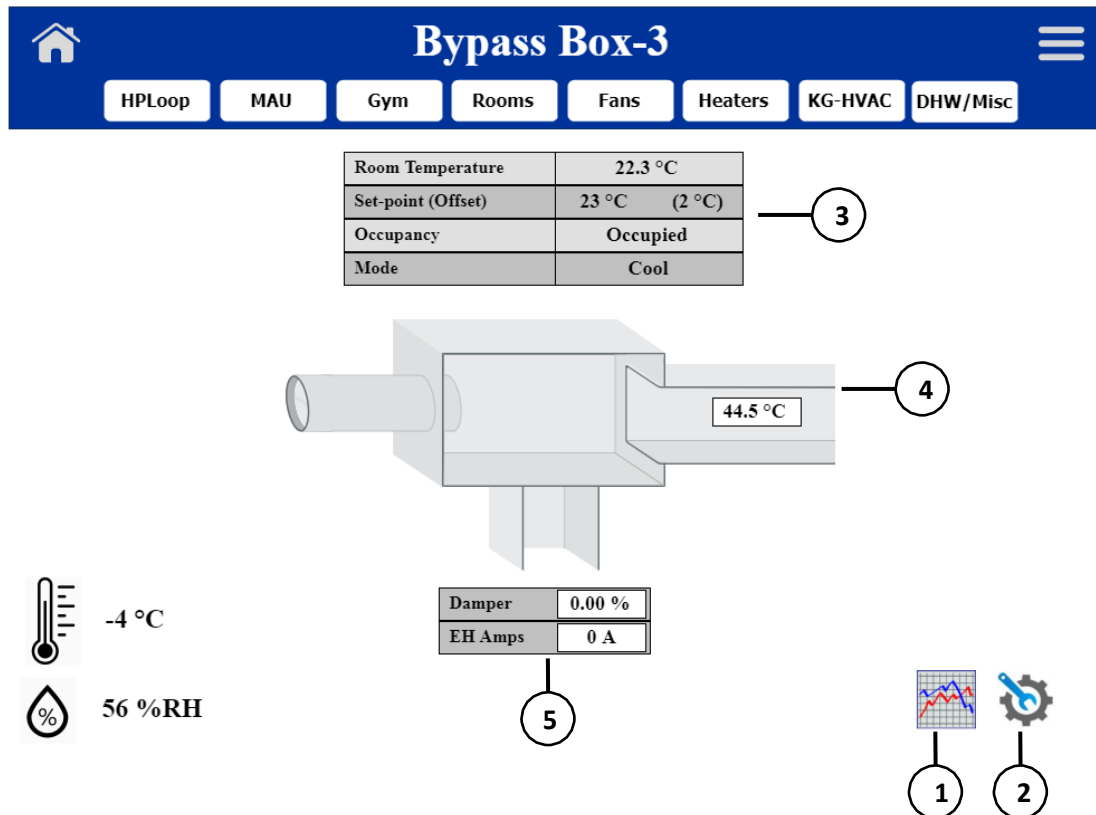




#### 16. By-Pass Box or VAV Page (individual equipment)

A By-Pass or VAV Box page name shall include an equipment identifier from which the air is being supply from.

A By-Pass or VAV Box page shall be comprised of: 1 - Trend navigation button (trend to include 7 days history of room temperature, set-point offset value, and damper position, discharge air temperature (°C), 2 - Settings button to be linked to settings page, 3 - a chart with the Room Temperature, Set-point (offset), Occupancy, and Mode, and 4 - template By-Pass or VAV box graphic. The following shall be graphically presented on the equipment graphic: re-heat command (red coil = on, gray coil = idle), cooling command (blue coil = on, gray coil = idle). The following status values shall be presented: damper position, return air temperature (°C), 5 - discharge air temperature (°C) and auxiliary heat status (amperage).



#### 17. Fans and Heaters Page

The Fans and Heaters page(s) shall be comprised of a Chart with live data under the following headers: Unit Number, Area Served, RmTemp, Set-point, Command, Status, and Occupancy

#### 18. Misc Page

The Misc page shall comprise operational information for: exterior lighting, domestic hot water status, trap flushing urinal flushing, grouped schedules, network comfort set-point

### 3.14 Low-Voltage Electrical and Control Wiring

1. It shall be the System Contractor's responsibility to complete and/or coordinate all wiring, less than 600 V, in accordance with 1.15, required for a complete Control System, including but not limited to:
  1. All raceways, boxes, cables, circuit breakers, grounding, relays, motors, starters and wirings from existing panel boards or switchgear through splitters, starters and field disconnect switches to complete power supply required for equipment supplied under this Contract not indicated on the electrical plans and specifications.
  2. Power to all actuators and sensors.
  3. Provide all wiring and cabling for network communications except for owner provided LAN(s)/WAN(s).
  4. All sensor and control device input and output wiring.
  5. All interconnecting cabling between and amongst network devices
  6. Interlock wiring between devices, and between motor starters.
  7. All other necessary wiring for fully complete and functional system as specified.
  8. Install piping, wiring/cabling routed parallel to or at right angles with the structure,



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properly supported every six (6) feet at a minimum and installed in a workmanlike manner.

2. Control system wiring and cabling installed for this project shall be performed by professionals in a workmanlike manner and in accordance with National Electric Code (NFPA 70), CSA C22.2 and latest NEMA standards, FCC, and any/all applicable local codes and/or Authorities Having Jurisdiction (AHJ).
3. All materials must be CSA and NEMA approved. Where this is not possible, arrange and pay for unconditional Electrical Safety Authority approval.
4. The following cabling shall be installed as continuous links, including shielding. Field splices are strictly prohibited.
  1. Network / Communication
  2. Signal (input / output control wiring)
5. Maximum allowable voltage for control wiring shall be 120-volts.
6. The Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site. This Section includes wiring, circuit breakers and accessories rated 600 V and less.

### **3.15 Power Wiring and Cabling**

1. Power wiring for all enclosures and equipment, including branch circuit wiring from circuit breaker panels shall be the responsibility of the System Contractor unless specifically shown on the Plans or Specifications.
2. The B-BC panel shall be served from isolated ground receptacle via UPS by dedicated branch circuits.
3. Power shall NOT be obtained by tapping into miscellaneous circuit that could inadvertently be switched off.
4. Transformers and power supplies for controllers and field devices shall be supplied in accordance with manufacturers recommendations and shall be located within the designated control enclosure.
5. Power for controls equipment shall be from a dedicated circuit. Where a controller is dedicated to controlling a single piece of equipment, power may be obtained directly from that equipment.
6. All other enclosures, sensor and control devices shall be fed from separate circuits in the electrical distribution panels and shall not be served from the typical floor receptacle or lighting circuits.

### **3.16 Network and Communication Cabling**

1. Network installation shall strictly adhere to the manufacturer's network installation instructions and procedures.
2. All data cabling shall use stranded conductors. Solid core conductors shall not be accepted.
3. Data cabling shall be run separately from power and signal wiring
4. All communications wire shall be externally identified as "Building Automation System Network" in accordance with the HDSB's Building Automation Systems Standards and Design, latest revision.
5. Network installation shall conform to standards for the LAN types and cabling types selected. Specific network rules inherent to the ANSI/AHRAE Standard 135, latest will be followed. Those include but are not limited to:

1. Only one path can exist from any BACnet device to another
2. The maximum length and cabling type of an MS/TP segment shall be in accordance with manufacturers specifications and shall comply with EIA-485.
3. Each internetwork LAN must have a unique Network Number (1 - 65,545).
4. The maximum number of nodes per segment shall be 32, as specified in the EIA 485 standard.
5. Wire type used for MSTP, RS-485 twisted pair communications must be balanced twisted pair with 100 to 120 Ohms Characteristic Impedance. The wire shall be less than 30 pF per foot, and preferred 20 AWG or lower. A shield wire shall be included for ground connection.
6. Primary LAN Network wire and cable shall be run separately from all other wiring.
7. Other LAN Network wire and cabling shall be installed separate from any wiring over thirty (30) volts.
8. All communications shielding shall be grounded as per Networked System manufacturer's recommendations.

### **3.17 BACnet Ethernet Communication Cabling**

1. Data cable shall Category 5 or better Ethernet cable.
2. Data cable shall be four twisted pair 24 AWG solid copper, Plenum Rated FT-6 / CMP or Riser Rated FT-4 / CMR (as required by local codes) unshielded twisted cable meeting EIA / TIA 568B.1 Category 5e classification.
3. The maximum cable length for each run shall be limited to 90 meters.
4. All cables must be Power Sum accepted and recognized by the manufacturer.
5. Cable Skew must be specified as 20Ns or less per 100 meters.
6. Cables must display the manufacturer's stamp stating that the cable is included in the latest UL verified publication for respective Category standards.

### **3.18 Signal (Input/output control) Wiring**

1. Minimum #20 AWG stranded copper conductors (larger gauge wire/cable shall be provided where required by BAS equipment and where applications warrant (e.g. rated load, long runs, etc.).
2. All BMS input/output point wire/cable and communication cable shall be shielded.
  1. Non-shielded cables may be approved for BAS input and output field point wiring following certification from the BAS manufacturer that non-shielded cables will function satisfactorily for the life of the building and that the use of non-shielded cables will not negatively affect other building systems/cabling.
  2. The manufacturers certification shall guarantee to the Board that should it be determined that BAS system performance is negatively affected or another building system or equipment is negatively affected due to the non-shielded cable, the BAS manufacturer shall replace the cable at no cost to the Board.

3. All cabling shall be installed in a neat and workman like manner. Follow manufacturer's installation recommendations for all communication cabling.
4. Free air cabling installed in non-combustible rated buildings shall be fire rated cable with a minimum rating of FT-6.
5. Wiring located in combustible rated buildings above T-bar ceiling shall be run in free air using fire rated cable with a minimum rating of FT-6.
6. Note: all free air cabling used in combustible rated buildings to interface to security or fire alarm systems shall be FT-6 rated.
7. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations.
8. Cables shall follow building lines and be installed in bundles resting in a cabling support system (J-hooks).
9. Cable supports shall be attached to the wall or ceiling of the area they are running through. Cable supports shall not be attached to:
  1. Electrical raceways,
  2. Duct work,
  3. Ceiling suspension systems,
  4. Piping,
  5. Wilson joists.
  6. All wire/cable terminations shall be made at screw type terminal strips. Wire nut terminations and butt splices shall not be acceptable. Wiring runs shall be continuous runs without splices.
10. All BAS equipment and components shall be grounded to building ground facilities.
11. BAS shall only be capable of controlling electric motors when the associated hand/off/auto (HOA) motor control switches are in the "auto" position. BAS control shall be wired into the auto circuit of the hand/off/auto motor control circuit only. Where hand/off/auto switches do not exist they shall be provided by the Controls Contractor.
12. Life safety and equipment protection interlocks shall be wired to override equipment whenever it is in operation.
13. Existing interlocks and override control should typically not be removed or overridden by the application of new BAS control without the specific instruction and/or approval of the Owner.

### **3.19 Utility Monitoring**

1. The metered systems include the electrical power, natural gas distribution, and water systems. The Controls Contractor is responsible for the integration and/or supply of metering equipment necessary to provide the following:  
Electricity – real time and historical kWh and KW  
Gas – real time and historical m<sup>3</sup>  
Water – real time and historical L
2. The Controls Contractor is responsible for coordination with the respective Electricity Provider for integration and/or installation.
3. The Board will coordinate with Union Gas the installation of the Utility provided signal output. The Controls Contractor is responsible for connection, integration and programming.

4. The Controls Contractor is responsible to integrate the water the existing Utility Provider's (Region of Halton) meter.

### **3.20 Commissioning, Testing, Demonstration, and Acceptance**

1. The system shall be commissioned in its entirety. All commissioning and tested shall be documented and submitted prior to Demonstration and Acceptance testing. Commissioning and Testing shall include, but not limited to the following:
  1. Verify all programming, naming, identification, and....conforms to the HDSB's Building Automation Systems Standards and Design, latest revision.
  2. A point-to-point check of the location, installation, and labeling
  3. Calibrate all analogue inputs and devices using actual versus the embedded UI
  4. Control loops are to be fully set-up and tuned
  5. Each control program and sequence shall be fully commissioned and confirmed by an end-to-end test, for the complete design intent compliance and functionality.
  6. Verify failsafe conditions
2. The naming and identification of all points, networking instances, objects, meta tags, etc. is to be extracted from the site controls electronically and sent to the Owner or its Authorized representative in one of the following formats .csv, .xls or .xlsx, for review and acceptance. The values are not to be edited or formatted prior to sending.
3. Pursuant to 3.8.1, Assist and cooperate with the Owner approved third party commissioning provider in the following manner: using a skilled technician who is familiar with the building, assist in the functional performance testing of the control system as per test requirements developed in the commissioning check sheets (prepared by the commissioning provider).
4. When Commissioning, Testing, Demonstration and Acceptance process has been completed and approved and/or verified by the Owner, and within ten (10) days, the contractor will be provided with a signed letter from the owner indicating acceptance.

### **3.21 Training**

1. Subsequent to the acceptance, per 3.9., and part of this contract, 1 day of training is to be provided to a maximum 6 individuals responsible for the operation of the site at the sole discretion of the Owner. The training shall provide instruction and demonstration on the operation, adjustment and maintenance of the BAS inclusive of all hardware and software supplied under this and other related specifications necessary to meet the functional intent. The training is to include, but not limited to, the following:
  1. Location of all controllers, devices, sensors, peripherals, etc.
  2. Equipment layout and dependencies
  3. Sequence of operation
  4. Preventative maintenance

### **3.22 Warranty, Maintenance, and Service**

1. Provide warranty under provisions of these specifications.
2. At no cost to the Owner, during the warranty period, the Contractor shall provide maintenance services for software and hardware components as specified below:

1. Normal Service: Any malfunction, failure, or defect in any hardware component or failure of any control programming that would not result in property damage or loss of comfort control shall be corrected and repaired. Response to any request for service shall be provided within eight (8) working hours of the Owner's initial request for service. In the event that the malfunction, failure, or defect cannot be corrected through telephone support to the Owner, or its representatives, the next step is to attempt to correct the issue through remote site access. In the event the problem persists, a service technician, trained in the system to be serviced, shall be dispatched to the Owner's site within forty-eight (48) hours of the Owner's initial request for service, as specified.
2. Emergency Service: Any malfunction, failure, or defect in any hardware component or failure of any control programming that would result in property damage or loss of comfort control shall be corrected and repaired. Response to any request for service shall be provided within two (2) working hours of the Owner's initial request for service. In the event that the malfunction, failure, or defect cannot be corrected immediately through telephone support or remote site access, a service technician, trained in the system to be serviced, shall be dispatched to the Owner's site within eight (8) hours of the Owner's initial telephone request for service, as specified.
3. Owners Request for Service: Contractor shall specify three telephone numbers and email addresses, including order of contact and procedure in the event a contact fails to respond, for the Owner to use in the event of a need for service.
3. Provide all labour, associated travel and expenses, materials and equipment necessary for the successful operation of this system for a period of 12 months from the date of final acceptance, per 3.9. In addition, provide three (3) visits for testing and evaluating the performance of the hardware and software installed per this specification, to be coordinated with the HDSB's Building Automation Manager. One visit shall be during the cooling season, one visit shall be during the heating season, and one visit shall be during a shoulder season, either spring or fall. Provide a written report after each visit is complete. This service visit shall include, but not be limited to, the following:
  1. Check calibration and re-calibrate if needed instrumentation sensors for air flow, liquid flow, pressure, humidity, temperature, and transducers. Written records shall be kept indicating the performance of such calibrations along with pertinent data.
  2. Check the operation of dampers and damper actuators to assure no lock up has occurred and stroke is proper. Written records shall be kept indicating the performance of such calibrations along with pertinent data.
  3. Check the overall system field operations by performing a review of all points. Verify that all monitoring and command points are valid and active. Written records shall be kept indicating the performance of such exercises.
4. If a problem develops at any time during the warranty/service period, the affected BAS point/object shall be monitored and logged for the remainder of the warranty/service period. "A problem" in the above statement will refer to an incident in which any of the following occur:
  1. An alarm occurs due to a defective control system component(s), improper installation or programming.
  2. Overall performance of the system is compromised due to a defective control component(s), improper installation or programming.

3. Major recalibration (by greater than 5 times the catalogued accuracy) is required for a sensor during one of the service visits.
5. Pursuant to 3.3, changes required to meet design, compliance, and functionality, that were not part of the Demonstration and Acceptance process, will be made at no cost to the Owner.
6. Any changes to programming, inclusive of but not limited to set-points, schedules, sequences, alarms, history, network addressing, object naming, etc. are to be performed in accordance with the Change Management Procedures outlined in the HDSB's Building Automation Systems Standards and Design, latest revision.

### **3.23 Schedule A**

1. Objects / Points identified in Schedule A as Mandatory ('Y' in Mandatory column) must be included in program of the respective system or equipment. Where an Object or Point is not listed as Mandatory, inclusion within Schedule A does not dictate the requirement for use within a program, and are listed for information purposes only where equipment differs from standard and program variations must be made to meet the sequences per 23 09 93.
2. Objects / Points identified as Mandatory must be adjustable, in accordance with 3.12 of this Section
3. Where a 'G' and/or 'V' is indicated in the User Interface column, the Object or Point shall be represented on the respective graphic page, in accordance with 3.9 of this Section. Mandatory points without a 'G' and/or 'V' indicated in the User Interface column shall be presented in the settings page.
4. Where an Object or Point is identified as a software point with a 'B' in the Software Point column of the table, BACnet value will be an accepted means of data source provided change of value requirements are met. BACnet shall not be used as a writeable point or as a data source for Alarms classified as Emergency.

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# Building Automation Systems

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Section 23 09 93

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Sequences of Operation for  
HVAC Control

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Note to Specification Writer or Project Lead:

Sub-section 3.15 must be edited accordingly to project scope and deliverables.

Modifications to these Specifications, beyond those detailed above, are to be approved by the Board's Building Automation Systems manager.

The contents of this document, not omitting any sub-sections, can be copied for the purposes of merging with other specifications.



## **1 General**

### **1.1 Summary**

A. Section Includes:

- i. Control Sequences for HVAC Systems, sub-systems, and accessories

B. Related Sections:

- ii. Section 23 09 00 – Instrumentation and Control for HVAC
- iii. Section 23 70 00 – Central HVAC Equipment
- iv. Section 23 80 00 – Decentralized HVAC Equipment
- v. Section 25 00 00 – Integrated Automation

### **1.2 General**

- A. Sequences specified herein indicate the functional intent of the systems operation and do not fully detail the programming required to obtain the indicated operation.
- B. Throttling ranges, proportional bands, and cycle differentials shall be centered on the associated set-point. All modulating feedback control loops shall include the capability of having proportional, integral, and derivative action. Contractor shall apply appropriate elements of integral and derivative gain to each control loop which shall result in stable operation, minimum settling time, and shall maintain the primary variable within the specified maximum allowable variance.
- C. Equipment start-up concluding a power failure shall be provisioned such that there is protection against building reduced voltage resulting from starting multiple inductive loads. Mechanical equipment shall be grouped such that the combined starting current of the defined group will not exceed the electrical distribution system rated capacity less base load. An interval of not less than 3 seconds shall be maintained between starting of the defined groups.
- D. Preference will be given to using OEM furnished controls. OEM furnished controls must have minimum hard-wired points as indicated herein.

## **2 Products**

**Section Not Used**

## **3 Execution**

### **3.1 Hydronic Heating Loop**

***High Temperature Heating Loop***

Hydronic heating loop applications, requiring a high temperature loop, include but is not limited to: radiant heating, hydronic heating coils (air handling units, unit heaters, etc.), heat exchangers.

- A. The Heating plant command is to be interlocked with the hydronic loop circulating pump(s).
- B. The BAS shall enable and/or command on primary and secondary heating circulating pump(s) between December 15<sup>th</sup> and March 31<sup>st</sup>.
- C. Between March 31<sup>st</sup> and December 14<sup>th</sup>, primary and secondary heating circulating pump(s) shall be enabled and/or commanded on if the outdoor air temperature is less than 5°C for 12 hours or there is a call for heat for the Heat-pump Loop or any HVAC System furnished with Hydronic Coil which serves an occupied area. The hydronic heating loop shall remain enabled until the outdoor air temperature is greater than 18°C.
- D. Where multiple circulation pumps exist for redundancy, the BAS shall rotate the lead pump every Tuesday at 6 am. In the event a pump fails the alternate pump shall start.
- E. All heating system pumps are to run for 15 minutes minimum per week.

**3.2 Central Heating Plant (Boilers)**

- A. The BAS shall continuously enable and/or command on the boiler plant with any call for heating from the Heat-pump Loop, HVAC System furnished with a hydronic coil, or High Temperature Heating Loop.
- B. The boiler supply water temperature shall be reset using an outdoor air reset for non-condensing boilers and a return water temperature reset for condensing boiler systems. Set-points are to adjust to higher set-points to meet the functional intent of all attached appliances.
- C. Where redundant boilers are installed, the lead boiler shall be rotated every Tuesday at 6 am.
- D. The control of boiler pumps shall be facilitated by the boiler plant OEM furnished controllers. Pump status shall be monitored using an analog signal from a Current Transformer.

**3.3 Heat-Pump Loop**

- A. The Heat-pump Loop main circulation pump shall be enabled and/or commanded on. For pumps equipped with a VFD, pump speed is to vary based on the design pressure differential between the Heat-pump Loop Supply Pressure and Heat-pump Loop Return Water Pressure.
- B. Where redundant circulation pumps exist, lead pump designation shall rotate every Tuesday at 6 am. In the event a lead pump failure occurs the lag pump shall be energized.

- C. The heat-pump loop temperature shall be configured to maximize efficiency of the heat-pumps using 5 distinct modes, “High Temperature”, “Low Temperature”, “Heating”, “Shoulder” and “Cooling”. No two modes can operate simultaneously.
- D. “High Temperature” and “Low Temperature” modes have priority over other modes. An Emergency Class Alarm is to be generated during these events.
- E. *NOTE: The program shall be written such that no event enables both the cooling tower and boiler simultaneously.*
- F. **High Temperature Mode (Safety):** Enabled when the Heat-pump Loop Return Water Temperature is greater than 31°C. This shall enable and/or command on the first two Stages of the cooling tower. Stages three and four shall be enabled and/or commanded on when the Return Water Temperature is greater than 32°C. This mode is released when the Return Water Temperature is less than 26°C.

**Low Temperature Mode (Safety):** Enabled when the Heat-pump Loop Return Water Temperature is less than 14°C. This enables and/or commands on the boiler(s) or opens the heat-exchanger valve. This mode is released when the Return Water Temperature is 22°C.

**Shoulder Mode:** Active when no other mode is active.

**Heating Mode:** Enabled when the Outdoor Air Temperature is less than 10°C for a period of 45 hours. This mode is released when half (adjustable) of the Heat-pumps enable cooling during the last 24 hour period (counter to be reset at 2 pm) or the Outdoor Air Temperature is above 20°C or in the event of network failure.

**Cooling Mode:** Enabled when the Outdoor Air Temperature is greater than 25°C and should half (adjustable) of the Heat-pumps enable cooling during the last 24 hour period (counter to be reset at 2 pm). This mode is disabled when Outdoor Air Temperature is below 15°C or in the event of network failure.

### 3.4 Heating Plant for Heat-pump Loop

- A. Pump status shall be monitored using an analog current transformer.
- B. Redundant boilers are rotated every Tuesday at 6 am.
- C. In “Heating” mode, the boiler(s)/heat injection will modulate the heat pump supply water temperature to a maximum of 32°C to maintain the return water temperature at 29°C.
- D. In “Shoulder” mode, the boiler(s)/heat will modulate the heat pump supply water temperature to a maximum of 32°C to maintain the return water temperature at 20°C.

### 3.5 Cooling Tower for Heat-pump Loop

- A. When in the “Cooling” mode, the Cooling Tower shall be staged using the following values:

Return Water Temperature	Stage	Enable
Base set-point + 2°C	4	Ramp Fan Speed to Maintain
Base set-point + 1.5°C	3	Spray Pump
Base set-point + 1°C	2	Fan Minimum Speed
Base set-point + 0.5°C	1	Open Dampers
Base set-point		Off

The base set-point is equal to the Outdoor Air Temperature minus 5°C but is limited between 17°C and 28°C.

- B. When in the “Shoulder” mode, the Cooling Tower shall be staged using the following values:

Return Water Temperature	Stage	Stage
28°C	4	Ramp Fan Speed to Maintain
27.5°C	3	Spray Pump
27°C	2	Fan Minimum Speed
26.5°C	1	Open Dampers
26°C		Off

- C. The BAS shall disable the Spray Pump when Outdoor Air Temperature is less than 4°C.

### 3.6 Gymnasium Unit(s)

#### ***Unit OEM Controller Minimum Hard-wired points***

Outdoor Air Damper Position Signal: Analogue input (0 to 10 Vdc, or 4 to 20 mA)

Fan(s) Command and/or Enable: Binary input

Heating Command and/or Enable: Binary input

Mechanical Cooling Command and/or Enable: Binary input

- A. In the event of power loss, the outdoor and exhaust air dampers are to close by way of mechanical spring, return air dampers shall open by way of mechanical spring and fans, heating, cooling and mechanical energy recovery system are to be disabled and/or commanded off.
- B. Where the unit is equipped with a hydronic heating coil, the heating valve will keep the unit internal temperature (mixed air temperature) to a minimum of 5°C. When the outdoor air is below 10°C or there is a heating load, any heating coil pump will run.
- C. Where the unit is equipped with a hydronic heating coil, in the event the freeze stat senses a low temperature event, the unit fans are to be disabled and the heating valve is to be opened 100% (heating circulation pump, where equipped is to be enabled and/or commanded on).
- D. ***Scheduled Occupancy***  
***Pre-Occupancy:*** The BAS shall command on and/or enable the supply and return air fans, 30 minutes prior to the start of the *Occupied* period. Outdoor air dampers are to remain closed. The unit is controlled to maintain the space temperature to the occupied set-point.

**Occupied:** The BAS shall command on and/or enable the unit (and all associated HVAC equipment, i.e. change room exhaust fans) as per Occupancy Appendix. The outdoor air dampers are to be kept to a minimum position or to vary to maintain a return air CO<sup>2</sup> level equal to or less than 800 ppm. The unit is controlled to maintain the space temperature at 19°C.

**Un-Occupied:** The BAS shall command off and/or disable the unit as per Occupancy Appendix. All fans are to be commanded off and/or disabled and the outdoor and exhaust air dampers are to be closed by way of mechanical spring return. The return air dampers are to be released and open by way of mechanical spring return. Outdoor air dampers are to remain closed during un-occupied times. The space temperature shall be controlled to maintain between 16°C and 25°C.

### 3.7 Make-Up Air Unit

**Unit OEM Controller Minimum Hard-wired points**

Discharge Air Temperature Reset Signal: Analogue input (0 Vdc – 10 Vdc or 4mA to 20 mA)

Outdoor Air Damper Position Signal: Analogue input (0 to 10 Vdc, or 4 to 20 mA)

Fan(s) Command and/or Enable: Binary input

Heating Command and/or Enable: Binary input

Mechanical Cooling Command and/or Enable: Binary input

- A. In the event of power loss, the outdoor and exhaust air dampers are to close by mechanical spring, fans, heating, cooling, and mechanical energy or heat recovery system are to shut-down.
- B. Where the unit is equipped with a hydronic heating coil, the heating valve will keep the unit internal temperature to a minimum of 15°C. When the outdoor air is below 10°C or there is a heating load, any heating coil pump will run.
- C. Where the unit is equipped with a hydronic heating coil, in the event the freeze stat senses a low temperature event, the unit fans are to be disabled and the heating valve is to be opened 100% (heating circulation pump, where equipped is to be enabled).
- D. When the supply and exhaust air fans are controlled by VFD, fan speed is programmed to maintain constant static pressure, per engineer or OEM specifications. A service notification is to be generated when either fan increases above design speed.

**E. Scheduled Occupancy**

**Occupied:** The BAS shall command on and/or enable the unit 15 minutes prior to scheduled occupancy, per Occupancy Appendix.

The Discharge Air Temperature shall reset between 18°C to 15°C based on outdoor air temperature of 0°C to 20°C respectively.

**Un-Occupied:** The BAS shall disable the unit according as per Occupancy Appendix. All fans are to be shut-down, the outdoor and exhaust air dampers are to be close by way of mechanical spring return.

### 3.8 Room Control Heat Pump

#### ***Heat-pump Controls Minimum Hard-wired points***

Fan Command and/or Enable: Binary input

Heating Command and/or Enable: Binary input

Cooling Command and/or Enable: Binary input

- A. Network Occupied Set-point is calculated each scheduled occupancy day at 7 am, from 21°C to 24°C based on Outdoor air temperature -10°C to 27°C, respectively. A +/-2°C set-point offset shall be provisioned through the room sensor.
- B. Heating or Cooling is to be enabled when the room temperature is 1°C away from set-point and will be disabled using a 1°C dead-band.
- C. A 1 hour Heating-Cooling Switch Over Delay is to be programed.
- D. The compressor will have minimum run time of 5 minutes.

#### ***Scheduled Occupancy***

***Occupied:*** Fan will run continually. Occupancy is to be scheduled as per Occupancy Appendix.

***Un-Occupied:*** Cooling and heating set-points shall be 18°C and 27°C and will be disabled by a 2°C dead-band, fan shall operate on a call for heating or cooling. The room sensor shall be provisioned with an occupancy override button that allows temporary occupancy for 120 minutes.

#### ***Perimeter Heat (Auxiliary Heat)***

When a room, conditioned by a heat-pump, is provisioned with auxiliary heating, the auxiliary heat shall be enabled when the heat pump has been heating for 30 minutes. For hydronic heating only, the heat is to be enabled when the radiant device is equal to or less than 6°C (must enable respective circulation pump).

### 3.9 Room Control Terminal or By-Pass Box (Excludes V.A.V. or V.V.T.)

- A. Room temperature set points are set to a Network Occupied Set-point, reset at 7 am each occupied period, from 21°C to 24°C based on Outdoor air temperature -10°C to 27°C, respectively. A +/-2°C set-point offset shall be provisioned through the room sensor.
- B. Heating or Cooling is to be enabled when the room temperature is 1°C away from set-point. Damper to open when there is a minimum 5°C differential between room temperature and the air supplied by the respective unit (Heating call supply air to be 5°C above room temperature, Cooling call supply air to be 5°C below room temperature), otherwise remain at minimum position. Heating or cooling will be disabled using a 1°C dead-band. There shall be a 30 minutes delay between heating and cooling.

***Scheduled Occupancy***

***Occupied:*** Occupancy is to be scheduled as per Occupancy Appendix.

***Perimeter Heat (Auxiliary Heat)***

When a room conditioned by a terminal or by-pass box is provisioned with auxiliary heating, the auxiliary heat shall be enabled when there has been a call for heat exceeding 30 minutes. For hydronic heating only, the heat is to be enabled when the radiant device is equal to or less than 6°C (must enable respective circulation pump).

**3.10 Room Control Terminal or By-Pass Box with Re-Heat (Excludes V.A.V. or V.V.T.)**

- A. Room temperature set-points are set to a Network Occupied Set-point, reset at 7 am each occupied period, from 21°C to 24°C based on Outdoor air temperature -10°C to 27°C, respectively. A +/-2°C set-point offset shall be provisioned through the room sensor.
- B. Heating or Cooling is to be enabled when the room temperature is 1°C away from set-point. On a call for Cooling the damper is to open when there is a minimum 5°C differential between room temperature and the air supplied by the respective unit (supply air to be 5°C below room temperature), otherwise remain at minimum position. Heating or cooling will be disabled using a 1°C dead-band. There shall be a 30 minutes delay between heating and cooling.

***Scheduled Occupancy***

***Occupied:*** Occupancy is to be scheduled as per Occupancy Appendix.

***Perimeter Heat (Auxiliary Heat)***

When a room conditioned by a terminal or by-pass box is provisioned with auxiliary heating, the auxiliary heat shall be enabled when there has been a call for heat exceeding 30 minutes. For hydronic heating only, the heat is to be enabled when the radiant device is equal to or less than 6°C (must enable respective circulation pump).

**3.11 Room Control HVAC Unit (single Zone)**

***HVAC Unit Controls Minimum Hard-wired points***

Outdoor Air Damper Signal (0 Vdc – 10 Vdc or 4mA to 20 mA)

Fan(s) Enable / Disable (10 Vdc to 24Vdc)

Heating Enable (10 Vdc to 24Vdc)

Mechanical Cooling Enable (10 Vdc to 24Vdc)

- A. Room temperature set-points are set to a Network Occupied Set-point, reset at 7 am each occupied period, from 21°C to 24°C based on Outdoor air temperature -10°C to 27°C, respectively. A +/-2°C set-point offset shall be provisioned through the room sensor.

- B. Heating or Cooling is to be enabled when the room temperature is 1°C away from set-point and will be disabled using a 1°C dead-band. There shall be a 30 minutes delay between heating and cooling.
- C. The compressor will have minimum run time of 5 minutes.
- D. In the event of power loss, the outdoor and exhaust air dampers are to close by way of mechanical spring, return air dampers shall open by way of mechanical spring and fans, heating, cooling and mechanical energy recovery system are to shut-down.
- E. Where the unit is equipped with a hydronic heating coil, the heating valve will keep the unit internal temperature (mixed air temperature) to a minimum of 15°C. When the outdoor air is below 10°C or there is a heating load, any heating coil pump will run.
- F. Where the unit is equipped with a hydronic heating coil, in the event the freeze stat senses a low temperature event, the unit fans are to be disabled, outdoor air dampers close by way of mechanical spring, and the heating valve is to be opened 100% (heating circulation pump, where equipped is to be enabled).

G. ***Scheduled Occupancy***

***Pre-Occupancy:*** The BAS shall enable the supply and return air fans 30 minutes prior to the start of the *Occupied* period. Outdoor air dampers are to remain closed. The unit is controlled to maintain the space temperature to the occupied set-point.

***Occupied:*** The BAS shall enable the unit as per Occupancy Appendix. The dampers are to be kept to a minimum position or to maintain the return air CO<sup>2</sup> to a level of 800 ppm. The unit is controlled to maintain the space temperature. The exhaust fan and dampers are enabled with the supply and return air fans.

***Un-Occupied:*** The BAS shall disable the unit as per Occupancy Appendix. All fans are to be disabled and the outdoor and exhaust air dampers are to be closed by way of mechanical spring return. The return air dampers are to be released and open by way of mechanical spring return. The space temperature shall be controlled to maintain between 16°C and 25°C.

***Perimeter Heat (Auxiliary Heat)***

When a room conditioned by a HVAC unit is provisioned with auxiliary heating, the auxiliary heat shall be enabled when the heat pump has been heating for 30 minutes. For hydronic heating only, the heat is to be enabled when the radiant device is equal to or less than 6°C (must enable respective circulation pump).

### 3.12 Room Control Unit Ventilator



***Unit Ventilator Controls Minimum Hard-wired points***

Outdoor Air Damper Signal (0 Vdc – 10 Vdc or 4mA to 20 mA)

Fan Enable / Disable (10 Vdc to 24Vdc)

Heating Enable (10 Vdc to 24Vdc)

Mechanical Cooling Enable (10 Vdc to 24Vdc)

- A. Room temperature set-points are set to a Network Occupied Set-point, reset at 7 am each occupied period, from 21°C to 24°C based on Outdoor air temperature -10°C to 27°C, respectively. A +/-2°C set-point offset shall be provisioned through the room sensor.
- B. Heating or Cooling is to be enabled when the room temperature is 1°C away from set-point and will be disabled using a 1°C dead-band. There shall be a 30 minutes delay between heating and cooling.
- C. The compressor will have minimum run time of 5 minutes.
- D. In the event of power loss, the outdoor and exhaust air dampers are to close by way of mechanical spring, return air dampers shall open by way of mechanical spring and fans, heating, cooling and mechanical energy recovery system are to shut-down.
- E. Where the unit is equipped with a hydronic heating coil, the heating valve will keep the unit internal temperature (mixed air temperature) to a minimum of 15°C. When the outdoor air is below 10°C or there is a heating load, any heating coil pump will run.
- F. Where the unit is equipped with a hydronic heating coil, in the event the freeze stat senses a low temperature event, the unit fans are to be disabled, outdoor air dampers close by way of mechanical spring, and the heating valve is to be opened 100% (heating circulation pump, where equipped is to be enabled).
- G. ***Scheduled Occupancy***

***Pre-Occupancy:*** The BAS shall enable the supply and return air fans 30 minutes prior to the start of the *Occupied* period. Outdoor air dampers are to remain closed. The unit is controlled to maintain the space temperature to the occupied set-point.

***Occupied:*** The BAS shall enable the unit as per Occupancy Appendix. The dampers are to be kept to a minimum position or to maintain the return air CO<sup>2</sup> to a level of 800 ppm. The unit is controlled to maintain the space temperature. The exhaust fan and dampers are enabled with the supply and return air fans.

***Un-Occupied:*** The BAS shall disable the unit as per Occupancy Appendix. All fans are to be disabled and the outdoor and exhaust air dampers are to be closed by way of mechanical spring return. The return air dampers are to be released and open by way of mechanical spring return. The space temperature shall be controlled to maintain between 16°C and 25°C.

***Perimeter Heat (Auxiliary Heat)***

When a room conditioned by a HVAC unit is provisioned with auxiliary heating, the auxiliary heat shall be enabled when the heat pump has been heating for 30 minutes. For hydronic heating only, the heat is to be enabled when the radiant device is equal to or less than 6°C (must enable respective circulation pump).

### **3.13 Room Control Occupant Comfort Heat - includes Duct Heaters**

Occupant comfort heat includes but is not limited to the following instances:

- Perimeter heaters, unit heaters, duct heaters, radiant panels, etc., in all classrooms, administrative areas, work rooms and resource areas.
- A. Room temperature set-points are set to a Network Occupied Set-point, reset at 7 am each occupied period, from 21°C to 24°C based on Outdoor air temperature -10°C to 27°C, respectively. A +/-2°C set-point offset shall be provisioned through the room sensor.
- B. Heating is to be enabled when the room temperature is 1°C away from set-point and will be disabled using a 1°C dead-band.
- C. The BAS shall control room temperature and indicate status with an analog current Transformer or temperature sensor in accordance with Object Table.

### **3.14 Room Control Variable Refrigerant Flow Indoor Air Handling Unit / Cassette**

#### ***Indoor Unit ('head') Controls Minimum Hard-wired points***

Fan Enable / Disable (10 Vdc to 24Vdc)

Heating Enable (10 Vdc to 24Vdc)

Cooling Enable (10 Vdc to 24Vdc)

- A. Room temperature set-points are set to a Network Occupied Set-point, reset at 7 am each occupied period, from 21°C to 24°C based on Outdoor air temperature -10°C to 27°C, respectively. A +/-2°C set-point offset shall be provisioned through the room sensor.
- B. Heating or Cooling is to be enabled when the room temperature is 1°C away from set-point and will be disabled using a 1°C dead-band. There shall be a 30 minutes delay between heating and cooling.

#### ***Scheduled Occupancy***

**Occupied:** Occupancy is to be scheduled as per Occupancy Appendix.

**Un-Occupied:** Cooling and heating set-points shall be 18°C and 27°C and will be disabled by a 2°C dead-band, fan shall operate on a call for heating or cooling. The room sensor shall be provisioned with an occupancy override button that allows temporary occupancy for 120 minutes.

#### ***Perimeter Heat (Auxiliary Heat)***

When a room conditioned by a VRF heat-pump is provisioned with auxiliary heating, the auxiliary heat shall be enabled when there has been a call for heat exceeding 30 minutes. For hydronic heating only, the heat is to be enabled when the radiant device is equal to or less than 6°C (must enable respective circulation pump).

### **3.15 HVAC Unit including V.A.V. or V.V.T. with more than two Zones and no re-heat**

***Unit Sequence of Operations, including all associated terminal or by-pass box sequencing, is to be detailed by engineer of record. Sequences must be in accordance with Section 23 09 00 and include the following:***

#### ***HVAC Unit Controls Minimum Hard-wired points***

Discharge Air Temperature Reset Signal (0 Vdc – 10 Vdc or 4mA to 20 mA)

Outdoor Air Damper Signal (0 Vdc – 10 Vdc or 4mA to 20 mA)

Fan(s) Enable / Disable (10 Vdc to 24Vdc)

Heating Enable (10 Vdc to 24Vdc)

Mechanical Cooling Enable (10 Vdc to 24Vdc)

- A. In the event of power loss, the outdoor and exhaust air dampers are to close by way of mechanical spring, return air dampers shall open by way of mechanical spring and fans, heating, cooling and mechanical energy recovery system are to shut-down.
- B. Where the unit is equipped with a hydronic heating coil, the heating valve will keep the unit internal temperature (mixed air temperature) to a minimum of 15°C. When the outdoor air is below 10°C or there is a heating load, any heating coil pump will run.
- C. Where the unit is equipped with a hydronic heating coil, in the event the freeze stat senses a low temperature event, the unit fans are to be disabled and the heating valve is to be opened 100% (heating circulation pump, where equipped is to be enabled).

#### ***Scheduled Occupancy***

***Occupied:*** Occupancy is to be scheduled as per Occupancy Appendix.

***Un-Occupied:*** Cooling and heating set-points shall be 18°C and 27°C and will be disabled by a 2°C dead-band

### **3.16 Domestic Hot-Water**

- A. The BAS shall monitor the Domestic Supply Water Temperature and domestic hot water circulating pump(s) using an analog current transformer.

### **3.17 Ancillary Heat**

- A. Ancillary Heat shall use a stainless-steel plate sensor include the following areas:
  - Vestibules
  - Above ceiling freeze protection
  - Outdoor storage areas

- Receiving areas
  - Electrical rooms
  - Supply storage rooms
  - Stairwells
- B. "Spare" I/O points from a typical room controller are not to be used for Ancillary Heat (i.e. points from Room Controller located within proximity to the Ancillary Heater). I/O point terminations and control points are to be detailed on the drawings.
- C. Stairwells: Ancillary heaters servicing a stairwell and vestibule are to be grouped and controlled using a sensor located within the stairwell (not the vestibule area). Status is required for individual heaters.
- D. Grouping multiple Ancillary Heaters to a single I/O control point is preferred. Status is required for individual heaters.
- E. The BAS shall indicate status using a temperature sensor located on the unit return water piping (Hydronic heater) or using an analog current transformer (Electric heater).
- F. The room temperature set-point shall use unoccupied set-point as for comfort heaters.
- G. For Hydronic heaters the heat is to be enabled and/or commanded on to maintain heater temperature at a minimum of 6°C. Will enable circulation pump where applicable.

### 3.18 Exhaust Fans

- A. The BAS shall control exhaust fans and monitor status with an analog current transformer.
- B. Fans are to be enabled in accordance with local, provincial and federal code requirements.

**Group A** fans include but is not limited to the following instances:

- Gym washrooms / change rooms
- Laundry room

Fans are to be enabled with the gymnasium HVAC unit occupancy schedule.

**Group B** fans include but is not limited to the following instances:

- Exterior storage areas
- Machine room (elevator)
- Electrical & Sprinkler rooms
- Hub room
- Mechanical room

Fans are to be enabled to maintain room temperature below 27°C.

**Group C** fans include but is not limited to the following instances:

- Staff and Classroom washrooms
- Interior storage areas

Fans are to be enabled during hours of school occupancy and when the school is occupied by custodial or cleaning staff.

**Group D** fans include but is not limited to the following instances:

- Food preparation (excluding staffroom kitchenettes)
- Kiln rooms
- Automotive shops
- Science fume hoods
- Dust collectors

Fans are to be removed from the BAS and controlled via a switch near their relative equipment.

### **3.19 Exterior Lighting**

- A. The BAS shall enable or disable exterior lighting using a combination calendar and astronomical clock. Command status shall be verified using an analog Current Transformer.
- B. The lighting is to be grouped as Wall-packs and Pole Lighting.

HALTON SCHOOL BOARD  
JOB No. 127047  
ROLLING MEADOWS PUBLIC SCHOOL (028)

INDEX

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Heating Plant	Sheet 3	B Jun 10, 1999
Misc. Fans and Equipment	Sheet 4	B Jun 10, 1999
Controller 2	Sheet 5	B Jun 10, 1999
Controller 2 (Typical Wiring)	Sheet 6	A Jun 10, 1999
Exhaust Fan Schedule	Sheet 7	B Jun 10, 1999
Equipment Summary	Sheet 8	B Jun 10, 1999

LEGENDS

I/O TYPE

- △ ANALOG INPUT TO CONTROLLER  
▽ ANALOG OUTPUT FROM CONTROLLER  
△ DIGITAL INPUT TO CONTROLLER  
▽ DIGITAL OUTPUT FROM CONTROLLER

WIRING LEGEND

- x—// 2 TWISTED PAIRS #18 LOW VOLTAGE  
—//— 1 PAIR #18 LOW VOLTAGE  
—\*— 3 WIRES #18 LOW VOLTAGE  
—x— 1 TWISTED PAIR #18 LOW VOLTAGE  
----- SINGLE WIRE LINE VOLTAGE, MIN> #14  
----- SINGLE WIRE #18 LOW VOLTAGE  
----- PNEUMATIC PIPING

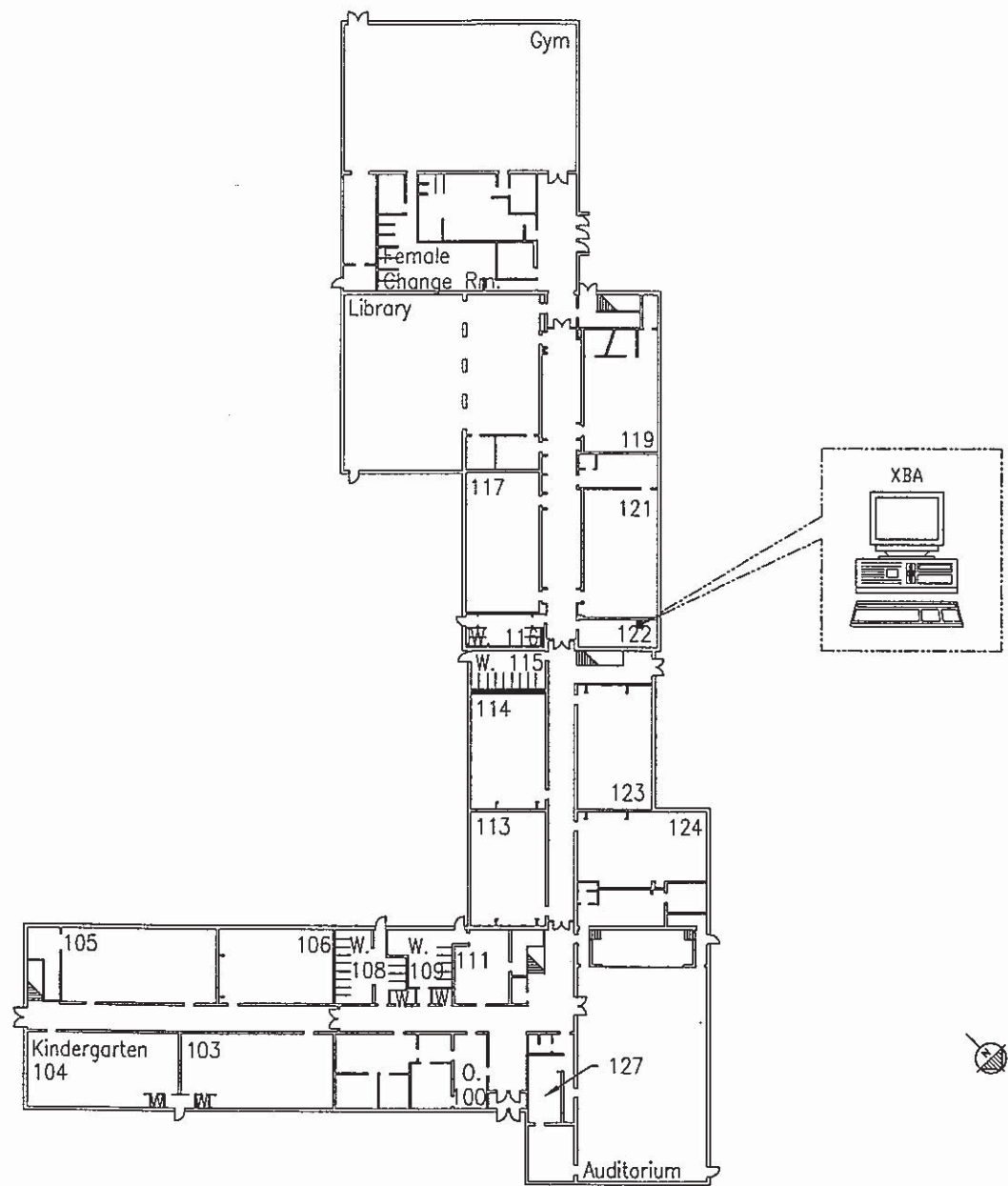
GENERAL NOTES:

- 1) FT6 WIRING IN CEILING SPACES
- 2) MECHANICAL ROOM WIRING IN CONDUIT.
- 3) OPEN CEILING WIRING IN CONDUIT.
- 4) COPPER PIPING IN MECHANICAL ROOM
- 5) PLASTIC PIPING IN CEILING SPACES
- 6) CONTACTOR SHALL BE FIELD MOUNTED. START/STOP RELAY CAN BE FIELD MOUNTED OR PANEL MOUNTED. IT IS SUBJECT FOR SITE DECISION.

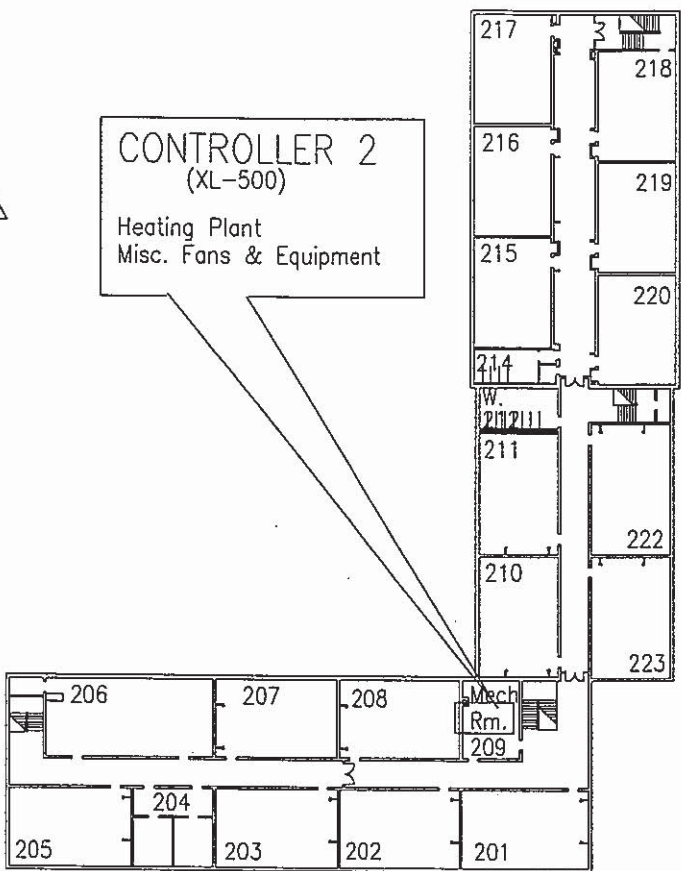
ROLLING MEADOWS PUBLIC SCHOOL  
1522 Mountain Grove  
Tel: 905-332-6000  
Contact: Mervin Seymour

REV D		BY	<b>Honeywell ExpertISE</b> ©		
REV C		BY	2511 Barton Street East, Hamilton, ON L8E 2X1		
REV B	As-Built	BY	Halton School Board		
Jun, 1999		G.D.	Rolling Meadows Public School		
REV A	Revised	BY	Drawing Index		
Jan, 1998		S.K.	FILE: INDEX	DATE: 05-14-97	SHEET:
APPROVED BY: P. Chow			DRAWING NUMBER	12-7047-028	REV B

EMS RISER

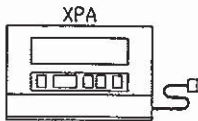


FIRST FLOOR



SECOND FLOOR

1 UPDATE DRAWING WITH MECH. ROOM #  
TO BE INCLUDED IN 'AS BUILD' DRAWINGS.



FIELD DEVICES			
Tag	Tot		
Name	Qty	Part Number	Description
XBA	1	DELL	PC and monitor
	1	XD505A	C-Bus Communication Submodule
	1	XPC500	Xbs c-bus interface board-one required for each pc
XPA	1	XI582AH	Excel 5000 portable operators terminal
	1	XW565	16 ft cable for XI582

REV D		BY	Honeywell ExpertISE ©		
REV C		BY	2511 Barton Street East, Hamilton, ON L8E 2X1		
REV B	As-Built	BY	Halton School Board		
Jun, 1999		G.D.	Rolling Meadows Public School		
REV A	Moved CTRL-1 to	BY	EMS Riser		
Jan, 1998	Second Flr	S.K.	FILE: RISER	DATE: 05-14-97	SHEET: 2
APPROVED BY: P. Chow			DRAWING NUMBER 12-7047-028		REV B



C:\DATA\JOBS\B0120N0\HALTONSCH\00028\EXACT\CTRL-2

HEATING-PLANT

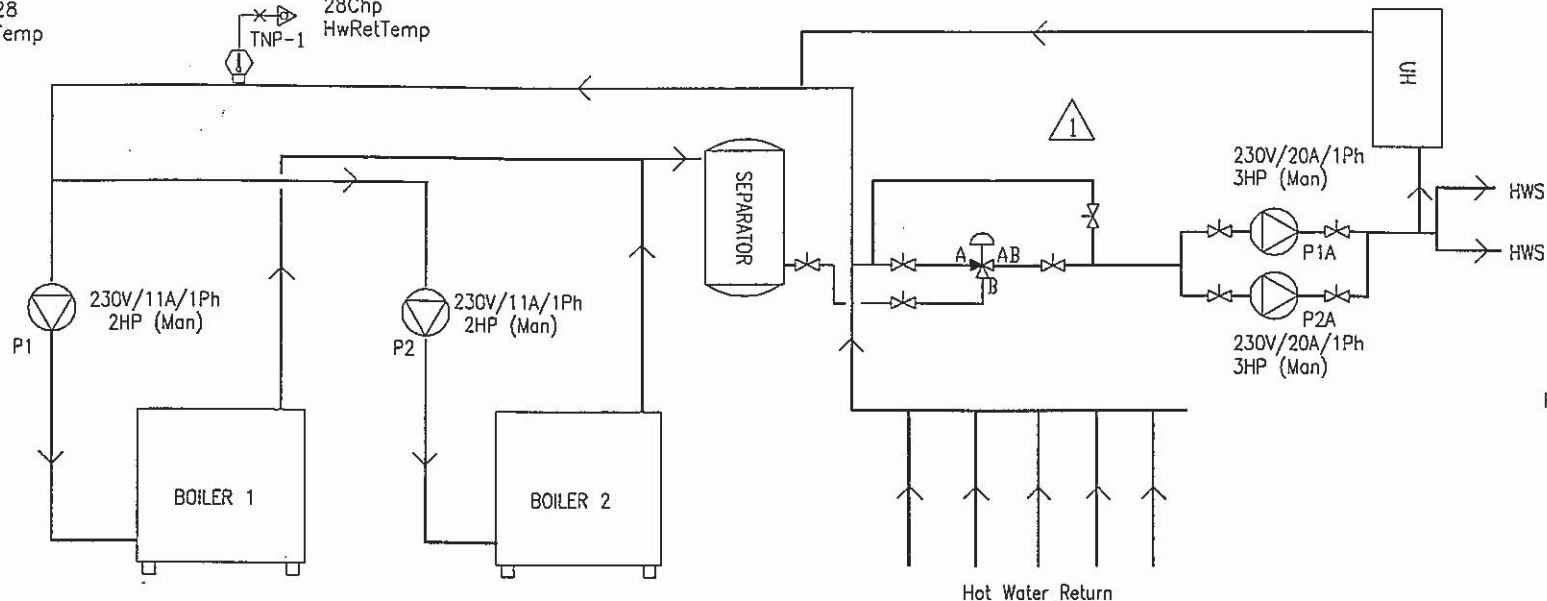
# HEATING PLANT

(Boiler Room, Ctrl-2)

Locate on North wall  
Across from Gym Fan Room

TNO-1  
28  
OaTemp

28Chp  
HwRetTemp  
TNP-1



REA-1  
28Chp  
P1

LRL-1  
28Chp  
Blr1Lo

REA-2  
28Chp  
P2

LRL-3  
28Chp  
Blr2Hi

REA-3  
28Chp  
P1A

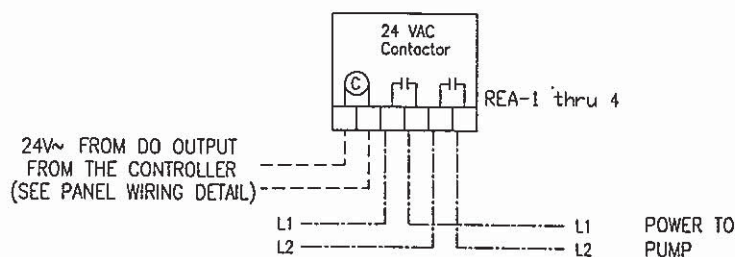
REA-4  
28Chp  
P2A

LRL-2  
28Chp  
Blr1Hi

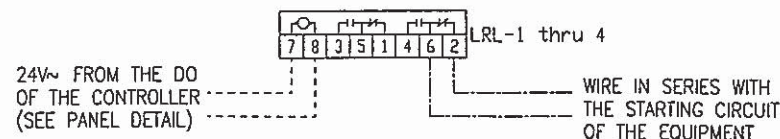
LRL-4  
28Chp  
Blr2Lo

3 WAY HOT WATER VALVE IS  
SET 'B' to 'AB' FULLY OPEN

## TYPICAL WIRING FOR MANUAL STARTER



## WIRING DIAGRAM FOR REMOTE RELAY



FIELD DEVICES				
Tag	Qty	Per	Tag	Description
LRL	4	1	LY2-AC24	24vac relay, 10A contacts, dpdt
REA	4	1	DP2030A5004	DP2030A5004
		1	138552B	Case for DP2030 Contactor
TNO	1	1	C7031F1018	Outdoor temp sensor, -40 to 302F
TNP	1	1	TE200E20B2	20K Thermistor Strap-On
TYR	1	1	T7750A1018	20K Thermistor Space Sensor - with logo

## WIRING LEGEND

- 2 TWISTED PAIR #18 LOW VOLTAGE
- 1 PAIR #18 LOW VOLTAGE
- 3 WIRES #18 LOW VOLTAGE
- 1 TWISTED PAIR #18 LOW VOLTAGE
- SINGLE WIRE LINE VOLTAGE, MIN. #14
- SINGLE WIRE #18 LOW VOLTAGE
- PNEUMATIC PIPING

## System Overview:

The heating boilers operate during the following conditions:

- Winter Mode (Occupied Period).
- Optimum Start.
- Night Cycle Period.
- Building OAT Low Limit Period.
- Heating request from another system (AHU or Secondary Loop)

Occupied Period: 7:00 to 21:00 (Monday to Friday, excluding holidays)

Low Occupied Period: 15:30 to 21:00 (Monday to Friday, excluding holidays)

## Seasonal Changeover:

Occupied/Low Occupied period: The building summer/winter flag controls heating system according to the average outdoor air temperature.

## Winter Mode:

**Boiler Staging:** Boiler control initiates once pump status is confirmed ON. The hot water return sensor controls boiler staging, through PI control, to maintain a calculated hot water return temperature setpoint. Minimum on-time (5min) and an interstage delay (10min) provide stable boiler sequencing. The boiler lead/lag alternates weekly on Tuesday at 10:00 am.

**Hot Water Pumps:** When the hot water system is enabled, the lead hot water pump runs continuously and the lag pump remains OFF. The lead/lag pumps alternate weekly on Tuesday at 10:00 am. During the lead/lag change-over, both pumps will remain on for a period of 2 minutes, the new lag pump then shuts down. The lag pump will start on lead pump failure (within 1 minute). On lead pump failure, the lead pump will NOT be brought into operation until a software reset from the front end computer is initiated. Both heating pumps are OFF when the heating system is disabled. Alarm indication is initiated if pump status does not match pump command.

**Occupied Period:** The lead hot water pump runs continuously. The hot water return temperature setpoint is reset by the outdoor air temperature as per schedule:

OAT	Setpoint
50°F	110°F
0°F	160°F

The space temperature sensor using step control, adjusts the calculated hot water setpoint ( $\pm 5^\circ\text{F}$ ) to maintain the space temperature setpoint within a defined range.

**Space Temperature Setpoint:** The Space temperature setpoint is based on building operational mode. The building operational modes are as follows: Occupied (70°F), Low Occupancy (65°F) and Night Cycle (50/60°F).

**Unoccupied period:** The heating system is disabled when the space temperature is above the night cycle setpoint AND the outside air temperature is above the OAT low limit.

The outside air temperature initiates the heating system when the outside air temperature is below the OAT low limit while space temperature is above the night cycle setpoint. The lead hot water pump is on and the hot water return temperature is maintained at the minimum loop temperature setpoint.

The space temperature sensor initiates the night cycle when space temperature is below the night cycle setpoint. During night cycle, the lead hot water pump is on and the hot water return setpoint is set to the maximum allowable setpoint.

**Low Occupancy Mode:** The hot water system operation is the same as in the occupied mode except the space temperature sensor using step control, adjusts the calculated hot water setpoint ( $\pm 5$ ) to maintain the low occupancy setpoint.

**Building Heating Request:** All fan and secondary pump status' are monitored to enable the Building Heating Request flag when heating is required. The Building Heating Request flag is ON when the Number of Heating Systems requesting heat is greater than Number of Heating Systems required for Heating plant Start-Up. While enabled, the boiler system operation is the same as in the occupied mode.

**Night Setback Mode Option:** The heating system remains enabled during unoccupied periods when the average outdoor air temperature is above the Building Outdoor air Low Limit condition. The lead hot water pump remains on and the hot water return temperature is maintained at the minimum loop temperature setpoint.

**Optimum Start:** The space and outdoor air temperature sensors are referenced to start the heating system prior to occupancy. The start time interval ensures the Space temperature is at Setpoint for occupancy. During optimum start, the lead hot water pump is on and the hot water return setpoint is set to the maximum allowable setpoint. When the space temperature reaches setpoint, the system resumes the occupied mode.

## Summer Mode:

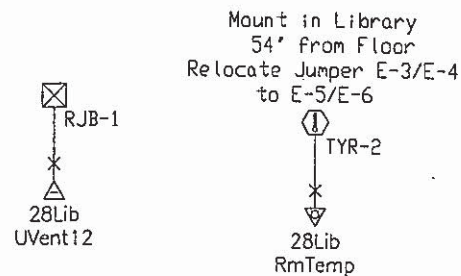
The heating pumps are off. Both heating pumps run for a period of 3 minutes every week on Tuesday at 10:00am.

REV D		BY	Honeywell ExpertISE ©
REV C		BY	2511 Barton Street East, Hamilton, ON L8E 2X1
REV B	As-Built	BY	Halton School Board
Jun, 1999		G.D.	Rolling Meadows Public School
REV A	Deleted Sec. HWS	BY	Heating Plant
Jan, 1998	Temp Control	S.K.	FILE: CTRL-2 DATE: 05-14-97 SHEET: 3
APPROVED BY: P. Chow		DRAWING NUMBER	12-7047-028
		REV	B

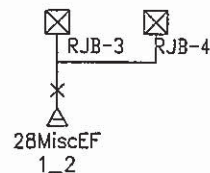


MISC. EQUIPMENT AND FANS

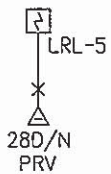
LIBRARY



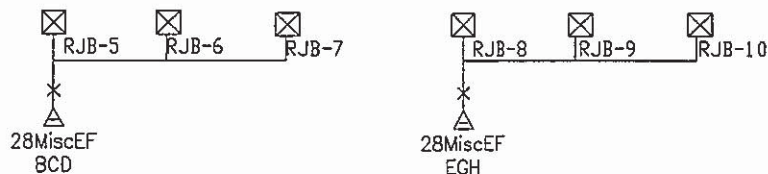
New Boy's & Caretaker ChRm



DAY NIGHT STATION

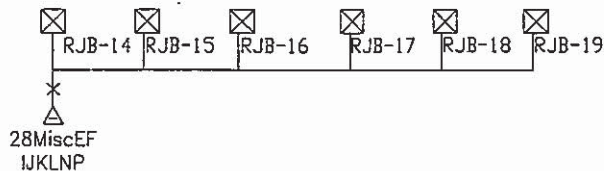


Class room Fans  
(MAN. STARTERS IN MECH ROOM)



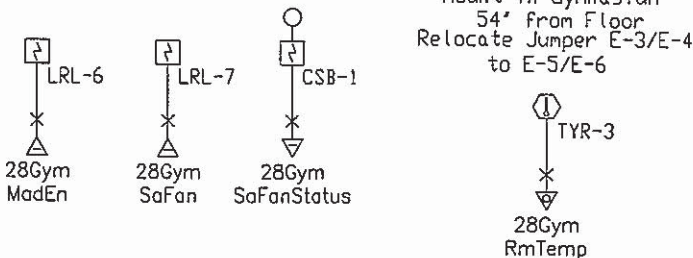
Classrooms

(MAN. STARTERS IN MECH ROOM)



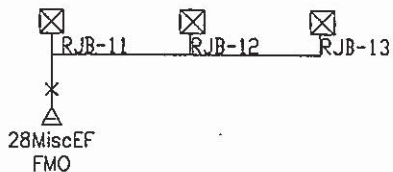
GYMNASIUM HV-1

(HQA STARTER IN CARETAKER'S ROOM)



Washrooms and Home Ec.

(MAN. STARTERS IN MECH ROOM)



Library & Gym:

System Start/Stop:

The fan system will start under any of the following conditions:  
Occupied Mode  
Low Occupancy  
Night Cycle  
Optimum Start

Occupied Period: 8:30 to 21:00 ( Monday to Friday, excluding holidays )  
Low Occupied Period: 15:30 to 21:00 ( Monday to Friday, excluding holidays )

Occupied Mode:

The supply fan starts. The mixed air temperature and the supply air temperature are maintained at a preset setpoint by the existing control equipment.

Low Occupancy Mode (Winter Only):

The mixed air dampers close. The space temperature sensor cycles the supply fan on to maintain the low occupancy setpoint (65°F).

When the space temperature rises above the low occupancy setpoint ( 65°F + DB of 2°F), the supply fan is off.

Night Cycle Mode (Winter Only):

The mixed air dampers remain closed. The space temperature sensor cycles the supply fan on to maintain the Night cycle setpoint (50°F).

When the space temperature rises above the night cycle setpoint the supply fan cycles off.

Unoccupied Mode:

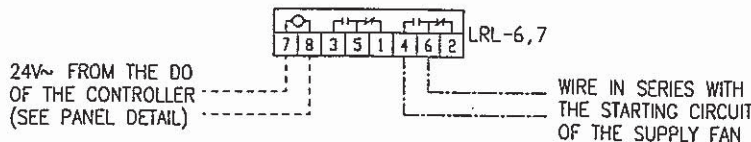
Winter: The supply fan stops and the mixed air dampers close.

Summer: The supply fan stops, the mixed air dampers close.

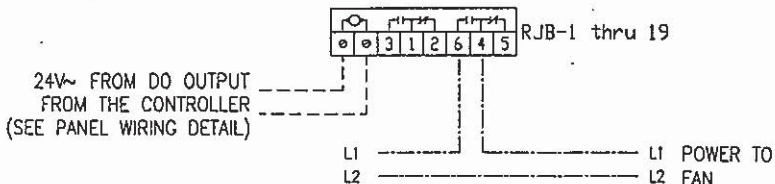
Optimum Start (Winter Only):

The space and outdoor air temperature sensors are referenced to start the fan system prior to occupancy. The start time interval ensures the space temperature is at setpoint for occupancy. The supply fan is cycled on with the mixed air dampers close. When the Space temperature reaches setpoint, the system resumes the occupied mode.

WIRING DIAGRAM FOR REMOTE RELAY



TYPICAL WIRING FOR 1 PHASE MANUAL STARTER



WIRING LEGEND

- x-// 2 TWISTED PAIR #18 LOW VOLTAGE
- // 1 PAIR #18 LOW VOLTAGE
- \*- 3 WIRES #18 LOW VOLTAGE
- x- 1 TWISTED PAIR #18 LOW VOLTAGE
- SINGLE WIRE LINE VOLTAGE, MIN. #14
- ..... SINGLE WIRE #18 LOW VOLTAGE
- ====> PNEUMATIC PIPING

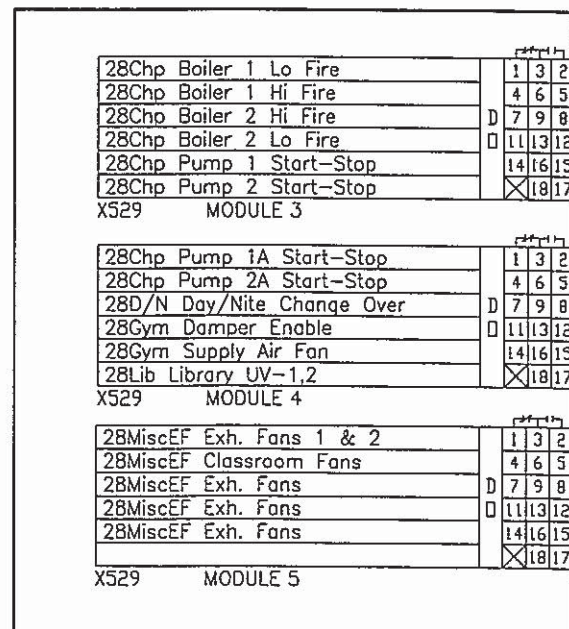
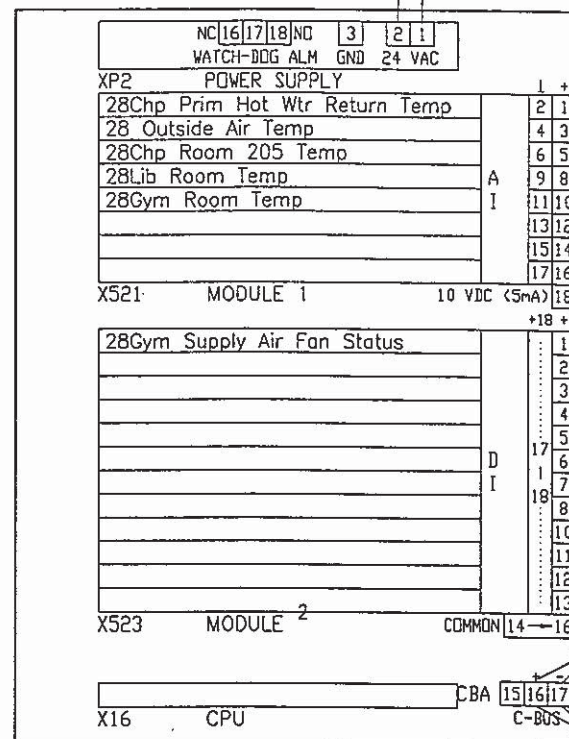
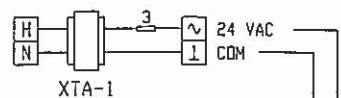
FIELD DEVICES

Tag	Qty	Per	Tag Port Number	Description
CSB	1	1	H708	Hawkeye 1-135A c/w LED
LRL	3	1	LY2-AC24	24vac relay, 10A contacts, dpdt
		1	PTF08A-E	DIN rail relay socket, dpdt
RJB	18	1	R8222D1014	Relay, 24vac, dpdt
		1	129384A	Cose for R8222
TYR	2	1	T7750A1018	20K Thermistor Space sensor - with logo.
		1	TC511B1008	Guard for Space sensor

REV D		BY	Honeywell ExpertISE ©
REV C		BY	2511 Barton Street East, Hamilton, ON L8E 2X1
REV B	As-Built	BY	Halton School Board
Jun, 1999		G.D.	Rolling Meadows Public School
REV A	Revised	BY	Misc. Exh. Fans & Equipment
Jan, 1998		S.K.	FILE: CTRL-2 DATE: 05-14-97 SHEET: 4
APPROVED BY:	P. Chow		DRAWING NUMBER 12-7047-028
			REV B

## CONTROLLER 2

(Boiler room)



## FIELD

(TNP-1) 28Chp HwRetTemp  
 (TND-1) 28 OaTemp  
 (TYR-1) 28Chp Rm205Temp  
 (TYR-2) 28Lib RmTemp  
 (TYR-3) 28Gym RmTemp

(CSB-1) 28Gym SoFanStatus

C BUS IN

C BUS OUT

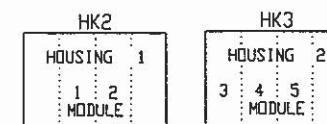
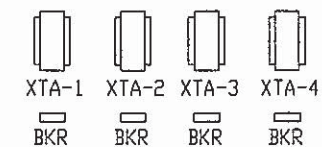
(LRL-1) 28Chp Blr1Lo  
 (LRL-2) 28Chp Blr1Hi  
 (LRL-3) 28Chp Blr2Hi  
 (LRL-4) 28Chp Blr2Lo  
 (REA-1) 28Chp P1  
 (REA-2) 28Chp P2

(REA-3) 28Chp P1A  
 (REA-4) 28Chp P2A  
 (LRL-5) 28D/N PRV  
 (LRL-6) 28Gym ModEn  
 (LRL-7) 28Gym SoFan  
 (RJB-1) 28Lib UVent12

(RJB-3) 28MiscEF 1\_2  
 (RJB-5) 28MiscEF BCD  
 (RJB-8) 28MiscEF EGH  
 (RJB-11) 28MiscEF FMO  
 (RJB-14) 28MiscEF IJKLNP

Transformer Schedule						
Output points	Relays / Contactors / Transducers					Transformers
Module/Pt	LRL	RJB	REA	RHA	YPF	
3/1-6	4		2			XTA-2
4/1,4/3-5,5/2	3	3	1			XTA-2
4/2,4/6,5/3-4		7	1			XTA-3
5/1,5/5		8				XTA-4

## XL500 CONTROLLER



ER2

## PANEL DEVICES

Tag Name	Qty	Per Tag	Part Number	Description
CSA	1	1	XD505A	C-BUS communications module
ER2	1	1	40889096-001	CSA Full size unitized cabinet ring and door
		1	40889089-001	Full size perf. pad
HK2	1	1	14507274-001	4 module housing wiring subbase
		1	14507330-001	3" ribbon cable
		1	XH561H	4 module housing
		1	XH562H	Housing cover
HK3	1	1	14507274-001	4 module housing wiring subbase
		1	14507330-001	3" ribbon cable
		1	XH561H	4 module housing
		1	XH562H	Housing cover
X16	1	1	XC5010	Excel 500 16bit CPU Module
X521	1	1	XF521A	Excel 500/600 Standard 8 AI Module
X523	1	1	XF523A	Excel 500/600 12 DI Module
X529	3	1	XF529	Excel 500/600 6 DO Module w/o override switches
XP2	1	1	XP502	Excel 500/600 Power Supply
XTA	1	4	AT175A1008	Power transformer, 120 to 24vac, 75VA
		4	1492-GH030	Allen Bradley 3A Circuit breaker

## WIRING LEGEND

- X—// 2 TWISTED PAIR #18 LOW VOLTAGE
- //— 1 PAIR #18 LOW VOLTAGE
- \*— 3 WIRES #18 LOW VOLTAGE
- X— 1 TWISTED PAIR #18 LOW VOLTAGE
- SINGLE WIRE LINE VOLTAGE, MIN. #14
- ..... SINGLE WIRE #18 LOW VOLTAGE
- ====> PNEUMATIC PIPING

REV D		BY	Honeywell ExpertISE ©
REV C		BY	2511 Barton Street East, Hamilton, ON L8E 2X1
REV B	As_Built	BY	Halton School Board
Jun, 1999		G.D.	Rolling Meadows Public School
REV A	Added XTAs & Breakers	BY	Controller 2
Jan, 1998		S.K.	FILE: CTRL-2 DATE: 05-14-97 SHEET: 5
ARCH:	ENG:	CONT:	DRAWING NUMBER 12-7047-028
SYS ENG: L. Koornneef	INST SUP: A. Laman	DRAFTER: L. Koornneef	APPROVED By: P. Chow
			REV B



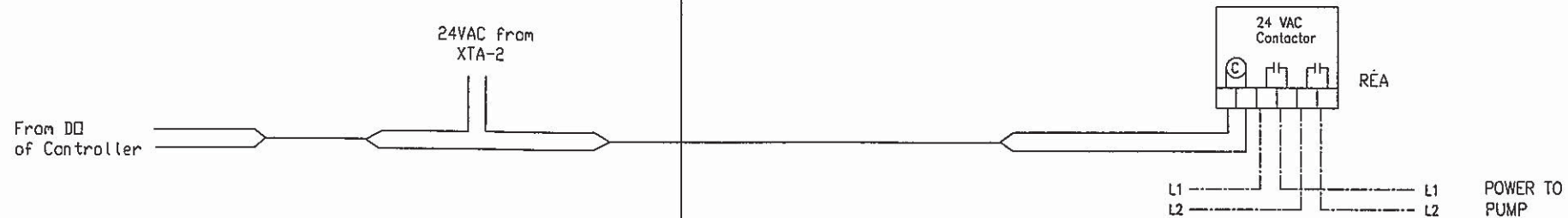
CONTROLLER

FIELD

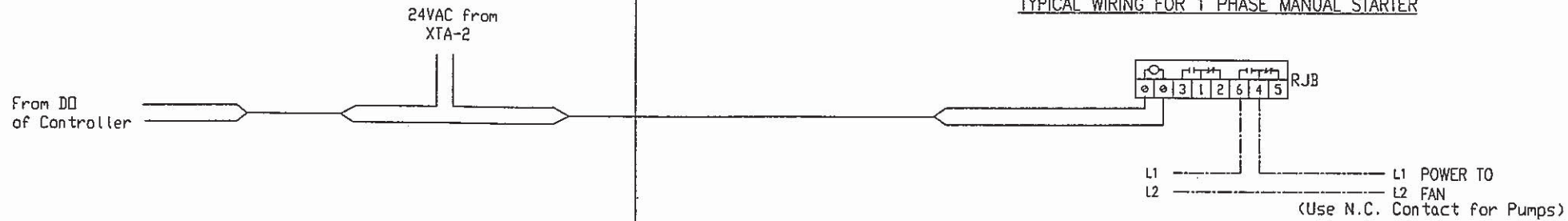
WIRING DIAGRAM FOR REMOTE RELAY



TYPICAL WIRING FOR MANUAL STARTER



TYPICAL WIRING FOR 1 PHASE MANUAL STARTER



WIRING LEGEND

- x—// 2 TWISTED PAIR #18 LOW VOLTAGE
- // 1 PAIR #18 LOW VOLTAGE
- \*— 3 WIRES #18 LOW VOLTAGE
- x— 1 TWISTED PAIR #18 LOW VOLTAGE
- 1 SINGLE WIRE LINE VOLTAGE, MIN. #14
- 1 SINGLE WIRE #18 LOW VOLTAGE
- 1 PNEUMATIC PIPING

REV D		BY	Honeywell ExpertISE ©
REV C		BY	2511 Barton Street East, Hamilton, ON L8E 2X1
REV B		BY	Halton School Board
REV A	As-Built	BY	Rolling Meadows Public School
Jun, 1999		G.D.	Controller 1 - Typical Wiring
FILE: CTRL-2	DATE: 05-14-97	SHEET: 6	DRAWING NUMBER 12-7047-028
APPROVED BY: P. Chow			REV A

TABLE No.1 EXHAUST FANS' EMS SCHEDULE

TABLE No.2: NEW MANUAL TIMER FOR EXHAUST FAN

STB-1 STB-2  
STB-3 STB-4  
STB-5

TABLE No.3: EQUIPMENT NOT CONTROLLED

### WIRING LEGEND

- ## FIELD DEVICES

REV D		BY	<b>Honeywell ExpertISE</b> ©		
REV C		BY	2511 Barton Street East, Hamilton, ON L8E 2X1		
REV B Jun, 1999	As-Built	BY G.D.	Halton School Board Rolling Meadows Public School Equipment Schedule		
REV A Jan, 1998	Updated	BY S.K.	FILE: CTRL-2	DATE: 05-14-97	SHEET: 7
APPROVED BY: P. Chow			DRAWING NUMBER 12-7047-028		

EQUIPMENT SUMMARY

FIELD DEVICES

Tag	Tot		
Name	Qty	Part Number	Description
CSB	1	H708	Hawkeye 1-135A c/w LED
LRL	7	LY2-AC24	24vac relay, 10A contacts, dpdt
	7	PTF08A-E	DIN rail relay socket, dpdt
REA	4	DP2030A5004	Relay, 24 VAC, 30A dpdt
	4	138552B	Case for DP2030 Contactor
RJB	18	R8222D1014	Relay, 24vac, dpdt
	18	129384A	Case for R8222
STB	5	FD6H	Intermatic Wind-up Timer
TNO	1	C7031F1018	Outdoor temp sensor, -40 to 302F
TNP	1	TE200E20B2	20K Thermistor Strap-On
TYR	1	T7750A1018	20K Thermistor Space Sensor - with logo
TYR	2	T7750A1018	20K Thermistor Space sensor - with logo
	2	TG511B1008	Guard for Space sensor
XBA	1	DELL	PC and monitor
	1	XD505A	C-Bus Communication Submodule
	1	XPC500	Xbs c-bus interface board-one required for each pc
XPA	1	XI582AH	Excel 5000 portable operators terminal
	1	XW565	16 ft cable for XI582

PANEL DEVICES

Tag	Tot		
Name	Qty	Part Number	Description
CBA	1	XD505A	C-BUS communications module
ER2	1	40889096-001	CSA Full size unitized cabinet ring and door
	1	40889089-001	Full size perf. pad
HK2	1	14507274-001	4 module housing wiring subbase
	1	14507330-001	3" ribbon cable
	1	XH561H	4 module housing
	1	XH562H	Housing cover
HK3	1	14507274-001	4 module housing wiring subbase
	1	14507330-001	3" ribbon cable
	1	XH561H	4 module housing
	1	XH562H	Housing cover
X16	1	XC5010	Excel 500 16bit CPU Module
X521	1	XF521A	Excel 500/600 Standard 8 AI Module
X523	1	XF523A	Excel 500/600 12 DI Module
X529	3	XF529	Excel 500/600 6 DO Module w/o override switches
XP2	1	XP502	Excel 500/600 Power Supply
XTA	4	AT175A1008	Power transformer, 120 to 24vac, 75VA
	4	1492-GH030	Allen Bradley 3A Circuit breaker

REV D		BY	Honeywell ExpertISE ©	
REV C		BY	2511 Berton Street East, Hamilton, ON L8E 2X1	
REV B	As-Built	BY	Halton School Board	
Jun, 1999		G.D.	Rolling Meadows Public School	
			Equipment Summary	
REV A	Updated	BY	FILE: CTRL-2	DATE: 05-14-97
Jan, 1998		S.K.	SHEET: 8	
APPROVED BY: P. Chow			DRAWING NUMBER	12-7047-028
				REV B

**1. GENERAL****1.1 Conditions and Requirements**

- 1.1.1 Conform to Section 01 00 00 – General Requirements and all documents referred to therein.
- 1.1.2 Refer to the General Conditions, Supplementary General Conditions, and General Requirements.
- 1.1.3 Provisions of this Section shall apply to all Sections of Division 26.
- 1.1.4 Refer to the Contract Drawings for exact location of electrical equipment and devices. Refer to Contract Drawings for additional notes which complement these Specifications.

**1.2 Related Sections**

- 1.2.1 Section 01 00 01 - General Requirements.

**1.3 Codes and Standards**

- 1.3.1 This contractor shall complete installation in accordance with the Canadian Electrical Code, Latest Edition. Comply with Canadian Standards Association (CSA) Electrical Bulletins in force at time of Tender submission. While not identified and specified by number in this Division, they are to be considered as forming part of the related CSA Standards. Comply with current regulations of the National Building Code of Canada, and the requirements of all applicable Municipal and Provincial Codes and Regulations.

**1.4 Permit and Fees**

- 1.4.1 Obtain and pay for all permits and fees required for the execution and inspection of the electrical work and pay all charges incidental to such permits. Submit to Electrical Inspection Department and Supply authority necessary number of drawings and specifications for examination and approval prior to commencement of work. Arrange and pay for any special inspection of equipment specified if and when required.

**1.5 Work Sequence**

- 1.5.1 Prior to start of each work period in occupied area, temporary protection shall be installed to prevent damage to any personal property or furnishing and as required by the CSA-Z317.13-17 - Infection Control During Construction, Renovation and Maintenance of Health Care Facilities.
- 1.5.2 Agency's representative shall approve temporary protection plan prior to use.
- 1.5.3 Necessary steps shall be taken by the Contractor to ensure that the required firefighting apparatus is accessible at all times. Flammable materials shall be kept in suitable places outside the building.
- 1.5.4 A step by step sequence of work to complete the scope of work is to be submitted by the Contractor and approved by the Consultant and Agency. Once approved a dry run or a simulation on site is to take place prior to the start of construction.

**1.6 Inspections**

- 1.6.1 Furnish a Certificate of Acceptance from the Inspection Department on completion of work. The Consultant will carry out inspections and prepare deficiency list for action by the Contractor, during and on completion of Project.

**1.7 Contract Drawings and Specifications**

- 1.7.1 The Contract Drawings and Specifications are complementary each to the other and what is called for by one to be binding as if called for by both. Should any discrepancy appear between the Contract Drawings and Specifications which leaves the Contractor in doubt as to the true intent and meaning of plans and specifications, a ruling is to be obtained from the Consultant in writing before

submitting Tender Documents. If this is not done, the maximum, the most expensive alternate or option will be provided in base Tender Bid.

- 1.7.2 All Contract Drawings and all Divisions of these specifications shall be considered as a whole and work of this Division shown anywhere therein shall be furnished under this Division.
- 1.7.3 Contract Drawings are diagrammatic and indicate the general arrangement of equipment and pathways. Most direct routing of conductors and wiring is not assured. Exact requirements shall be governed by architectural, structural, and mechanical conditions of the Project. Consult all other Contract Drawings in preparation of the bid. Extra lengths of wiring or addition of pull and junction boxes, etc. necessitated by such conditions shall be included in the bid. Check all information and report any apparent discrepancies before submitting the bid.
- 1.7.4 Contractor shall determine the exact locations of equipment and rough-ins, and the exact routing of pathways so as to best fit the layout of the work.
- 1.7.5 Scaling off the Contract Drawings will not be sufficient or accurate for determining these locations. Where job conditions require reasonable changes in indicated arrangement and locations, such changes shall be made by the Contractor at no additional cost to the Agency.
- 1.7.6 Because of the scale of the Contract Drawings, certain basic items, such as junction boxes, pull boxes, conduit fittings, etc. may not be shown, but where such items are required by other Sections of the Specifications of where there are requirements for proper installation of the work, such items shall be furnished and installed.
- 1.7.7 Before ordering any conduit, cable tray, conductors, wireways, raceway bus duct, fittings, etc., this Contractor shall verify all pertinent dimensions at the Project site and be responsible for their accuracy.

1.8 **Material**

- 1.8.1 Where several manufacturers' names are given, the first named manufacturer constitutes the basis for the Project design and establishes the equipment quality required to be used in this Contract.
- 1.8.2 This Contractor, at own option, may use equipment as manufactured by the other manufacturers if listed. The Contractor is responsible to ensure that all items submitted by these other manufacturers meets all requirements of the Contract Drawings and Specification and fits in the allocated space. The final determination of a product being equivalent shall be determined by the Consultant when a catalogue number is not listed or listed in part.
- 1.8.3 Any material, article or equipment of other unnamed manufacturer which will adequately perform the services and duties imposed by the design and is of a quality equal to, or better than the material, article or equipment identified by the Contract Drawings and Specifications may be used if approval is secured in writing from the Consultant as described in the General Provisions of the Contract for Submittals. The Contractor bears full responsibility for the unnamed manufacturer's equipment adequately meeting the intent of the design. The Agency/Consultant may reject manufacture at time of shop drawing submittal.

1.9 **Record Drawings**

- 1.9.1 Extra sets of white prints will be provided on which to make, as the job progresses, all approved changes and deviations from the original drawings. Complete Record Drawings accurately marked up in red ink must be submitted for approval before the Contract is considered to be completed.

1.10 **Location of Outlets**

- 1.10.1 The Consultant reserves the right to change the location of outlets to within 3m from the point indicated on the Contract Drawings without extra charge providing the Contractor is advised before installation is made. Refer to the Contract Drawings for locations.

**1.11 Wiring Termination**

- 1.11.1 Lugs, terminals, or screws used for termination of wiring to be suitable for copper conductors. Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tape, on both ends of phase conductors of feeders and branch circuit wiring. Maintain phase sequence and colour coding throughout.

**1.12 Supports**

- 1.12.1 All conduits, panels, etc. to be securely and adequately supported where more than three (3) conduits run together, conduit racks to be used. Single runs of conduit to be supported by galvanized conduit straps or ring bolt type hangers.
- 1.12.2 Tie wire or perforated metal strap hangers will NOT be accepted.

**1.13 Paining and Finishes**

- 1.13.1 All electrical fittings, supports, hanger rods, pull boxes, channel frames, conduit racks, outlet boxes, brackets, clamps etc., to have galvanized finish or paint finish over corrosion-resistant primer.
- 1.13.2 All panel boards, motor starters etc., to be factory finished with baked on enamel.
- 1.13.3 All enamel to be baked on gloss over corrosion resistant primer. Minor damages to finish on factory finished equipment shall be touched up to the Consultant's satisfaction. Items suffering major damage to finish shall be replaced at the direction of the Consultant.
- 1.13.4 Protect work so that finishes will not be damaged or marred during construction. Maintain the necessary protection until completion of the Work.

**1.14 Adjusting and Start-Up**

- 1.14.1 The Contractor shall conduct acceptance tests to demonstrate that the equipment and systems actually meet the specified requirements.
- 1.14.2 Tests may be conducted as soon as conditions permit, and consequently the Contractor shall make all changes, adjustments, or replacements required as the preliminary tests may indicate prior to the final tests.
- 1.14.3 Tests shall be as specified in various Sections of the Specification. Carry out tests in the presence of the Consultant.
- 1.14.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of the Project.
- 1.14.5 The Electrical Contractor shall be in charge of the generator plant during tests. The Contractor shall assume responsibility for damages in the event of injury to the personnel, building, equipment, and shall bear all costs for liability, repairs, and restoration in this connection. Submit test results.

**1.15 Safety**

- 1.15.1 The Contractor shall be responsible for the safety of his workmen and the equipment on the project in accordance with all applicable safety legislation passed by Federal, Provincial, and local authorities governing construction safety. The more stringent regulations shall prevail.

**1.16 Concrete Work**

- 1.16.1 Provide all concrete housekeeping pads for new electrical equipment.
- 1.16.2 Provide fire stops at all walls, floors and ceiling penetrations of new electrical conduits and wiring.

**1.17 Demolition**

- 1.17.1 Remove all electrical equipment and devices on redundant structures. Make safe all circuits.
- 1.17.2 To make safe: Withdraw redundant wiring and remove unwanted conduit/wiring and accessories. Position breakers to OFF position and update panel schedules.



**2. PRODUCTS****2.1 Material Approval**

- 2.1.1 The design, manufacture and testing of electrical equipment and materials shall conform to or exceed the latest applicable (CSA), Institute of Electrical and Electronics Engineers (IEEE), and American National Standards Institute (ANSI) standards.
- 2.1.2 All materials must be new and be ULC or CSA listed. Any materials not covered by the aforementioned listing standards shall be tested and approved by an independent testing laboratory, Technical Inspection Services, or other government agency.

**2.2 Shop Drawings**

- 2.2.1 Submit shop drawings within one (1) week after award of Contract, for the following:
  - .1 Natural gas fired generator and controls
  - .2 Manual Transfer Switches (MTS)
  - .3 Quick Connection Enclosure (QC)
  - .4 Distribution Panels, disconnect switches and splitters
  - .5 Low voltage transformers.
- 2.2.2 Reference Section 01 33 00 – Submittal Procedure.

**3. EXECUTION****3.1 Workmanship and Contractor's Qualifications**

- 3.1.1 Only first class workmanship will be accepted, not only in regards to durability, efficiency and safety, but also in regards to neatness of detail. Present a neat and clean appearance on completion to the satisfaction of the Consultant. Any unsatisfactory workmanship will be replaced at no extra cost to the Agency.
- 3.1.2 Conform to the best practices applicable to this type of work. Install all equipment and systems in accordance with the manufacturer's recommendations, but consistent with the General Requirements of this Specification. Store all electrical equipment and materials in dry locations.
- 3.1.3 Provide site supervisor in charge of this work at all times while work is being done.

**3.2 Coordination**

- 3.2.1 Coordinate work of sub-trades to avoid conflict and to provide correct rough-in and connection for equipment furnished under other trades that require electrical connection. Inform sub-trades of the required access to and clearances around electrical equipment to maintain serviceability and code compliance.
- 3.2.2 Verify equipment dimensions and requirements with provision specified under this Section. Check actual job conditions before fabricating work. Report necessary changes in time to prevent needless work. Changes or additions subject to additional compensation, which are made without written authorization and an agreed price, shall be at the Contractor's own risk and expense.
- 3.2.3 Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
- 3.2.4 Coordinate utility service outages with the Agency. Obtain permission from the Agency at least 24 hours before partially or completely disabling system. Minimize outage duration.
- 3.2.5 Existing Fire Alarm System: Maintain existing system in service. Disable system only to make switch overs and connections. Notify Agency at least 24 hours before partially or completely disabling system. Minimize outage duration.
- 3.2.6 Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits use personnel experienced in such operations.

- 3.3 **Manufacturer's Instructions**
- 3.3.1 Where the Specifications call for an installation to be made in accordance with Manufacturer's recommendations, a copy of such recommendations shall be at all times be kept on the job site and be available to the Agency's Representative.
- 3.3.2 Follow manufacturer's instructions where they cover points now specifically indicated on the Contract Drawings and Specifications. If they are in conflict with the Contract Drawings and Specifications, obtain clarification from the Consultant before starting the Work.
- 3.4 **Quality Assurance**
- 3.4.1 See Section 01 00 00 General Requirements of the Contract of the Specification.
- 3.4.2 The Specifications contained herein are set forth as the minimum acceptable requirements. This does not relieve the Contractor from executing other quality assurance measures to obtain a complete operating system within the Scope of this Project.
- 3.4.3 The Contractor shall ensure that all workmanship, all materials employed, all required equipment and the manner and method of installation conforms to accepted construction and engineering practices, and that each piece of equipment is in satisfactory working condition to satisfactorily perform its functional operation.
- 3.4.4 Provide quality assurance tests and operational check on all components of the electrical distribution system, all lighting fixtures, and communication systems.
- 3.5 **Cutting and Patching**
- 3.5.1 The General Contractor will be responsible for all cutting and patching required for the electrical installation. Structural members are not to be cut without the consent of the Consultant.
- 3.5.2 Provide radar screen prior to cutting and drilling for structural members and concealed services.
- 3.5.3 Structural members are not to be cut without the consent of the Consultant.
- 3.6 **Labels and Signs**
- 3.6.1 Manufacturers' nameplates and CSA labels are to be visible and legible after equipment is installed. Provide warning signs, as specified, or to meet requirements of Electrical Safety Authority (ESA), Health and Safety, and the Consultant.
- 3.6.2 Label power outlets with circuit identification on visible portion of faceplate or surface mounted outlet box.
- 3.7 **Adjust and Clean-Up**
- 3.7.1 The Contractor and associated sub trades, at all times during construction, to keep the site free of all debris, boxes, packing, etc., resulting from this work of this Trade. At the completion of this work, the electrical installation is to be left in a clean and finished condition to the satisfaction of the Consultant.
- 3.8 **Tests and Acceptance**
- 3.8.1 The operation of the equipment and electrical system does not constitute an acceptance of the Work by the Agency. The final acceptance is to be made after the Contractor has adjusted the equipment and demonstrated that it fulfills the requirements of the Contract Drawings and Specifications.
- 3.8.2 Testing of all systems shall be performed in the presence of the Agency's designated representative. The Contractor shall give 72 hours advance notice to the Agency before beginning the tests.
- 3.8.3 Upon completion of the installation, the Contractor shall furnish certificates of approval from all authorities having jurisdiction, including Electrical Safety Authority (ESA), as applicable.

- 3.8.4 Contractor shall demonstrate that work is complete and in perfect operating condition, with raceway and conduit systems properly grounded, wiring free from grounds, shorts, and that the entire installation is free of any physical defects. In the presence of the Agency, the Contractor shall demonstration the proper operation of all miscellaneous systems.

**END OF SECTION**

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**1. GENERAL****1.1 Summary**

- 1.1.1 Work in this Section includes, but is not limited to, the following:
- .1 Performance testing of equipment.
  - .2 Manufacturer's startup of equipment.

**1.2 Related Sections**

- 1.2.1 Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

**1.3 References**

- 1.3.1 American Society for Testing and Materials (ASTM).
- 1.3.2 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- 1.3.3 American Society of Mechanical Engineers (ASME).
- 1.3.4 American Society of Plumbing Engineers (ASPE).
- 1.3.5 Canadian Standards Association (CSA).
- 1.3.6 National Fire Protection Association (NFPA):
- 1.3.7 NFPA (Fire) 20, Installation of Stationary Pumps for Fire Protection, 2007 Edition.
- 1.3.8 Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
- 1.3.9 Emergency electrical power supply for buildings (C282-15)

**1.4 Quality Assurance**

- 1.4.1 Use factory trained representatives and submit manufacturer's check sheets for starting all systems and equipment.
- 1.4.2 Prior to starting, testing, balancing, adjusting, and cleaning processes, verify with the Consultant any tests required to be witnessed. Provide sufficient notice to the Consultant prior to commencement of procedures.
- 1.4.3 The Consultant shall be allowed to witness any testing, adjusting, starting, balancing, and cleaning procedures.
- 1.4.4 Assume all costs associated with starting and testing, including the supply of testing or cleaning medium.
- 1.4.5 Prior to starting equipment or systems, secure and review manufacturer's installation, operation, and starting instructions. Read in conjunction with procedures defined herein.
- 1.4.6 Use manufacturer's or supplier's starting personnel where required to ensure integrity of manufacturer's warranty.
- 1.4.7 Compare installations to published manufacturer's data and record discrepancies. Items potentially detrimental to equipment performance shall be corrected prior to equipment starting.
- 1.4.8 Some processes involved in starting procedures defined in this Section may be duplications of authorities verification. To facilitate expedient completion of the Project, arrange for authorities to assist or witness these procedures.
- 1.4.9 All starting, testing, and procedures shall be in accordance with applicable portions of ASME, ASHRAE, AABC, CSA, NFPA, SMACNA, ASTM, ASPE and as required and outlined in these Specifications.
- 1.4.10 Personnel involved in starting, testing, balancing and adjusting procedures shall be experienced in the design and operation of mechanical equipment and systems being checked and shall be able to interpret results of the readings and tests.
- 1.4.11 Assume all liabilities associated with starting, testing and balancing procedures.

**2. PRODUCTS - NOT APPLICABLE****3. EXECUTION****3.1 General**

- 3.1.1 Conduct performance tests to demonstrate equipment and systems meet specified requirements after installations are completed. Conduct tests as soon as conditions permit. Make changes, repairs, and adjustments required prior to operating tests.

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- 3.1.2 Gas fired equipment rated in excess of 117 kW shall be subjected to an operational test established by the Gas Protection Branch and shall pass this test before being approved for operation.
- 3.1.3 Meet with Division 26 manufacturers, suppliers, and other specialists as required to ensure all phases of the Work are properly coordinated prior to commencement of each particular testing procedure. Establish all necessary manpower requirements.
- 3.1.4 Operate and test motors and speed switches for correct wiring and sequences and direction of rotation. Check and record overload heaters in motor starters.
- 3.1.5 Confirm voltages and operating amperages at full load.
- 3.1.6 Failure to follow instructions pertaining to correct starting procedures may result in re-evaluation of equipment by an independent testing agency selected by the Agency at the Contractor's own expense. Should results reveal equipment has not been properly started, equipment may be rejected, removed from site, and replaced. Replacement equipment shall also be subject to full starting procedures, using same procedures specified on the originally installed equipment.
- 3.2 **Procedures**
- 3.2.1 Procedure shall be identified in the following five (5) distinct phases:
- .1 Pre-Starting: Visual inspection.
  - .2 Starting: Actual starting procedure.
  - .3 Post-Starting: Operational testing, adjusting or balancing, and equipment run-in phase.
  - .4 Pre-Interim Acceptance of the Work: Final cleaning, re-testing, balancing and adjusting, and necessary maintenance.
  - .5 Post-Interim Acceptance of the Work: Repeat tests and fine-tuning resulting from corrective action of deficiency clean-up.
- 3.2.2 Check specification and shop drawings data against installed data.
- 3.2.3 Check the installation is as defined by the Contract Documents and as per manufacturer's recommendations including manufacturer's installation check sheets.
- 3.3 **Contractor Testing Responsibilities**
- 3.3.1 The Contractor shall be required to provide the following tests as part of the Construction Contract. For each test, a test form is to be filled out, witnessed, kept on site for the Consultant to verify at any time during construction and then they are to be included in the final submission of the Contractor's Operating and Maintenance Manual.

**END OF SECTION**

1. **GENERAL**
  - 1.1 **References**
    - 1.1.1 Conform to Section 01 00 00 – General Requirements and all documents referred to therein.
    - 1.1.2 CSA C22.1-09 - Canadian Electrical Code, Part I Latest Edition, Safety Standard for Electrical Installations.
    - 1.1.3 Ontario Electrical Safety Code Latest Edition.
    - 1.1.4 Ontario Electrical Safety Code Bulletins.
2. **PRODUCTS - NOT APPLICABLE**
3. **EXECUTION**
  - 3.1 **Examination**
    - 3.1.1 Verify exact field measurements before proceeding with the Work.
    - 3.1.2 Verify that abandoned wiring and equipment serve only abandoned facilities.
    - 3.1.3 Demolition Drawings are based on casual field observation. Report any discrepancies to the Consultant before disturbing existing installation.
    - 3.1.4 Beginning of demolition means installer accepts existing conditions.
  - 3.2 **Preparation**
    - 3.2.1 Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
    - 3.2.2 Coordinate utility service outages with Utility Company.
    - 3.2.3 Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits use personnel experienced in such operations.
    - 3.2.4 Existing Electrical Service: Maintain emergency existing system in service until new system is complete and ready for service. Disable system only to make switch over and connections. Obtain permission from the Agency at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.
  - 3.3 **Demolition and Extension of Existing Electrical Work**
    - 3.3.1 Repair adjacent construction and finishes damaged during demolition and extension work.
    - 3.3.2 Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
    - 3.3.3 Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

**END OF SECTION**

**1. GENERAL****1.1 Section Includes**

- 1.1.1 Building wire and cable.
- 1.1.2 Armoured cable.
- 1.1.3 Metal clad cable.
- 1.1.4 Wiring connectors and connections.

**1.2 Related Sections**

- 1.2.1 Conform to Section 01 00 00 – General Requirements and all documents referred to therein.
- 1.2.2 Section 26 05 53 - Electrical Identification.
- 1.2.3 Section 26 00 00 – General Electrical Requirements.
- 1.2.4 Section 01 00 01 - Project Specific General Requirements.

**1.3 References**

- 1.3.1 CSA C22.1-09 - Canadian Electrical Code, Part I (21st Edition), Safety Standard for Electrical Installations.
- 1.3.2 Ontario Electrical Safety Code (24th Edition).
- 1.3.3 CSA C22.2 No. 0.3 - Test Methods for Electrical Wires and Cables.
- 1.3.4 CSA C22.2 No. 48-M90 (R2000) - Non-metallic Sheathed Cable.
- 1.3.5 CSA C22.2 No. 51 Armoured Cables.
- 1.3.6 CSA C22.2 No. 52-96 (R2000) - Underground Service-Entrance Cables.
- 1.3.7 CAN/CSA C22.2 No. 65-03 (CSA/UL/ANCE) – Wire Connectors.
- 1.3.8 CSA C22.2 No. 75-03 (CSA/UL/ANCE) - Thermoplastic-Insulated Wires and Cables.
- 1.3.9 CSA C22.2 No. 123 Aluminum Sheathed Cables.
- 1.3.10 CSA C22.2 No. 131 Type TECK 90 Cable.
- 1.3.11 CSA C22.2 No. 208-03 - Fire Alarm and Signal Cable.
- 1.3.12 NECA (National Electrical Contractors Association) - Standard of Installation.
- 1.3.13 NETA (International Electrical Testing Association) - ATS-2003 - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

**1.4 Qualifications**

- 1.4.1 Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' experience.

**1.5 Regulatory Requirements**

- 1.5.1 Conform to CSA C22.1.
- 1.5.2 Provide products listed and classified by CSA as suitable for the purpose specified and indicated.

**1.6 Project Conditions**

- 1.6.1 Verify that field measurements are as indicated.
- 1.6.2 Conductor sizes are based on copper unless indicated as aluminum or "AL".
- 1.6.3 Wire and cable routing indicated is approximate unless dimensioned.

**1.7 Coordination**

- 1.7.1 Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

**2. PRODUCTS****2.1 Fire Resistive Circuit Integrity Cable Systems (FRCS)**

- 2.1.1 FRCS's and installations shall comply with the National Building Code of Canada, CSA 22.1 and as modified by NFPA 130 or NFPA 502. FRCS's shall be tested to UL 2196/ULC S139 or approved equivalent.
- 2.1.2 UL System FHIT7 120 or listed equivalent shall be used.
- 2.1.3 Each component used in the installation shall be tested at the maximum rated or maximum utilization voltage.

- 2.1.4 All required listings shall encompass the cable type, construction, and conductor size range procured.
- 2.1.5 All FRCS's shall be tested and pass UL 2196/ULC S139 as a complete system, both horizontal and vertical installation configurations, with an S-Bend. UL 2196/ULC S139 testing shall include the components per 3.1 through 3.9 as applicable to the installation. FRCS shall additionally meet the requirements per paragraphs 4 through 13 as applicable to the installation.
- 2.2 **Cable**
- 2.2.1 Cable shall be constructed in accordance with CSA C22.2 No 123. Cables shall additionally comply with the following requirements:
- .1 Conductors:
    - .1 Conductors shall be stranded bare copper and meet the requirements of ASTM B3, B8, and B49.
    - .2 Conductors shall pass hydrogen embrittlement test as outlined in ASTM B577 when heated to 850°C.
  - .2 Insulation:
    - .1 Insulation shall be cross-linked silicone, non-hygroscopic, and rated for continuous use at 90°C.
    - .2 Insulation shall emit less than 2 percent acid gas when tested in accordance with MIL-DTL-24643C.
    - .3 Insulation shall be halogen free.
    - .4 100 percent of insulated conductors shall be submerged in water for a minimum of six (6) hours and pass dielectric withstand, direct current resistance (DCR), and insulation resistance (IR) tests per requirements in UL 44/CSA C22.2 No 38. This test shall be performed prior to further manufacturing processing after extrusion operation of the insulation.
    - .5 Insulation shall meet requirements in Table 1.

Table 1 – Silicone Insulation Properties

Material	Conditions	Property	Value
Silicone	Unaged	Tensile (Min)	800 lbf/in <sup>2</sup>
		Elongation (Min)	250%
	Aged in Air – 60 days (1440h) @ 158°C	Tensile (Min)	50% retention
		Elongation (Min)	50% retention

- .3 Inner Jacket:
  - .1 Inner jacket shall emit less than 2 percent acid gas when tested in accordance with MIL-DTL-24643C.
  - .2 Inner jacket shall be halogen free.
- .4 Groundwires:
  - .1 All groundwires shall adhere to conductor requirements
  - .2 Groundwires shall be sized in accordance with the CSA 22.1.
  - .3 Bare groundwires, both segmented and non-segmented, shall be included in all cable listings.
  - .4 Segmented groundwires shall be in the FRCS listing from the fire test lab.
- .5 Copper Sheath:
  - .1 Copper sheath shall meet ASTM B577.
  - .2 Copper sheath shall be continuously welded and corrugated.
  - .3 Copper sheaths used as an equipment grounding conductor shall be UL listed for use as an equipment grounding conductor.
  - .4 100 percent of cable shall be pressure tested at 25 lbs for five (5) minutes with zero drop in pressure prior to applying outer jacket.
- .6 Outer Jacket:



- .1 Outer jacket shall emit less than 2 percent acid gas when tested in accordance with MIL-DTL-24643C.
- .2 Outer jacket shall be applied over copper sheath and shall be halogen free.
- .3 Out jacket shall meet requirements in Table 2.

Table 2 – LSZH Jacket Properties

Material	Conditions	Property	Value
LSZH Jacket	Unaged	Tensile (Min)	1800 lbf/in <sup>2</sup>
		Elongation (Min)	100%
	Aged in Air – 7 days (168h) @ 121°C	Tensile (Min)	85% retention
		Elongation (Min)	65% retention

- .7 Cable Listings:
  - .1 Cables shall be listed as Type RC90 per CSA C22.2 No 123.
  - .2 Single copper conductor.
  - .3 Minimum #12 America Wire Gauge (AWG) for branch circuit wiring.
  - .4 Minimum #14 AWG for 120V control wiring.
  - .5 Chemically cross-linked polyethylene insulation.
  - .6 Rated for 90°C, 600V.
  - .7 Suitable for handling to minus 40°C.
  - .8 For interior installations in conduit.
  - .9 Cable shall be listed for FT4 per UL 2556/CSA C22.2 No 2556.

## 2.3 **Mounting**

- 2.3.1 Components for mounting in areas where the FRCS is required for fire protection shall be steel.
- 2.3.2 Mounting straps used for jacketed cables shall be independently secured to strut such that they can be self-supporting without the need for a cable to be routed through them.
- 2.3.3 Components shall be mounted to a steel or concrete 2-hour fire rated structure.

## 2.4 **Supports**

- 2.4.1 Support intervals in areas where the FRCS is required for fire protection shall be steel and shall be no greater than the allowed distance per the FRCS listing.

## 2.5 **Raceways and Couplings**

- 2.5.1 Raceways and couplings shall be steel Type EMT or IMC or fireberglass Type RTRC.
- 2.5.2 Groundwires shall be included for fiberglass raceways and shall be tested with the system.
- 2.5.3 Fill ratio shall not exceed the fill ratio for the FRCS.

## 2.6 **Cable Trays**

- 2.6.1 Cable trays shall be steel.
- 2.6.2 Supports for the tray shall be installed as per 2.4 – *Supports* section.

## 2.7 **Boxes**

- 2.7.1 Boxes shall be steel.

## 2.8 **Pulling Lubricants**

- 2.8.1 Pulling lubricant shall be compatible with cable material which it is applied onto as described in testing per IEEE 1210.

## 2.9 **Vertical Supports**

- 2.9.1 The cable inside the copper sheath for Type RC90 cable shall be self-supporting.

**2.10 Block Splices**

- 2.10.1 Block splices consist of an enclosure, mounting hardware, termination base, terminal wire connectors, cable, grounding/bonding wires, and cable box connectors.
- 2.10.2 The block splice assembly shall be listed as per CSA C22.2 No. 76.
- 2.10.3 Components for splices provided in Canada shall additionally comply with the following requirements:
  - .1 Enclosure:
    - .1 Shall be stainless steel.
    - .2 Enclosure for splice shall be NEMA 4X listed as per UL50/CSA C22.2 No. 94.1.
    - .3 Enclosure shall have silicone gasket material.
    - .4 Enclosure shall have internal cover respecting the space requirements of CSA C22.2 No. 76.
  - .2 Termination Base:
    - .1 Termination base shall be listed as per CSA C22.2 No. 76.
  - .3 Terminal Wire Connectors:
    - .1 Terminal wire connectors shall be copper.
    - .2 Terminal wire connectors shall be listed as per UL 486A-486B/CSA C22.2 No. 65.
- 2.10.4 All terminations and splices shall be of an approved type for the conductors being used.
- 2.10.5 Where conductors are terminated or spliced, it shall be done in the following manner:
  - .1 Where a single solid conductor is terminated in a device under one screw or clamping mechanism, no additional terminating hardware is required.
  - .2 Where multiple or stranded conductors are terminated in a device under one screw or clamping mechanism, self-insulated crimp-on cable ends or approved equal shall be used up to and including No. 10 sized conductors. Approved compression lugs shall be used for larger conductor sizes.
  - .3 Where multiple conductors are spliced, properly sized Wing Nut connectors, or approved equal, shall be used for up to two (2) No. 8 or three (3) No. 10 AWG conductors. Pressure type sleeve cable connectors, splices, tee's, etc., shall be used for all larger size connections and terminations
  - .4 All bare surfaces of splices shall be insulated with heat shrink sleeving or equivalent.
  - .5 Conductors connected to ground rods for service or equipment grounding or to building structural or architectural elements shall be terminated, connected and spliced using a thermos-weld process or approved non-mechanical compression type connectors.
- 2.10.6 All service and feeder conductors shall be installed as continuous lengths without breaks, measured and cut based on site dimensions.

**2.11 Voltage Drop**

- 2.11.1 Voltage drop in power and control conductors shall be in accordance with the requirements of the Electrical Safety Code. Size conductors accordingly when sizes are not identified.

**2.12 Building Wire**

- 2.1.6 RW90:
  - .1 Single copper conductor.
  - .2 Minimum #12 America Wire Gauge (AWG) for branch circuit wiring.
  - .3 Minimum #14 AWG for 120V control wiring.
  - .4 Chemically cross-linked polyethylene insulation.
  - .5 Rated for 90°C, 600V.
  - .6 Suitable for handling to minus 40°C.
  - .7 For interior installations in conduit.

- .8 Runs to be limited to fixture drops and in walls, maximum exposed run 1.5 metres.
- 2.1.7 RWU90:
  - .1 Single copper conductor.
  - .2 Minimum #12 AWG for branch circuit wiring.
  - .3 Minimum #14 AWG for 120V control wiring.
  - .4 Chemically cross-linked polyethylene insulation.
  - .5 Rated for 90°C, 600V.
  - .6 Suitable for handling to minus 40°C.
  - .7 For exterior installations in conduit.

### 2.13 **Terminations and Splices**

- 2.2.2 All terminations and splices shall be of an approved type for the conductors being used.
- 2.2.3 Where conductors are terminated or spliced, it shall be done in the following manner:
  - .1 Where a single solid conductor is terminated in a device under one screw or clamping mechanism, no additional terminating hardware is required.
  - .2 Where multiple or stranded conductors are terminated in a device under one screw or clamping mechanism, self-insulated crimp-on cable ends or approved equal shall be used up to and including No. 10 sized conductors. Approved compression lugs shall be used for larger conductor sizes.
  - .3 Where multiple conductors are spliced, properly sized Wing Nut connectors, or approved equal, shall be used for up to two (2) No. 8 or three (3) No. 10 AWG conductors. Pressure type sleeve cable connectors, splices, tee's, etc., shall be used for all larger size connections and terminations
  - .4 All bare surfaces of splices shall be insulated with heat shrink sleeving or equivalent.
  - .5 Conductors connected to ground rods for service or equipment grounding or to building structural or architectural elements shall be terminated, connected and spliced using a thermos-weld process or approved non-mechanical compression type connectors.
- 2.2.4 All service and feeder conductors shall be installed as continuous lengths without breaks, measured and cut based on site dimensions.

### 2.14 **Voltage Drop**

- 2.3.4 Voltage drop in power and control conductors shall be in accordance with the requirements of the Electrical Safety Code. Size conductors accordingly when sizes are not identified.

## 3. **EXECUTION**

### 3.1 **Examination**

- 3.1.1 Verify that mechanical work likely to damage wire and cable has been completed.
- 3.1.2 Verify that raceway installation is complete and supported.

### 3.2 **Preparation**

- 3.2.1 Completely and thoroughly swab raceway before installing wire.

### 3.3 **Installation**

- 3.3.1 Route wire and cable as required to meet project conditions.
- 3.3.2 Install cable to the CSA C22.1.
- 3.3.3 Any Cross Linked Polyethylene (XLPE) wiring requiring replacement to be installed in Pressure Regulated Volume Control (PRVC) at all exposed areas unless otherwise specified.
- 3.3.4 All mechanical equipment to be connected with liquid tight flexible conduit.
- 3.3.5 Pull all conductors into raceway at same time.
- 3.3.6 Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- 3.3.7 Protect exposed cable from damage.

- 3.3.8 Support cables above accessible ceiling, using spring metal clips to support cables from structure. Do not rest cable on ceiling panels.
- 3.3.9 Use suitable cable fittings and connectors.
- 3.3.10 Neatly train and lace wiring inside boxes, equipment, and panel boards.
- 3.3.11 Clean conductor surfaces before installing lugs and connectors.
- 3.3.12 Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- 3.3.13 Use split bolt connectors for copper conductor splices and taps. Tape uninsulated conductors and connector with electrical tape to 150 per cent of insulation rating of conductor.
- 3.3.14 Identify and colour code wire and cable to Section 26 05 53 - Electrical Identification. Identify each conductor with its circuit number or other designation indicated.

**END OF SECTION**

**1. GENERAL****1.1 Section Includes**

- 1.1.1 Grounding electrodes and conductors.
- 1.1.2 Equipment grounding conductors.
- 1.1.3 Bonding.

**1.2 References**

- 1.2.1 Conform to Section 01 00 00 – General Requirements and all documents referred to therein.
- 1.2.2 CSA C22.1-09 - Canadian Electrical Code, Part I (21st Edition), Safety Standard for Electrical Installations.
- 1.2.3 Ontario Electrical Safety Code (24th Edition).
- 1.2.4 CSA C22.2 No.0.4 - Bonding of Electrical Equipment.
- 1.2.5 CSA C22.2 No. 41 - Grounding and Bonding Equipment.
- 1.2.6 ANSI/TIA/EIA J-STD-607-A - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

**1.3 Grounding System Description**

- 1.3.1 All live metal parts of emergency generator to satisfy Ontario Electrical Safety Code (OESC) latest edition.

**1.4 Performance Requirements**

- 1.4.1 Grounding System Resistance: maximum up to 5 ohms.
- 1.4.2 Provide all equipment grounding as required regardless of whether it has been shown on the Contract Drawings or called for in this Specification. Arrange grounds so that under normal operating conditions no injurious amount of current will flow in any grounding conductor.

**1.5 Submittals for Information**

- 1.5.1 Test Reports: Indicate overall resistance to ground and resistance of each electrode.
- 1.5.2 Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

**1.6 Submittals for Closeout**

- 1.6.1 Project Record Documents: Record actual locations of components and grounding electrodes.
- 1.6.2 Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

**1.7 Qualifications**

- 1.7.1 Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three (3) years' experience.

**1.8 Regulatory Requirements**

- 1.8.1 Products: Listed and classified testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

**2. PRODUCTS****2.1 Mechanical Connectors**

- 2.2.1 Material: Bronze.

**2.2 Wire**

- 2.2.1 Material: Stranded copper.
- 2.2.2 Foundation Electrodes: 2/0 AWG.
- 2.2.3 Grounding Electrode Conductor: Size to meet Ontario Electrical Safety Code requirements.

**3. EXECUTION****3.1 Examination**

- 3.1.1 Verify and examine existing bonding related to the scope of work of this Project.

**3.2 Installation**

- 3.2.1 Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where required.
- 3.2.2 Provide bonding to meet Regulatory Requirements.
- 3.2.3 Bond together metal siding not attached to grounded structure; bond to ground.
- 3.2.4 Install ground grid under access floors indicated. Construct grid of 6 AWG bare copper wire installed on 24 inch centres both ways. Bond each access floor pedestal to grid.
- 3.2.5 Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to under floor ground grid. Use 6 AWG bare copper conductor.
- 3.2.6 Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- 3.2.7 Interface with site grounding system.
- 3.2.8 Interface with lightning protection system, if present.

**3.3 Field Quality Control**

- 3.3.1 Perform inspections and tests listed in International Electrical Testing Association (NETA) Acceptance Testing Specifications (ATS), Section 7.13

**END OF SECTION**

**1      GENERAL****1.1      General Requirements**

- 1.1.1 Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

**1.2      Work included**

- 1.2.1 Provide all hangers and supports necessary for the electrical work and as required to complete the installation.

**1.3      References**

- 1.3.1 ASTM A123, Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
- 1.3.2 ASTM A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by Hot-Dip Process.
- 1.3.3 ASTM B766, Specification for Electrodeposited Coatings of Cadmium.
- 1.3.4 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standards for Electrical Installations.
- 1.3.5 OESC, Ontario Electrical Safety Code.

**2      PRODUCTS****2.1      Materials**

- 2.1.1 Steel sheet: ASTM A653, Z275 coating designation; galvanized steel sheet.
- 2.1.2 Hardware: hot-dipped galvanized steel, unless otherwise specifically noted on the Contract Drawings.
- 2.1.3 Fastening devices in various types of structure:
- .1 Precast concrete panel: sleeve anchor, 10mm maximum diameter and 50mm deep.
  - .2 Concrete structure: stud bolt by star, red head stud anchors, sleeve anchor, size shown on the Contract Drawings or approved by the Consultant.
  - .3 Concrete block wall: spring-in toggle bolt
  - .4 Concrete anchoring:
    - .1 Red head by “Philips” or approved equivalent.
  - .5 Machine bolts and threaded rod:
    - .1 Cadmium plated to ASTM B766. Size machine bolts and threaded rod according to the Contract Drawings or as accepted by the Consultant.
  - .6 Hollow wall anchoring:
    - .1 Spring-in toggle bolt by “Star” or approved equivalent.
  - .7 Platform mounting channels:
    - .1 Flexibar spring nuts
  - .8 Steel beams and columns:
    - .1 Bolts, washers, and nuts, cadmium plated to ASTM B766.
  - .9 Fastening equipment to mounting channel:
    - .1 Spring nuts, accessories and hardware by strut system manufacturer.
  - .10 Supports and brackets:
    - .1 Supply supports and brackets for installation of equipment, cables, and cable trays and conduit in accordance with manufacturer’s written requirements. Hot-dip galvanize steel parts after fabrication to ASTM A123.
    - .2 Cushion clamps for fastening cables.
  - .11 Wire harness:
    - .1 Supply strapping for control wire and cable installation within equipment.
- 2.1.4 Fasteners:
- .1 Expansion bolt or concrete anchor, drilled-in type, 10mm diameter studboly by “Star”, readhead by “Philips” or approved equal.

- 2.1.5 Clamps:
  - .1 Stainless steel as recommended by support channel manufacturer.
- 2.1.6 Galvanizing:
  - .1 ASTM A123, 457 g/m<sup>2</sup>, galvanized after fabrication.

## 2.2 **Fabrication**

- 2.2.1 Fabricate mounting channels for cable trough in U-shape; hot dip galvanized after fabrication to ASTM A123.

## 2.3 **Acceptable Manufacturer's**

- 2.3.1 Unitstrut
- 2.3.2 Hilti
- 2.3.3 Copper (B-Line)
- 2.3.4 Thomas & Betts

# 3 **EXECUTION**

## 3.1 **Installation**

- 3.1.1 Precast concrete panel: obtain approval from the Consultant before drilling precast concrete panels. Install in accordance with manufacturer's instructions.
- 3.1.2 Install support channels for support of conduits, cables, troughs, trays, boxes, cabinets, and other electrical devices and equipment.
- 3.1.3 Install mounting channels in precast reinforced concrete trough at 1.22mm intervals along entire length of trough.
- 3.1.4 Fasten support channels at maximum 100mm from each end and install clamps for mounting conduits and cables on channels.
- 3.1.5 Secure equipment to poured concrete with drilled-in expandable inserts.
- 3.1.6 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- 3.1.7 Secure surface mounted equipment with twist clip fasteners to inverted T-Bar ceilings. Before installation, ensure ceiling can adequately support the weight of the equipment specified.
- 3.1.8 Steel beams and columns: drill through steel and bolt as accepted by the Consultant.
- 3.1.9 Support equipment, conduit or cables using clips, spring-loaded bolts, cable clamps designed as accessories to basic channel members.
- 3.1.10 Wire harness:
  - .1 Install in accordance with manufacturer's instructions. Install wire harness to support wires and cables correctly.
- 3.1.11 Fasten exposed conduit or cables to structures or support system using straps, as follows:
  - .1 One-hole steel straps to secure surface conduits and cables smaller than 50mm diameter.
  - .2 Two-hole steel straps for conduits and cables 50mm and larger in diameter.
  - .3 Beam clamps to secure conduit to exposed steel work.
- 3.1.12 Suspended support systems:
  - .1 Support individual cable or conduit runs with 6mm diameter threaded rods and spring clips.
  - .2 Support two (2) or more cables or conduits on channels supported by 6mm diameter threaded rod hangers where direct fastening to building construction is impractical.
- 3.1.13 For surface mounting of two (2) or more conduits, use channels at maximum 1500mm spacing.
- 3.1.14 Install metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- 3.1.15 Do not use supports or equipment installed for other trades for conduit or cable supports except with permission of other trade and with the acceptance of the Contractor.
- 3.1.16 Do not use wire lashing or perforated straps to support or secure raceways or cables.



- 3.1.17 Install fastenings and supports as required for each type of equipment, cables, and conduits, and in accordance with manufacturer's installation recommendations.
- 3.1.18 Touch-up abrasions, cuts and welds of galvanized material with "Galvicon"

**END OF SECTION**

**1. GENERAL****1.1 Related Sections**

- 1.1.1 Conform to Section 01 00 00 – General Requirements and all documents referred to therein.
- 1.1.2 Section 01 00 01 - General Requirements.
- 1.1.3 Section 26 00 00 – General Electrical Requirements.
- 1.1.4 Section 26 05 26 - Grounding and Bonding.
- 1.1.5 Section 26 05 53 - Electrical Identification.

**1.2 References**

- 1.2.1 CSA C22.1-09 - Canadian Electrical Code, Part I (21st Edition), Safety Standard for Electrical Installations.
- 1.2.2 Ontario Electrical Safety Code (24th Edition).
- 1.2.3 CAN/CSA-C22.2 No. 18 - Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
- 1.2.4 CSA C22.2 No.45 - Rigid Metal Conduit.
- 1.2.5 CSA C22.2 No. 45.1 - Rigid Metal Conduit - Steel.
- 1.2.6 CSA C22.2 No. 56 - Flexible Metal Conduit and Liquid Tight Flexible Metal Conduit.
- 1.2.7 CSA C22.2 N0.83.1 (CSA/UL) - Electrical Metallic Tubing –Steel.
- 1.2.8 CSA C22.2 No. 211.1 - Rigid Types EB1 and DB2/ES2 Polyvinyl Chloride (PVC) Conduit.
- 1.2.9 CSA C22.2 No.211.2 - Rigid PVC (Unplasticized) Conduit.
- 1.2.10 CSA C22.2 No. 211.3 (CSA/UL) - Reinforced Thermosetting Resin Conduit (RTRC) on Fittings.
- 1.2.11 CSA C22.2 No. 227.1 (CSA/UL) - Electrical Nonmetallic Tubing.
- 1.2.12 CSA C22.2 No. 227.2.1 (CSA/UL) Liquid-Tight Flexible Nonmetallic Conduit.
- 1.2.13 NFPA 70 – National Electrical Code.

**1.3 Design Requirements**

- 1.3.1 CSA C22.1 - Canadian Electrical Code, Part I (21st Edition), Safety Standard for Electrical Installations.

**1.4 Work Included**

- 1.4.1 Provide all electrical boxes necessary for the electrical work and as required to complete the installation.

**1.5 Project Record Documents**

- 1.5.1 Accurately record actual routing of conduits larger than 51mm.

**1.6 Regulatory Requirements**

- 1.6.1 Provide products listed and classified by CSA (Canadian Standards Association) as suitable for purpose specified and shown.

**1.7 Delivery, Storage, and Handling**

- 1.7.1 Accept conduit on site. Inspect for damage.
- 1.7.2. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

**1.8 Project Conditions**

- 1.8.1 Verify that field measurements are as shown on the Contract Drawings.
- 1.8.2 Verify routing and termination locations of conduit prior to rough in.
- 1.8.3 Conduit routing is shown on the Contract Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

**2. PRODUCTS****2.1 Conduit Requirements**

- 2.1.1 Outdoor Locations, Above Grade: Use electrical metallic tubing in other areas unless otherwise noted.
- 2.1.2 Wet and Damp Locations: Use rigid and non-metallic tubing.
- 2.1.3 Exposed: Use rigid steel and electrical metallic tubing.

3. **EXECUTION**

3.1 **Installation**

- 3.1.1 Install conduit to CSA C22.1.
- 3.1.2 Install non-metallic conduit to manufacturer's instructions.
- 3.1.3 Arrange supports to prevent misalignment during wiring installation.
- 3.1.4 Support conduit using coated steel or malleable iron straps, lay in adjustable hangers, clevis hangers, and split hangers.
- 3.1.5 Group related conduits; support using conduit rack.
- 3.1.6 Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- 3.1.7 Fasten conduit supports to building structure.
- 3.1.8 Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- 3.1.9 Do not attach conduit to ceiling support wires.
- 3.1.10 Arrange conduit to maintain headroom and present neat appearance.
- 3.1.11 Route exposed conduit parallel and perpendicular to walls.
- 3.1.12 Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- 3.1.13 Route conduit in and under slab from point to point.
- 3.1.14 Maintain adequate clearance between conduit and piping.
- 3.1.15 Maintain 300mm clearance between conduit and surfaces with temperatures exceeding 40°C.
- 3.1.16 Cut conduit square using saw or pipe cutter; de burr cut ends.
- 3.1.17 Bring conduit to shoulder of fittings; fasten securely.
- 3.1.18 Use conduit hubs or sealing locknuts to fasten conduit and to cast boxes.
- 3.1.19 Install no more than equivalent of three 90 degree bends between boxes.
- 3.1.20 Use conduit bodies to make sharp changes in direction, as around beams.
- 3.1.21 Use hydraulic one shot bender to fabricate bends in metal conduit larger than 50mm size.
- 3.1.22 Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- 3.1.23 Provide suitable fittings to accommodate expansion and deflection where conduit crosses expansion joints.
- 3.1.24 Provide suitable pull string in each empty conduit except sleeves and nipples.
- 3.1.25 Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- 3.1.26 Ground and bond conduit to Section 26 05 26 - Grounding and Bonding.
- 3.1.27 Identify conduit to Section 26 05 53 - Electrical Identification.

**END OF SECTION**

## 1

**GENERAL****1.1 Related Sections**

- 1.1.1 Conform to Section 01 00 00 – General Requirements and all documents referred to therein.
- 1.1.2 Section 26 05 26 - Grounding and Bonding
- 1.1.3 Section 26 05 29 – Hangers and Supports

**1.2 References**

- 1.2.1 ASTM A123/A123M – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- 1.2.2 ASTM A653/A653M – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- 1.2.3 CSA C22.1 – Canadian Electrical Code, latest edition.
- 1.2.4 CSA C22.2 No. 126.1 – Metal Cable Tray Systems, latest edition.

**1.3 Submittals for Review**

- 1.3.1 Product Data:
  - .1 Provide data for fittings and accessories.
- 1.3.2 Shop Drawings:
  - .1 Indicate tray type, dimensions, support points, and finishes.

**1.4 Submittals for Information**

- 1.4.1 Manufacturer's Instructions:
  - .1 Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.
  - .2 Include instructions for storage, handling, protection, examination, preparation, and installation of product.

**1.5 Submittals for Closeout**

- 1.5.1 Project Record Documents:
  - .1 Record actual routing of cable tray and locations of supports.

**1.6 Qualifications**

- 1.6.1 Manufacturer:
  - .1 Company specializing in manufacturing the products specified in this Section with a minimum of three (3) years experience and with service facilities within 100km of project site.

**1.7 Regulatory Requirements**

- 1.7.1 Products:
  - .1 Listed and classified by CSA (Canadians Standards Association) and ULC (Underwriters Laboratories Inc., as suitable for the purposes specified and indicated.
- 1.7.2 Field Measurements:
  - .1 Verify that field measurements are as indicated on shop drawings and instructed by manufacturer.

## 2

**PRODUCTS****2.1 Ladder-Type Cable Tray**

- 2.1.1 Description: CSA 22.2 No. 126.1, Class C1 ladder type tray.
- 2.1.2 Material:
  - .1 Steel
- 2.1.3 Finish:
  - .1 ASTM A 123, hot dipped galvanized after fabrication and painted with grey epoxy coating.
- 2.1.4 Cable tray dimensions as indicated on the Contract Drawings.
- 2.1.5 Provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and grounding straps.

**2.2     Warning Labels**

- 2.2.1     Engraved nameplates: 13mm – ½ inch with black letters on yellow laminated plastic nameplate, engraved with the following wording:

WARNING! DO NOT USE CABLE TRAY AS WALKWAY, LADDER, OR  
SUPPORT. USE ONLY AS STRUCTURAL SUPPORTS FOR CABLES AND  
TUBING!

**3       EXECUTION****3.1       Installation**

- 3.1.1     Install metallic cable tray to CSA C22.1 SB-02 and C22.2 No. 126.1.
- 3.1.2     Provide supports at each connection point, at the end of each run, and at others points to maintain spacing between supports of 610mm – (24 inches) maximum.
- 3.1.3     Use expansion connectors where required.
- 3.1.4     Provide fire stopping to sustain ratings when passing cable tray through fire-rated elements.
  - .1        Provide continuity between tray components.
  - .2        Use anti-oxidant compound to prepare aluminum contact surfaces before assembly.
  - .3        Provide 2 AWG bare copper equipment grounding conductor through entire length of tray; bond to each component.
  - .4        Connections to tray may be made using mechanical or exothermic connectors.
  - .5        Install warning labels at 1500mm centers along cable tray, located to be clearly visible.

**END OF SECTION**

**1. GENERAL****1.1 Section Includes**

- 1.1.1 Nameplates and labels.
- 1.1.2 Wire and cable markers.
- 1.1.3 Conduit markers.

**1.2 Related Sections**

- 1.2.1 Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

**1.3 Submittals**

- 1.3.1 Product Data: Provide catalogue data for nameplates, labels, and markers.
- 1.3.2 Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

**1.4 Regulatory Requirements**

- 1.4.1 Provide products listed and classified by CSA as suitable for the purpose specified and indicated.

**2. PRODUCTS****2.1 Nameplates and Labels**

- 2.1.1 Nameplates: Engraved three-layer laminated plastic, letters on contrasting background: 347/600 Volt Emergency System: White text on Blue Background.
- 2.1.2 Confirm colours with the Consultant prior to ordering nameplates.
- 2.1.3 Equipment Nameplates shall indicate:
  - .1 Equipment/Panelboard ID,
  - .2 Ampacity,
  - .3 Voltage,
  - .4 Phase,
  - .5 Wire,
  - .6 Interrupting Capacity, and
  - .7 Size, number of poles, Panelboard ID, and circuit number of upstream overcurrent protection device.
- 2.1.4 Branch Breaker nameplates on Distribution Panels and Switchboards shall indicate:
  - .1 Equipment ID
  - .2 Breaker size and number of poles
  - .3 Circuit number.
- 2.1.5 Locations: Outdoor Diesel Generator Distribution if required replacement per site conditions.
- 2.1.6 Letter Size:
  - .1 Use 3mm letters for identifying individual equipment and loads. Use 6mm letters for identifying grouped equipment and loads
- 2.1.7 Labels: Mechanically fastened with sheet metal screws, with 5 mm white letters on black background. White letters on red background for Uninterrupted Power Supply (UPS) and equipment, and devices downstream of UPS.

**2.2 Wire Markers**

- 2.2.1 Description: tape, split sleeve, or tubing type wire markers.
- 2.2.2 Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes and each load connection.
- 2.2.3 Legend:
  - .1 Power and Lighting Circuits: Branch circuit or feeder number indicated on the Contract Drawings.
  - .2 Control Circuits: Control wire number indicated on shop drawings.

**2.3     Conduit Markers**

- 2.3.1     Location: Provide markers for each conduit longer than 2m.
- 2.3.2     Spacing: 6m on centre.
- 2.3.3     Colours to match equipment nameplate background colour: 347/600 Volt System: Blue.
- 2.3.4     Confirm colours with the Consultant prior to commencing rough-in.

**3.     EXECUTION****3.1     Preparation**

- 3.1.1     Degrease and clean surfaces to receive nameplates and labels.

**3.2     Application**

- 3.2.1     Install nameplate and label parallel to equipment lines.
- 3.2.2     Secure nameplate to equipment front using adhesive.
- 3.2.3     Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.
- 3.2.4     Identify conduit using field painting.
- 3.2.5     Paint coloured band on each conduit longer than 2m.
- 3.2.6     Paint bands 6m on centre.
- 3.2.7     Colour: confirm.

**END OF SECTION**

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**1. GENERAL****1.1 Scope**

- 1.1.1 The Contractor shall provide an engineering analysis and coordination study for the new portions of electrical distribution system. The basic analysis shall include a short-circuit analysis with protective device evaluation, and a protective device coordination study.
- 1.1.2 The Project shall begin at the point of utility service for the facility and continue down through the system to all downstream distribution and branch panelboards, motor control centres and significant motor locations.
- 1.1.3 The Project shall include any new Automatic Transfer Switches and generator ground fault protection.

**1.2 Related Sections**

- 1.2.1 Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

**1.3 Submittals**

- 1.3.1 Submit the following according to the Conditions of the Contract and Division 1 Specification Sections:
  - 1.3.2 Submit for review three (3) copies of the protection coordination study.
  - 1.3.3 Shop drawings for equipment effected by the coordination study will not be reviewed until the coordination study has been submitted and approved.
  - 1.3.4 A one-line diagram of the system shall be included.
  - 1.3.5 The final report shall be bound in a three-ring binder.

**1.4 Projection System Coordination**

- 1.4.1 Prepare a graph or co-ordination curves, prior to manufacture of service entrance and distribution equipment on K & E No. 336E Time-Current characteristic graph paper. Time-current characteristics shall be plotted of the following:
  - .1 Main and feeder protective devices at every voltage level used in emergency distribution system.
  - .2 Protective devices associated with largest motor and/or refrigeration compressor.
- 1.4.2 Each time-current characteristic curve sheet shall include:
  - .1 A single line diagram for the portion of the system involved.
  - .2 Transformer damage curves (where applicable).
  - .3 Cable damage curves (where applicable).
  - .4 Available fault levels for the portion of the system involved.
- 1.4.3 Consult manufacturer of the refrigeration compressors and obtain recommendations for settings on starters. Incorporate information in co-ordination curves and submit the associated curves to Compressor Manufacturer and obtain approval from the manufacturer.
- 1.4.4 Compressor Manufacturer and mechanical trade contractor will determine and calibrate proper protection on motor starters and will ensure that it co-ordinates with protective devices on switchboard.
- 1.4.5 Co-ordination curves, mentioned above, shall be prepared by distribution equipment manufacturers as soon as possible after award of contract.
- 1.4.6 At the option of the Contractor under this Section, these co-ordination curves may also be prepared by an independent testing organization. In this case, the independent testing organization shall determine the proper settings of all protective relays and devices and pass them on to the Switchboard manufacturer for incorporation into the switchboards. Include all associated costs in the Contract Price.
- 1.4.7 Distribution Equipment manufacturers shall examine drawings and specifications prior to award of contract to ensure that relays and devices being supplied by them will co-ordinate satisfactorily to Supply Authority requirements. Payment will not be allowed, after award of contract, for extra charges due to device changes to comply with recommended practices, due to oversight or negligence by distribution equipment manufacturers.



**1.5     Related Standards**

- 1.5.1     All studies shall be performed in accordance with the latest applicable IEEE and ANSI standards.

**1.6     Quality Assurance**

- 1.6.1     Preparer Qualifications:     Firm experienced in the analysis, evaluation, and coordination of electrical distribution systems and similar to the system for this Project.
- 1.6.2     The study shall be prepared in accordance with the latest edition of NETA Std. ATS, the Canadian Electrical Code, as well as manufacturer's recommendations.
- 1.6.3     Short-Circuit Analysis and Coordination Study shall be performed by a registered Professional Engineer. Study shall be signed and sealed by the Engineer. The firm conducting the study shall have one million dollars' worth of Professional Liability Insurance in addition to Standard General Insurance.

**2.     PRODUCTS****2.1     Short-Circuit Analysis with Protective Device Evaluation**

- 2.1.1     Systematically calculate fault currents based on the available fault current at the facility service entrance. Study preparer shall obtain the available fault current from the local utility.
- 2.1.2     Short-circuit calculations shall be prepared by means of a digital computer utilizing a commercially available software package. Motor contribution shall be incorporated in determining fault levels.
- 2.1.1     Results of short-circuit calculations shall be presented in tabular form and shall include momentary and interrupting fault values for three-phase and phase-to-ground faults.
- 2.1.3     Analyze the short-circuit currents by preparing a tabulation comparing the fault levels to the device interrupting ratings. Indicate areas in which integrated/series ratings are utilized. The following information shall be included in the tabulation:
- .1     Bus identification number.
  - .2     Location identification.
  - .3     Voltage.
  - .4     Manufacturer and type of equipment.
  - .5     Device rating.
  - .6     Calculated short-circuit current.

**2.2 Protective Device Coordination Study**

- 2.2.1 Prepare coordination time-current characteristic curves to determine the required settings/sizes of the protective devices to maximize selectivity. The utility upstream protective device feeding the facility shall be maintained as the upper limit for coordination. These settings shall be obtained by the preparer, along with any other protective device setting requirements. The coordination curves shall be prepared on log-log paper and illustrate adequate clearing times between series devices. The curves shall be created through the use of the study software package but must reflect actual protective devices to be installed. Adequate time-current curves shall be generated to depict coordination. In addition, protective device characteristics shall be suitably determined to reflect calculated short-circuit levels at the location.
- 2.2.2 A narrative analysis shall accompany each coordination curve sheet and describe the coordination and protection in explicit detail. All curve sheets shall be multi-color for improved clarity. Areas lacking complete coordination shall be highlighted and reasons provided for allowing condition to remain or provide solution to resolve situation. System coordination, recommended ratings, and setting of protective devices shall be accomplished by a registered professional electrical engineer with a minimum of eight (8) years of current experience in the coordination of electrical power systems.
- 2.2.3 The following information shall be provided on all curve sheets.
- .1 Device identification and associated settings/size.
  - .2 Voltage at which curves are plotted.
  - .3 Current multiplier.
  - .4 ANSI frequent fault damage curve.
  - .5 Cable insulation damage curves.
  - .6 Transformer inrush point.
  - .7 Single-line for the portion of the system.
  - .8 Motor starting profiles (where applicable).

**2.3 Single Line Diagram**

- 2.3.1 The final report shall include a multi-colour approved single-line diagram and submitted on 11" x 17" format in the closeout document of the electrical distribution system within the scope of the project. The single-line shall include:
- 2.3.2 Transformer rating, voltage ratio, impedance, and winding connection.
- 2.3.3 Feeder cable phase, neutral and ground sizes, length of cable, conductor material, and conduit size and type.
- 2.3.4 Generator ATS's and switches continuous current ratings.
- 2.3.5 Protective relays with appropriate device numbers.
- 2.3.6 Detailed legend indicating device type identification and other significant details.

**3. EXECUTION****3.1 Summary**

- 3.1.1 The results of the system studies shall be summarized in a final report.
- 3.1.2 Where required, copies of the final report shall be submitted to the power company for their review and approval. Approved copies of the report shall be submitted to the Consultant.

3.2 **Field Settings**

- 3.2.1 The Contractor shall engage the manufacturer's service group or alternately a qualified independent testing firm to perform field adjustments of the protective devices as required for placing the equipment in final operating condition. The settings shall be in accordance with the approved short circuit study and protective device evaluation / coordination study.
- 3.2.2 Necessary field settings of devices and adjustments and minor modifications to equipment to accomplish conformance with the approved short-circuit and protective device coordination study, shall be carried out by manufacturer's service group.

**END OF SECTION**

**1. GENERAL****1.1 Submittals**

- 1.1.1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.
- 1.1.2 Product Data: include product characteristics, performance criteria, physical size, horsepower, watt rating, limitations and finish.
- 1.1.3 Indicate dimensions, recommended installation procedure, wiring diagrams, sizes and location of mounting bolt holes and recommended support method.
- 1.1.4 Quality Assurance Submittals:
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Manufacturer's instructions: submit manufacturer's installation instructions

**1.2 General Requirements**

- 1.2.1 Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

**2. PRODUCTS****2.1 General**

- 2.1.1 Refer to Mechanical Equipment and Wiring schedule for equipment list and wiring scope.
- 2.1.2 Refer to related sections for motor specifications.
- 2.1.3 Equipment to be supplied by other divisions for installation by this division.

**3. EXECUTION****3.1 Manufacturer's Instructions**

- 3.1.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

**3.2 Installation**

- 3.2.1 Install wiring, flexible connections, and grounding.
- 3.2.2 Check rotation before coupling to driven equipment.

**3.3 Cleaning**

- 3.3.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

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**1. GENERAL****1.1 Scope**

1.1.1 The contractor shall furnish and install where indicated on the drawings a dead front type, low-voltage service entrance (or non-service entrance) switchboard, combining a main breaker (or fusible switch), utility metering transformer compartment (where required) and distribution feeder section(s) in a switchboard assembly. The switchboard to be built in factory in single switchboard sections, to be assembled on site, by the contractor.

- .1 General assembly drawing of the boiler including product description, model number, dimensions, clearances, weights, service sizes, etc.
- .2 Schematic flow diagram of the boiler's gas valve train(s).
- .3 Schematic wiring diagram of the boiler's control system that shows all components, interlocks, etc. and shall clearly identify factory wiring and field wiring.

**1.2 References**

1.2.1 The low voltage switchboard assembly and all components shall be designed, manufactured, and tested in accordance with the latest applicable following standards:

- .1 CSA C22.2 No. 244 or No. 31 (Switchboards)
- .2 CSA C22.2 No. 5 (Moulded Case Circuit Breakers)
- .3 CSA C22.2 No. 4 (Dead Front Switches)
- .4 ANSI C37.13 (Power Circuit Breakers)
- .5 ANSI C37.17 (Trip Devices)

**1.3 Submittals for Review/Approval**

1.3.1 The following information shall be submitted to the Engineer.

- .1 Specification Sheet
- .2 Layout Sheet - Front view and plan view of the assembly
- .3 Single Line diagram.
- .4 Schematic diagram (where required).
- .5 Component List.
- .6 Floor plan with conduit/cable space locations.
- .7 Assembly ratings including:
  - .1 Short circuit rating
  - .2 Voltage class
  - .3 Continuous current rating
- .8 Major component ratings including:
  - .1 Voltage class
  - .2 Continuous current
  - .3 Interrupting ratings
- .9 Cable lug/termination sizes

**1.4 Submittals for Close-out**

1.4.1 The following information shall be submitted for record purposes prior to final payment.

- .1 Final as-built drawings for items listed in section 1.04.
- .2 Wiring diagrams (where applicable).
- .3 Installation information including equipment anchorage provisions.

1.4.2 The final as-built drawings shall include the same drawings as the construction drawings and shall incorporate all changes made during the manufacturing process.

**1.5 Qualifications**

1.5.1 The manufacturer of the assembly shall be the manufacturer of the moulded case breakers, fusible switches and/or power circuit breakers installed within the assembly.

- 
- 1.5.2 The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this request.

1.6 **Regulatory Requirements**

- 1.6.1 The switchboard shall comply with the latest standard CSA C22.2 No. 244, or No. 31. The assembly shall bear a CSA label. All devices and components contained in this switchboard shall bear a CSA label and comply with the latest issue of their respective CSA standard. All power circuit breakers shall meet ANSI C37.13 and be CSA certified for use in the assembly.

1.7 **Delivery, Storage, and Handling**

- 1.7.1 Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.
- 1.7.2 Each switchgear assembly shall be split into shipping groups for handling as determined during the shop drawing phase jointly with the installing contractor. Shipping groups shall be designed to be shipped by truck, rail or ship. Shipping groups shall be bolted to skids, and covered with tarps for protection from weather. Accessories shall be packaged separately.

2. **PRODUCT**

2.1 **Ratings**

- 2.1.1 Voltage rating shall be as indicated on the drawings. The entire assembly shall be suitable for 240 volts maximum service.
- 2.1.2 The service panel bus shall be rated 800 amperes.
- 2.1.3 The assembly shall be rated, type tested and CSA listed to withstand a short circuit of 65,000 amperes symmetrical tested in accordance with CSA C22.2 No. 244, or No. 31.
- 2.1.4 All bussing shall be tin plated aluminum and braced as per short circuit requirements of 2.02 (C) above. Bus sizing shall be based on CSA standard temperature rise criteria of 65 degrees C over a 40 degree C ambient (outside the enclosure).
- 2.1.5 Provide a full capacity neutral bus where a neutral bus is indicated on the drawings.
- 2.1.6 A copper ground bus (minimum 1/4 x 2 inch) shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchboard.
- 2.1.7 All hardware used on conductors shall be high-tensile strength and zinc-plated. All bus joints shall be provided with conical spring-type washers.

2.2 **Construction**

- 2.2.1 The service entrance switchboard shall be Sprinklerproof per CEC 26-008 enclosed, and fabricated from code gauge steel complete with formed doors to form a rigid dead front, totally enclosed structure. The service entrance switchboard shall be free standing.
- 2.2.2 Where required, all compartments are to be designed to make components totally front accessible to enable the switchboard to be installed against the wall.
- 2.2.3 For custom applications, Rear Access and Side Access configurations are available. Isolation barriers shall be provided to separate the main disconnect device and the utility current/potential transformer section. The distribution section(s) / cell(s) shall be separately barriered and isolated from the main service entrance section. Ventilation shall be provided to meet CSA temperature

rise requirements. Where a sprinklerproof switchboard is supplied, ventilation shall not compromise sprinklerproof rule 26-008 of the Canadian Electrical Code.

2.2.4 All structures and covers are to be painted ASA-61 Grey

2.2.5 The switchboard shall consist of the required number of vertical sections bolted together to form a rigid assembly. Provision shall be made for additional structures as required to accommodate future additions.

### 2.3 **Wiring/Terminations**

2.3.1 Small wiring, necessary fuse blocks and terminal blocks within the switchboard shall be furnished as required. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.

2.3.2 NEMA 2-hole lugs shall be provided for all line side terminations suitable for copper or aluminum cable rated for 75 degrees C of the size indicated on the drawings.

2.3.3 Lugs shall be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors shall be provided as indicated on the drawings.

2.3.4 All control wire shall be type SIS, bundled and secured with nylon ties. Insulated locking spade terminals shall be provided for all control connections, except where saddle type terminals are provided integral to a device. All current transformer secondary leads shall first be connected to conveniently accessible short-circuit terminal blocks before connecting to any other device. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips. Provide wire markers at each end of all control wiring.

### 2.4 **Main Breaker**

2.4.1 The main breaker shall be an Eaton moulded case type 600A with RMS sensing standard thermal magnetic trip unit. Changing the breaker's continuous rating shall be accomplished by the use of a mechanically interlocked rating plug, or adjustment of Long Delay Pick-up setting, with no exposure to live parts (trip unit on standard thermal magnetic breaker may be changed, however all power to switchboard must be disconnected prior to removal of breaker cover). The breaker's interrupting rating shall be 65 kA RMS Symmetrical at 240V.

### 2.5 **Utility Metering Transformer Compartment**

2.5.1 When requested, the utility transformer compartment shall be designed to meet the local utility requirements. It shall be bussed and pre-drilled to accept standard bar type and/or window type current transformers. The compartment shall have a hinged, padlockable access door.

### 2.6 **Distribution Section – Group Chassis Mounted**

2.6.1 The distribution section shall be designed to accept the installation of circuit breakers and/or fusible switches or fusible meter switches, type FSMC (fusible switch meter sockets) on an Eaton Pow-R-Line 4 type interior. Any space not occupied by a feeder breaker or switch shall have a filler plate allowing no access to parts when energized.

2.6.2 Each full height distribution cubicle shall accommodate 50X of vertical distribution space suitable for use with both moulded case circuit breakers and/or fusible switches. Standard distribution cubicle dimensions shall be 90" high x 30" wide x 18" deep.

**2.7 Nameplates**

- 2.7.1 Engraved nameplates, mounted on the face of the assembly, shall be furnished for all main and feeder circuits as indicated on the drawings. Nameplates shall be laminated plastic, black characters on white background. Characters shall be 3/16- inch high, minimum. Nameplates shall give item designation and circuit number as well as frame ampere size and appropriate trip rating. Furnish master nameplate giving switchboard designation, voltage ampere rating, short-circuit rating, manufacturer's name, general order number, and item number.
- 2.7.2 Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.

**2.8 Finish**

- 2.8.1 All exterior and interior steel surfaces of the switchboard shall be properly cleaned and provided with a rust-inhibiting phosphatized coating. Color and finish of the switchboard shall be ASA 61 light gray.

**3. EXECUTION****3.1 Factory Testing**

- 3.1.1 The switchboard shall be completely assembled, wired, adjusted and tested at the factory. After assembly, the complete switchgear shall be tested to ensure the accuracy of the wiring and the functioning of all equipment. The main bus system shall be given a dielectric test of 2200 volts for one minute between live parts and ground and between opposite polarities.
- 3.1.2 The wiring and control circuits shall be given a dielectric test of 1500 volts for one minute between live parts and ground, in accordance with CSA standards.
- 3.1.3 A certified test report of all standard production tests shall be shipped with each assembly.

**3.2 Field Quality Control**

- 3.2.1 Provide the services of a qualified factory-trained manufacturer's representative to assist the Contractor in installation and start-up of the equipment specified under this section. The manufacturer's representative shall provide technical direction and assistance to the contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained therein.
- 3.2.2 The Contractor shall provide three (3) copies of the manufacturer's field startup report.

**3.3 Manufacturer's Certification**

- 3.3.1 A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.
- 3.3.2 The Contractor shall provide three (3) copies of the manufacturer's representative's certification before final payment.

**3.4 Training**

- 3.4.1 The Contractor shall provide a training session for up to five (5) owner's representatives at a job site location determined by the owner.
- 3.4.2 The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of the instruction on the operation of the assembly, circuit breakers, and major components within the assembly.



**3.5 Field Service Organization**

- 3.5.1 The manufacturer of the Switchgear shall also have a national service organization that is available throughout Canada and is available on call 24 hours a day, 365 days a year.
- 3.5.2 Equipment warranty shall be extended to two years from date of installation when service representatives employed by the equipment manufacturer perform installation.

**3.6 Installation**

- 3.6.1 The Contractors shall install all equipment per the manufacturer's recommendations and the contract drawings.
- 3.6.2 All necessary hardware to secure the assembly in place shall be provided by the Contractor.
- 3.6.3 The equipment shall be installed and checked in accordance with the manufacturer's recommendations. This shall include but not limited to:
  - .1 Checking to ensure that the pad location is level to within 0.125 inches per three foot of distance in any direction
  - .2 Checking to ensure that all bus bars are torqued to the manufacturer's recommendations
  - .3 Assembling all shipping sections, removing all shipping braces and connecting all shipping split mechanical and electrical connections
  - .4 Securing assemblies to foundation or floor channels
  - .5 Measuring and recording Megger readings phase-to-phase, phase-to-ground, and neutral-to-ground (four wire systems only)
  - .6 Inspecting and installing all circuit breakers in their proper compartments

**END OF SECTION**

**1. GENERAL****1.1 General**

- 1.1.1 Conform to Section 01 00 00 – General Requirements and all documents referred to therein.

**1.2 Section Includes**

- 1.2.1 Materials and installation for standard and custom breaker type panelboards.

**1.3 References**

- 1.3.1 Canadian Standards Association (CSA International)  
.1 CSA C22.2No.29-[M1989(R2000)], Panelboards and enclosed Panelboards.

**1.4 Shop Drawings**

- 1.4.1 Submit shop drawings in accordance with Section 01 33 00 Submittal Procedures.  
1.4.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.  
1.4.3 Breaker layout drawing with dimensions indicated and nameplate designation.  
1.4.4 Component list.  
1.4.5 Assembly ratings including:  
.1 Short circuit rating.  
.2 Voltage.  
.3 Continuous current.  
1.4.6 Cable terminal sizes.

**1.5 Submittals for Closeout**

- 1.5.1 The following information shall be submitted for record purposes prior to final payment:  
.1 Final as-built drawings and information for items listed in Section 1.5.  
.2 Installation information.

**1.6 Qualifications**

- 1.6.1 The manufacturer of the panelboard shall be the manufacturer of the major components within the assembly, including circuit breakers.  
1.6.2 For the equipment specified herein, the manufacturer shall be ISO 9000, 9001 or 9002 certified.  
1.6.3 The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested, by the Consultant, an acceptable list of installation with similar equipment shall be provided demonstrating compliance with this requirement.

**1.7 Delivery, Storage, and Handling**

- 1.7.1 Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

**1.8 Operation and Maintenance Manuals**

- 1.8.1 Three (3) copies of the equipment and operation and maintenance manuals shall be provided prior to final payment.  
1.8.2 Operation and maintenance manuals shall include the following information:  
.1 Instruction books and/or leaflets.  
.2 Recommended renewal parts list.  
.3 Drawings and information required by Section 1.6.

**1.9     Waste Management and Disposal**

- 1.9.1     Separate and recycle waste materials.
- 1.9.2     Construction/Demolition Waste Management And Disposal.
- 1.9.3     Remove from site and dispose of packaging materials at appropriate recycling facilities.
- 1.9.4     Collect and separate for disposal [paper] [plastic] [polystyrene] [corrugated cardboard] packaging material [in appropriate on site bins]for recycling in accordance with Waste Management Plan.
- 1.9.5     Divert unused metal and wiring materials from landfill to metal recycling facility.

**2.     PRODUCTS****2.1     Manufacturers:**

- 2.1.1     Cutler-Hammer
- 2.1.2     Square D
- 2.1.3     Siemens

**2.2     Panelboards**

- 2.2.1     Panelboards: to CSA C22.2No.29 and product of one manufacturer.
  - .1         Install circuit breakers in panelboards before shipment.
  - .2         In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- 2.2.2     Panelboards rated 240Vac or less shall have short circuit ratings as shown on the drawings or as herein scheduled, but not less than 10,000 amperes RMS symmetrical.
- 2.2.3     Panelboards rated 600Vac shall have short circuit ratings as shown on the drawings or as herein scheduled, but not less than 14,000 amperes RMS symmetrical.
- 2.2.4     Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- 2.2.5     Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- 2.2.6     Two keys for each panelboard and key panelboards alike.
- 2.2.7     Copper bus with neutral of same ampere rating as mains.
- 2.2.8     Mains: suitable for bolt on breakers.
- 2.2.9     Trim with concealed front bolts and hinges.
- 2.2.10    Trim and door finish: air dried grey enamel or as per colour schedule.

**2.3     Construction**

- 2.3.1     Interiors shall be completely factory assembled with plug-on main and branch devices only. They shall be designed such that switching and protective devices can be replaced without disturbing adjacent units and without disturbing the main bus.
- 2.3.2     Trims shall be a three piece design. Doors in panelboard trims shall not uncover any live parts. Doors shall have a T-handle lock and catch assembly.
- 2.3.3     Distribution panelboard trims shall cover all live parts. Switching device handles shall be accessible.
- 2.3.4     A directory card with a clear plastic cover shall be supplies.
- 2.3.5     All lock shall be keyed alike.

**2.4     Bus**

- 2.4.1     Main bus bars shall be plated aluminum or copper sized in accordance with UL standards to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum. Use of screws and/or bolts utilized to attach main and branch devices to the main bus bars is not acceptable.

- 2.4.2 A bolted ground bus shall be included in all panels.
- 2.4.3 Full-size insulated neutral shall be included for panelboards shown with neutral. Bus bar taps for panels with single-pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral busing shall have a suitable lug for each outgoing feeder requiring a neutral connection.
- 2.5 **Custom Built Panelboard Assemblies**
  - 2.5.1 125 mm relay section on sides of panels as indicated for installation of low voltage remote control switching components.
  - 2.5.2 Double stack panels as indicated.
  - 2.5.3 Contactors in mains as indicated.
  - 2.5.4 Feed through lugs as indicated.
  - 2.5.5 Isolated ground bus.
- 2.6 **Power Distribution Panelboards—Circuit Breaker Type**
  - 2.6.1 Power distribution panelboards and the devices contained therein shall have fully rated interrupting ratings as indicated on the drawings. Panelboards shall be type POW-R-LINE C, PRL-5P. Panelboards shall have molded case circuit breakers permanently affixed to plug on breaker adapter, as indicated below.
  - 2.6.2 Molded case circuit breakers permanently affixed to adapters shall provide circuit overcurrent protection with inverse time and instantaneous tripping characteristics and shall be Cutler-Hammer or approved equal. Ground fault protection shall be provided where indicated.
  - 2.6.3 Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be nonwelding silver alloy, and arc extinction shall be accomplished by means of DE-ION arc chutes.  
A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.
  - 2.6.4 Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the drawings.
  - 2.6.5 Where indicated, circuit breakers shall be CSA tested and approved for series application.
  - 2.6.6 Where indicated, circuit breakers shall be current limiting.
  - 2.6.7 Circuit breakers 400 ampere frame and below shall be Cutler-Hammer, or approved equal, with thermal-magnetic trip units and inverse time-current characteristics.
  - 2.6.8 Circuit breakers 400 ampere through 1200 ampere frame shall be Cutler-Hammer, or approved equal, with microprocessor-based RMS sensing trip units.
    - .1 Each molded case circuit breaker microprocessor-based tripping system shall consist of three current sensors, a trip unit, and a flux-transfer shunt trip. The trip unit shall use microprocessor-based technology to provide the adjustable time-current protection functions. True RMS sensing circuit protection shall be achieved by analyzing the secondary current signals received from the circuit breaker current sensors and initiating trip signals to the circuit breaker trip actuators when predetermined trip levels and time delay settings are reached.
    - .2 Interchangeable rating plugs shall establish the continuous trip ratings of each circuit breaker. Rating plugs shall be fixed or adjustable as indicated. Rating plugs shall be interlocked so they are not interchangeable between frames, and interlocked such that a breaker cannot be closed and latched with the rating plug removed.
    - .3 The microprocessor-based trip unit shall have thermal memory capabilities to prevent the breaker from being reset following an overload condition until after a preset time delay.

- .4 When the adjustable instantaneous setting is omitted, the trip unit shall be provided with an instantaneous override. Internal ground fault protection adjustable pick-up ratings shall not exceed 1200 amperes. Provide neutral ground fault current sensor for four wire loads.
  - .5 Breakers shall have built-in test points for testing the long time delay, instantaneous, and ground fault functions of the breaker by means of a 120-volt operated test set. Provide one test set capable of testing all breakers 400 ampere frame and above.
  - .6 System coordination shall be provided by the following microprocessor-based time-current curve shaping adjustments:
    - .1 Adjustable long time pick-up and delay
    - .2 Adjustable short time pick-up and delay, with selective curve shaping
    - .3 Adjustable instantaneous pick-up
    - .4 Adjustable ground fault pick-up and delay, with selective curve shaping
  - .7 Circuit Breakers shall be Cutler-Hammer, or approved equal, circuit breakers, microprocessor-based RMS sensing trip units type Digitrip RMS 310.
- 2.6.9 Provide shunt trips, bell alarms, and auxiliary switches as shown on the contract drawings.

2.7 **Enclosure**

- 2.7.1 Enclosures shall be at least 30 inches wide for 800 ampere and at least 48 inches wide for 1200 ampere panelboards and are made from galvanized steel. Provide minimum gutter space in accordance with CSA and CEC Codes. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, the box shall be sized to include the additional required wiring space. At least four interior mounting studs with adjustable nuts shall be provided.

2.8 **Equipment Identification**

- 2.8.1 Provide equipment identification.
- 2.8.2 Nameplate for each panelboard size 4 engraved as indicated on the Contract Drawings.
- 2.8.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated on the Contract Drawings.
- 2.8.4 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.9 **Finish**

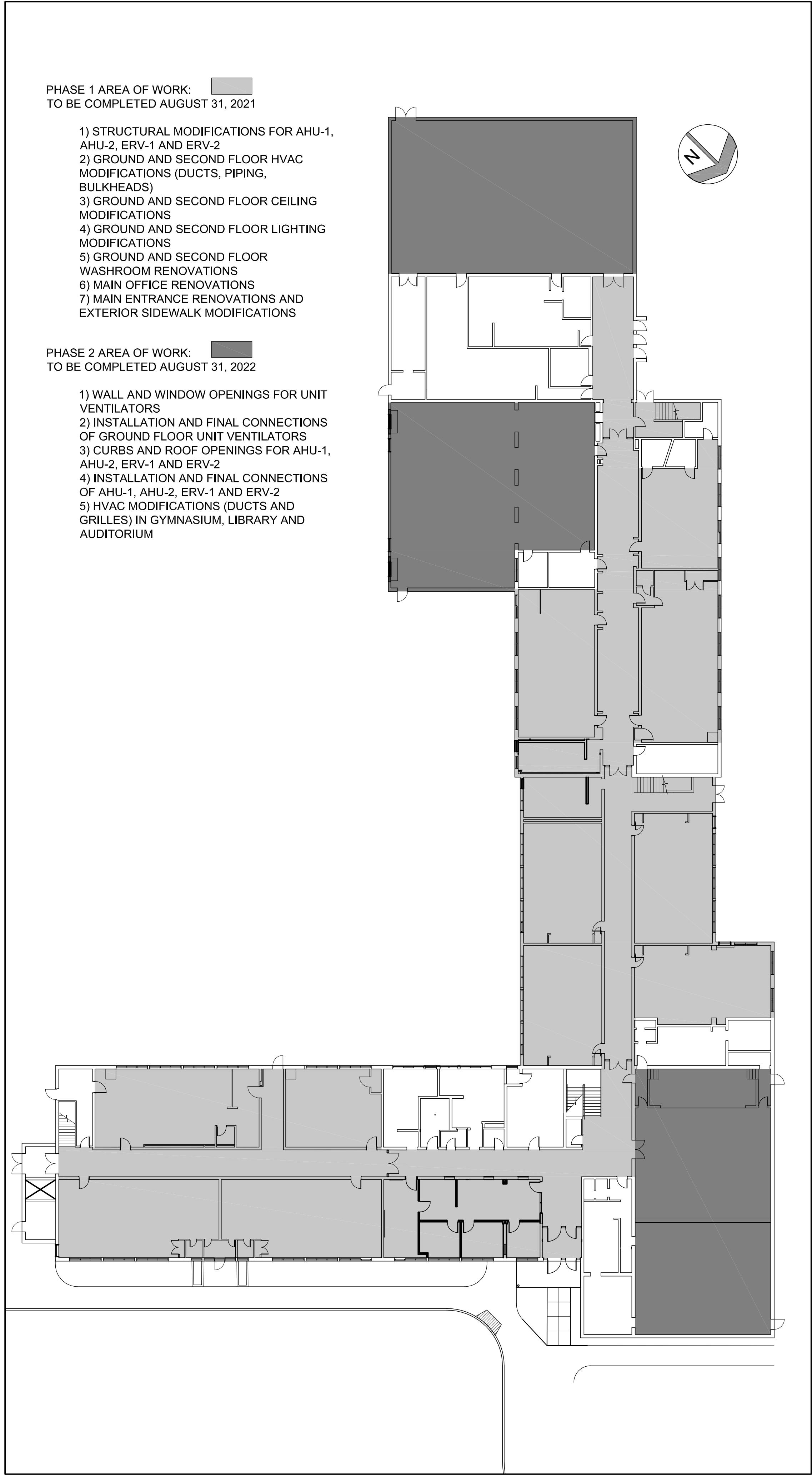
- 2.9.1 Surfaces of the trim assembly shall be properly cleaned, primed, and a finish coat of gray ANSI 61 paint applied.

3. **EXECUTION**3.1 **Installation**

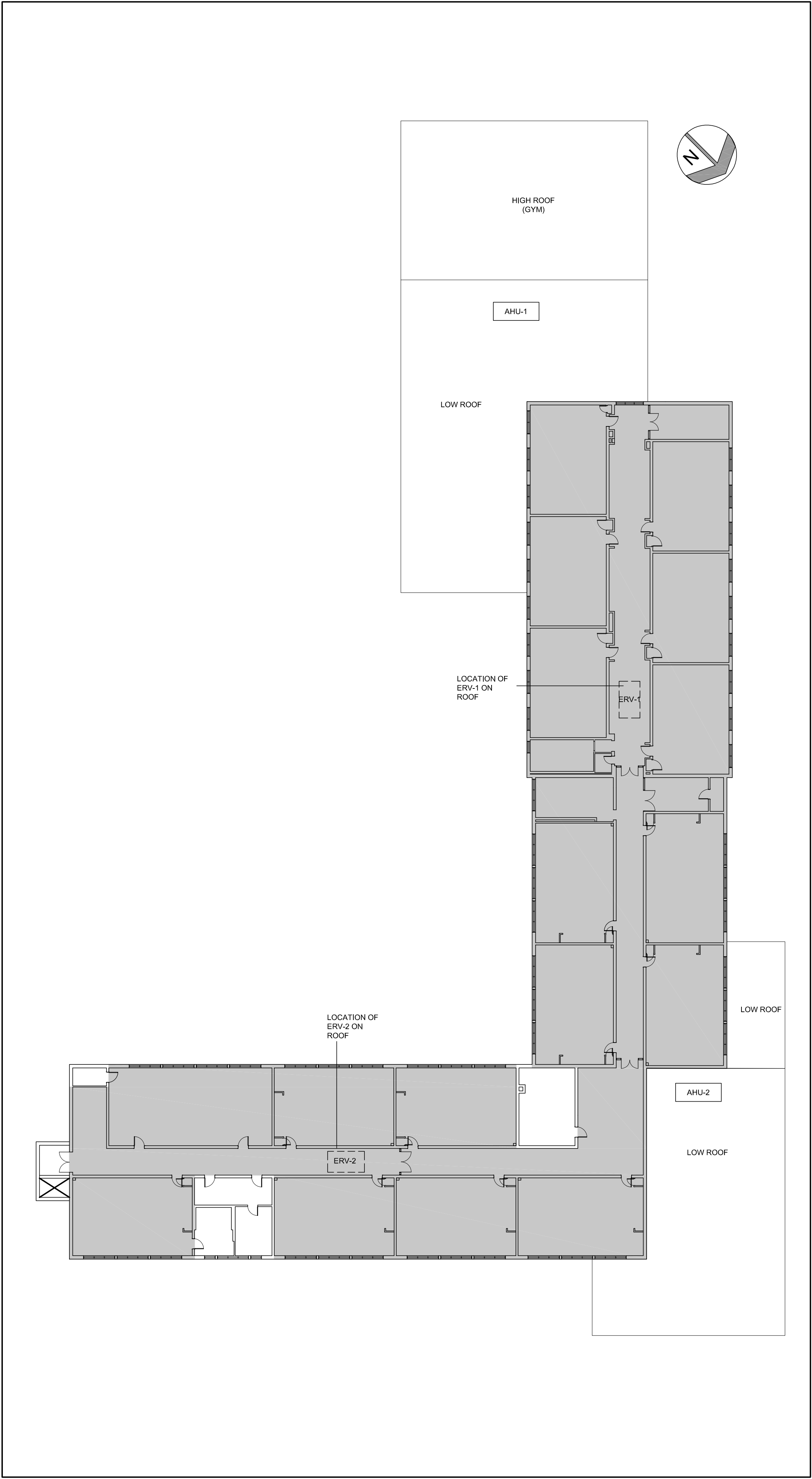
- 3.1.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- 3.1.2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.
- 3.1.3 Mount panelboards to height as indicated.
- 3.1.4 Connect loads to circuits.
- 3.1.5 Connect neutral conductors to common neutral bus with respective neutral identified.

**END OF SECTION**

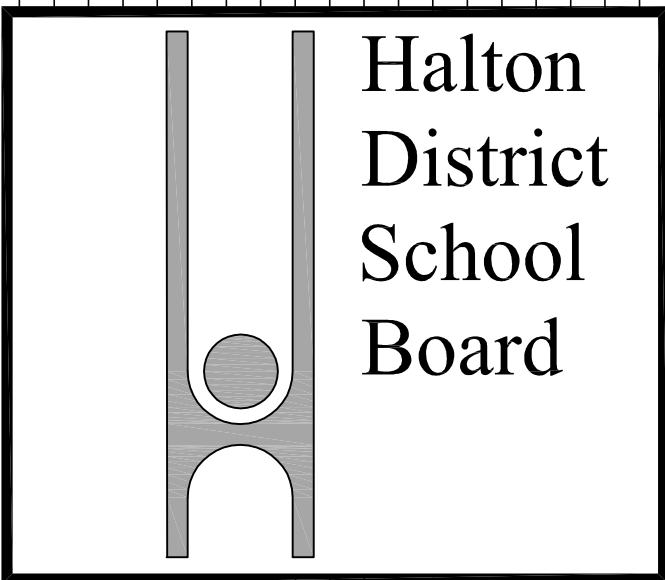




GROUND FLOOR PHASING / AREA OF WORK KEY PLAN  
SCALE: NTS



SECOND FLOOR PHASING / AREA OF WORK KEY PLAN  
SCALE: NTS



**GRGURIC ARCHITECTS INCORPORATED**

28 KING STREET EAST, UNIT B  
STONEY CREEK, ONTARIO, L8G 1J8  
Tel. 905-664-8735 Fax. 905-664-8737  
Web: www.2gai.com

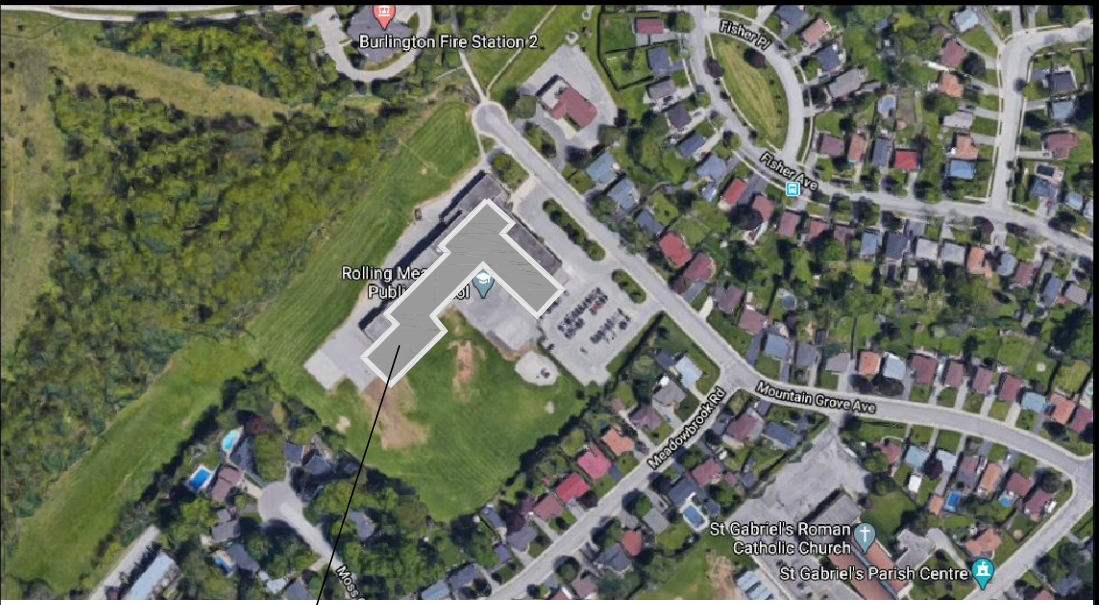
**PNF ENGINEERING INC.**

4-1290 EGLINGTON AVENUE EAST  
MISSISSAUGA, ONTARIO,  
L4W 1K8  
TEL: (905) 625-5322

MECHANICAL / ELECTRICAL ENGINEER

1016 SUTTON DRIVE, UNIT A  
BURLINGTON, ONTARIO,  
L7L 6B8  
TEL: (905) 639-2552

STRUCTURAL ENGINEER



KEY MAP  
SCALE: N.T.S.

**DRAWING LIST:**

ARCHITECTURAL	
A0.00	COVER SHEET
A0.01	OBC DATA MATRIX, EXITING PLANS AND FIRE RESISTANCE DIAGRAM
A1.00	GROUND FLOOR PLAN
A1.01	GROUND FLOOR PLAN
A1.02	GROUND FLOOR DEMOLITION REFLECTED CEILING PLAN
A1.03	GROUND FLOOR DEMOLITION REFLECTED CEILING PLAN
A1.04	SECOND FLOOR DEMOLITION REFLECTED CEILING PLAN
A1.05	GROUND FLOOR REFLECTED CEILING PLAN
A1.06	GROUND FLOOR REFLECTED CEILING PLAN
A1.07	SECOND FLOOR REFLECTED CEILING PLAN
A1.08	ROOF PLAN
A1.09	ROOF PLAN
A2.00	ENLARGED GROUND FLOOR WASHROOM PLANS AND ELEVATIONS
A2.01	ENLARGED SECOND FLOOR WASHROOM PLANS AND ELEVATIONS
A2.02	ENLARGED MAIN OFFICE FLOOR PLANS
A3.00	SECTIONS AND PLAN DETAILS
A3.01	DETAILS
A4.00	ROOM FINISH AND DOOR SCHEDULE

STRUCTURAL	
S1.0	GENERAL NOTES
S2.0	SECOND FLOOR FRAMING PLAN AND SCHEDULES
S2.1	ROOF FRAMING PLAN
S3.0	JOIST REINFORCEMENT ELEVATIONS AND DETAILS

MECHANICAL	
M-0	PHASING PLAN
M-1	GROUND FLOOR CEILING DEMOLITION
M-2	GROUND FLOOR CEILING DEMOLITION
M-3	SECOND FLOOR CEILING DEMOLITION
M-4	GROUND FLOOR CEILING NEW LAYOUT
M-5	GROUND FLOOR CEILING NEW LAYOUT
M-6	SECOND FLOOR CEILING NEW LAYOUT
M-7	ROOF PLAN DEMOLITION
M-8	ROOF PLAN DEMOLITION
M-9	ROOF PLAN NEW HVAC LAYOUT
M-10	ROOF PLAN NEW HVAC LAYOUT
M-11	BOILER ROOM UPGRADE
M-12	WASHROOMS HVAC LAYOUT
M-13	WASHROOMS PLUMBING LAYOUT
M-14	SCHEDULES, AND LEGEND
M-15	DETAILS

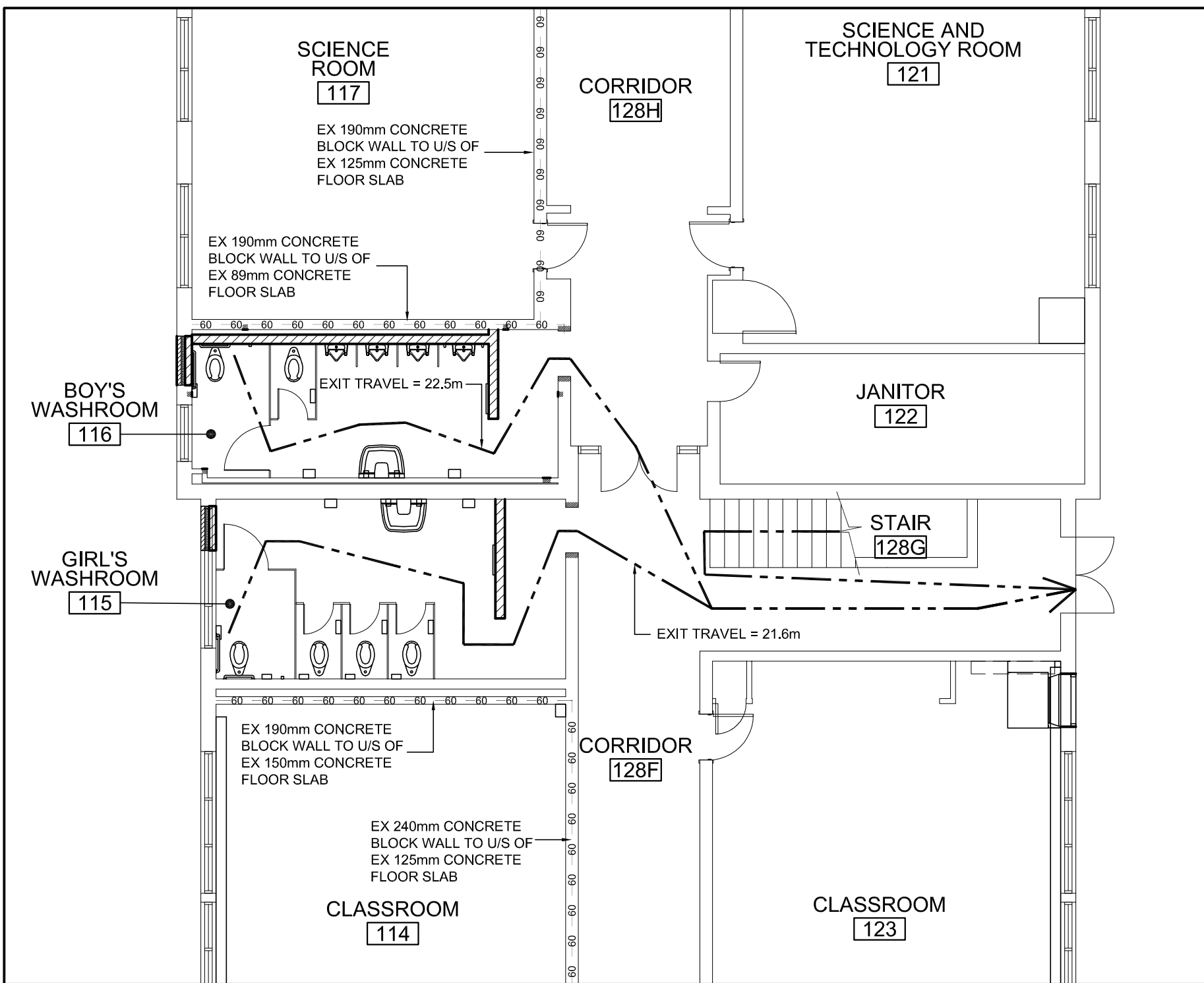
ELECTRICAL	
E-0	PHASING PLAN
E-1	GROUND FLOOR CEILING DEMOLITION
E-2	GROUND FLOOR CEILING DEMOLITION
E-3	SECOND FLOOR CEILING DEMOLITION
E-4	GROUND FLOOR CEILING NEW LAYOUT
E-5	GROUND FLOOR CEILING NEW LAYOUT
E-6	SECOND FLOOR CEILING NEW LAYOUT
E-7	ROOF PLAN DEMOLITION
E-8	ROOF PLAN DEMOLITION
E-9	ROOF PLAN NEW POWER LAYOUT
E-10	ROOF PLAN NEW POWER LAYOUT
E-11	GROUND FLOOR NEW POWER LAYOUT
E-12	GROUND FLOOR NEW POWER LAYOUT
E-13	EQUIPMENT SCHEDULE AND SINGLE LINE DIAGRAM
E-14	WASHROOMS ELECTRICAL LAYOUT
E-15	BOILER ROOM UPGRADE
E-16	SPECIFICATIONS, LEGEND AND DETAILS

**ROLLING MEADOWS  
ELEMENTARY SCHOOL  
INTERIOR RENOVATIONS**  
1522 MOUNTAIN GROVE AVE,  
BURLINGTON, ONTARIO, L7P 2H5

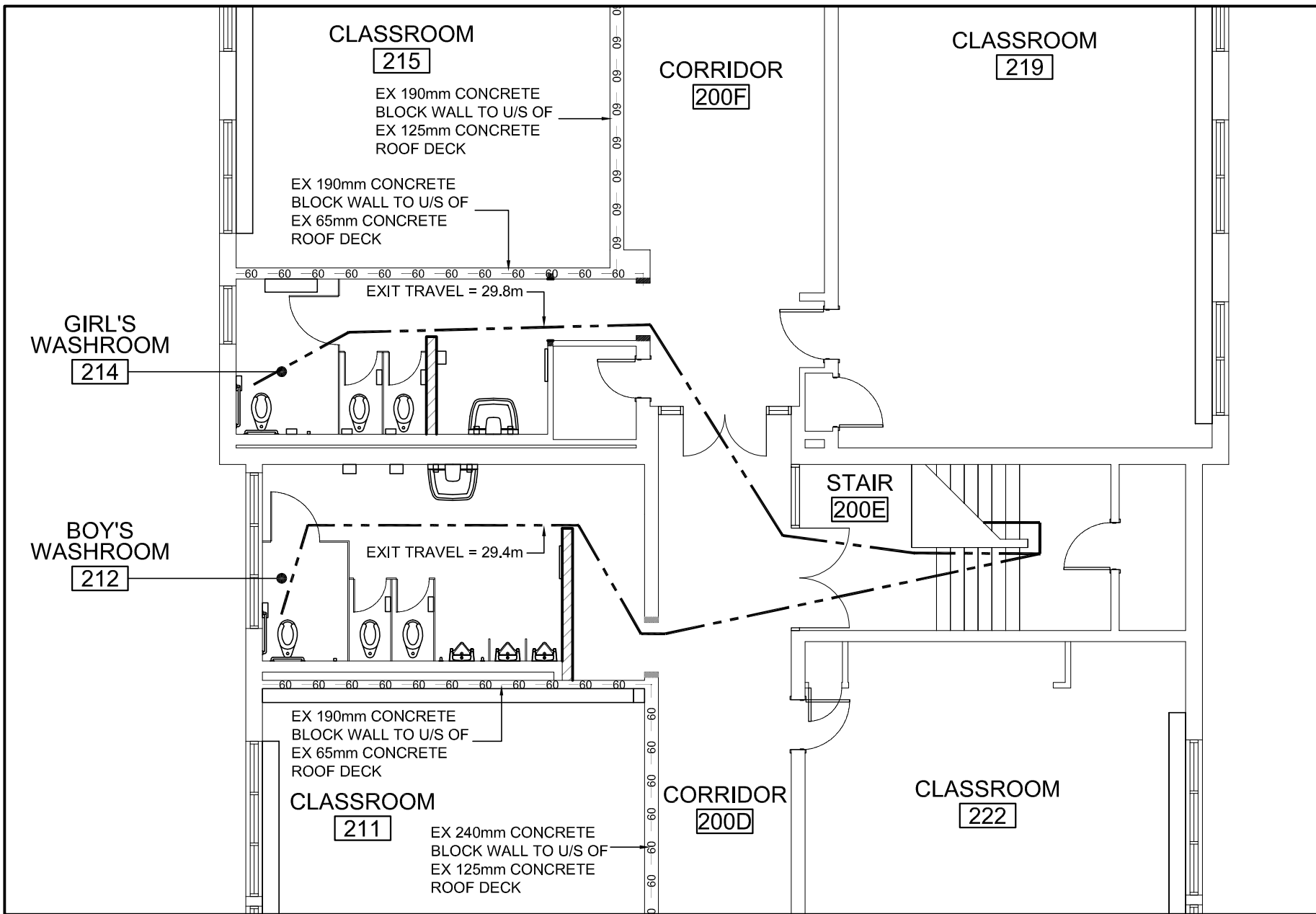
**ISSUED FOR  
TENDER**

PROJECT NUMBER	SHEET NUMBER
2020-31	A0.00
	2021-05-07

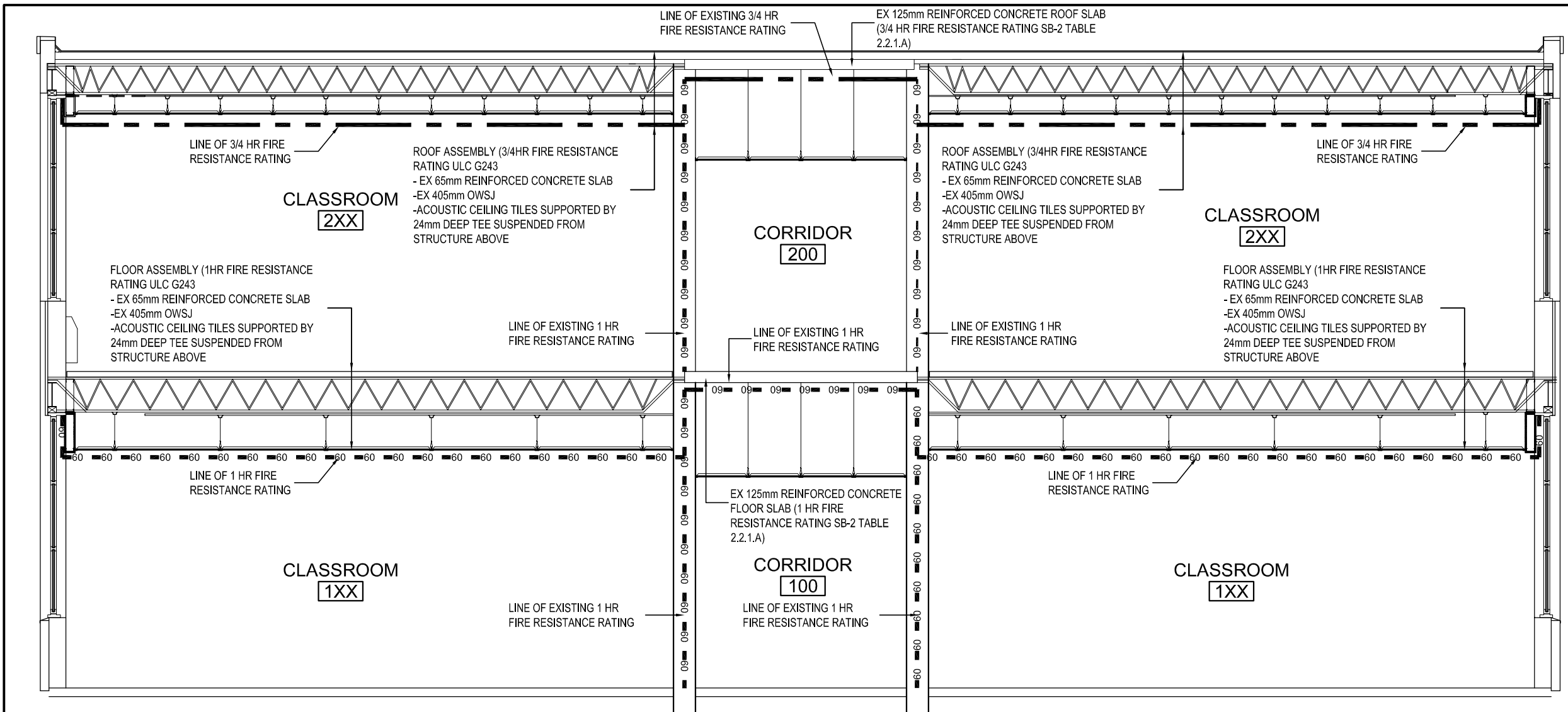




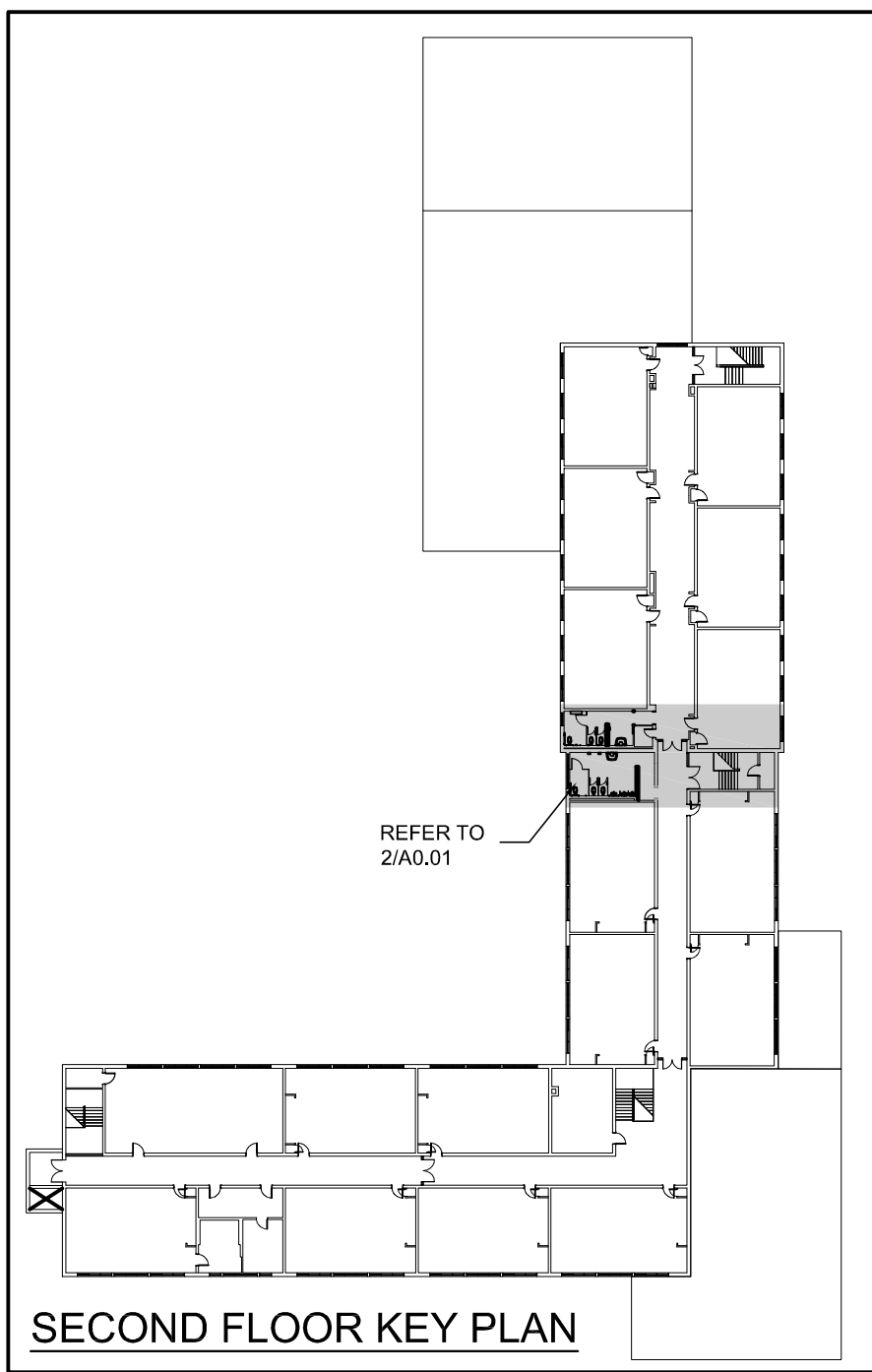
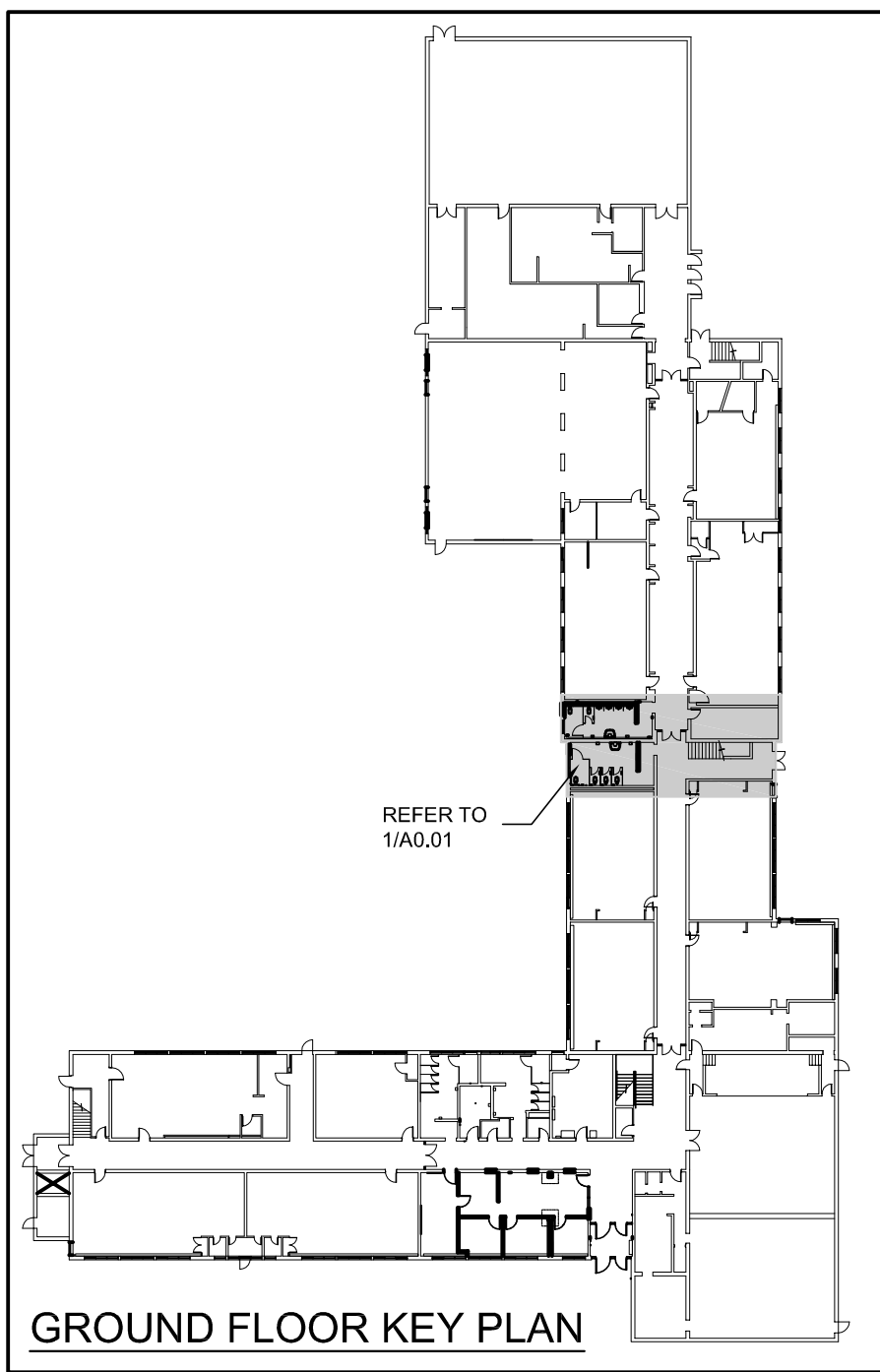
**1 PARTIAL GROUND FLOOR EXITING PLAN**  
SCALE: 1:100



**2 PARTIAL SECOND FLOOR EXITING PLAN**  
SCALE: 1:100



**3 FIRE RESISTANCE RATING DIAGRAM**  
SCALE: NTS



Ontario Building Code Data Matrix Part 11 – Renovation of Existing Building				Building Code Reference
11.2.	Existing Building classification:	Describe Existing Use: <b>Group A-2 Elementary School</b> Construction Index: <b>C1-6</b> Hazard Index: <b>HI-8</b> <b>Not Applicable</b> (no major change of occupancy)		11.2.1 T 11.2.1.1A T 11.2.1.1B to N
11.3.	Alteration to Existing Building is:	Basic Renovation <b>■</b> Extensive Renovation <b>■</b>		11.3.3.1 11.3.3.2
11.4.	Reduction in Performance Level:	Structural: <b>■</b> No <input type="checkbox"/> Yes By Increase in occupant load: <b>■</b> No <input type="checkbox"/> Yes By change of major occupancy: <b>■</b> No <input type="checkbox"/> Yes Plumbing: <b>■</b> No <input type="checkbox"/> Yes Sewage System: <b>■</b> No <input type="checkbox"/> Yes		11.4.2 11.4.2.1 11.4.2.2 11.4.2.3 11.4.2.4 11.4.2.5
11.4.3.	Compensating Construction:	Structural: <b>■</b> No <input type="checkbox"/> Yes (explain) Increase in occupant load: <b>■</b> No <input type="checkbox"/> Yes (explain) Change of major occupancy: <b>■</b> No <input type="checkbox"/> Yes (explain) Plumbing: <b>■</b> No <input type="checkbox"/> Yes (explain) Sewage system: <b>■</b> No <input type="checkbox"/> Yes (explain)		11.4.3 11.4.3.2 11.4.3.3 11.4.3.4 11.4.3.5 11.4.3.6
11.5	Compliance Alternatives Proposed:	<b>■</b> No <input type="checkbox"/> Yes (give number [s])		11.4.2

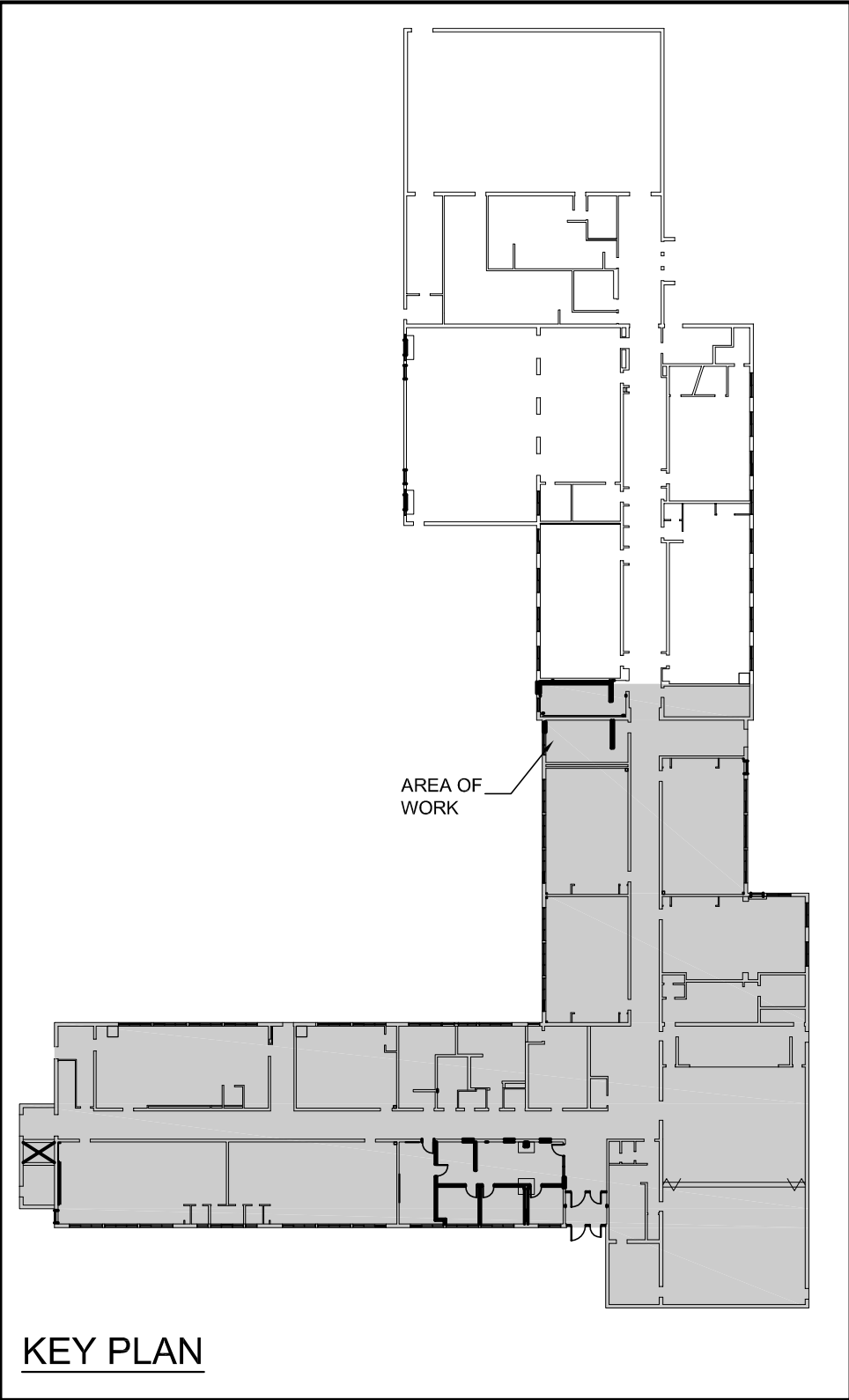
<div>FIRM NAME: GRGURIC ARCHITECTS INCORPORATED CERTIFICATE OF PRACTICE NUMBER: 4164  CONTACT: GRGURIC ARCHITECTS INCORPORATED 28 KING STREET EAST, UNIT B, STONEY CREEK, ONTARIO, L8G 1J8  NAME OF PROJECT: ROLLING MEADOWS PUBLIC ELEMENTARY SCHOOL, INTERIOR ALTERATIONS.   LOCATION: 1522 MOUNTAIN GROVE AVE, BURLINGTON, ONTARIO, L7P 2H5</div>					<div><div><div></div><div></div><div></div></div><div>District School Board</div></div>						
Item	Ontario's 2012 Building Code Data Matrix Parts 3 and Part 11			OBC Reference References are to Division B unless noted [A] for Division A or [C] for Division C							
1	<div>Project Description: REPLACEMENT OF PARTIAL FIRST AND SECOND FLOOR CORRIDOR CEILING AND CLASSROOM CEILINGS, COMPLETE RENOVATION OF TWO SETS OF BOYS AND GIRLS WASHROOMS, RENOVATIONS OF ADMINISTRATION SPACE, NEW HVAC FOR CLASSROOMS, AUDITORIUM, LIBRARY AND GYM.</div> <div><div><input type="checkbox"/> New <input type="checkbox"/> Addition <input checked="" type="checkbox"/> Alteration <input type="checkbox"/> Change of Use</div><div><input checked="" type="checkbox"/> Part 11</div></div>			<div><input checked="" type="checkbox"/> Part 3</div> 1.1.2. [A]	<div><input type="checkbox"/> Part 9</div>						
2	Major Occupancy(s) Group A, Division 2 (Existing)			3.1.2.1.(1)							
3	Building Area (m²) Existing 3,176m² New Total 3,176m²			1.4.1.2.[A]							
4	Gross Area (m²) Existing 5,188m² New Total 5,188m² Area to be Renovated 2,416m² New 0.0m² Total 2,416m²			1.4.1.2.[A]							
5	Number of storeys Above grade 2 Below grade 0			1.4.1.2.[A] & 3.2.1.1							
7	Number of Streets/ Fire Fighter Access 2			3.2.2.10 & 3.2.5							
8	Building Classification Existing - 11.3.3.1			3.2.2.20.-83							
9	Sprinkler System Proposed <input type="checkbox"/> entire building (existing) <input type="checkbox"/> selected compartments <input type="checkbox"/> selected floor areas EXISTING (area of alteration) <input type="checkbox"/> basement <input type="checkbox"/> in lieu of roof rating <input type="checkbox"/> not required <input checked="" type="checkbox"/> not sprinkled			3.2.2.20.-83 3.2.1.5. 3.2.2.17. INDEX							
10	Standpipe required <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (Existing)			3.2.9							
11	Fire Alarm required <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (Existing)			3.2.4							
12	Water Service/Supply is Adequate <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (Existing)			3.2.5.7.							
13	High Building <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			3.2.6							
14	Permitted Construction <input type="checkbox"/> Combustible permitted <input checked="" type="checkbox"/> Non-combustible required <input type="checkbox"/> Both Actual Construction <input type="checkbox"/> Combustible <input checked="" type="checkbox"/> Non-combustible <input type="checkbox"/> Both			3.2.2.20.-83							
15	Mezzanine(s) Area m² N/A			3.2.1.1.(3)-(8)							
16	Occupant load based on <input type="checkbox"/> m²/person Occupancy A-2 <input checked="" type="checkbox"/> design of building Load 531 persons			3.1.17							
17	Barrier-free Design <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No (Explain)			3.8							
18	Hazardous Substances <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			3.3.1.2. & 3.3.1.19							
19	<div>Required Fire Resistance Rating - See Note Below (FRR)</div> <div><div><div>Horizontal Assemblies (Existing) FRR (Hours)</div><div>Floors 1 Hours</div><div>Roof 3/4 Hours</div><div>Mezzanine 1 Hours</div><div>FRR of Supporting Members</div><div>Floors 1 Hours</div><div>Roof 3/4 Hours</div><div>Mezzanine N/A Hours</div></div><div><div>Listed Design No. or Description (SG-2)</div><div>ULC G243, 125mm REINFORCED CONCRETE (SG-2 TABLE 2.2.1.A)</div><div>ULC G243, 125mm REINFORCED CONCRETE (SG-2 TABLE 2.2.1.A)</div><div>N/A</div><div>Listed Design No. or Description (SG-2)</div><div>EXISTING</div><div>EXISTING</div><div>N/A</div></div></div>			3.2.2.20.-83 & 3.2.1.4							
19	Spatial Separation - Construction of Exterior Walls			3.2.3							
	Wall	Area of EBF (m²)	L.D. (m)	L/H or H/L	Permitted Max. % of Openings	Proposed % of Openings	FRR (Hours)	Listed Design or Description	Comb. Constr.	Comb. Constr. Nonc. Cladding	Non-comb. Constr.
	North	N/A	-	-	-	-	-	-	-	-	-
	South	N/A	-	-	-	-	-	-	-	-	-
	East	N/A	-	-	-	-	-	-	-	-	-
	West	N/A	-	-	-	-	-	-	-	-	-
20	Sanitary Facility Summary - Elementary School			3.7.4.3.(14)							
<div>Occupant Load Calculations Rolling Meadows Public School 1522 Mountain Grove Ave, Burlington  Current Occupant load of the building: Students: 478 (239 Boys / 239 Girls based on 50/50 split) Staff: 53 Total: 531  Required W/C Based on Occupant Load: Based on 50% / 50% split except as noted otherwise  Total Male: 266 Total Male Fixtures required: 9 (1 Fixture per 30 males)  Total Female: 266 Total Female Fixtures required: 11 (1 Fixture per 26 females)  Provided W/C:  Male: 26 (includes universal washroom) Female: 17 (includes universal washroom)</div>											

<div>LEGEND</div> <div>EX EXISTING U/S UNDERSIDE</div> <div><div></div> TRAVEL DISTANCE (MAX. 30m ALLOWED)</div> <div>ABBREVIATIONS LEGEND</div> <div>EX EXISTING ITEM</div>		
2	ISSUED FOR TENDER	2021-05-07
1	ISSUED FOR BUILDING PERMIT	2021-05-07
NO	REVISIONS	DATE
DRAWINGS ARE NOT TO BE SCALED. CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND CONDITIONS ON THE PROJECT, AND MUST REPORT ANY DISCREPANCIES TO THE ARCHITECTS BEFORE PROCEEDING WITH THE WORK. THE USE OF THIS DRAWING OR PART THEREOF IS FORBIDDEN WITHOUT THE WRITTEN APPROVAL OF THE ARCHITECTS.		

**OBC MATRIX**

SCALE: AS NOTED	PROJECT: <b>2020-31</b>
DATE: JAN-2021	
DRAWN DW	DRAWING
CHECKED JG	<b>A0.01</b>
PRINT DATE	05/07/21





NON-LOAD BEARING BLOCK LINTEL SCHEDULE						
WIDTH	4'-0"	5'-0"	7'-0"	8'-0"	12'-0"	SECTION DETAIL
4"	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	
6"	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	
8"	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	
10"	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	
12"	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	2 JL3 1/2x3/4" (LL.V)	

MASONRY VENEER LINTEL SCHED.		
MAX. CLEAR SPAN	SIZE	REMARKS
7'-0"	L3 1/2"x3 1/4" (LL.H)	
9'-0"	L5x4x1/4"	
10'-0"	L5x3 1/2"x5/16" (LL.V)	
11'-0"	L5x3 1/2"x3/8" (LL.V)	
12'-0"	L6x4x3/8" (LL.V)	
13'-0"	L6x4x3/8" (LL.V)	
14'-0"	L7x4x7/16" (LL.V)	
15'-0"	L8x4x7/16" (LL.V)	

CONC. BLOCK WALL PLATE SCHEDULE		
MARK	PLATE SIZE THK(L)xLxWID.	ANCHORAGE
WPL1	3/8"x9-1/2"x9-1/2"	1 - 1/2" Ø ROD w/12" EMBEDMENT
WPL2	3/8"x7"x7"	2 - 1/2" Ø ROD w/12" EMBEDMENT

NOTES:

- FULLY GROUT END COURSES BENEATH ALL BEARING PLATES.
- PLATE DIMENSION NOTED AS "LENGTH" TO BE PARALLEL WITH BEAM WEB.
- FIELD WELD BEAM TO BEARING PLATE w/2-1/4"x1 1/2" LG. FILLET WELDS (EACH SIDE).

TYP. ELEVATION DETAIL @ WALL PLATE (N.T.S.)

TYP. ELEVATION DETAIL @ WALL PLATE (N.T.S.)

TYP. SECTION DETAIL @ CONT. WELD PLATE (N.T.S.)

BLOCK LINTEL SCHEDULE	
MARK	DETAIL
L1	(2)L4x3-1/2x3/8" PROVIDE WPL1 AT EA. END
L2	1/2"Ø RODS x 12" LG. @ 24" o/c W6x9 CONT. 1/4" THK. PLATE PROVIDE WPL2 AT EA. END
L3	1/2"Ø RODS x 12" LG. @ 24" o/c W8x13 CONT. 1/4" THK. PLATE PROVIDE WPL2 AT EA. END

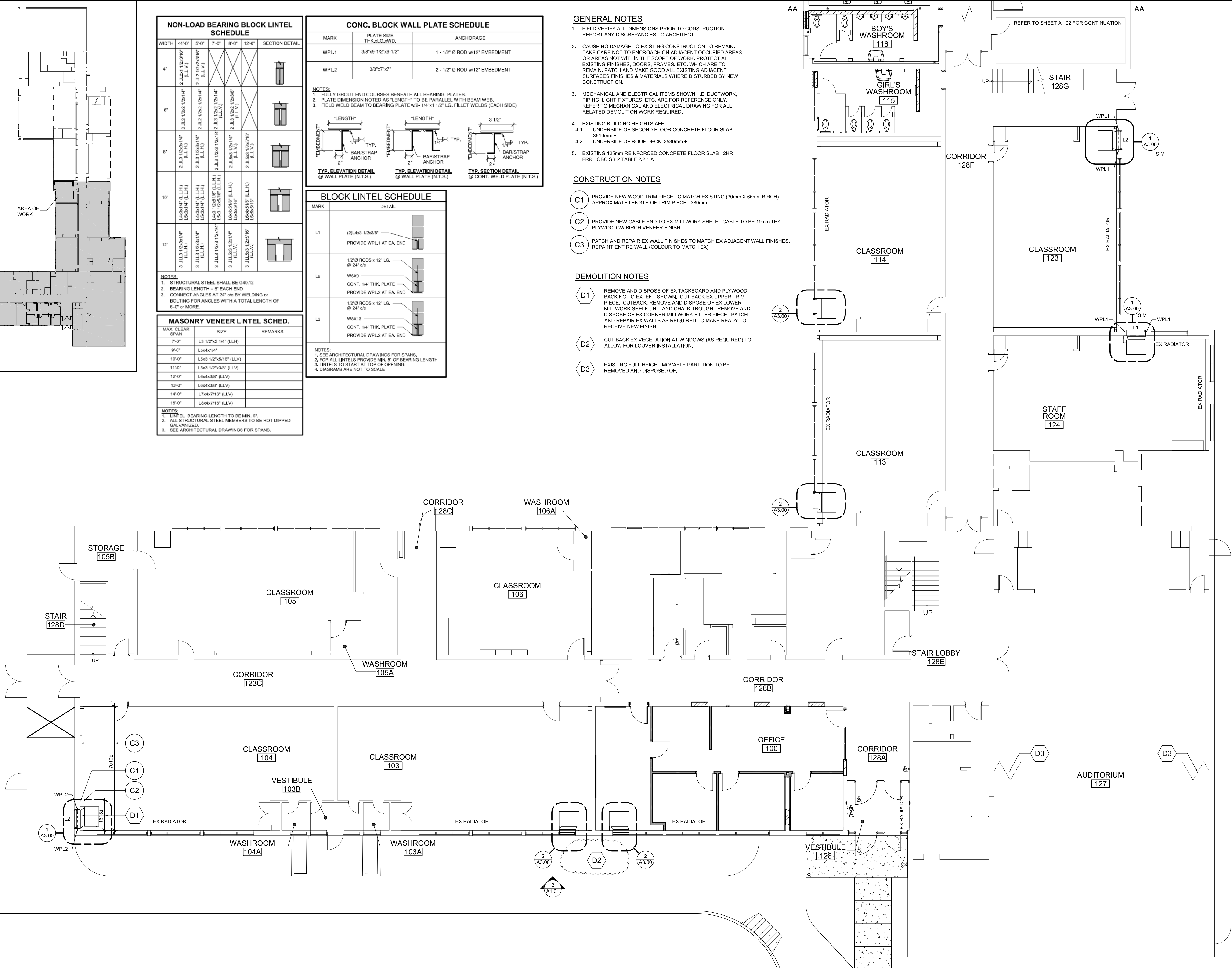
NOTES:

- SEE ARCHITECTURAL DRAWINGS FOR SPANS.
- FOR ALL LINTELS PROVIDE MIN. 8" OF BEARING LENGTH.
- LINTELS TO START AT TOP OF OPENING.
- DIAGRAMS ARE NOT TO SCALE.

- GENERAL NOTES
- FIELD VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTION. REPORT ANY DISCREPANCIES TO ARCHITECT.
  - CAUSE NO DAMAGE TO EXISTING CONSTRUCTION TO REMAIN. TAKE CARE NOT TO ENCRoACH ON ADJACENT OCCUPIED AREAS OR AREAS NOT WITHIN THE SCOPE OF WORK. PROTECT ALL EXISTING FINISHES, DOORS, FRAMES, ETC. WHICH ARE TO REMAIN. PATCH AND MAKE GOOD ALL EXISTING ADJACENT SURFACES FINISHES & MATERIALS WHERE DISTURBED BY NEW CONSTRUCTION.
  - MECHANICAL AND ELECTRICAL ITEMS SHOWN, I.E. DUCTWORK, PIPING, LIGHT FIXTURES, ETC. ARE FOR REFERENCE ONLY. REFER TO MECHANICAL AND ELECTRICAL DRAWING FOR ALL RELATED DEMOLITION WORK REQUIRED.
  - EXISTING BUILDING HEIGHTS AFF:
    - UNDERSIDE OF SECOND FLOOR CONCRETE FLOOR SLAB: 3510mm ±
    - UNDERSIDE OF ROOF DECK: 3530mm ±
  - EXISTING 125mm REINFORCED CONCRETE FLOOR SLAB - 2HR FRR - OBC S8-2 TABLE 2.2.1A

- CONSTRUCTION NOTES
- PROVIDE NEW WOOD TRIM PIECE TO MATCH EXISTING (30mm X 65mm BIRCH). APPROXIMATE LENGTH OF TRIM PIECE - 380mm
  - PROVIDE NEW GABLE END TO EX MILLWORK SHELF. GABLE TO BE 19mm THK PLYWOOD W/ BIRCH VENEER FINISH.
  - PATCH AND REPAIR EX WALL FINISHES TO MATCH EX ADJACENT WALL FINISHES. REPAINT ENTIRE WALL (COLOUR TO MATCH EX)

- DEMOLITION NOTES
- REMOVE AND DISPOSE OF EX TACKBOARD AND PLYWOOD BACKING TO EXTENT SHOWN. CUT BACK EX UPPER TRIM PIECE. CUTBACK REMOVE AND DISPOSE OF EX LOWER MILLWORK SHELF UNIT AND CHALK TROUGH. REMOVE AND DISPOSE OF EX CORNER MILLWORK FILLER PIECE. PATCH AND REPAIR EX WALLS AS REQUIRED TO MAKE READY TO RECEIVE NEW FINISH.
  - CUT BACK EX VEGETATION AT WINDOWS (AS REQUIRED) TO ALLOW FOR LOUVER INSTALLATION.
  - EXISTING FULL HEIGHT MOVABLE PARTITION TO BE REMOVED AND DISPOSED OF.



1 GROUND FLOOR PLAN  
SCALE: 1:100

Halton District School Board

N

STRUCTURAL

**ABBREVIATIONS LEGEND**

AFF	ABOVE FINISHED FLOOR
BBH	BASE BOARD HEATER
EX	EXISTING ITEM
Lx	LINTEL NUMBER
LG	LONG
O/C	ON CENTRE
SIM	SIMILAR
THK	THICK
TYP	TYPICAL
US	UNDER SIDE
WD	WIDE
W/	WITH

3	ISSUED FOR TENDER	2021-05-07
2	ISSUED FOR BUILDING PERMIT	2021-05-07
1	ISSUED FOR ZONING CLEARANCE	2021-03-16

NO REVISIONS

DATE

ROLLING MEADOWS  
PUBLIC ELEMENTARY  
SCHOOL  
INTERIOR RENOVATIONS  
1522 MOUNTAIN GROVE AVE.  
BURLINGTON, ONTARIO, L7P 2H5

GROUND FLOOR PLAN

GRGURIC  
ARCHITECTS  
INCORPORATED

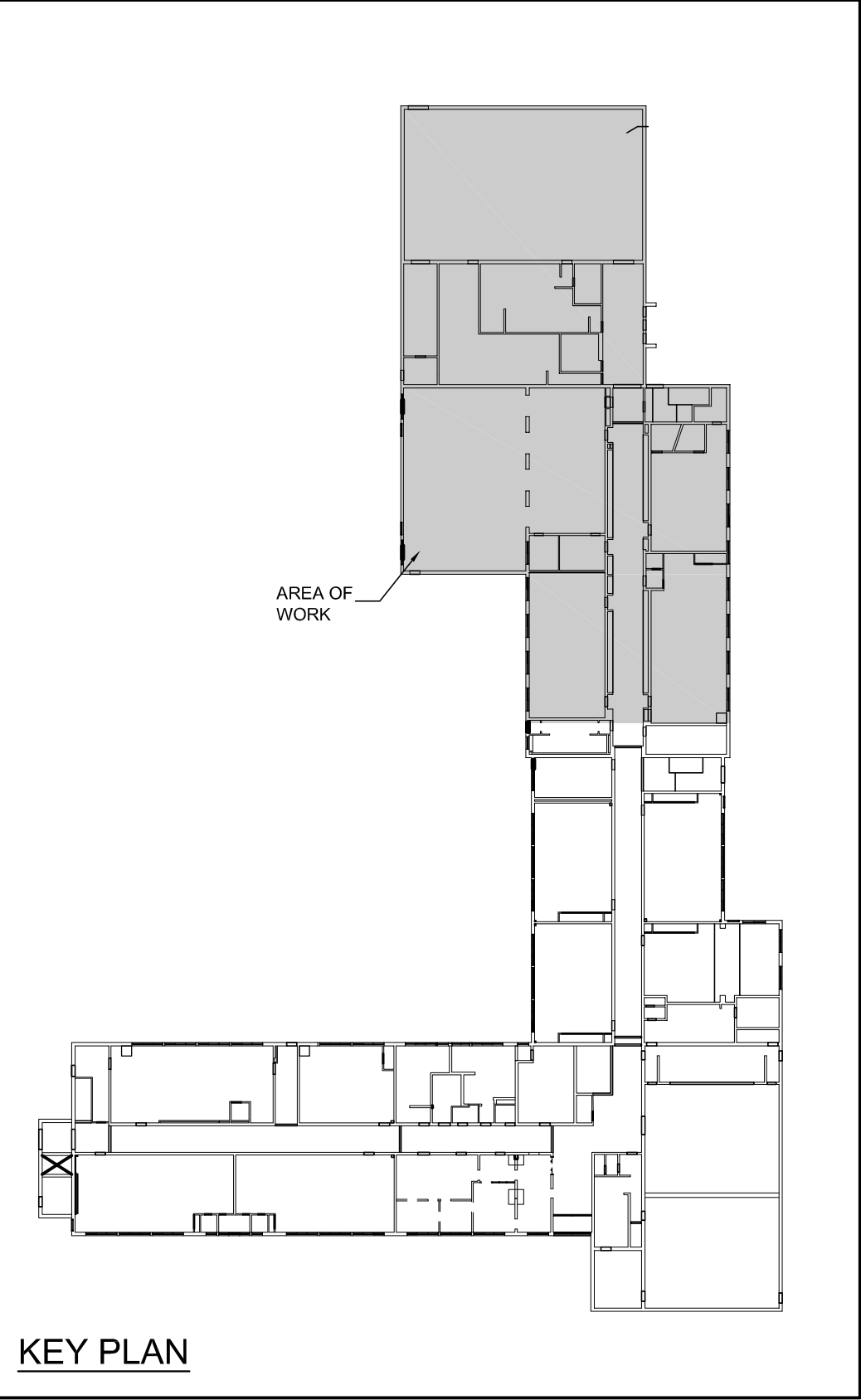
28 KING STREET EAST, UNIT B  
STONEY CREEK, ONTARIO, L8G 1J8  
Tel. 905-664-8735 Fax. 905-664-8737  
Web: www.2gai.com

SCALE: AS NOTED	PROJECT: 2020-31
DATE: JAN-2021	DRAWING A1.00
DRAWN DW	
CHECKED JG	
PRINT DATE	05/07/21

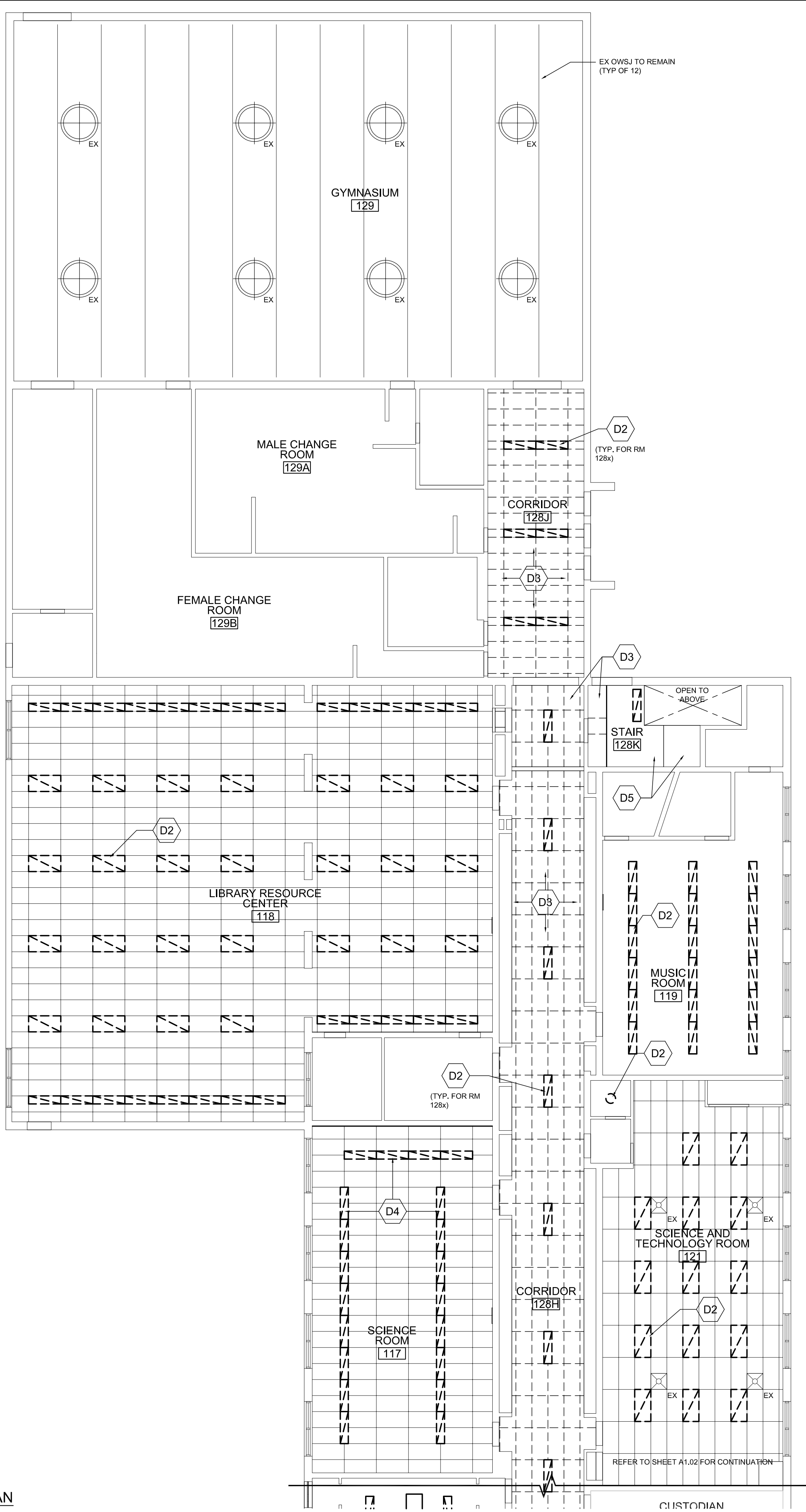
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KEY PLAN

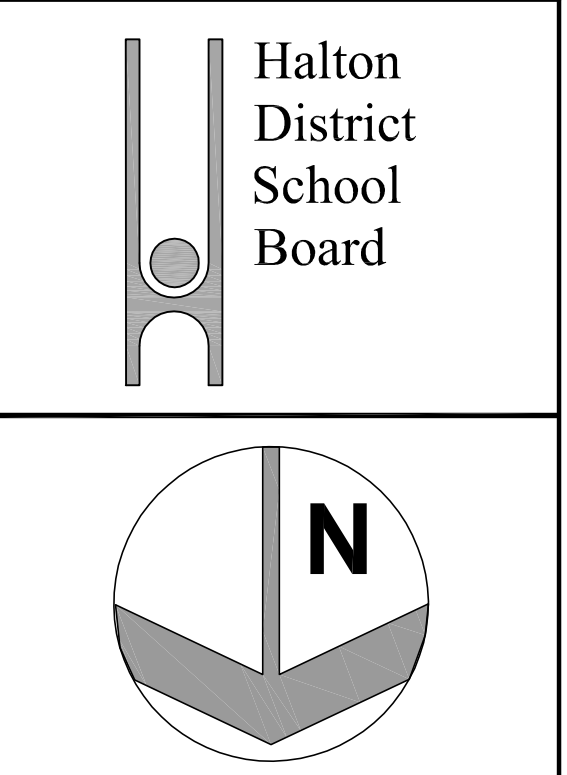


GENERAL NOTES

1. FIELD VERIFY ALL DIMENSIONS PRIOR TO STARTING CONSTRUCTION.
2. UNO EXISTING SUSPENDED ACOUSTIC TILE CEILING ARE TO REMAIN.
3. WHERE EXISTING CEILING MATERIALS ARE INDICATED TO BE REMOVED ON REFLECTED CEILING PLANS, REMOVE ALL EXISTING CEILING SYSTEMS AND BULKHEADS COMPLETELY INCLUDING SUSPENSION SYSTEMS AND HANGERS. MAKE EXISTING STRUCTURE READY TO RECEIVE NEW CEILING FINISH.
4. ALL PATCHING AND REPAIRING OF EXISTING CEILINGS AND CEILING SURFACES ARE NOT NECESSARILY SHOWN. PATCH, REPAIR & REFINISH ALL EXISTING SURFACES AFFECTED BY CONSTRUCTION ACTIVITIES SO THAT ALL SURFACES WHEN COMPLETE RESEMBLE A NEW INSTALLATION.
5. REFER TO MECHANICAL & ELECTRICAL DOCUMENTS FOR REMOVAL OF EXISTING MECHANICAL AND ELECTRICAL FIXTURES.

DEMOLITION NOTES

- D1 EX 305x305 ACOUSTIC CEILING TILES TO BE REMOVED AND DISPOSED OF
- D2 EX LIGHT FIXTURES TO BE REMOVED AND DISPOSED OF. REFER TO AND COORDINATE WITH ELECTRICAL DRAWINGS. TYPICAL FOR ENTIRE ROOM UNO.
- D3 EX ACOUSTIC CEILING TILES, SUSPENDED CEILING GRID SYSTEM, WALL TRACK AND HANGING WIRES TO BE REMOVED AND DISPOSED OF
- D4 EX SURFACE MOUNTED LIGHT FIXTURES TO BE REMOVED AND DISPOSED OF. REFER TO AND COORDINATE WITH ELECTRICAL DRAWINGS. PATCH REPAIR EXISTING CEILING SUSPENSION TRACK AS REQUIRED TO MAKE READY TO RECEIVE NEW LIGHT FIXTURES.
- D5 EX 305x305 ACOUSTIC CEILING TILES AND GYPSUM BOARD BACKING TO BE REMOVED AND DISPOSED OF. REMOVE AND DISPOSE OF EX METAL HANGING CHANNELS AND ALL HANGING WIRES.



LEGEND

- EX LIGHT FIXTURE TO REMAIN
- EX LIGHT FIXTURE TO BE REMOVED
- EX DIFFUSER TO REMAIN
- EX ACOUSTIC CEILING TILE TO REMAIN
- EX ACOUSTIC CEILING TILE TO BE REMOVED

ABBREVIATIONS LEGEND

- EX EXISTING ITEM
- RM ROOM
- TYP TYPICAL
- UNO UNLESS NOTED OTHERWISE

NO	REVISIONS	DATE
2	ISSUED FOR TENDER	2021-05-07
1	ISSUED FOR BUILDING PERMIT	2021-05-07

DRAWINGS ARE NOT TO BE SCALED. CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND CONDITIONS ON THE PROJECT, AND MUST REPORT ANY DISCREPANCIES TO THE ARCHITECTS BEFORE PROCEEDING WITH THE WORK. THE USE OF THIS DRAWING OR PART THEREOF IS FORBIDDEN WITHOUT THE WRITTEN APPROVAL OF THE ARCHITECTS.

ROLLING MEADOWS  
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GROUND FLOOR -  
DEMOLITION REFLECTED  
CEILING PLAN

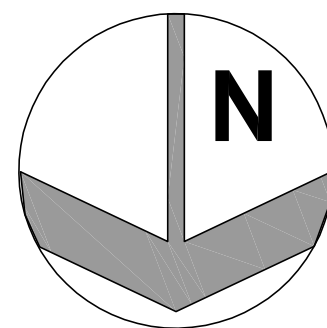
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DATE: JAN-2021	
DRAWN DW	DRAWING <b>A1.03</b>
CHECKED JG	
PRINT DATE	05/07/21

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Ground\_Floor\_Demo\_RCP.dwg





LEGEND

- EX LIGHT FIXTURE TO BE REMOVED
- EX GRILLE TO REMAIN
- EX HVAC UNIT TO REMAIN
- EX ACOUSTIC CEILING TILE TO REMAIN
- EX ACOUSTIC CEILING TILE TO BE REMOVED

ABBREVIATIONS LEGEND

- EX EXISTING ITEM
- UNO UNLESS NOTED OTHERWISE

2 ISSUED FOR TENDER 2021-05-07

1 ISSUED FOR BUILDING PERMIT 2021-05-07

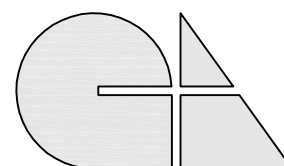
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ROLLING MEADOWS  
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1522 MOUNTAIN GROVE AVE.  
BURLINGTON, ONTARIO, L7P 2H5

SECOND FLOOR -  
DEMOLITION REFLECTED  
CEILING PLAN

GRGURIC  
ARCHITECTS  
INCORPORATED



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SCALE:

AS NOTED

DATE:

JAN-2021

DRAWN

DW

CHECKED

JG

PROJECT:

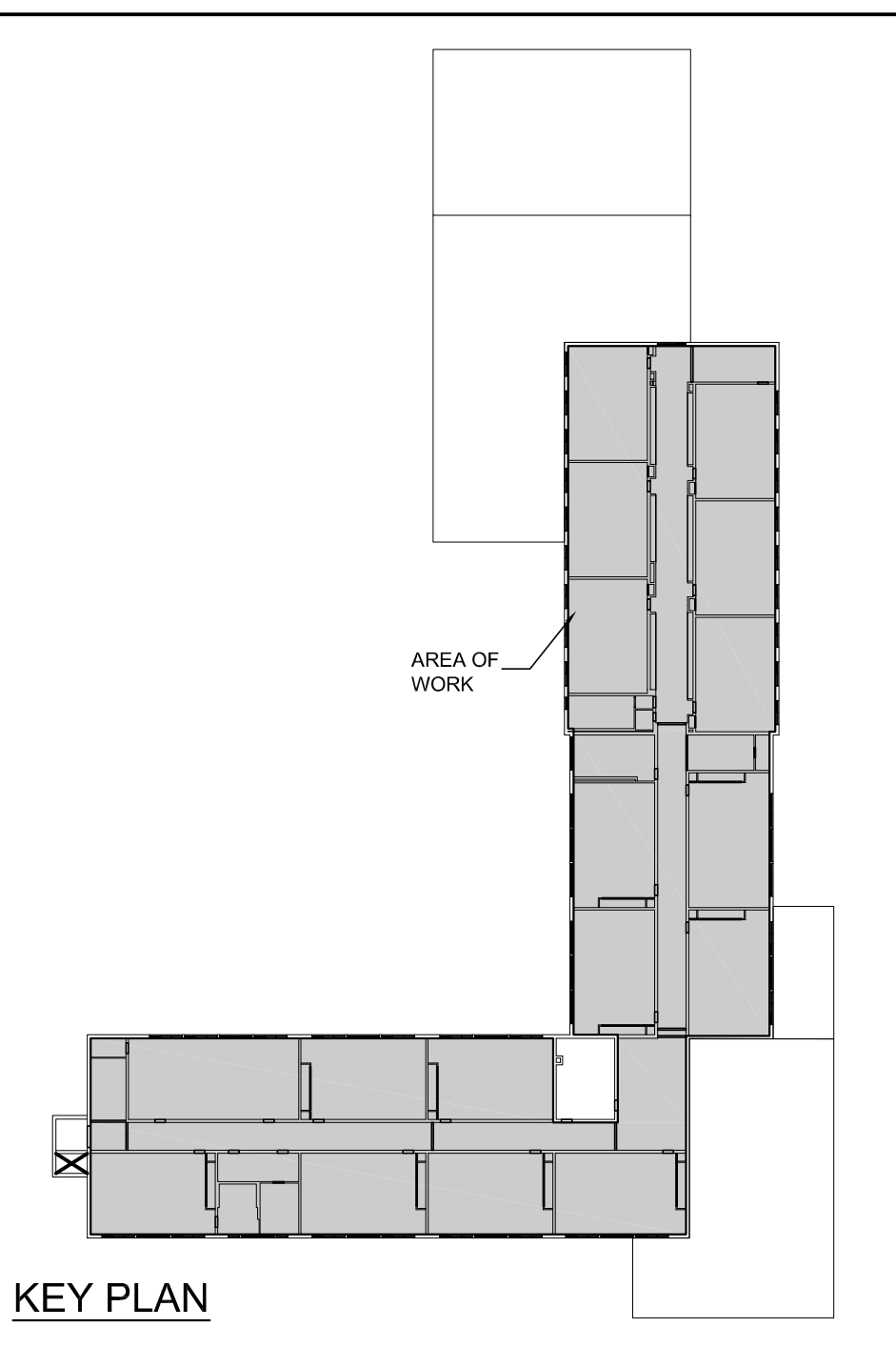
2020-31

DRAWING

A1.04

PRINT DATE 05/07/21

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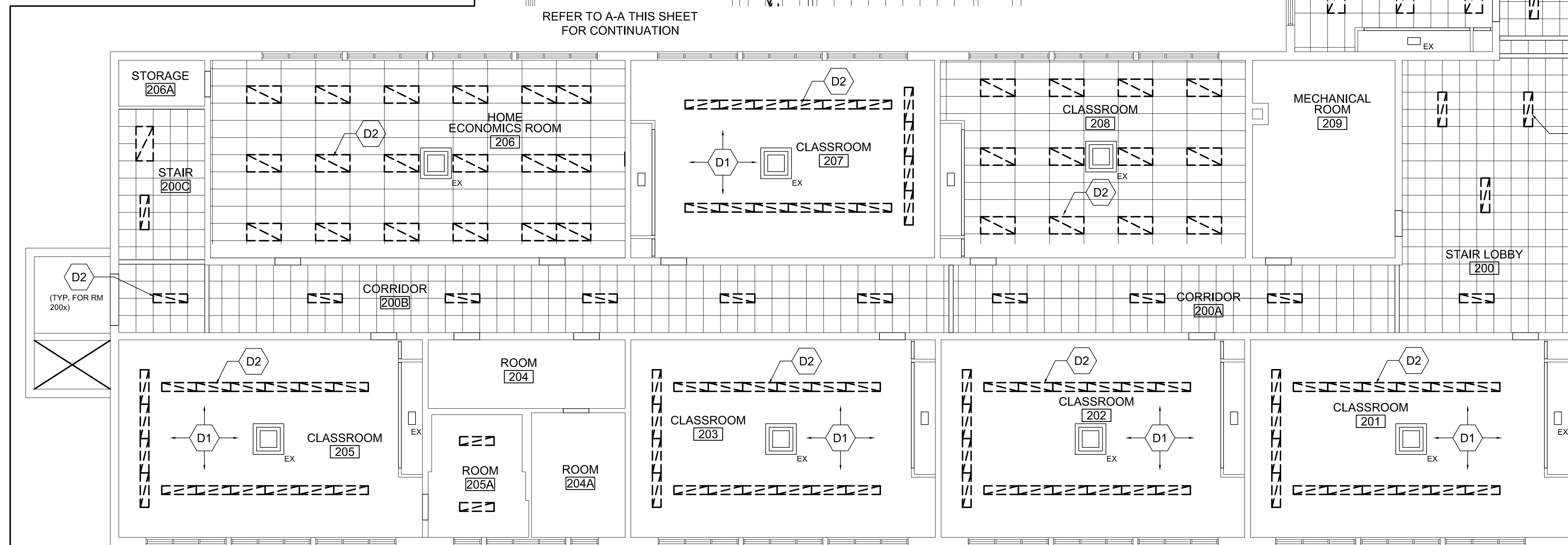
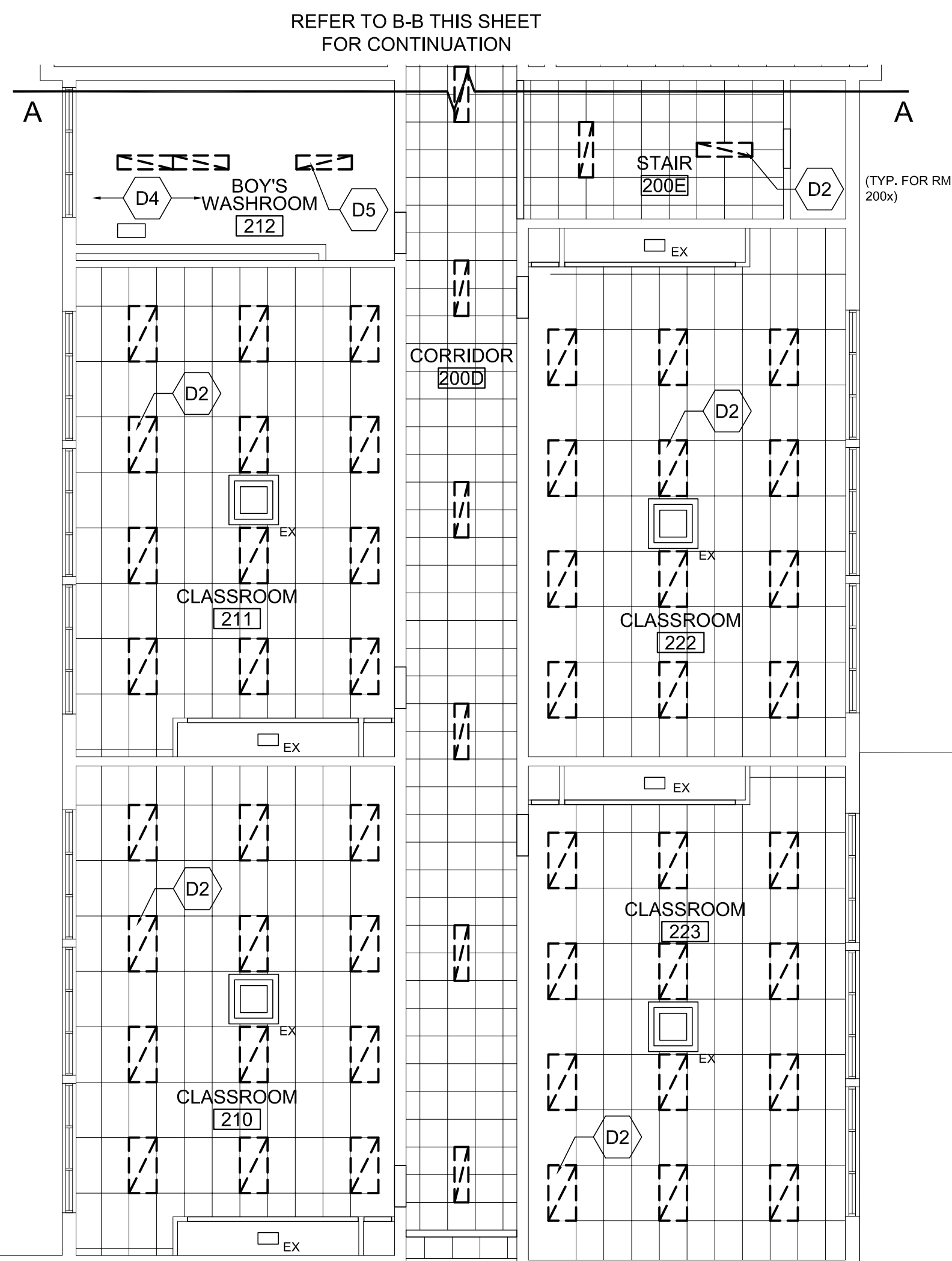
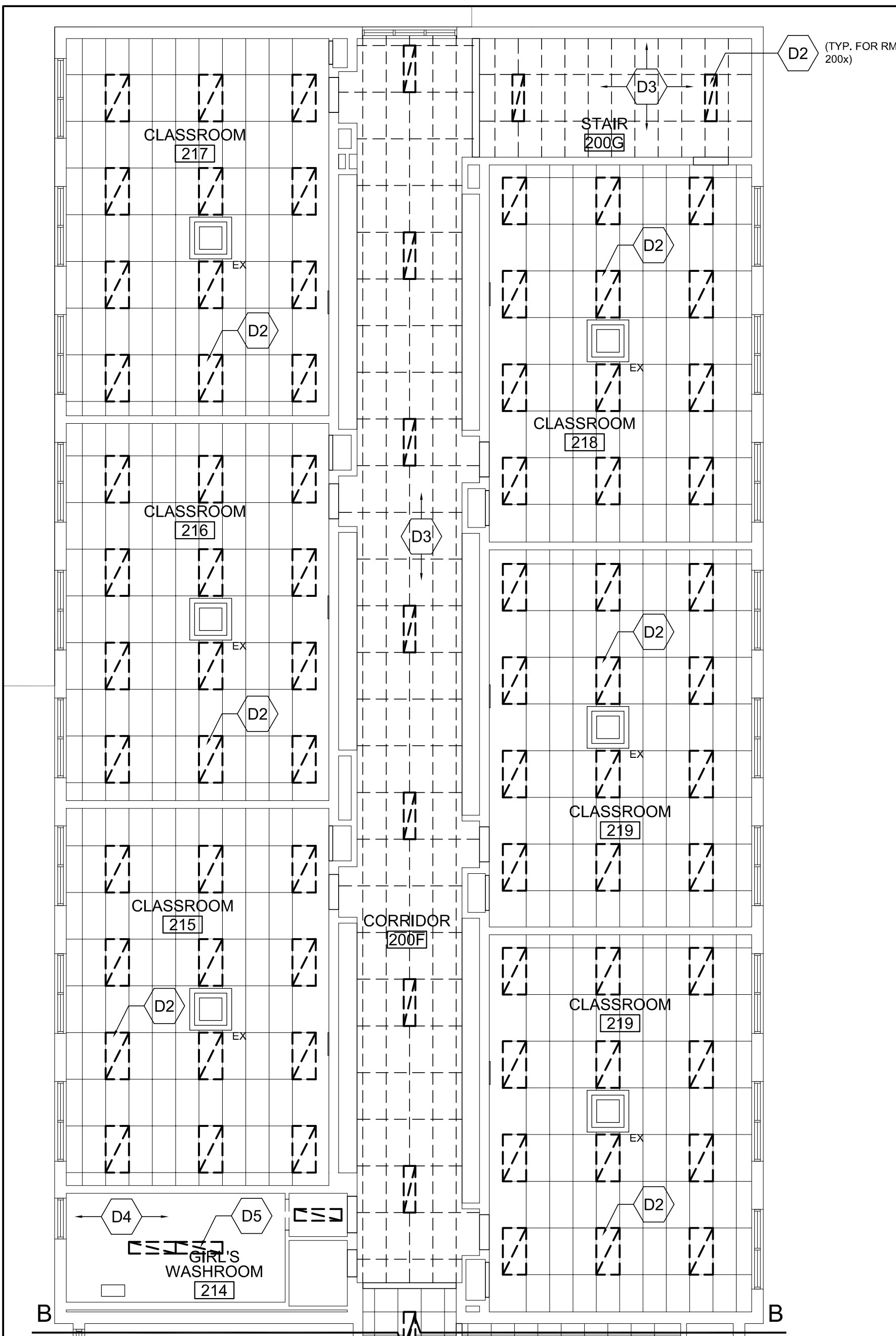


GENERAL NOTES

- FIELD VERIFY ALL DIMENSIONS PRIOR TO STARTING CONSTRUCTION.
- UNO EXISTING SUSPENDED ACOUSTIC TILE CEILING ARE TO REMAIN.
- WHERE EXISTING CEILING MATERIALS ARE INDICATED TO BE REMOVED ON REFLECTED CEILING PLANS, REMOVE ALL EXISTING CEILING SYSTEMS AND BULKHEADS COMPLETELY INCLUDING SUSPENSION SYSTEMS AND HANGERS. MAKE EXISTING STRUCTURE READY TO RECEIVE NEW CEILING FINISH.
- ALL PATCHING AND REPAIRING OF EXISTING CEILINGS AND CEILING SURFACES ARE NOT NECESSARILY SHOWN. PATCH, REPAIR & REFINISH ALL EXISTING SURFACES AFFECTED BY CONSTRUCTION ACTIVITIES SO THAT ALL SURFACES WHEN COMPLETE RESEMBLE A NEW INSTALLATION.
- REFER TO MECHANICAL & ELECTRICAL DOCUMENTS FOR REMOVAL OF EXISTING MECHANICAL AND ELECTRICAL FIXTURES.

DEMOLITION NOTES

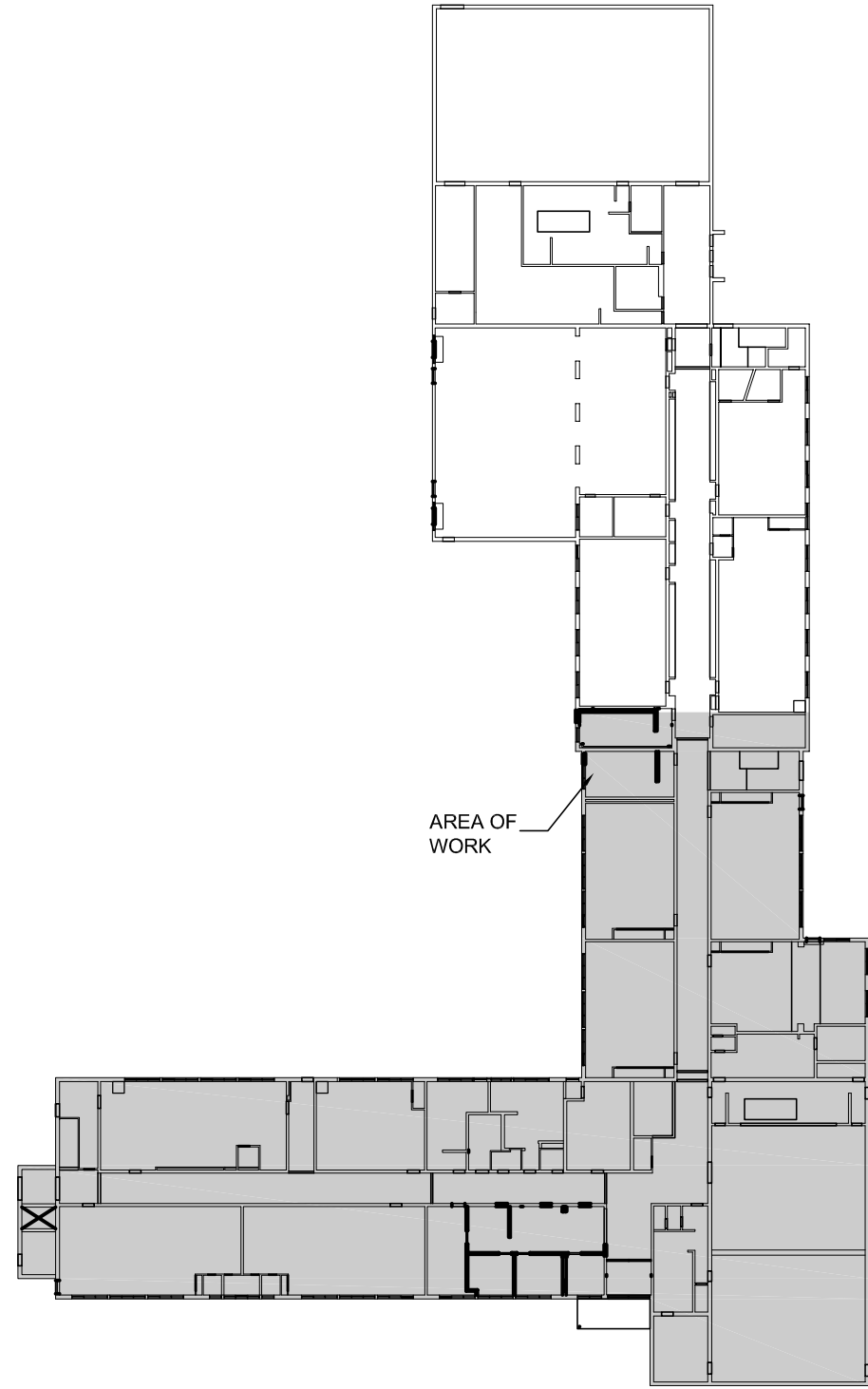
- D1 EX 305x305 ACOUSTIC CEILING TILES TO BE REMOVED AND DISPOSED OF
- D2 EX LIGHT FIXTURES TO BE REMOVED AND DISPOSED OF. REFER TO AND COORDINATE WITH ELECTRICAL DRAWINGS. TYPICAL FOR ENTIRE ROOM UNO.
- D3 EX ACOUSTIC CEILING TILES, SUSPENDED CEILING GRID SYSTEM, WALL TRACK AND HANGING WIRES TO BE REMOVED AND DISPOSED OF
- D4 EX 305x305 ACOUSTIC CEILING TILES AND GYPSUM BOARD BACKING TO BE REMOVED AND DISPOSED OF. REMOVE AND DISPOSE OF EX METAL HANGING CHANNELS AND ALL HANGING WIRES. WORK TO BE COMPLETED BY THE ABATEMENT CONTRACTOR
- D5 EX LIGHT FIXTURES TO BE REMOVED AND DISPOSED OF. REFER TO AND COORDINATE WITH ELECTRICAL DRAWINGS. WORK TO BE COMPLETED BY THE ABATEMENT CONTRACTOR



1

SECOND FLOOR - DEMOLITION REFLECTED CEILING PLAN

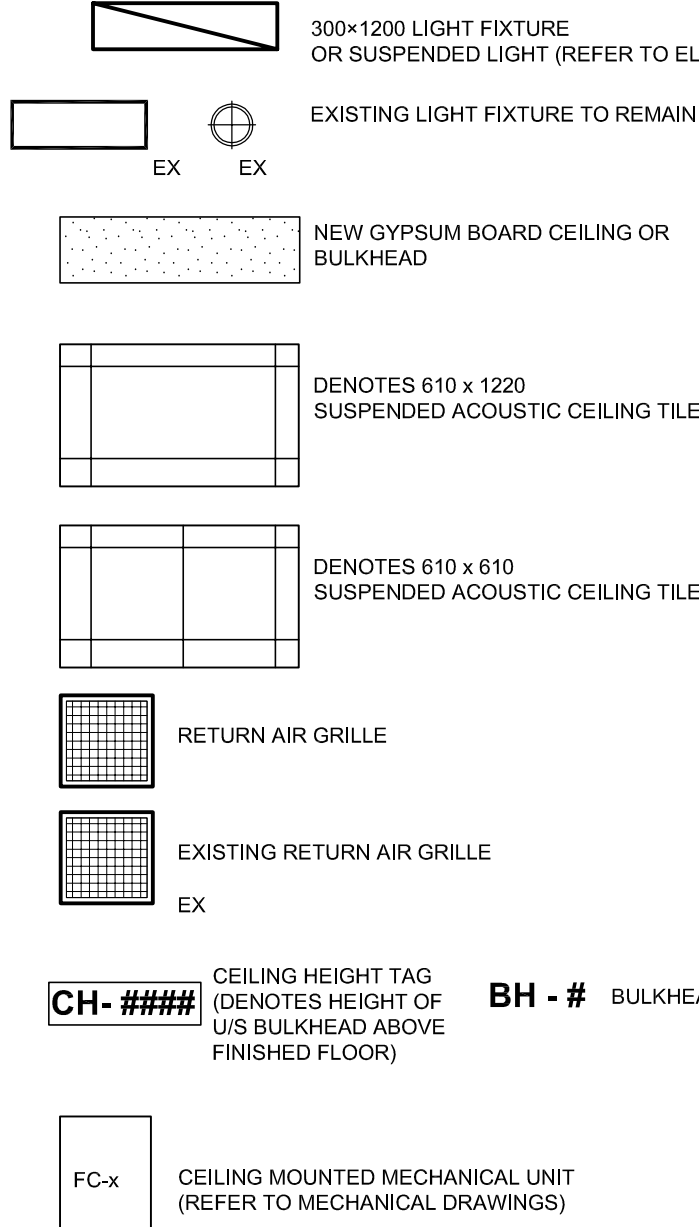
SCALE: 1:100



KEY PLAN

### GRAPHIC RCP LEGEND

NOTE: REFER TO ELECTRICAL DRAWINGS FOR FIXTURE TYPES  
- MECHANICAL AND ELECTRICAL ITEMS SHOWN, I.E. DUCTWORK,  
PIPING, LIGHT FIXTURES, ETC. ARE FOR REFERENCE ONLY  
AND ARE NOT INCLUSIVE, REFER TO MECHANICAL AND  
ELECTRICAL DRAWINGS FOR ALL RELATED FIXTURES.



### BULKHEAD TYPES

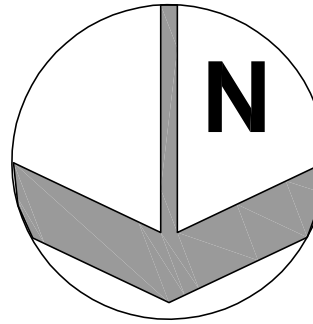
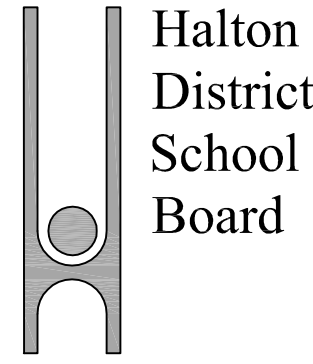
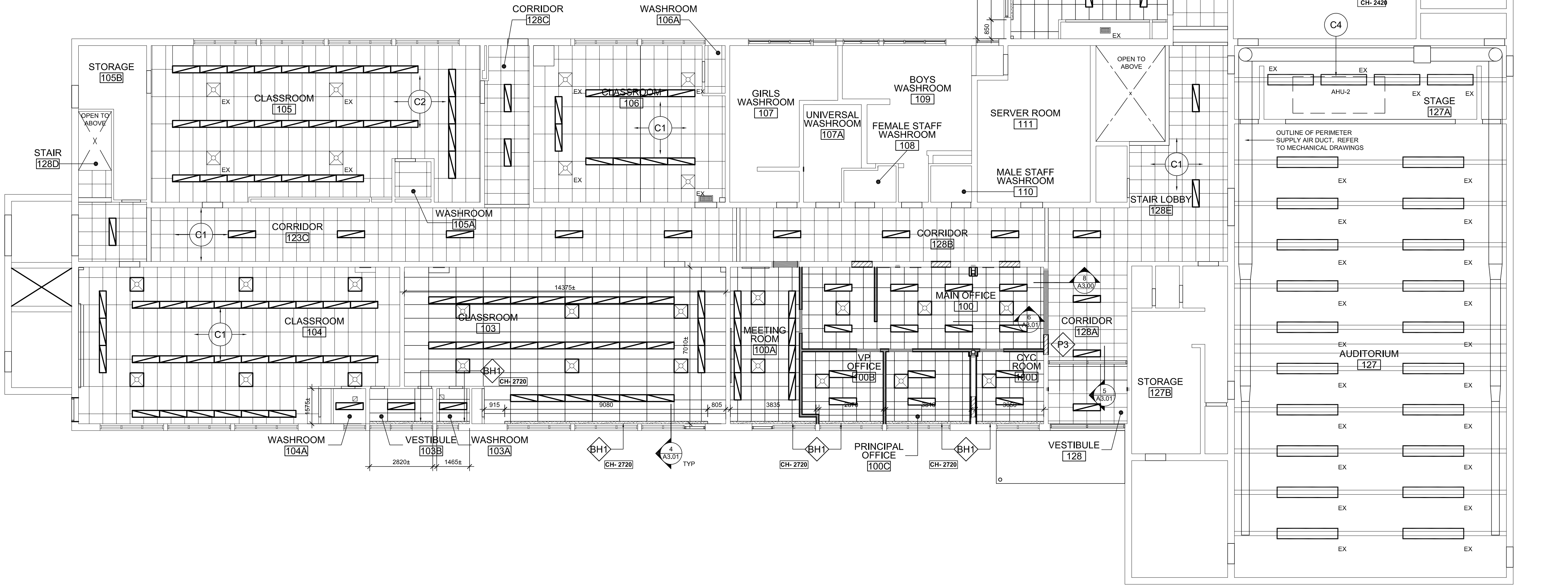
NO.	ASSEMBLY	DESCRIPTION	REMARKS
BH1	1 HR ULC W407	-16mm TYPE 'X' GYPSUM BOARD TO U/S OF EX WINDOW FRAME -92mm METAL STUDS @ 600mm O/C -16mm TYPE 'X' GYPSUM BOARD TO U/S OF EX OWSJ - PROVIDE 2 LAYERS - 16mm TYPE 'X' GYPSUM BOARD (1 HR FIRE RATED - OBC SB-2 2.3.4.5) BETWEEN METAL STUDS AT U/S OF OWSJ	REFER TO DETAIL 4/A3.01
BH2		-16mm GYPSUM BOARD HORIZONTAL / 13mm GYPSUM BOARD VERTICAL - 64mm METAL STUDS @ 600mm O/C HORIZONTAL AND VERTICAL	REFER TO DETAIL 9/A3.01
BH3	1 HR SB-2	-2 LAYERS - 16mm GYPSUM BOARD HORIZONTAL AND VERTICAL - 92mm METAL STUDS @ 400mm O/C HORIZONTAL AND VERTICAL	REFER TO DETAIL 10/A3.01

### GENERAL NOTES

- FIELD VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTION. REPORT ANY DISCREPANCIES TO ARCHITECT.
- CAUSE NO DAMAGE TO EXISTING CONSTRUCTION TO REMAIN. TAKE CARE NOT TO ENCRONCH ON ADJACENT OCCUPIED AREAS OR AREAS NOT WITHIN THE SCOPE OF WORK. PROTECT ALL EXISTING FINISHES, DOORS, FRAMES, ETC. WHICH ARE TO REMAIN. PATCH AND MAKE GOOD ALL EXISTING ADJACENT SURFACES FINISHES & MATERIALS WHERE DISTURBED BY NEW CONSTRUCTION.
- MECHANICAL AND ELECTRICAL ITEMS SHOWN, I.E. DUCTWORK, PIPING, LIGHT FIXTURES, ETC. ARE FOR REFERENCE ONLY. REFER TO MECHANICAL AND ELECTRICAL DRAWING FOR ALL RELATED DEMOLITION WORK REQUIRED.
- EXISTING BUILDING HEIGHTS AFF:
  - UNDERSIDE OF SECOND FLOOR CONCRETE FLOOR SLAB: 3510mm ±
- EXISTING 125mm REINFORCED CONCRETE FLOOR SLAB - 1HR FRR - OBC SB-2 TABLE 2.2.1.A

### CONSTRUCTION NOTES

- EX ACOUSTIC CEILING TILES TO REMAIN. EXISTING LIGHTING TO BE REPLACE. REFER TO AND COORDINATE WITH ELECTRICAL DRAWINGS.
- EX ACOUSTIC CEILING TILES TO REMAIN. SUPPLY AND INSTALL ACT TO MATCH EXISTING WHERE EXISTING LIGHT FIXTURES WERE REMOVED. REFER TO A1.02 FOR EXISTING LIGHT FIXTURE LOCATIONS.
- PATCH AND REPAIR THE EX GYPSUM BOARD CEILING AROUND REPLACED LIGHT FIXTURE AS REQUIRED.
- OUTLINE OF AIR HANDLING UNIT ON ROOF. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS
- SUPPLY AND INSTALL 2 LAYERS - 16mm TYPE 'X' GYPSUM BOARD ON 22mm METAL FURRING CHANNELS AT 400mm O.C. FURRING CHANNELS TO BE SUPPORTED FROM 38mm METAL CHANNELS AT 1220mm O.C. (MAX). SUSPEND CHANNELS FROM UNDERSIDE OF EX STRUCTURE ABOVE BY METAL HANGING WIRE SPACED 1220mm O.C. (MAX). 1HR FIRE RATING (OBC SB-2 TABLE 2.3.12)
- SUPPLY AND INSTALL 2 LAYERS - 16mm GYPSUM BOARD ON 22mm METAL FURRING CHANNELS AT 400mm O.C. FURRING CHANNELS TO BE SUPPORTED FROM 38mm METAL CHANNELS AT 1220mm O.C. (MAX). SUSPEND CHANNELS FROM UNDERSIDE OF EX STRUCTURE ABOVE BY METAL HANGING WIRE SPACED 1220mm O.C. (MAX).



### ABBREVIATIONS LEGEND

AFF	ABOVE FINISHED FLOOR
EX	EXISTING ITEM
FRR	FIRE RESISTANCE RATING
MAX	MAXIMUM
MIN	MINIMUM
O.C.	ON CENTER
OWSJ	OPEN WEB STEEL JOIST
TYP	TYPICAL
W/	WITH

NO.	REVISIONS	DATE
3	ISSUED FOR TENDER	2021-05-07
2	ISSUED FOR BUILDING PERMIT	2021-05-07
1	ISSUED FOR ZONING CLEARANCE	2021-03-16

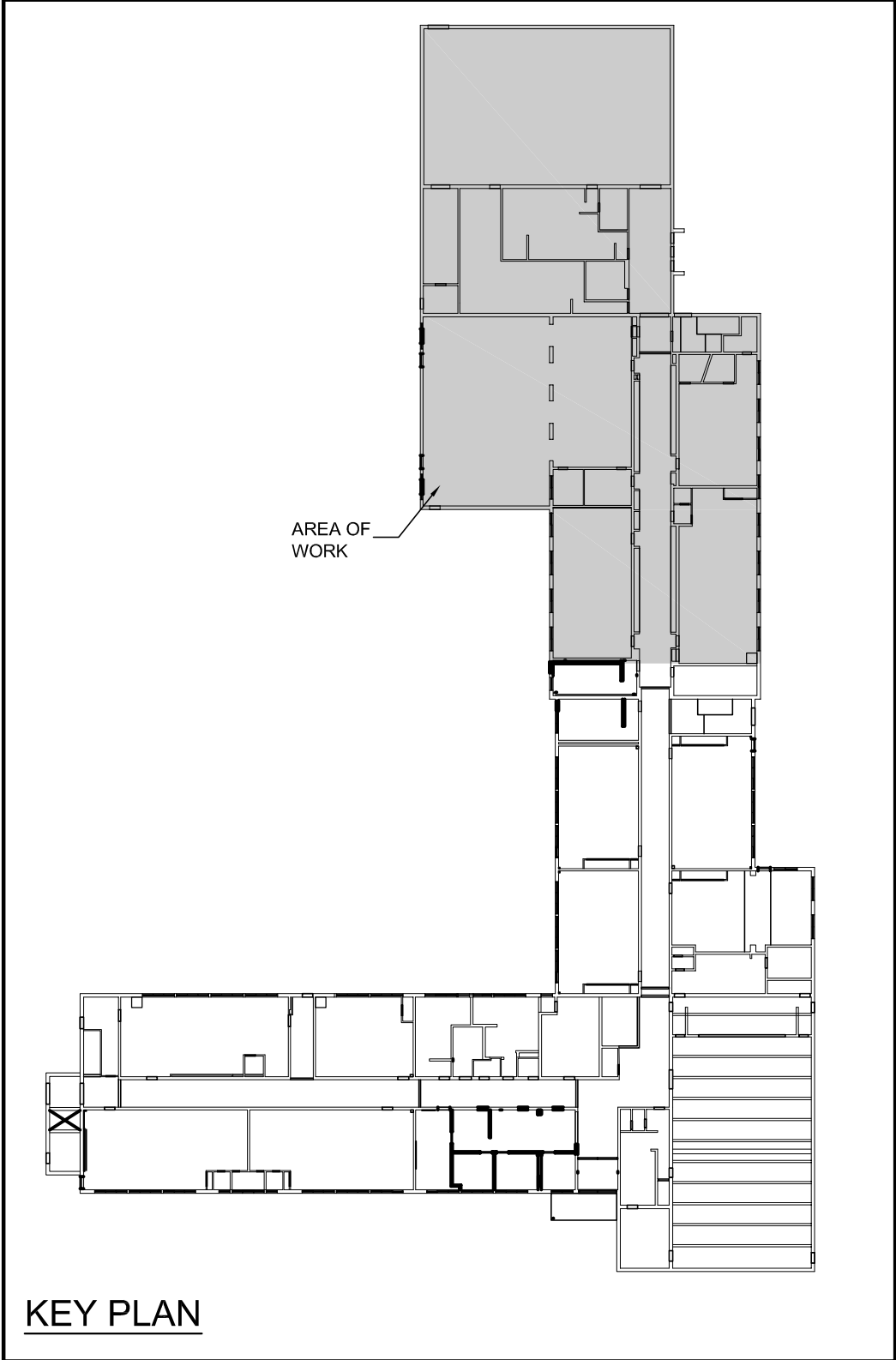
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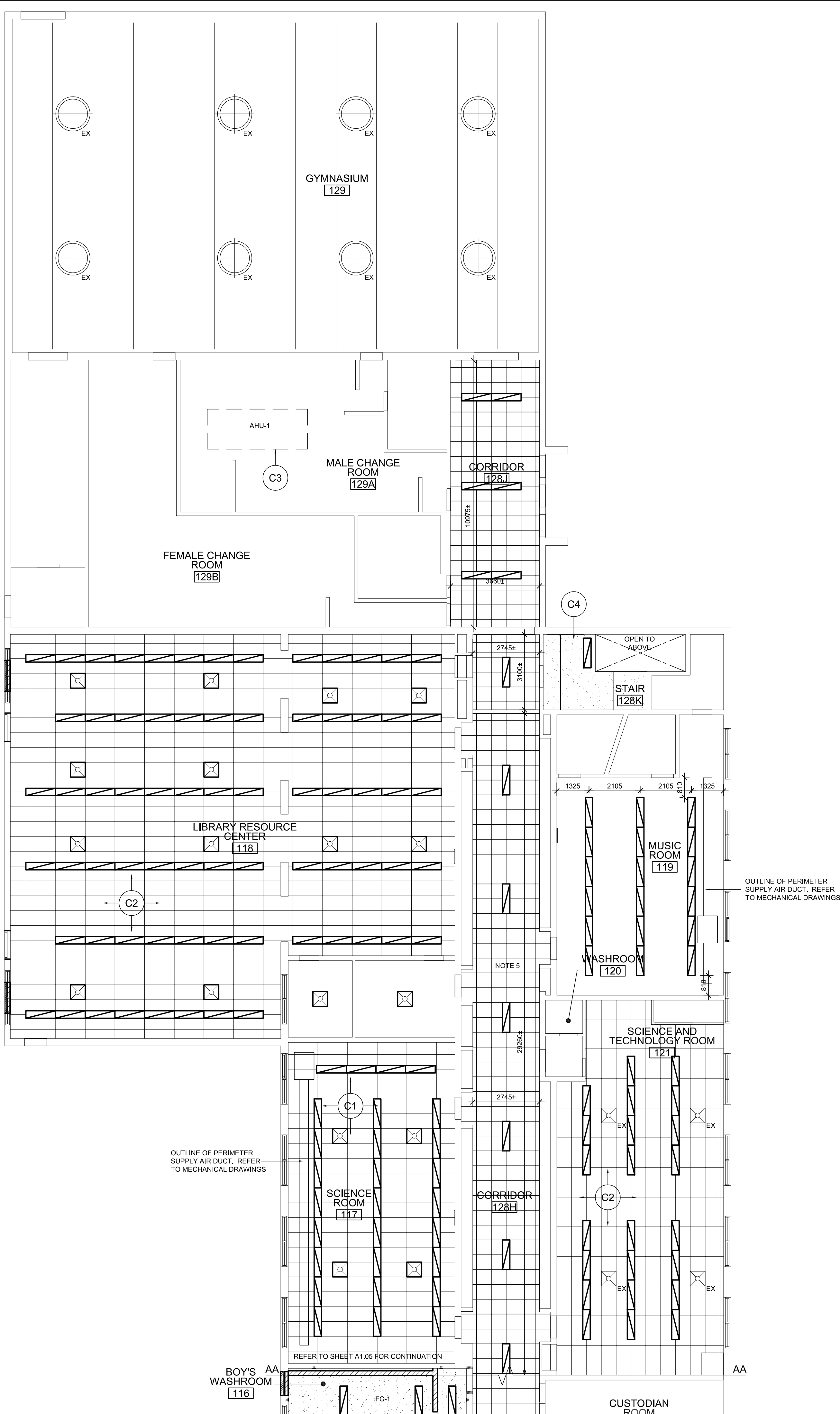
GROUND FLOOR  
REFLECTED CEILING PLAN

GRGURIC  
ARCHITECTS  
INCORPORATED  
28 KING STREET EAST, UNIT B  
STONEY CREEK, ONTARIO, L8G 1J8  
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DATE: JAN-2021	DRAWING: A1.05
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CHECKED JG	
PRINT DATE	05/07/21



KEY PLAN



1  
A1.06  
GROUND FLOOR REFLECTED CEILING PLAN  
SCALE: 1:100

**GENERAL NOTES**

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- CAUSE NO DAMAGE TO EXISTING CONSTRUCTION TO REMAIN. TAKE CARE NOT TO ENCRoACH ON ADJACENT OCCUPIED AREAS OR AREAS NOT WITHIN THE SCOPE OF WORK. PROTECT ALL EXISTING FINISHES, DOORS, FRAMES, ETC. WHICH ARE TO REMAIN. PATCH AND MAKE GOOD ALL EXISTING ADJACENT SURFACES FINISHES & MATERIALS WHERE DISTURBED BY NEW CONSTRUCTION.
- MECHANICAL AND ELECTRICAL ITEMS SHOWN, I.E. DUCTWORK, PIPING, LIGHT FIXTURES, ETC. ARE FOR REFERENCE ONLY. REFER TO MECHANICAL AND ELECTRICAL DRAWING FOR ALL RELATED DEMOLITION WORK REQUIRED.
- EXISTING BUILDING HEIGHTS AFF:  
4.1. UNDERSIDE OF SECOND FLOOR CONCRETE FLOOR SLAB: 3510mm ±
- EXISTING 125mm REINFORCED CONCRETE FLOOR SLAB - 2HR FRR - OBC SB-2 TABLE 2.2.1.A

**CONSTRUCTION NOTES**

C1 EX ACOUSTIC CEILING TILES TO REMAIN.

C2 EX ACOUSTIC CEILING TILES TO REMAIN. SUPPLY AND INSTALL ACT TO MATCH EXISTING WHERE EXISTING LIGHT FIXTURES WERE REMOVED. REFER TO A1.02 FOR EXISTING LIGHT FIXTURE LOCATIONS.

C3 OUTLINE OF AIR HANDLING UNIT ON ROOF. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS

C4 SUPPLY AND INSTALL 10mm GYPSUM BOARD CEILING ON 22mm METAL FURRING CHANNELS AT 400mm O.C. FURRING CHANNELS TO BE SECURED TO UNDERSIDE OF STRUCTURE ABOVE.

**GRAPHIC RCP LEGEND**

NOTE: REFER TO ELECTRICAL DRAWINGS FOR FIXTURE TYPES - MECHANICAL AND ELECTRICAL ITEMS SHOWN, I.E. DUCTWORK, PIPING, LIGHT FIXTURES, ETC. **ARE FOR REFERENCE ONLY** AND ARE NOT INCLUSIVE. REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR ALL RELATED FIXTURES.

300x1200 LIGHT FIXTURE OR SUSPENDED LIGHT (REFER TO ELECTRICAL).

EXISTING LIGHT FIXTURE TO REMAIN

NEW GYPSUM BOARD CEILING OR BULKHEAD

DENOTES 610 x 1220 SUSPENDED ACOUSTIC CEILING TILE

DENOTES 610 x 610 SUSPENDED ACOUSTIC CEILING TILE

DIFFUSER (REFER TO MECHANICAL)

RETURN AIR GRILLE

EXISTING RETURN AIR GRILLE

CEILING HEIGHT TAG (DENOTES HEIGHT OF U/S BULKHEAD ABOVE FINISHED FLOOR)

BH - # BULKHEAD TAG

FC-x CEILING MOUNTED MECHANICAL UNIT (REFER TO MECHANICAL DRAWINGS)

2  
A1.06  
DETAIL - GYPSUM BOARD ENCLOSURE AT MECHANICAL UNIT  
SCALE: 1:10

3	ISSUED FOR TENDER	2021-05-07
2	ISSUED FOR BUILDING PERMIT	2021-05-07
1	ISSUED FOR ZONING CLEARANCE	2021-03-16

NO	REVISIONS	DATE
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GROUND FLOOR  
REFLECTED CEILING PLAN

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SCALE: AS NOTED	PROJECT: 2020-31
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DRAWN DW	DRAWING A1.06
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PRINT DATE	05/07/21

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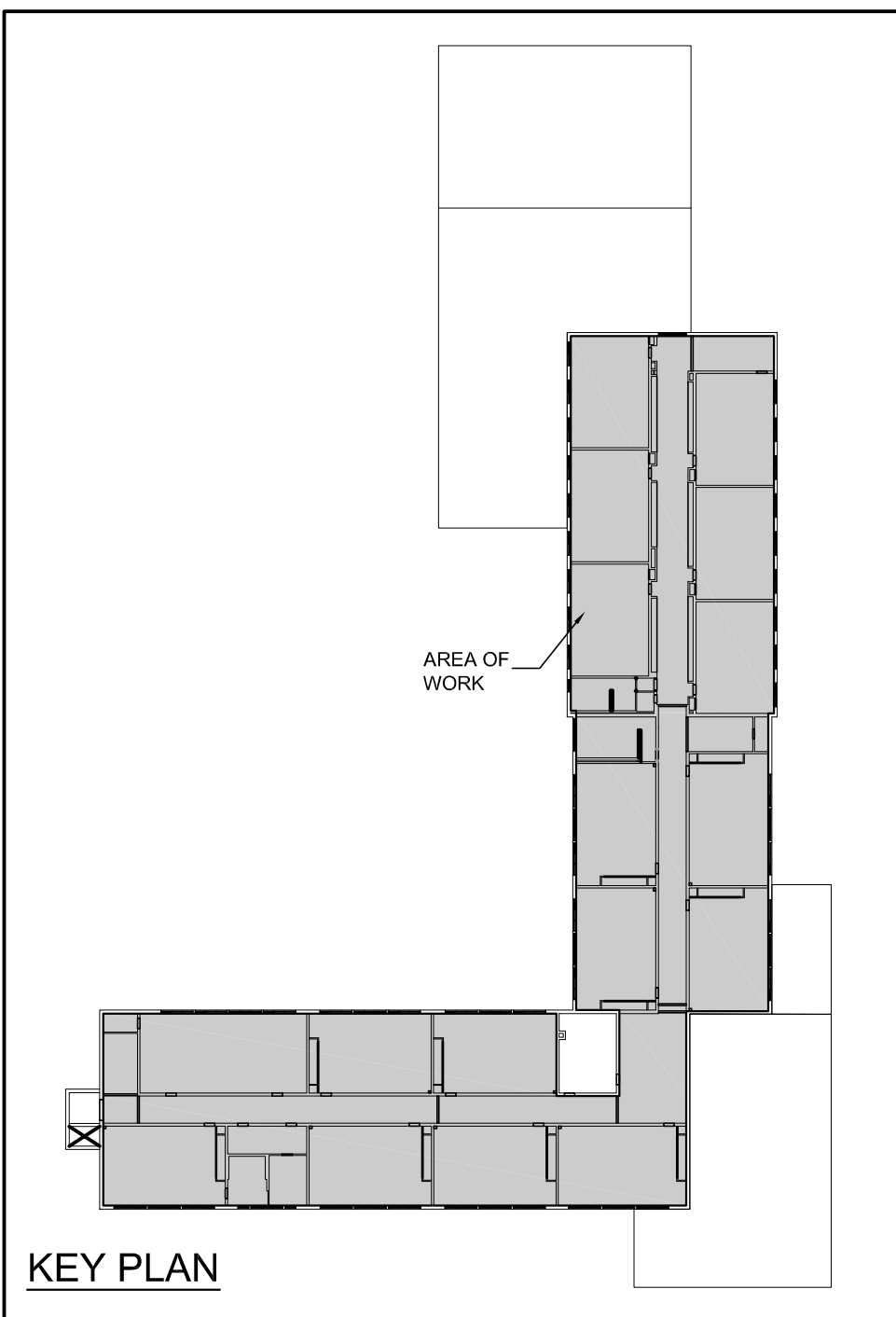
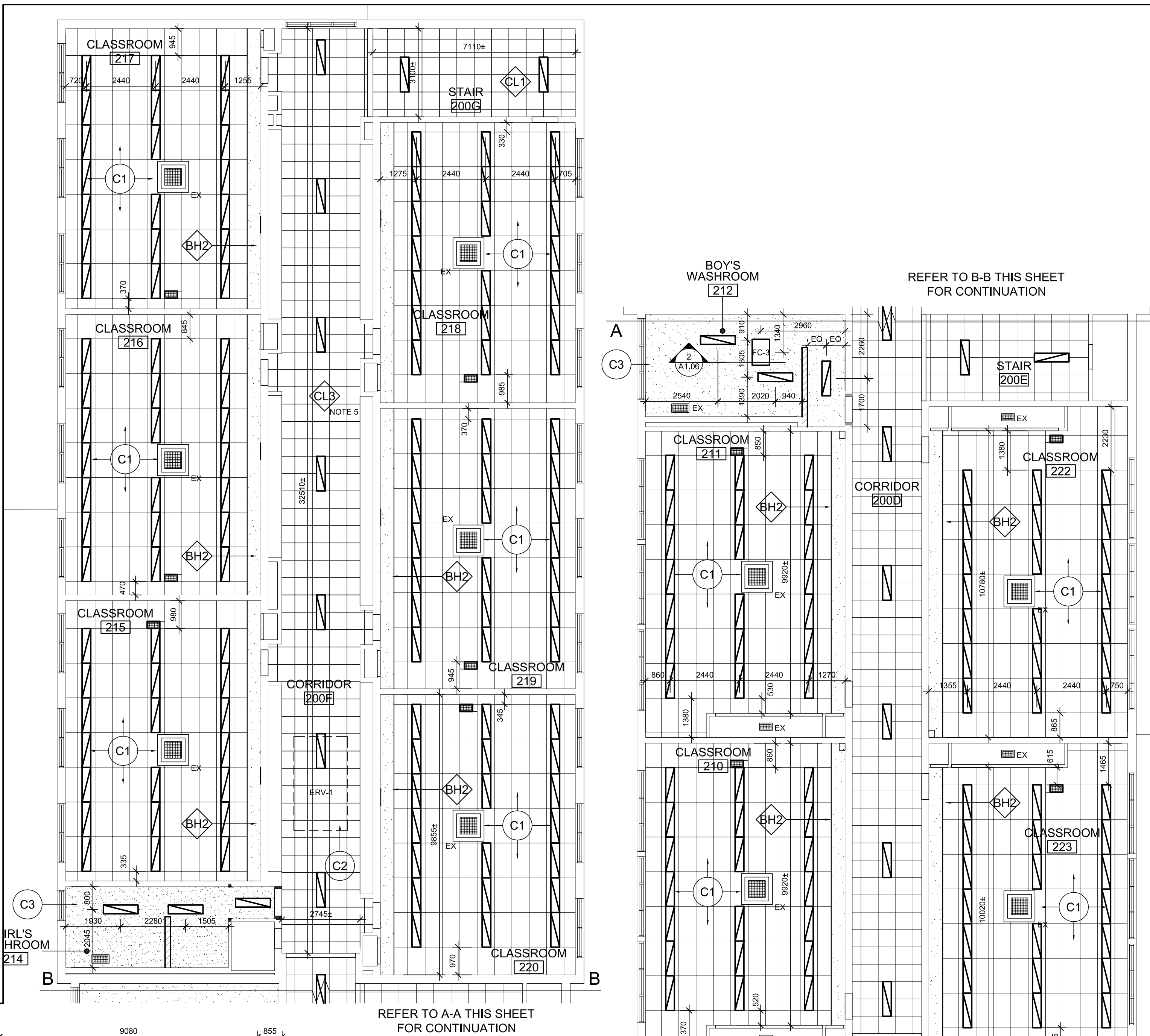


## CEILING TYPES

NO.	ASSEMBLY	DESCRIPTION	REMARKS
CL1	1 HR ULC Q243	- EX 65mm REINFORCED CONCRETE SLAB - EX 405 OWSJ - NO. 12 SWG GALVANIZED STEEL WIRE TWIST-TIED TO 38mm DEEP 16 GAUGE STEEL CHANNELS. HANGER WIRE TO BE SPACED 1220mm O.C. MAX ON MAIN RUNNER ADJACENT TO CROSS TEE INTERSECTION - MAIN RUNNERS - 24mm DEEP X 3655mm LONG (NOMINAL) SPACED AT 1220mm O.C. - CROSS TEE - NOMINAL 1220mm LONG INSTALLED PERPENDICULAR TO MAIN RUNNERS AND SPACED AT 610mm O.C. - ACOUSTIC CEILING TILES - 610mm X 610mm OR 1220mm LAY-IN PANELS. BORDER PANELS TO BE SUPPORT AT WALLS BY MIN 28 MSG PAINTED STEEL ANGLE W/ 25mm LEGS - HOLD-DOWN CLIPS - NO. 30 MSG SPRING STEEL PLACED OVER CROSS TEES 610mm O.C.	- AIR DUCTS - 24 GAUGE GALVANIZED STEEL (MIN). - DAMPER - 25 GAUGE GALVANIZED STEEL (MIN) W/ 15mm THICK CERAMIC FIBER PAPER ON EACH SURFACE. DAMPER TO BE HELD OPEN BY A FUSIBLE LINK. DAMPER TO OVERLAP DUCT OUTLET BY 25mm (MIN)  - FOR 610mm X 610mm CEILING TILES - INSTALL ADDITIONAL 610mm CROSS TEE PERPENDICULAR TO 1220mm CROSS TEE. MIDWAY BETWEEN MAIN RUNNERS.  - HOLD DOWN CLIPS REQUIRED WHEN CEILING TILES HAVE A WEIGHT OF LESS THAN 1 LBS PER SQUARE FOOT
CL2	60 MIN OBC SB-2 TABLE 2.3.12	- 2 LAYERS - 16mm TYPE 'X' GYPSUM BOARD - 92mm METAL STUDS AT 400mm O.C.	
CL3		- ACOUSTIC CEILING TILE - 24mm DEEP SUSPENSION TEES	

## BULKHEAD TYPES

NO.	ASSEMBLY	DESCRIPTION	REMARKS
BH1	1 HR ULC W407	- 16mm TYPE 'X' GYPSUM BOARD TO U/S OF EX WINDOW FRAME - 92mm METAL STUDS @ 600mm O/C - 16mm TYPE 'X' GYPSUM BOARD TO U/S OF EX OWSJ - PROVIDE 2 LAYERS - 16mm TYPE 'X' GYPSUM BOARD (1 HR FIRE RATED - OBC SB-2 2.3.4.B) BETWEEN METAL STUDS AT U/S OF OWSJ	REFER TO DETAIL 4/A3.01
BH2		- 16mm GYPSUM BOARD HORIZONTAL / 13mm GYPSUM BOARD VERTICAL - 64mm METAL STUDS @ 600mm O/C HORIZONTAL AND VERTICAL	REFER TO DETAIL 9/A3.01



## GENERAL NOTES

- FIELD VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTION. REPORT ANY DISCREPANCIES TO ARCHITECT.
- CAUSE NO DAMAGE TO EXISTING CONSTRUCTION TO REMAIN. TAKE CARE NOT TO ENCRONCH ON ADJACENT OCCUPIED AREAS OR AREAS NOT WITHIN THE SCOPE OF WORK. PROTECT ALL EXISTING FINISHES, DOORS, FRAMES, ETC. WHICH ARE TO REMAIN. PATCH AND MAKE GOOD ALL EXISTING ADJACENT SURFACES FINISHES & MATERIALS WHERE DISTURBED BY NEW CONSTRUCTION.
- MECHANICAL AND ELECTRICAL ITEMS SHOWN, I.E. DUCTWORK, PIPING, LIGHT FIXTURES, ETC. ARE FOR REFERENCE ONLY. REFER TO MECHANICAL AND ELECTRICAL DRAWING FOR ALL RELATED DEMOLITION WORK REQUIRED.
- EXISTING BUILDING HEIGHTS AFF:
  - UNDERSIDE OF ROOF DECK: 3530mm ±
- EXISTING 125mm REINFORCED CONCRETE ROOF SLAB - 2HR FRR - OBC SB-2 TABLE 2.2.1.A

## CONSTRUCTION NOTES

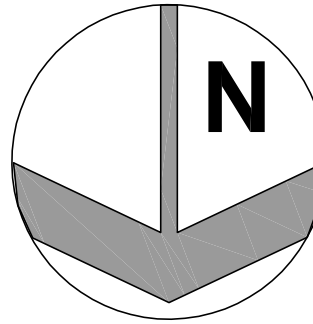
- C1 EX ACOUSTIC CEILING TILES TO REMAIN.
- C2 OUTLINE OF ENERGY RECOVERY VENTILATOR (ERV) ON ROOF. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS
- C3 SUPPLY AND INSTALL 2 LAYERS - 16mm TYPE 'X' GYPSUM BOARD ON 22mm METAL FURRING CHANNELS AT 400mm O.C. FURRING CHANNELS TO BE SUPPORTED FROM 38mm METAL CHANNELS AT 1220mm O.C. (MAX). SUSPEND CHANNELS FROM UNDERSIDE OF EX STRUCTURE ABOVE BY METAL HANGING WIRE SPACED 1220mm O.C. (MAX). 1HR FIRE RATING (OBC SB-2 TABLE 2.3.12)

## GRAPHIC RCP LEGEND

NOTE: REFER TO ELECTRICAL DRAWINGS FOR FIXTURE TYPES - MECHANICAL AND ELECTRICAL ITEMS SHOWN, I.E. DUCTWORK, PIPING, LIGHT FIXTURES, ETC. **ARE FOR REFERENCE ONLY** AND ARE NOT INCLUSIVE. REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR ALL RELATED FIXTURES.

- 300x1200 LIGHT FIXTURE OR SUSPENDED LIGHT (REFER TO ELECTRICAL).
- NEW GYPSUM BOARD CEILING OR BULKHEAD
- DENOTES 610 x 1220 SUSPENDED ACOUSTIC CEILING TILE
- DENOTES 610 x 610 SUSPENDED ACOUSTIC CEILING TILE
- RETURN AIR GRILLE
- EXISTING RETURN AIR GRILLE
- EX
- EXISTING CEILING MOUNTED HVAC UNIT
- EX
- CEILING HEIGHT TAG (DENOTES HEIGHT OF UIS BULKHEAD ABOVE FINISHED FLOOR)
- BH - # BULKHEAD TAG
- CEILING MOUNTED MECHANICAL UNIT (REFER TO MECHANICAL DRAWINGS)

1 SECOND FLOOR - REFLECTED CEILING PLAN  
SCALE: 1:100



## ABBREVIATIONS LEGEND

AFF	ABOVE FINISHED FLOOR
EX	EXISTING ITEM
FRR	FIRE RESISTANCE RATING
MAX	MAXIMUM
MIN	MINIMUM
O.C.	ON CENTER
OWSJ	OPEN WEB STEEL JOIST
TYP	TYPICAL
W/	WITH

NO.	REVISIONS	DATE
3	ISSUED FOR TENDER	2021-05-07
2	ISSUED FOR BUILDING PERMIT	2021-05-07
1	ISSUED FOR ZONING CLEARANCE	2021-03-16

DRAWINGS ARE NOT TO BE SCALED. CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND CONDITIONS ON THE PROJECT, AND MUST REPORT ANY DISCREPANCIES TO THE ARCHITECTS BEFORE PROCEEDING WITH THE WORK. THE USE OF THIS DRAWING OR PART THEREOF IS FORBIDDEN WITHOUT THE WRITTEN APPROVAL OF THE ARCHITECTS.

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SCHOOL  
INTERIOR RENOVATIONS  
1522 MOUNTAIN GROVE AVE.  
BURLINGTON, ONTARIO, L7P 2H5

SECOND FLOOR  
REFLECTED CEILING PLAN

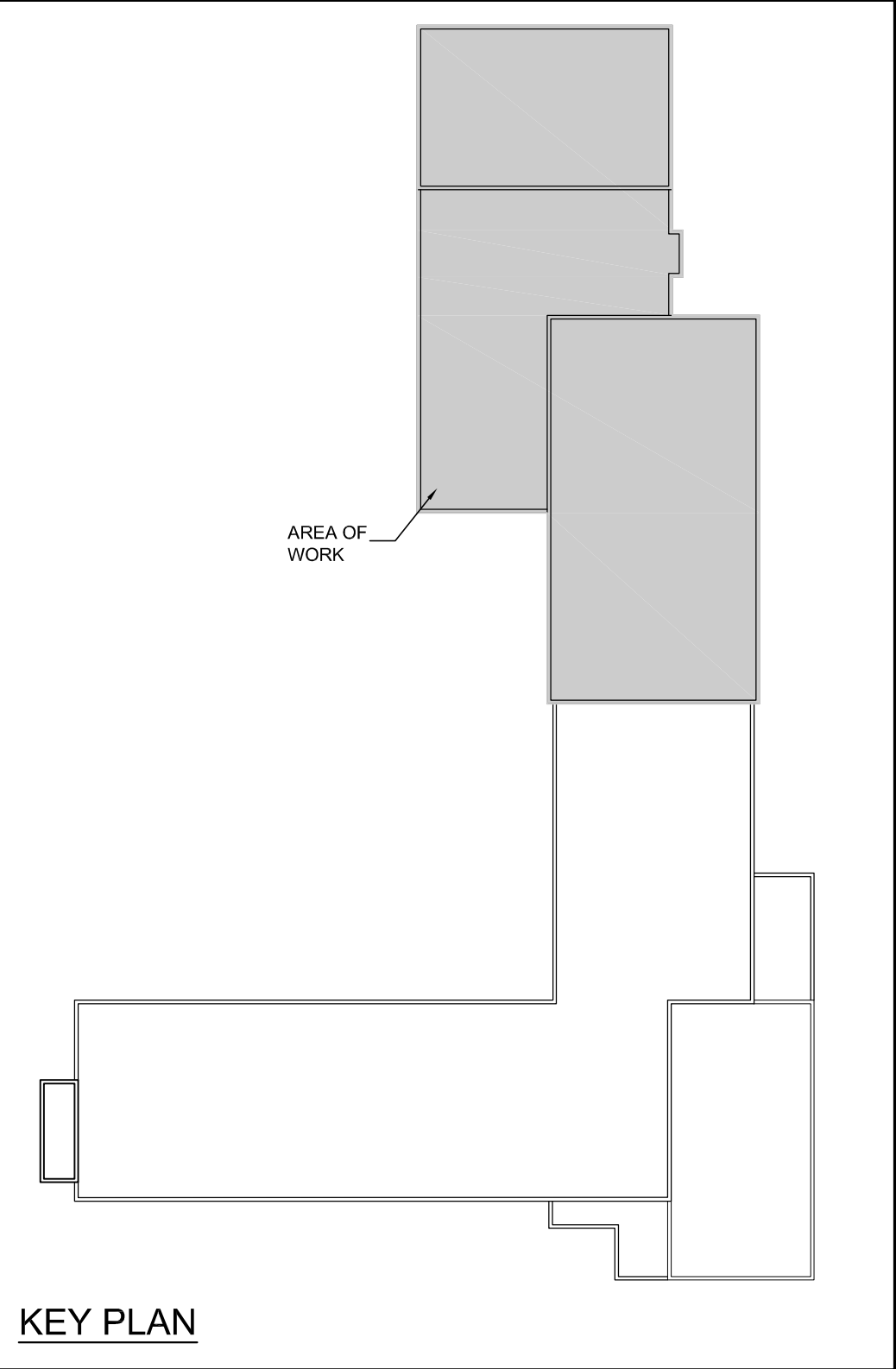
GRGURIC  
ARCHITECTS  
INCORPORATED

28 KING STREET EAST, UNIT B  
STONEY CREEK, ONTARIO, L8G 1J8  
Tel. 905-664-8735 Fax. 905-664-8737  
Web: www.2gai.com

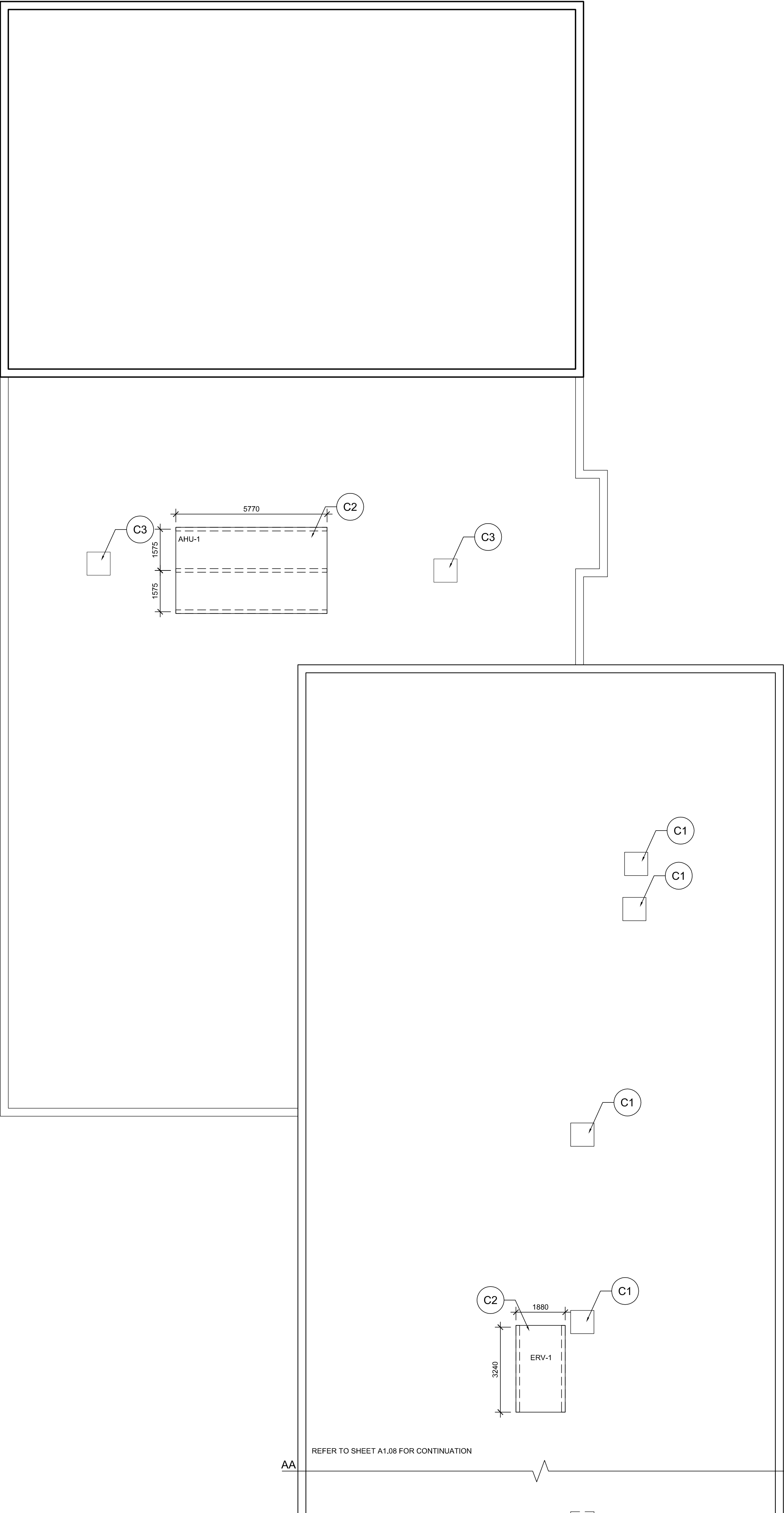
SCALE: AS NOTED	PROJECT: <b>2020-31</b>
DATE: JAN-2021	
DRAWN DW	DRAWING
CHECKED JG	<b>A1.07</b>
PRINT DATE	05/07/21







KEY PLAN



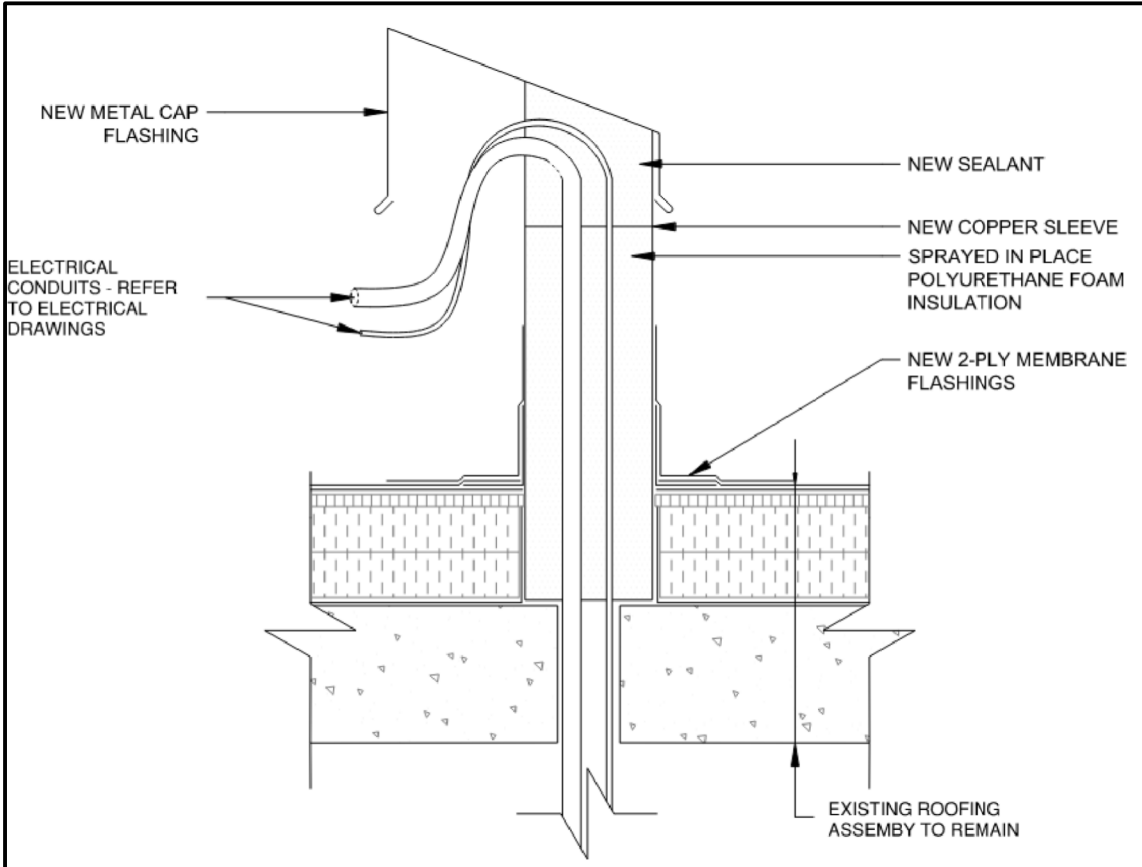
1  
A1.09  
ROOF PLAN  
SCALE: 1:100

GENERAL NOTES

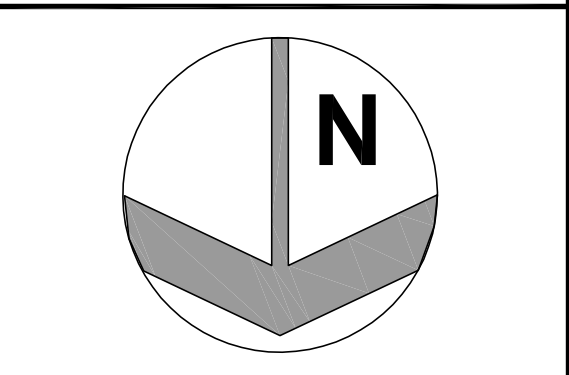
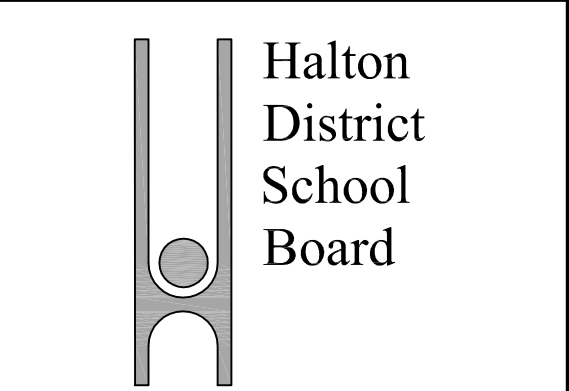
1. FIELD VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTION. REPORT ANY DISCREPANCIES TO ARCHITECT.
2. MECHANICAL AND ELECTRICAL ITEMS SHOWN, I.E. DUCTWORK, PIPING, LIGHT FIXTURES, ETC. ARE FOR REFERENCE ONLY. REFER TO MECHANICAL AND ELECTRICAL DRAWING FOR ALL RELATED DEMOLITION WORK REQUIRED.

CONSTRUCTION NOTES

- C1 EX MECHANICAL UNIT AND CURB TO BE REMOVED AND DISPOSED OF. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS. CUT BACK EXISTING ROOF ASSEMBLY APPROXIMATELY 150mm FROM ROOF OPENING ON ALL SIDES (APPROXIMATELY 915mmX915mm). PROVIDE NEW 6mm STEEL PLATE AND TAPCON THE 4 CORNERS INTO THE EXISTING CONCRETE DECK. PROVIDE NEW 4 PLY ROOF AND INSULATION TO MATCH EXISTING
- C2 NEW MECHANICAL UNIT ON WOOD SLEEPERS. REFER TO DETAIL 2/A1.08 FOR SLEEPER DETAIL. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS
- C3 EXISTING MECHANICAL UNIT TO REMAIN



2  
A1.09  
TYPICAL CONDUIT ROOF PENETRATION DETAIL  
SCALE: NTS



ABBREVIATIONS LEGEND

EX EXISTING ITEM

NO	REVISIONS	DATE
1	ISSUED FOR BUILDING PERMIT	2021-05-07

DRAWINGS ARE NOT TO BE SCALED. CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND CONDITIONS ON THE PROJECT, AND MUST REPORT ANY DISCREPANCIES TO THE ARCHITECTS BEFORE PROCEEDING WITH THE WORK. THE USE OF THIS DRAWING OR PART THEREOF IS FORBIDDEN WITHOUT THE WRITTEN APPROVAL OF THE ARCHITECTS.

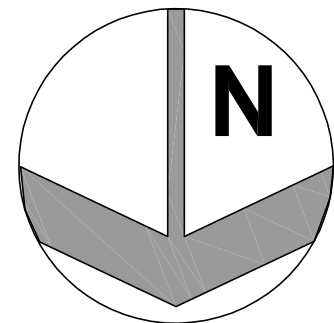
ROLLING MEADOWS  
PUBLIC ELEMENTARY  
SCHOOL  
INTERIOR RENOVATIONS  
1522 MOUNTAIN GROVE AVE.  
BURLINGTON, ONTARIO, L7P 2H5

ROOF PLAN

GRGURIC  
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STONEY CREEK, ONTARIO, L8G 1J8  
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SCALE: AS NOTED	PROJECT: 2020-31
DATE: JAN-2021	
DRAWN DW	DRAWING
CHECKED JG	A1.09
PRINT DATE	05/07/21



#### ABBREVIATIONS LEGEND

ABB	DESCRIPTION
APPROX	APPROXIMATE
CH	COAT HOOK
CONC	CONCRETE
CWT	CERAMIC WALL TILE
EX	EXISTING ITEM
GB-#	GRAB BAR
HD	HAND DRYER
MI	MIRROR
MIN	MINIMUM
ND	NAPKIN DISPOSAL
O.C.	ON CENTER
SD	SOAP DISPENSER
TPD	TOILET PAPER DISPENSER
TYP	TYPICAL
U/S	UNDERSIDE
WD	WOOD
W/	WITH

NO	REVISIONS	DATE
3	ISSUED FOR TENDER	2021-05-07
2	ISSUED FOR BUILDING PERMIT	2021-05-07
1	ISSUED FOR ZONING CLEARANCE	2021-03-16

DRAWINGS ARE NOT TO BE SCALED. CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND CONDITIONS ON THE PROJECT, AND MUST REPORT ANY DISCREPANCIES TO THE ARCHITECTS BEFORE PROCEEDING WITH THE WORK. THE USE OF THIS DRAWING OR PART THEREOF IS FORBIDDEN WITHOUT THE WRITTEN APPROVAL OF THE ARCHITECTS.

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ENLARGED GROUND  
FLOOR WASHROOM PLANS  
AND ELEVATIONS

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SCALE: AS NOTED	PROJECT: <b>2020-31</b>
DATE: JAN-2021	
DRAWN DW	DRAWING
CHECKED JG	<b>A2.00</b>
PRINT DATE	05/07/21

S:\Data\2020\2020-31\HESB-Rolling Meadows\4\AC-WRM-Renov\05065.dwg 2020-31-A2.00.dwg

#### GENERAL NOTES

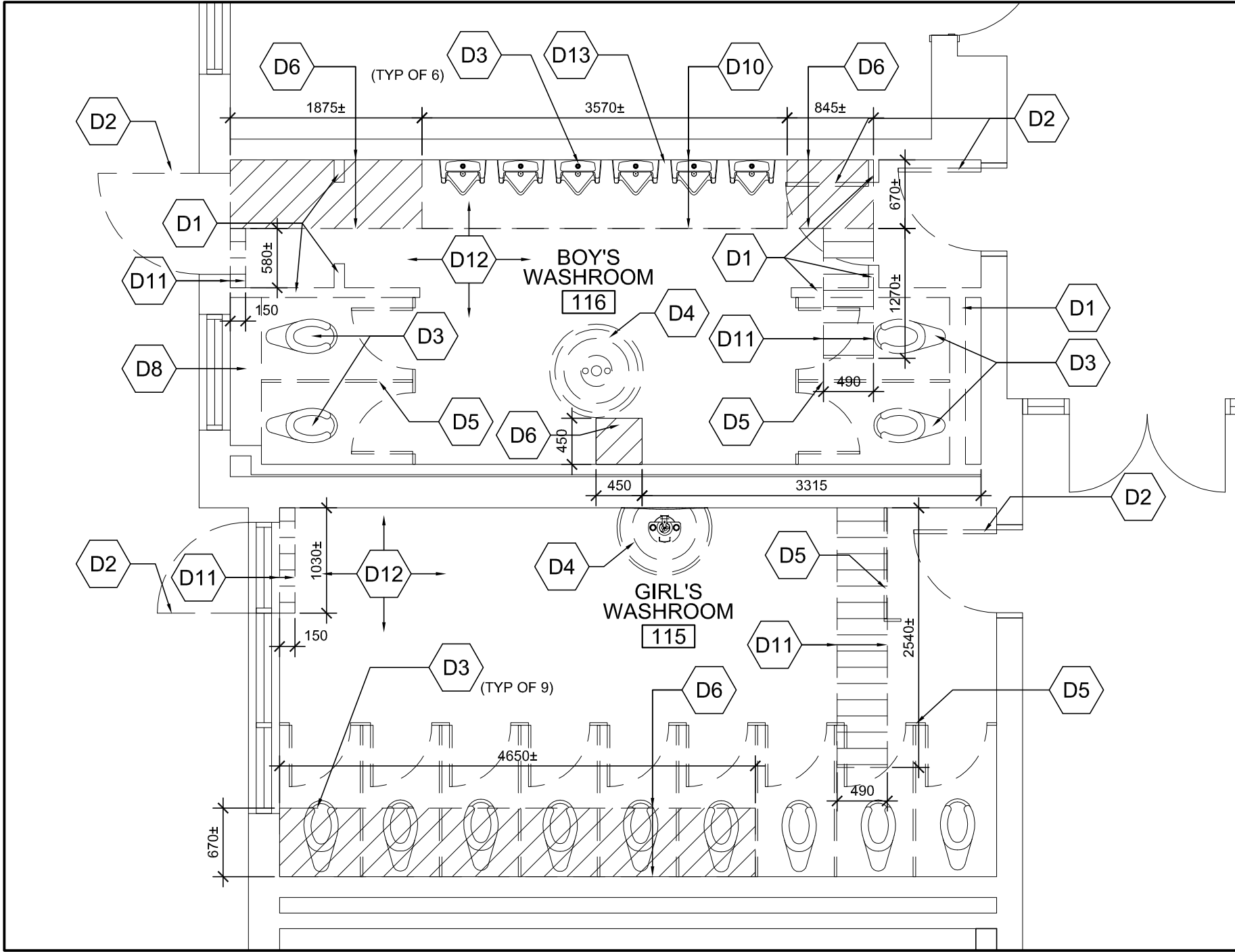
- FIELD VERIFY ALL DIMENSIONS.
- CAUSE NO DAMAGE TO EXISTING CONSTRUCTION TO REMAIN. TAKE CARE NOT TO ENCRoACH ON ADJACENT OCCUPIED AREAS OR AREAS NOT WITHIN THE SCOPE OF WORK. PROTECT ALL EXISTING FINISHES, DOORS, FRAMES, ETC. WHICH ARE TO REMAIN. PATCH AND MAKE GOOD ALL EXISTING ADJACENT SURFACES FINISHES & MATERIALS WHERE DISTURBED BY NEW CONSTRUCTION.
- MECHANICAL AND ELECTRICAL ITEMS SHOWN, I.E. DUCTWORK, PIPING, LIGHT FIXTURES, ETC. ARE FOR REFERENCE ONLY. REFER TO MECHANICAL AND ELECTRICAL DRAWING FOR ALL RELATED DEMOLITION WORK REQUIRED.
- WHEN A WALL HUNG ITEM IS REMOVED, GC TO PATCH AND REPAIR ANY VOIDS LEFT IN THE WALL AND MAKE THE WALL SURFACE READY TO RECEIVE NEW FINISH.
- SPACING OF DIVIDER STRIPS IN NEW TERRAZZO FLOORING TO MATCH SPACING IN EX TERRAZZO FLOOR. DIVIDER STRIPS TO BE INSTALLED IN LINE WITH ADJACENT EX STRIP.
- EXISTING BUILDING HEIGHTS AFF:
  - UNDERSIDE OF SECOND FLOOR CONCRETE FLOOR SLAB: 3510mm ±
  - UNDERSIDE OF 305mm x 305mm ACOUSTIC CEILING TILES: GROUND FLOOR: 2655mm ±

#### DEMOLITION NOTES

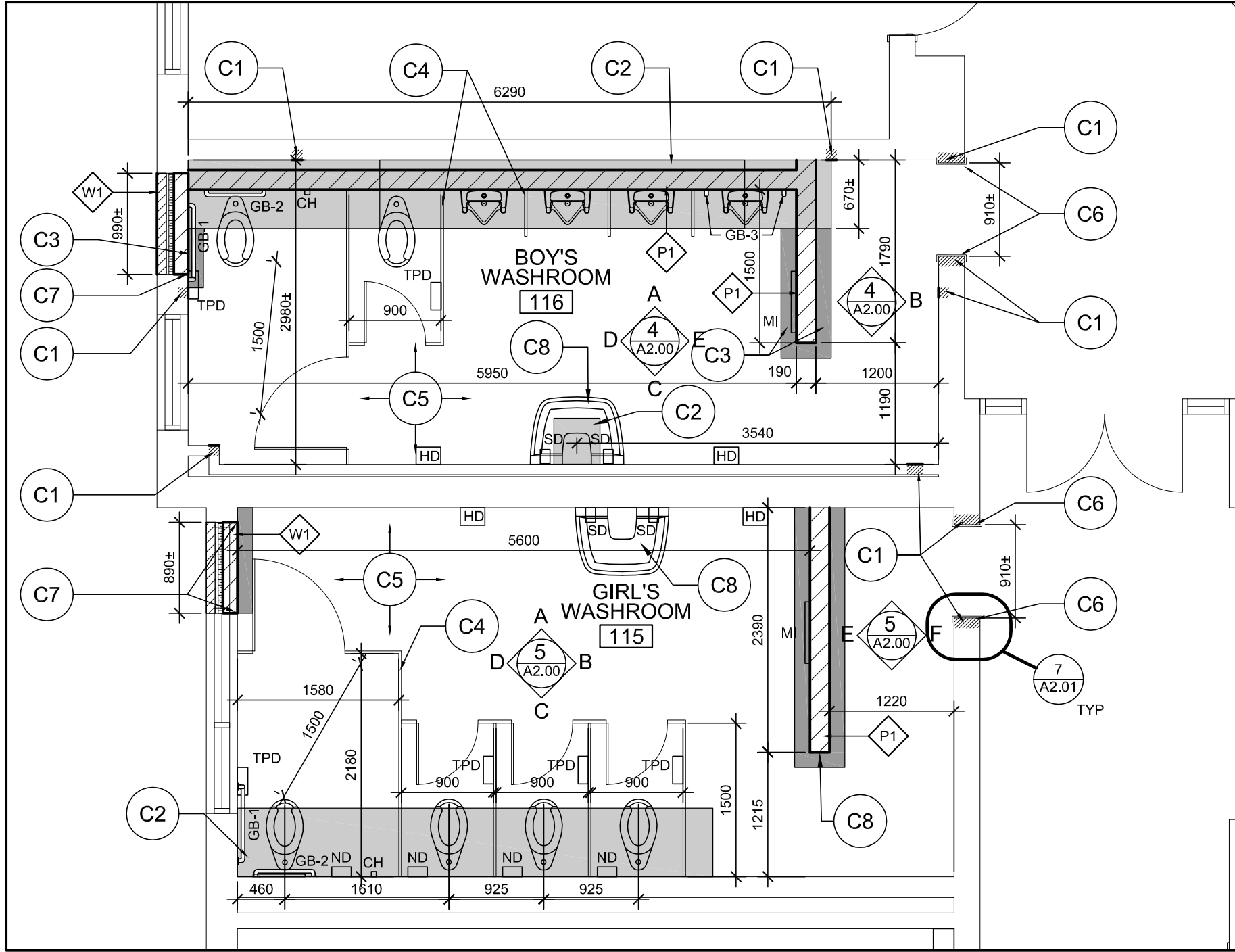
- EX. CONCRETE BLOCK WALLS TO UNDERSIDE OF FLOOR SLAB ABOVE BE REMOVED AND DISPOSED OF. REMOVE AND DISPOSE OF EXISTING TERRAZZO BASE TO CLOSEST JOINT IN TERRAZZO FLOOR FINISH.
- EX. HM DOOR AND WD DOOR FRAMES TO BE REMOVED AND DISPOSED OF. PATCH AND REPAIR ANY EX WALLS TO REMAIN AND MAKE READY TO RECEIVE NEW FINISH.
- EX. WASHROOM FIXTURES TO BE REMOVED AND DISPOSED OF. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS.
- EX. CIRCULAR TERRAZZO WASH FOUNTAIN TO BE REMOVED AND DISPOSED OF. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS.
- EX METAL TOILET PARTITIONS TO BE REMOVED AND DISPOSED OF.
- EX TERRAZZO AND CONCRETE FLOOR SLAB AND SUBSTRATE TO BE REMOVED AND DISPOSED OF TO ALLOW FOR INSTALLATION OF NEW MECHANICAL SERVICES. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS.
- NOT USED
- REMOVE AND DISPOSE OF EX CONCRETE BLOCK WALL TO THE UNDERSIDE OF EX WINDOW FRAME (APPROX. 2010mm). REMOVE AND DISPOSE OF EXISTING WOOD SILL.
- EX. CIRCULAR METAL WASH FOUNTAIN TO BE REMOVED AND DISPOSED OF. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS.
- EX FLOOR TILE AND CONCRETE FLOOR SLAB AND SUBSTRATE TO BE REMOVED AND DISPOSED OF TO ALLOW FOR INSTALLATION OF NEW MECHANICAL SERVICES. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS.
- EX TERRAZZO FLOOR TO BE REMOVED AND DISPOSED OF. PATCH AND REPAIR EX CONCRETE FLOOR SLAB AS REQUIRED TO MAKE READY TO RECEIVE NEW FLOOR FINISH.
- REMOVE AND DISPOSE OF EXISTING WASHROOM ACCESSORIES INCLUDING PAPER TOWEL DISPENSERS, GRAB BARS, MIRRORS, FEMININE NAPKIN DISPOSALS SOAP DISPENSERS AND HAND DRYERS. REMOVE TOILET PAPER DISPENSERS AND TURNOVER TO OWNER. REFER TO AND COORDINATE WITH ELECTRICAL DRAWINGS AS REQUIRED.
- REMOVE AND DISPOSE OF EXISTING WALL TILE AND BACKING BOARD AT URINALS. WORK TO BE COMPLETED BY THE ABATEMENT CONTRACTOR.

#### CONSTRUCTION NOTES

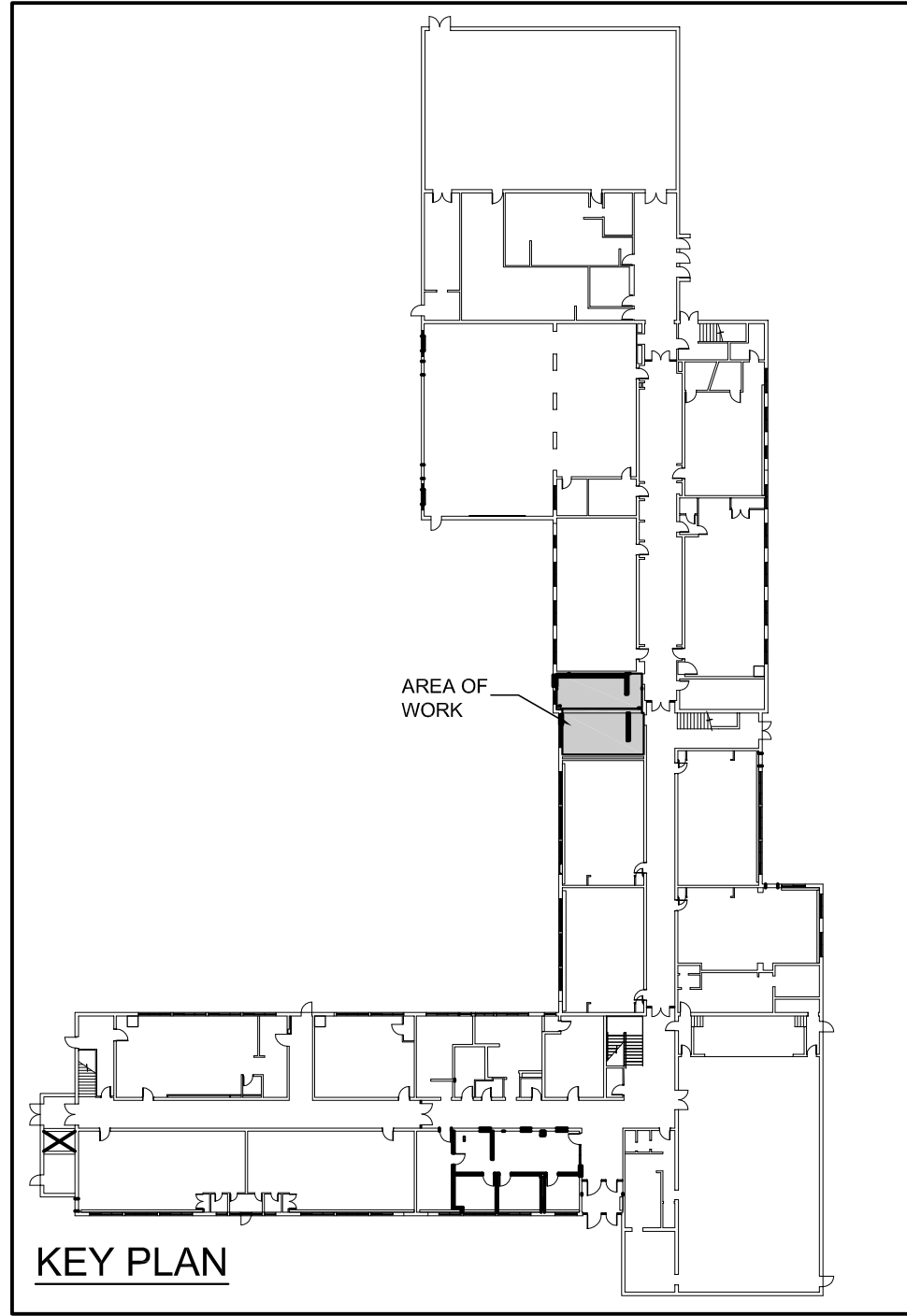
- PATCH AND REPAIR EX CONCRETE BLOCK WALL AND MAKE READY TO RECEIVE NEW WALL FINISH.
- PROVIDE NEW 125mm THICK CONC. SLAB ON 150mm (MIN) COMPACTED GRANULAR BASE. PREPARE FLOOR SLAB TO RECEIVE NEW FLOOR FINISH. REFER TO ROOM FINISH SCHEDULE
- PATCH EX TERRAZZO FLOOR WITH NEW TERRAZZO FLOORING AND BASE TO MATCH EX.
- INSTALL NEW TOILET PARTITIONS AND SCREENS
- REMOVE AND INSTALL NEW CONCRETE BLOCK TO SUIT PLUMBING ROUGH IN. REFER TO MECHANICAL DRAWING. SITE VERIFY EXISTING BLOCK WIDTH. (TYP)
- PROVIDE NEW PAINTED BENT STEEL PLATE AROUND CORRIDOR OPENING (SIDES AND TOP). STEEL PLATE TO HAVE 2 - 50mm LONG LEGS AND TO BE THE WIDTH OF THE BLOCK (APPROX. 250mm).
- GROUT IN BULLNOSE CORNER OF THE EX CONCRETE BLOCK TO PROVIDE A SQUARE EDGE FOR NEW CONCRETE BLOCK. TOOL IN "MORTAR JOINTS" TO MATCH EXISTING.
- NEW 4 STATION WASH FOUNTAIN. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS



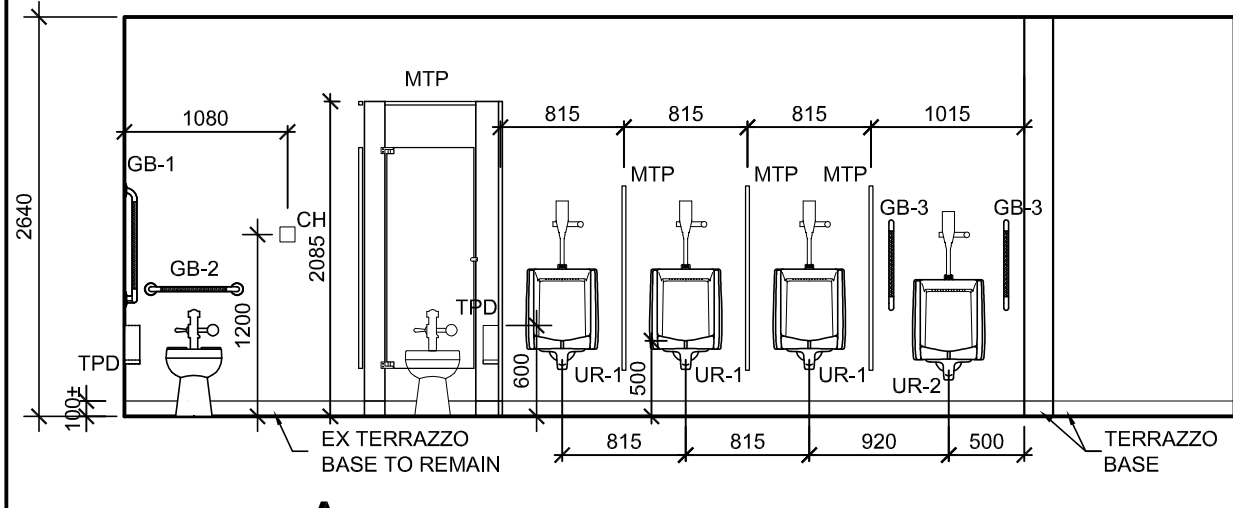
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A2.00  
**DEMOLITION PLAN - ROOMS 115 AND 116**  
SCALE: 1:50



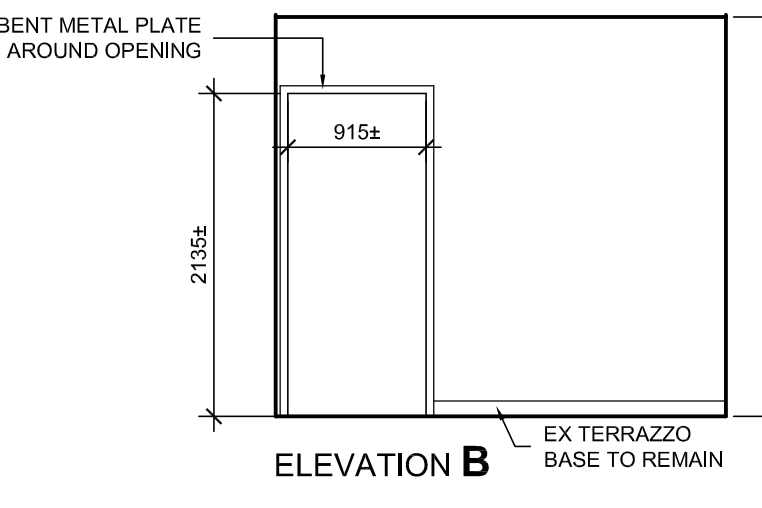
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A2.00  
**FLOOR PLAN - ROOMS 115 AND 116**  
SCALE: 1:50



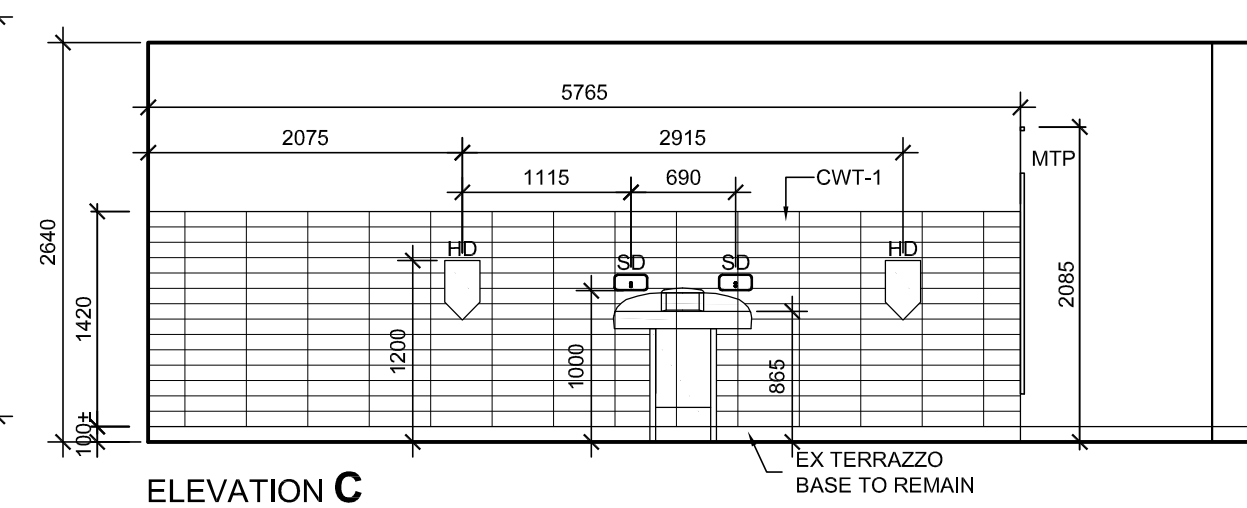
**KEY PLAN**



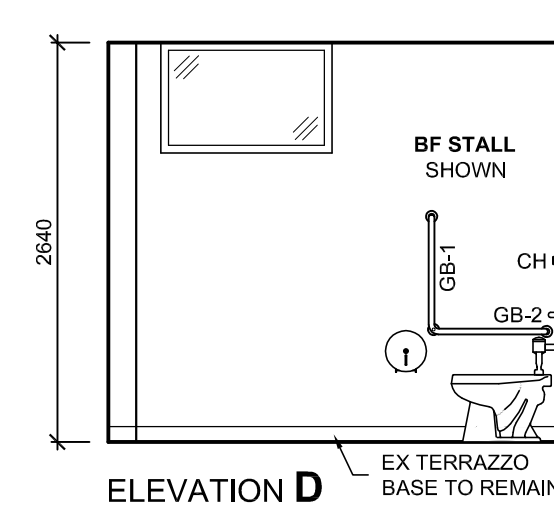
**ELEVATION A**



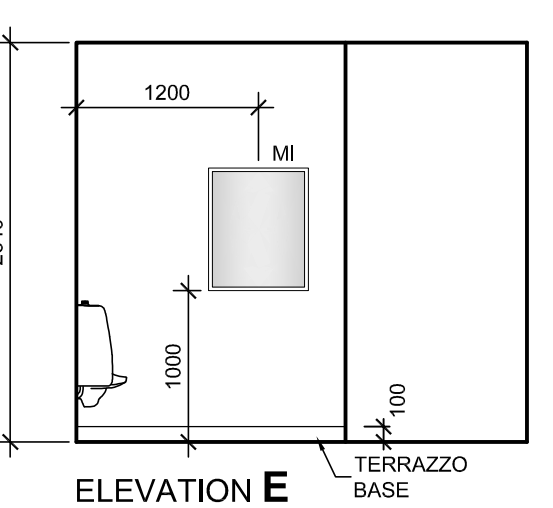
**ELEVATION B**



**ELEVATION C**

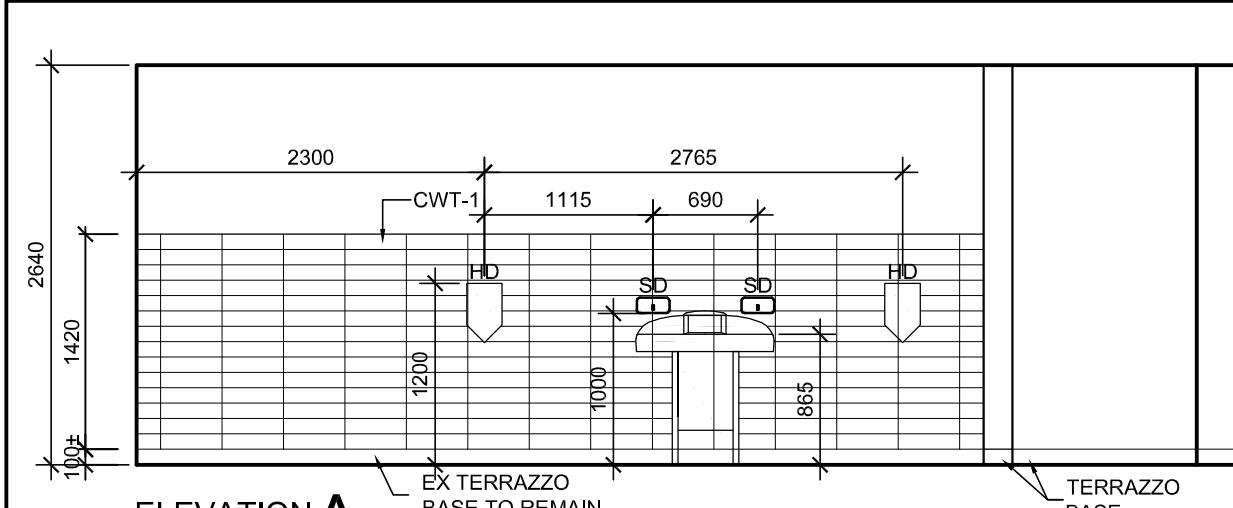


**ELEVATION D**

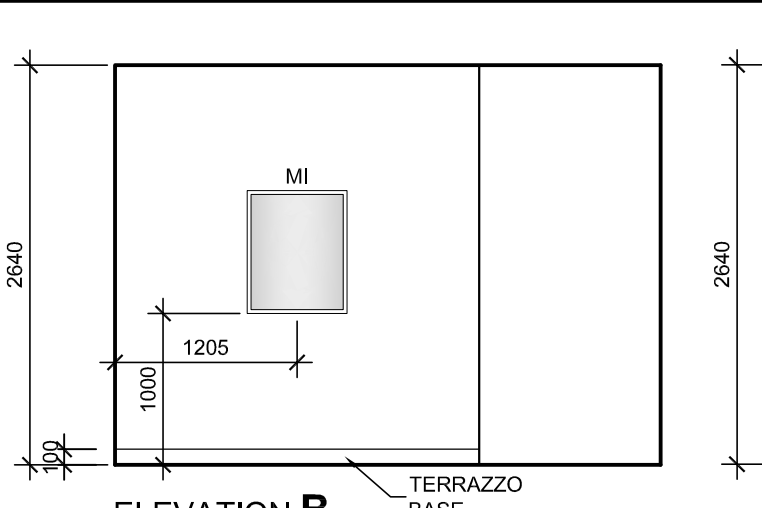


**ELEVATION E**

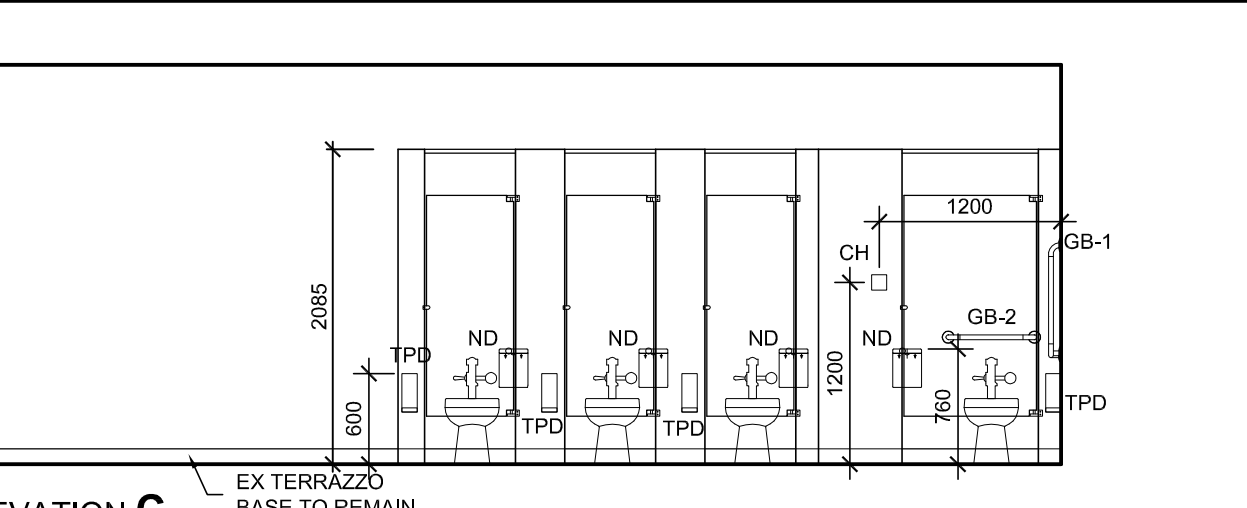
**4**  
A2.00  
**INTERIOR ELEVATIONS - ROOM 116**  
SCALE: 1:50



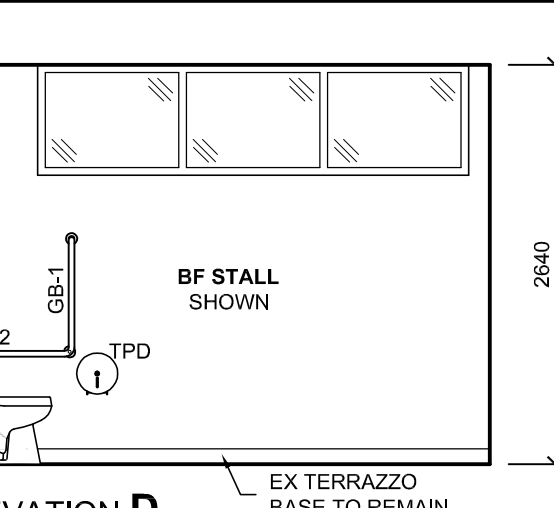
**ELEVATION A**



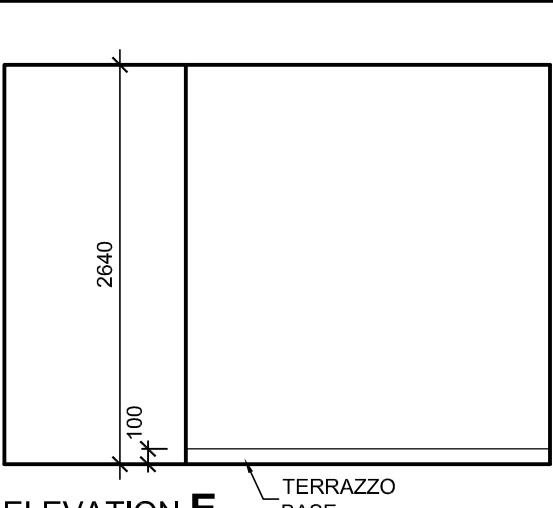
**ELEVATION B**



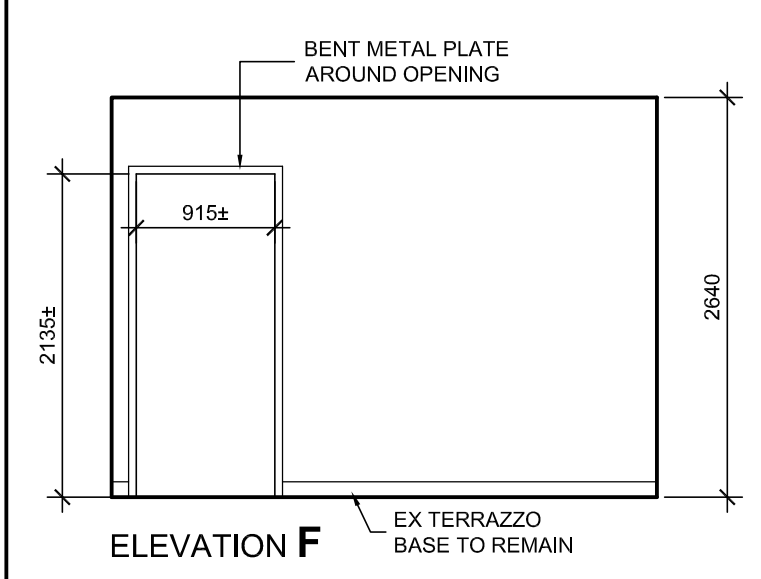
**ELEVATION C**



**ELEVATION D**



**ELEVATION E**



**ELEVATION F**

**5**  
A2.00  
**INTERIOR ELEVATIONS - ROOM 115**  
SCALE: 1:50

#### EXTERIOR WALL TYPES

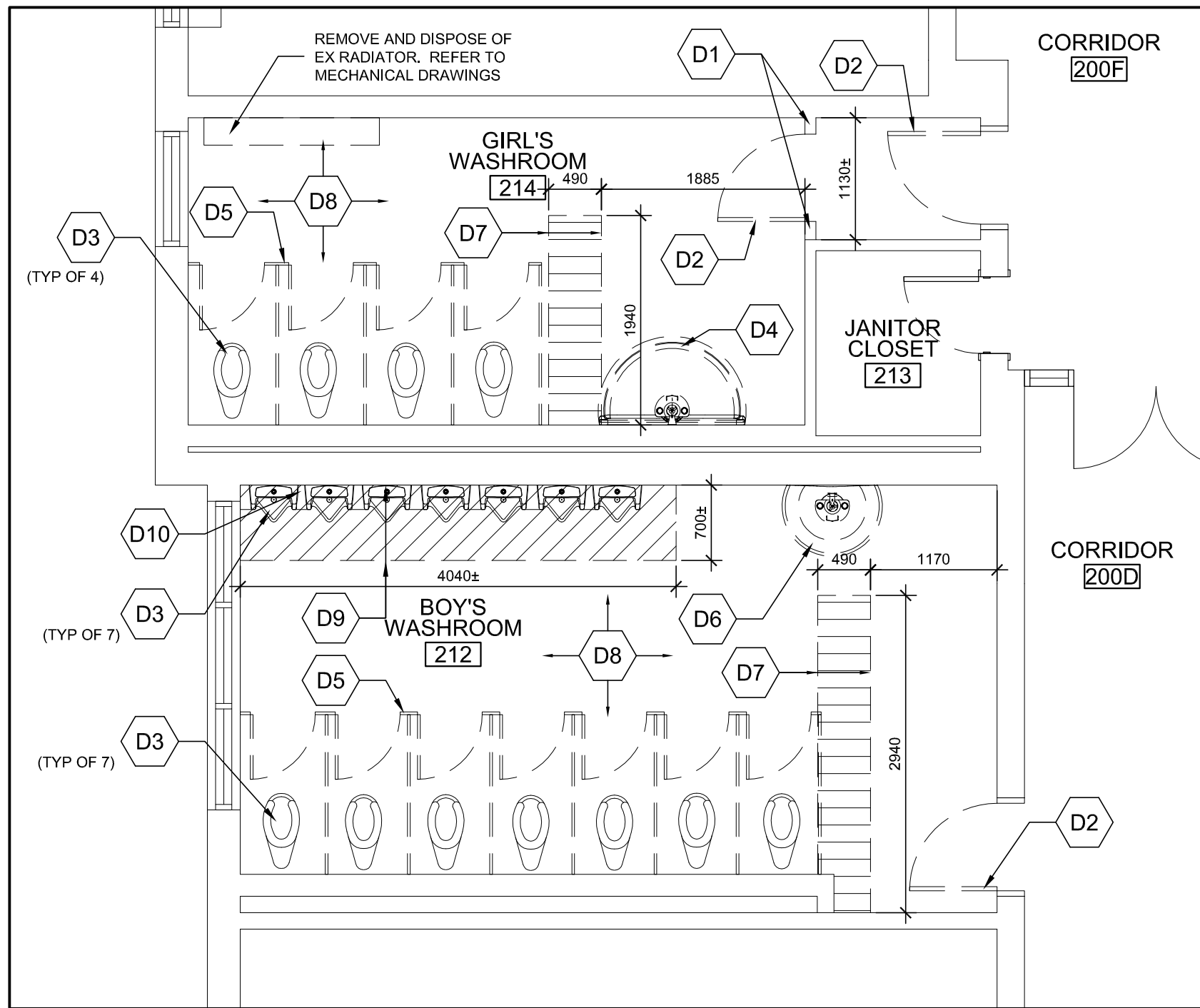
NO.	ASSEMBLY	DESCRIPTION	REMARKS
W1		140MM CONCRETE BLOCK BLUESKIN-AIR/VAPOUR BARRIER 50MM RIGID INSULATION. 25MM AIR SPACE. 50MM BRICK TO MATCH EXISTING.	- EXTEND TO U/S OF EX DOOR OPENING (2135mm±)

#### INTERIOR WALL PARTITION TYPES

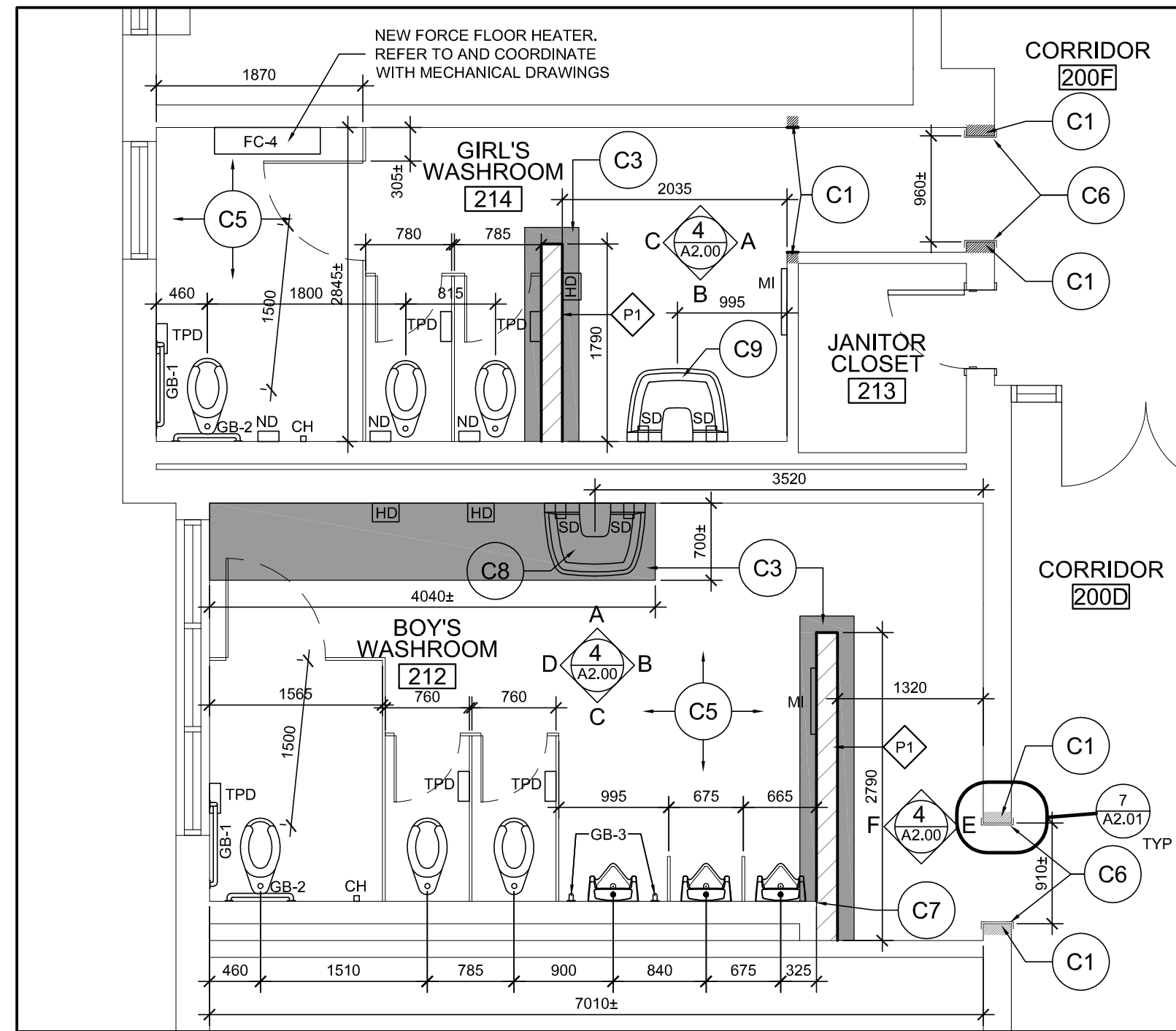
NO.	ASSEMBLY	DESCRIPTION	REMARKS
P1		- 190mm CONC. BLOCK	- EXTEND TO U/S OF STRUCTURE. REFER TO GENERAL NOTE #6 FOR EX STRUCTURE HEIGHTS - BULLNOSE BLOCK AT ALL EXPOSED CORNERS
P1A		- 240mm CONC. BLOCK	- EXTEND TO U/S OF EX DOOR OPENING (2135mm±) - BULLNOSE BLOCK AT ALL EXPOSED CORNERS
P1B		- 240mm CONC. BLOCK	- EXTEND TO U/S OF EX DOOR OPENING (2135mm±)
P2		- 16mm GYPSUM BOARD - 92mm METAL STUDS AT 400mm O.C. - 16mm GYPSUM BOARD	- EXTEND TO U/S OF STRUCTURE.
P3		- 16mm GYPSUM BOARD - 92mm METAL STUDS AT 400mm O.C. - 89mm SOUND BATT INSULATION TO FILL CAVITY - 16mm GYPSUM BOARD	- EXTEND TO 150mm ABOVE ADJACENT CEILING
P3A		- 16mm GYPSUM BOARD - 92mm METAL STUDS AT 400mm O.C. - 89mm SOUND BATT INSULATION TO FILL CAVITY - 16mm GYPSUM BOARD	- EXTEND TO U/S OF STRUCTURE
P4		- 16mm GYPSUM BOARD - 92mm METAL STUDS AT 400mm O.C. - 89mm SOUND BATT INSULATION TO FILL CAVITY - 16mm GYPSUM BOARD	- EXTEND TO U/S OF STRUCTURE

#### TYPICAL MASONRY WALL REINFORCING

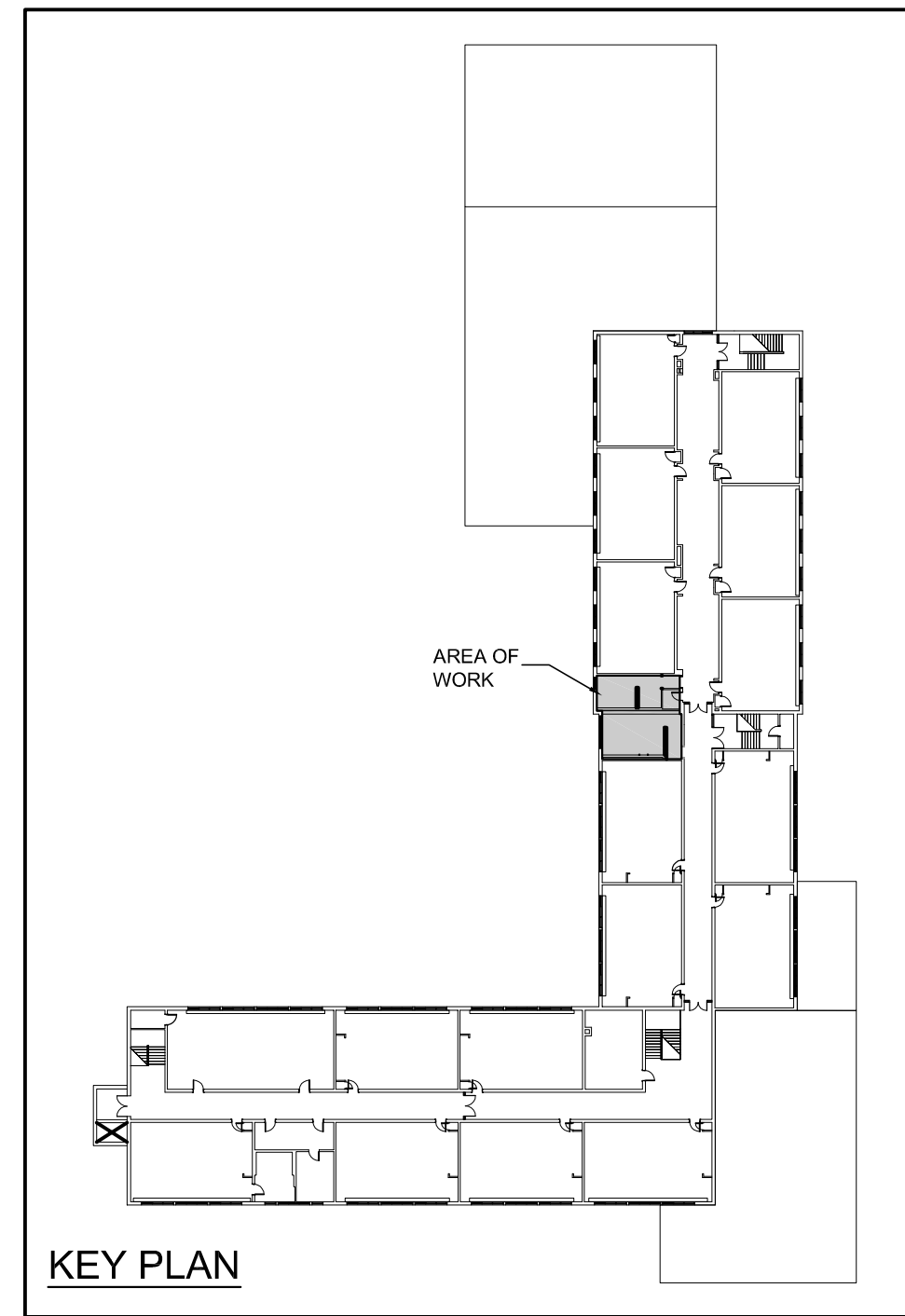
- 15 M VERTICAL REINFORCING BARS AT 400 O.C. EMBEDDED IN GROUT FILLED BLOCKS. CONTINUOUS FULL HEIGHT OF WALL OR INFILL.
- PROVIDE STANDARD HORIZONTAL BLOCK REINFORCING - HEAVY DUTY TRUSS TYPE EVERY 2ND. COURSE (TYP.) EMBEDDED FULLY IN BED JOINT MORTAR
- INSTALL 15M DOWELS AT 400 O.C. W/ 150mm EMBEDMENT INTO EX. CONCRETE FLOOR SLAB OR FOUNDATION WALL W/ HIT-HY 200 EPOXY.
- GROUT SOLID FIRST 3 COURSES OF BLOCK (TYP.)



1  
A2.01  
ENLARGED DEMOLITION PLAN - ROOMS 212 AND 214  
SCALE: 1:50



2  
A2.01  
ENLARGED CONSTRUCTION PLAN - ROOMS 212 AND 214  
SCALE: 1:50



KEY PLAN

#### GENERAL NOTES

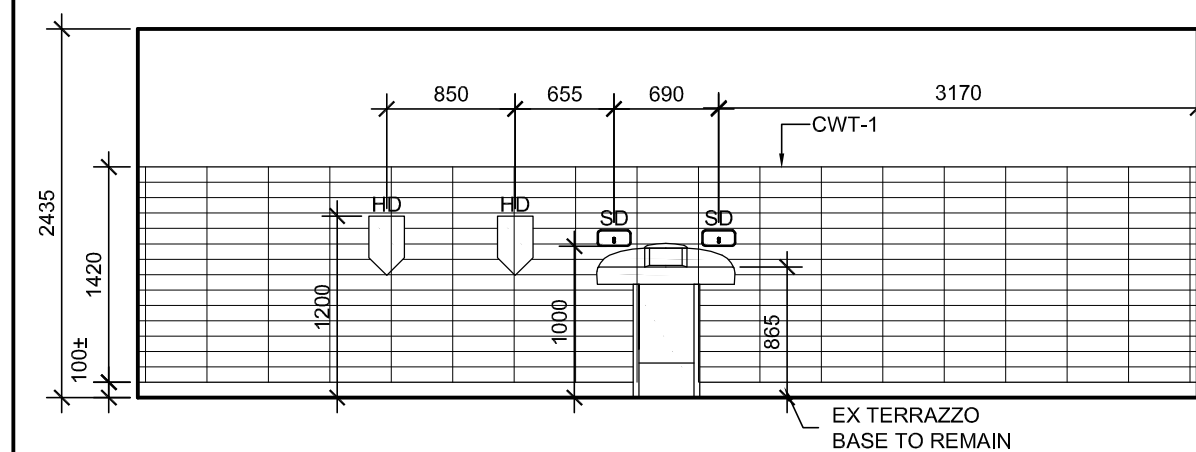
1. FIELD VERIFY ALL DIMENSIONS.
2. CAUSE NO DAMAGE TO EXISTING CONSTRUCTION TO REMAIN. TAKE CARE NOT TO ENCRoACH ON ADJACENT OCCUPIED AREAS OR AREAS NOT WITHIN THE SCOPE OF WORK. PROTECT ALL EXISTING FINISHES, DOORS, FRAMES, ETC. WHICH ARE TO REMAIN. PATCH AND MAKE GOOD ALL EXISTING ADJACENT SURFACES FINISHES & MATERIALS WHERE DISTURBED BY NEW CONSTRUCTION.
3. MECHANICAL AND ELECTRICAL ITEMS SHOWN, I.E. DUCTWORK, PIPING, LIGHT FIXTURES, ETC. ARE FOR REFERENCE ONLY. REFER TO MECHANICAL AND ELECTRICAL DRAWING FOR ALL RELATED DEMOLITION WORK REQUIRED.
4. WHEN A WALL HUNG ITEM IS REMOVED, GC TO PATCH AND REPAIR. ANY VOIDS LEFT IN THE WALL AND MAKE THE WALL SURFACE READY TO RECEIVE NEW FINISH.
5. SPACING OF DIVIDER STRIPS IN NEW TERRAZZO FLOORING TO MATCH SPACING IN EX TERRAZZO FLOOR. DIVIDER STRIPS TO BE INSTALLED IN LINE WITH ADJACENT EX STRIP.
6. EXISTING BUILDING HEIGHTS AFF:
  - 6.1. UNDERSIDE OF ROOF DECK: 3530mm ±
  - 6.2. UNDERSIDE OF 305mm x 305mm ACOUSTIC CEILING TILES: GROUND FLOOR: 2450mm ±

#### DEMOLITION NOTES

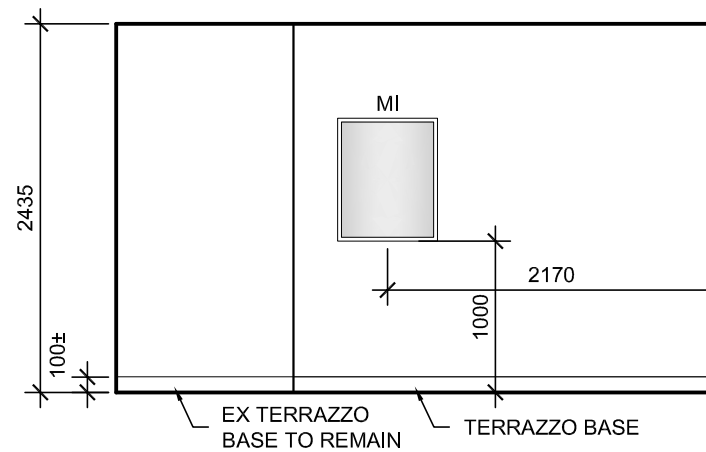
- D1** EX. CONCRETE BLOCK WALLS TO UNDERSIDE OF FLOOR SLAB ABOVE BE REMOVED AND DISPOSED OF. REMOVE AND DISPOSE OF EXISTING TERRAZZO BASE TO CLOSEST JOINT IN TERRAZZO FLOOR FINISH.
- D2** EX. HM DOOR AND WD DOOR FRAMES TO BE REMOVED AND DISPOSED OF. PATCH AND REPAIR ANY EX WALLS TO REMAIN AND MAKE READY TO RECEIVE NEW FINISH.
- D3** EX. WASHROOM FIXTURES TO BE REMOVED AND DISPOSED OF. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS.
- D4** EX. CIRCULAR TERRAZZO WASH FOUNTAIN TO BE REMOVED AND DISPOSED OF. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS.
- D5** EX METAL TOILET PARTITIONS TO BE REMOVED AND DISPOSED OF.
- D6** EX. CIRCULAR METAL WASH FOUNTAIN TO BE REMOVED AND DISPOSED OF. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS.
- D7** EX TERRAZZO FLOOR TO BE REMOVED AND DISPOSED OF. PATCH AND REPAIR EX CONCRETE FLOOR SLAB AS REQUIRED TO MAKE READY TO RECEIVE NEW FLOOR FINISH.
- D8** REMOVE AND DISPOSE OF EXISTING WASHROOM ACCESSORIES INCLUDING PAPER TOWEL DISPENSERS, GRAB BARS, MIRRORS, FEMINE NAPKIN DISPOSALS SOAP DISPENSERS AND HAND DRYERS. REMOVE TOILET PAPER DISPENSERS AND TURNOVER TO OWNER. REFER TO AND COORDINATE WITH ELECTRICAL DRAWINGS AS REQUIRED.
- D9** REMOVE AND DISPOSE OF EXISTING FLOOR TILE. REMOVE ANY MORTAR FROM EXISTING FLOOR SLAB. PATCH AND REPAIR EXISTING FLOOR SLAB AS REQUIRED TO MAKE READY TO RECEIVE NEW FINISH.
- D10** REMOVE AND DISPOSE OF EXISTING WALL TILE AND BACKING BOARD AT URINALS. WORK TO BE COMPLETED BY THE ABATEMENT CONTRACTOR.

#### CONSTRUCTION NOTES

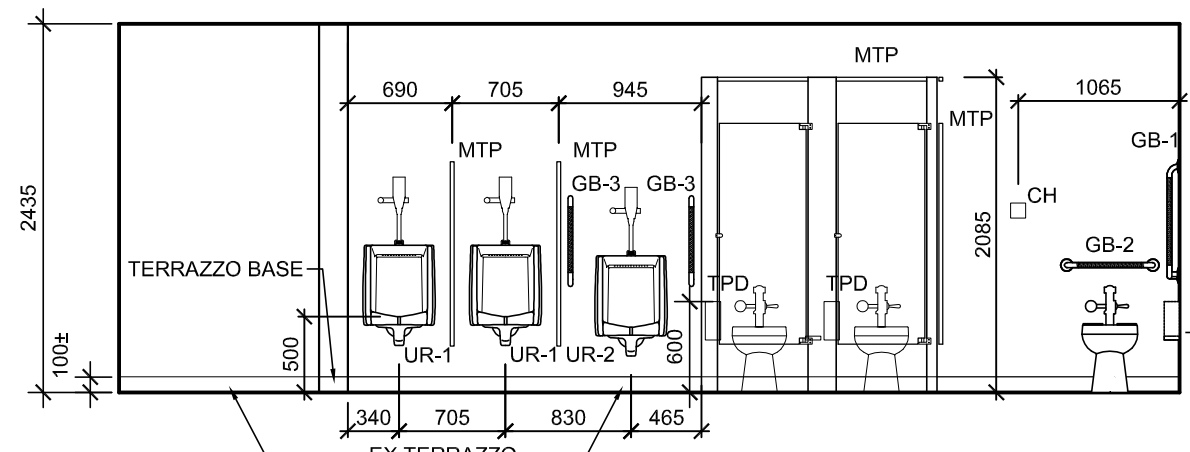
- C1** PATCH AND REPAIR EX CONCRETE BLOCK WALL AND MAKE READY TO RECEIVE NEW WALL FINISH.
- C2** PROVIDE NEW 125mm THICK CONC. SLAB ON 150mm (MIN) COMPACTED GRANULAR BASE. PREPARE FLOOR SLAB TO RECEIVE NEW FLOOR FINISH. REFER TO ROOM FINISH SCHEDULE.
- C3** PATCH EX TERRAZZO FLOOR WITH NEW TERRAZZO FLOORING AND BASE TO MATCH EX.
- C4** INSTALL NEW TOILET PARTITIONS AND SCREENS
- C5** REMOVE AND INSTALL NEW CONCRETE BLOCK TO SUIT PLUMBING ROUGH IN. REFER TO MECHANICAL DRAWING. SITE VERIFY EXISTING BLOCK WIDTH. (TYP)
- C6** PROVIDE NEW PAINTED BENT STEEL PLATE AROUND CORRIDOR OPENING (SIDES AND TOP). STEEL PLATE TO HAVE 2 - 50mm LONG LEGS AND TO BE THE WIDTH OF THE BLOCK (APPROX. 250mm). REFER TO DETAIL 7/A2.01
- C7** GROUT IN BULLNOSE CORNER OF THE EX CONCRETE BLOCK TO PROVIDE A SQUARE EDGE FOR NEW CONCRETE BLOCK. TOOL IN "MORTAR JOINTS" TO MATCH EXISTING.
- C8** NEW 4 STATION WASH FOUNTAIN. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS
- C9** NEW 3 STATION WASH FOUNTAIN. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS



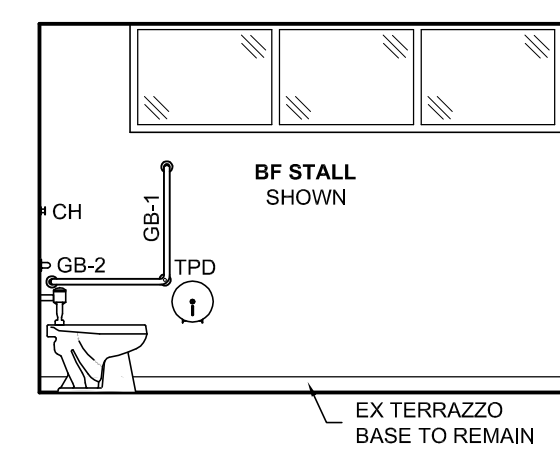
ELEVATION A



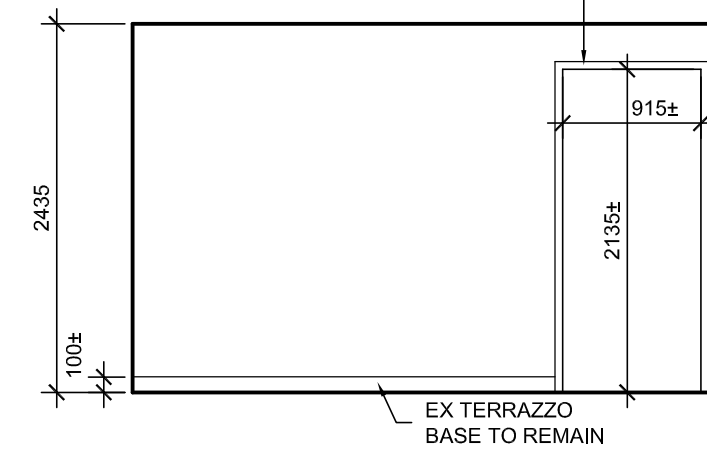
ELEVATION B



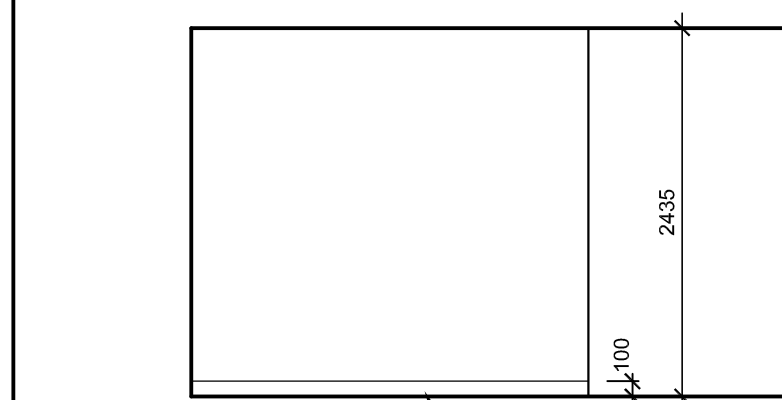
ELEVATION C



ELEVATION D

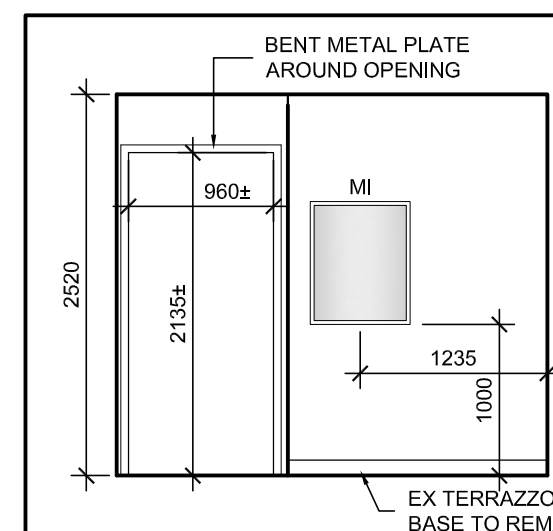


ELEVATION E

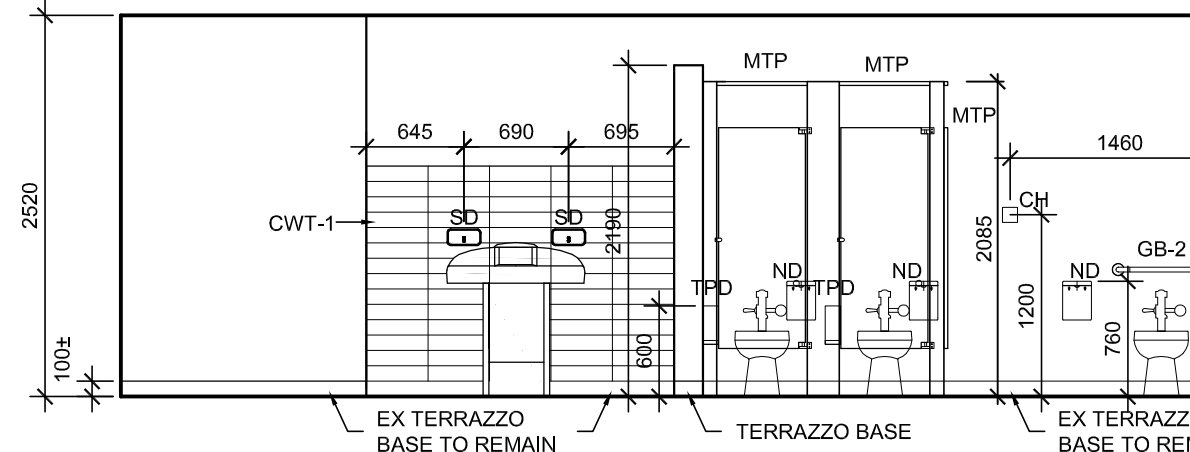


ELEVATION F

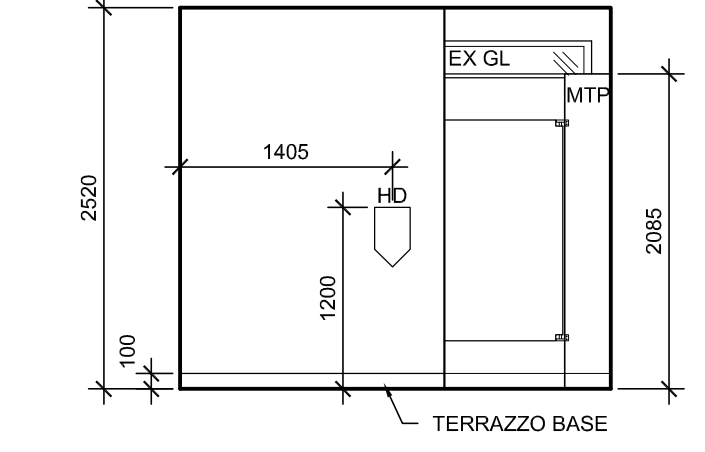
3  
A2.01  
INTERIOR ELEVATIONS - ROOM 212  
SCALE: 1:50



ELEVATION A

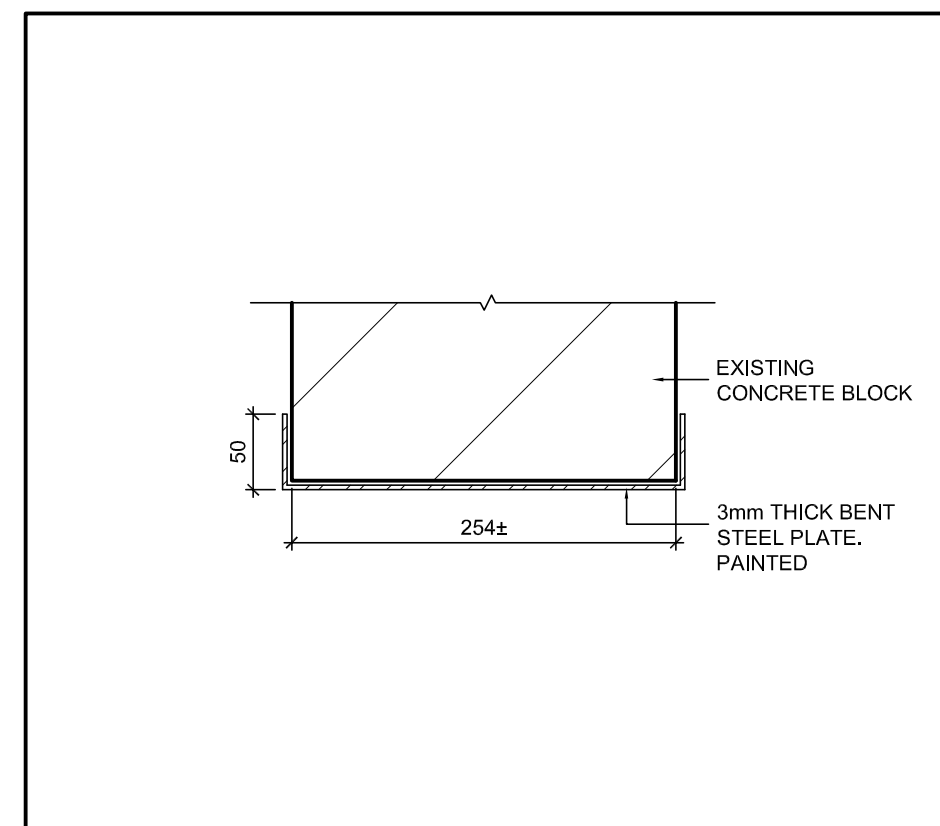


ELEVATION B

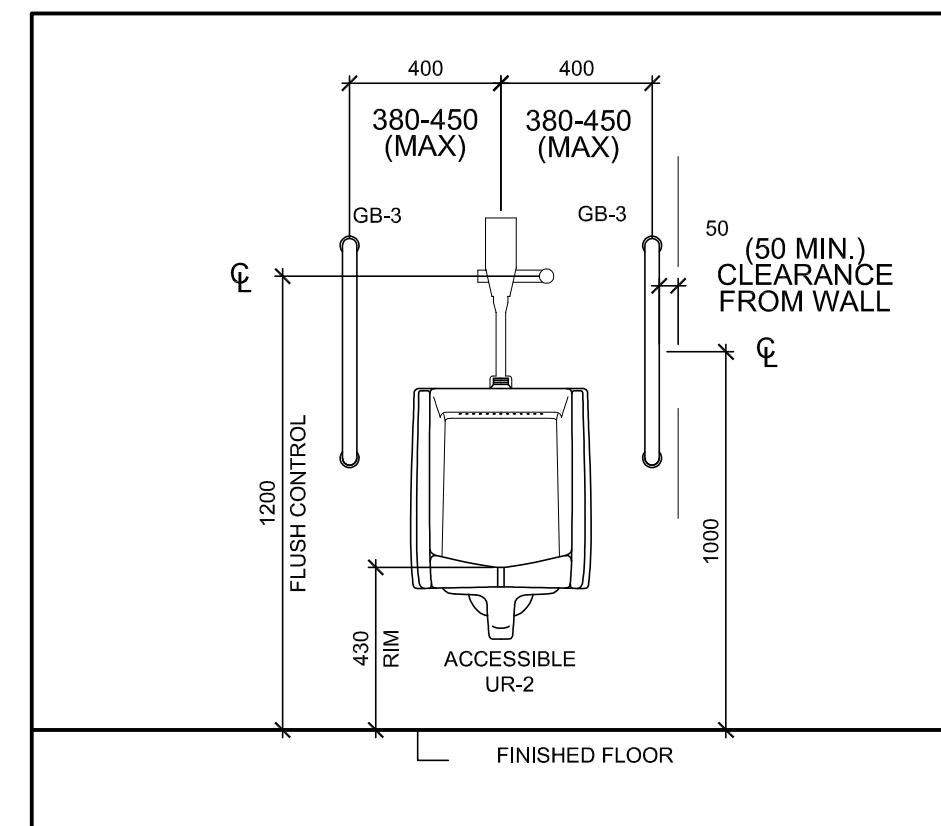


ELEVATION C

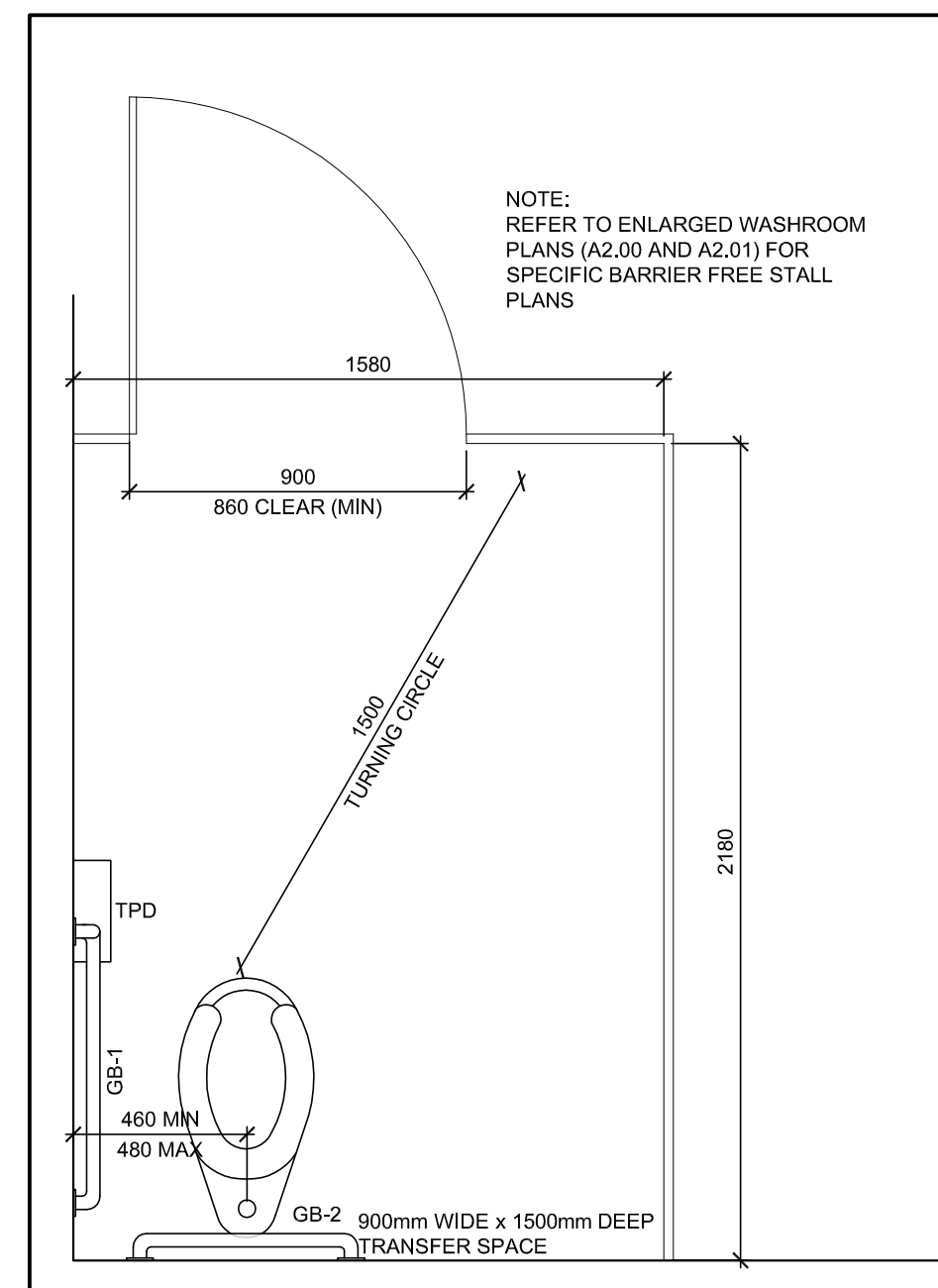
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A2.01  
INTERIOR ELEVATIONS - ROOM 214  
SCALE: 1:50



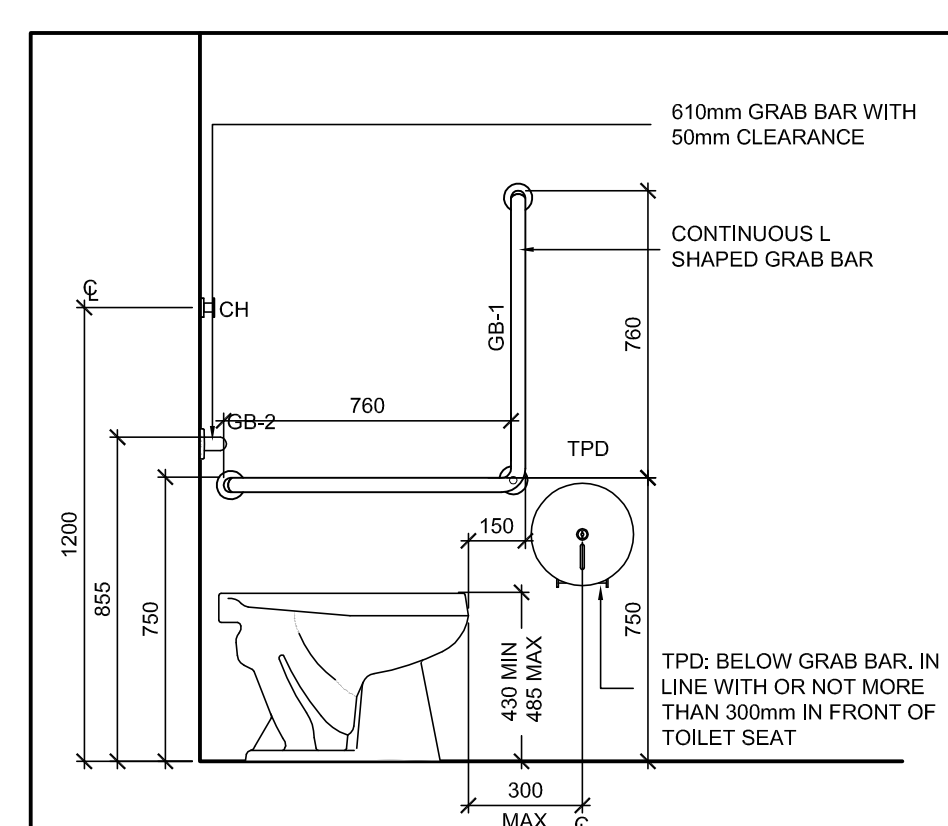
7  
A2.01  
DETAIL - BENT STEEL PLATE  
SCALE: 1:5



8  
A2.01  
TYPICAL ACCESSIBLE URINAL  
SCALE: 1:20



5  
A2.01  
TYPICAL BARRIER FREE STALL - PLAN  
SCALE: 1:20



6  
A2.01  
TYPICAL BARRIER FREE STALL - ELEVATION  
SCALE: 1:20

#### ABBREVIATIONS LEGEND

ABBREVIATION	DESCRIPTION
AFF	ABOVE FINISHED FLOOR
APPR	APPROXIMATE
CH	COAT HOOK
CONC	CONCRETE
CWT	CERAMIC WALL TILE
EX	EXISTING ITEM
GB#	GRAB BAR
GL	GLASS
HD	HAND DRYER
MAX	MAXIMUM
MI	MIRROR
MIN	MINIMUM
ND	NAPKIN DISPOSAL
O.C.	ON CENTER
SD	SOAP DISPENSER
TPD	TOILET PAPER DISPENSER
TYP	TYPICAL
U/S	UNDERSIDE
WD	WOOD
W/	WITH

NO	REVISIONS	DATE
3	ISSUED FOR TENDER	2021-05-07
2	ISSUED FOR BUILDING PERMIT	2021-05-07
1	ISSUED FOR ZONING CLEARANCE	2021-03-16

NO	REVISIONS	DATE
3	ISSUED FOR TENDER	2021-05-07
2	ISSUED FOR BUILDING PERMIT	2021-05-07
1	ISSUED FOR ZONING CLEARANCE	2021-03-16

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ROLLING MEADOWS  
PUBLIC ELEMENTARY  
SCHOOL  
INTERIOR RENOVATIONS  
1522 MOUNTAIN GROVE AVE.  
BURLINGTON, ONTARIO, L7P 2H5

ENLARGED SECOND  
FLOOR WASHROOM PLANS  
AND ELEVATIONS

GRGURIC  
ARCHITECTS  
INCORPORATED

28 KING STREET EAST, UNIT B  
STONEY CREEK, ONTARIO, L8G 1J8  
Tel. 905-664-8735 Fax. 905-664-8737  
Web: www.2gai.com

SCALE: AS NOTED	PROJECT: <b>2020-31</b>
DATE: JAN-2021	
DRAWN DW	DRAWING
CHECKED JG	<b>A2.01</b>
PRINT DATE	05/07/21



## CONSTRUCTION NOTES

- C1 PATCH AND REPAIR EX CONCRETE BLOCK WALL AND MAKE READY TO RECEIVE NEW WALL FINISH.
- C2 PATCH EX TERRAZZO FLOOR WITH NEW TERRAZZO FLOORING TO MATCH EX. FLOOR JOINT LINES IN NEW TERRAZZO FLOOR TO BE IN LINE WITH JOINT LINES IN EX FLOOR. SPACING OF NEW JOINT LINES TO MATCH EX.
- C3 PATCH AND REPAIR EX WALL FINISHES TO MATCH EX ADJACENT WALL FINISHES. REPAIR ENTIRE WALL (COLOUR TO MATCH EX)
- C4 INSTALL NEW GWB WALL. WALL TO FIT AROUND EX RADIATOR
- C5 NEW 150mm CONCRETE PAD INSTALLED OVER EX CONCRETE PAD.

- C6 NEW 125mm CONCRETE SIDE WALK AND CURB.

- C7 PROVIDE 125mm TOP SOIL IN PLANTING BED WHERE EX SIDEWALK WAS CUT BACK. APPROXIMATE AREA: 2.6m<sup>2</sup>

- C8 NOT USED

- C9 PROVIDE NEW HSS 152x152x3.175 STEEL POSTS ON NEW CONCRETE FOOTING (F1). REFER TO BASE PLATE AND FOOTING SCHEDULE FOR SIZE OF BASE PLATE AND FOOTING. GEOTECHNICAL ENGINEER TO VERIFY THE SOIL BEARING CAPACITIES

- C10 PROVIDE NEW CONC FLOOR SLAB W/ 152x152xMW18.7xMW18.7 WWF. THICKNESS OF THE NEW FLOOR SLAB TO MATCH EXISTING (APPROX 125mm±). EPOXY GROUT 15M AT 300mm O.C. INTO EX CONC FLOOR SLAB. PROVIDE 100mm MIN EMBEDMENT

- C11 PROVIDE 16mm GYPSUM BOARD ON 22mm METAL FURRING CHANNELS AT 800mm O/C ON EACH SIDE OF CONCRETE BLOCK WALL.

- C12 PROVIDE A STAINLESS STEEL CORNER GUARD W/ 89mm LEGS AND IT IS TO BE THE WIDTH OF THE WALL (APPROX 125mm)

- C13 NEW MILLWORK COUNTER W/ CUPBOARDS ABOVE. REFER TO SHEET A4.00 FOR DETAILS. COORDINATE W/ MILLWORK SUPPLIER FOR REQUIRED BLOCKING IN GYPSUM BOARD PARTITION.

## DEMOLITION NOTES

- D1 REMOVE AND DISPOSE OF EX CONC BLK WALLS TO UNDERSIDE OF EX CONC SLAB ABOVE.
- D2 REMOVE AND DISPOSE OF EX CONC BLK WALLS TO UNDERSIDE OF EX CONC BEAMS ABOVE (APPROX. 3100mm ±). PROVIDE TEMPORARY BRACING TO SUPPORT FLOOR SLAB AND BEAMS ABOVE. REMOVE AND DISPOSE OF EX CONC BLK FOUNDATION WALL TO A DEPTH OF 127mm± BELOW EX CONC FLOOR SLAB
- D3 REMOVE AND DISPOSE OF EX HM DOORS AND FRAMES
- D4 REMOVE AND DISPOSE OF EX WD DOORS AND FRAMES
- D5 REMOVE AND DISPOSE OF EX WOOD STUD AND WOOD PANEL WALL TO UNDERSIDE OF EX CEILING.
- D6 REMOVE AND DISPOSE OF EX CONC BLOCK WALL. REFER TO AND COORDINATE WITH DOOR SCHEDULE FOR HEIGHT OF OPENING
- D7 REMOVE AND DISPOSE OF EX WOOD WINDOW FRAMES AND GLAZING.

- D8 EX REINFORCED CONC FLOOR TO BE REMOVED AND DISPOSED OF. REMOVE AND DISPOSE OF EX FILL BELOW EX CONC SLAB TO A DEPTH OF 300mm. REMOVE AND DISPOSE OF EX CONC BLK FOUNDATION WALL TO A DEPTH OF 300mm BELOW EX CONC FLOOR SLAB

- D9 REMOVE AND DISPOSE OF EX WOOD COUNTER.

- D10 REMOVE AND DISPOSE OF EX METAL SHEETS TO EXPOSE EX DOOR OPENING.

- D11 REMOVE AND DISPOSE OF EX METAL DOORS, FRAMES AND GLAZING. PATCH AND REPAIR EX OPENING AS REQUIRED TO MAKE READY TO RECEIVE NEW DOORS

- D12 REMOVE AND DISPOSE OF EX VCT FLOORING AND WOOD BASE. REMOVE ADHESIVES FROM FLOORS AND PREPARE SURFACE TO RECEIVE NEW FLOOR FINISH. PATCH AND REPAIR WALLS AS REQUIRED TO MAKE READY TO RECEIVE NEW FINISH. WORK TO BE COMPLETED BY THE ABATEMENT CONTRACTOR

- D13 REMOVE AND DISPOSE OF EX CPT-T AND VINYL BASE. REMOVE ADHESIVES FROM FLOOR AND WALLS TO REMAIN. PREPARE SURFACE TO RECEIVE NEW FLOOR FINISH.

- D14 REMOVE AND DISPOSE OF EX TERRAZZO FLOORING AND BASE. TERRAZZO FLOOR IS TO BE REMOVED TO NEAREST HORIZONTAL JOINT.

- D15 REMOVE AND DISPOSE OF EX TERRAZZO FLOORING. TERRAZZO FLOOR IS TO BE REMOVED TO NEAREST HORIZONTAL JOINT.

- D16 REMOVE AND DISPOSE OF EX CONCRETE SIDEWALK (APPROX. 125mm THK.)

- D17 REMOVE AND DISPOSE OF RADIATOR. REFER TO AND COORDINATE WITH MECHANICAL DRAWINGS

## GENERAL NOTES

- FIELD VERIFY ALL DIMENSIONS.
- CAUSE NO DAMAGE TO EXISTING CONSTRUCTION TO REMAIN. TAKE CARE NOT TO ENCROACH ON ADJACENT OCCUPIED AREAS OR AREAS NOT WITHIN THE SCOPE OF WORK. PROTECT ALL EXISTING FINISHES, DOORS, FRAMES, ETC. WHICH ARE TO REMAIN. PATCH AND MAKE GOOD ALL EXISTING ADJACENT SURFACES FINISHES & MATERIALS WHERE DISTURBED BY NEW CONSTRUCTION.
- MECHANICAL AND ELECTRICAL ITEMS SHOWN, I.E. DUCTWORK, PIPING, LIGHT FIXTURES, ETC. ARE FOR REFERENCE ONLY. REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR ALL RELATED DEMOLITION WORK REQUIRED.
- WHEN A WALL HUNG ITEM IS REMOVED, GC TO PATCH AND REPAIR ANY VOIDS LEFT IN THE WALL AND MAKE THE WALL SURFACE READY TO RECEIVE NEW FINISH.
- SPACING OF DIVIDER STRIPS IN NEW TERRAZZO FLOORING TO MATCH SPACING IN EX TERRAZZO FLOOR. DIVIDER STRIPS TO BE INSTALLED IN LINE WITH ADJACENT EX STRIP.
- EXISTING BUILDING HEIGHTS AFF:
  - UNDERSIDE OF SECOND FLOOR CONCRETE FLOOR SLAB: 3510mm ±
  - UNDERSIDE OF 305mm x 305mm ACOUSTIC CEILING TILES: GROUND FLOOR: 2655mm ±
- REFER TO LINTEL SCHEDULE ON SHEET A1.00 FOR LINTEL SIZES AND REQUIRED WALL PLATES.

KEY PLAN

Structural Footing Schedule

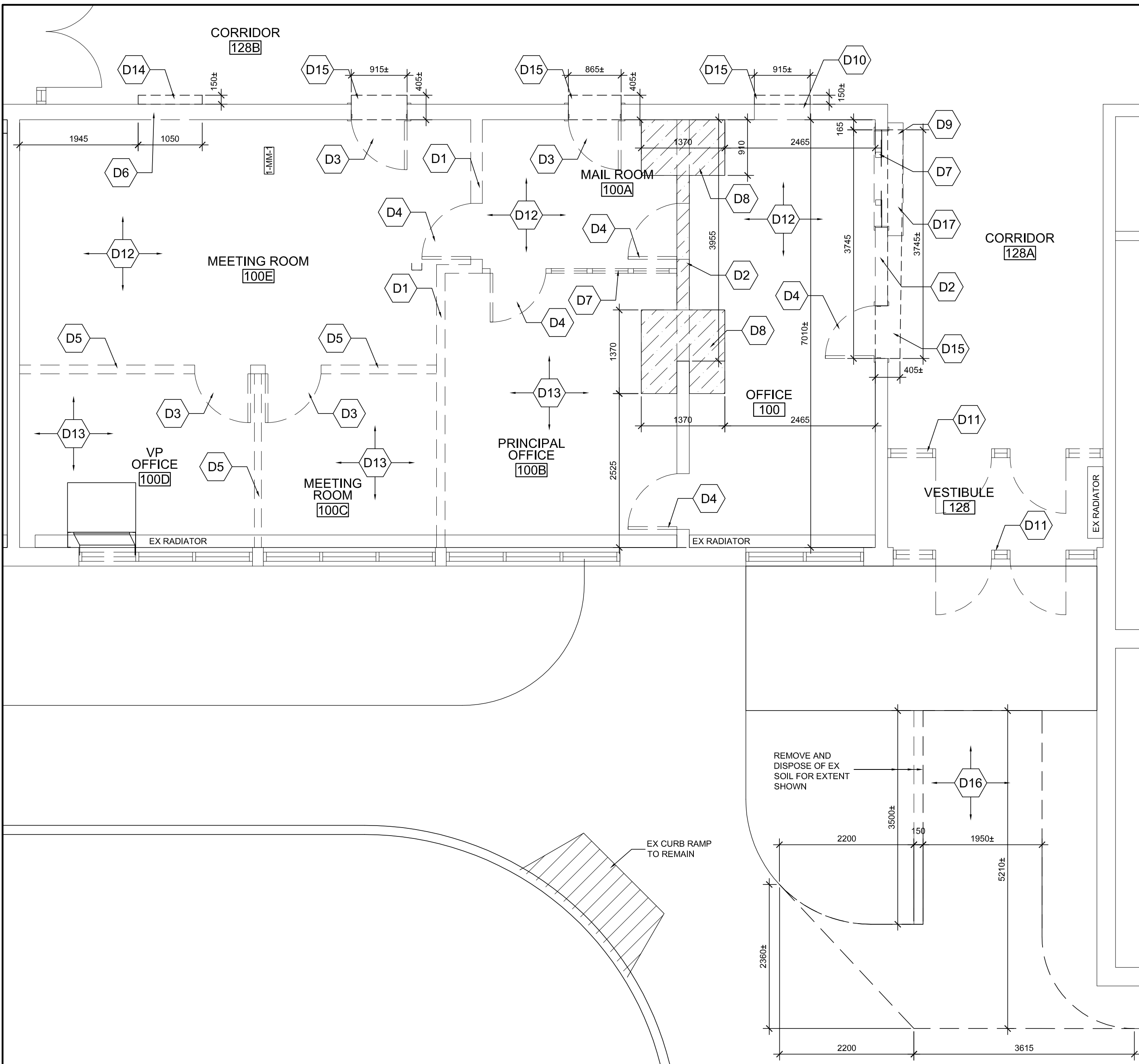
Type	Width	Length	Depth	Reinforcing
F1	1370	1370	300	15M @ 300mm BEW

### 3 COLUMN - BASE PLATE AND FOOTING SCHEDULE

A2.02 SCALE: NTS

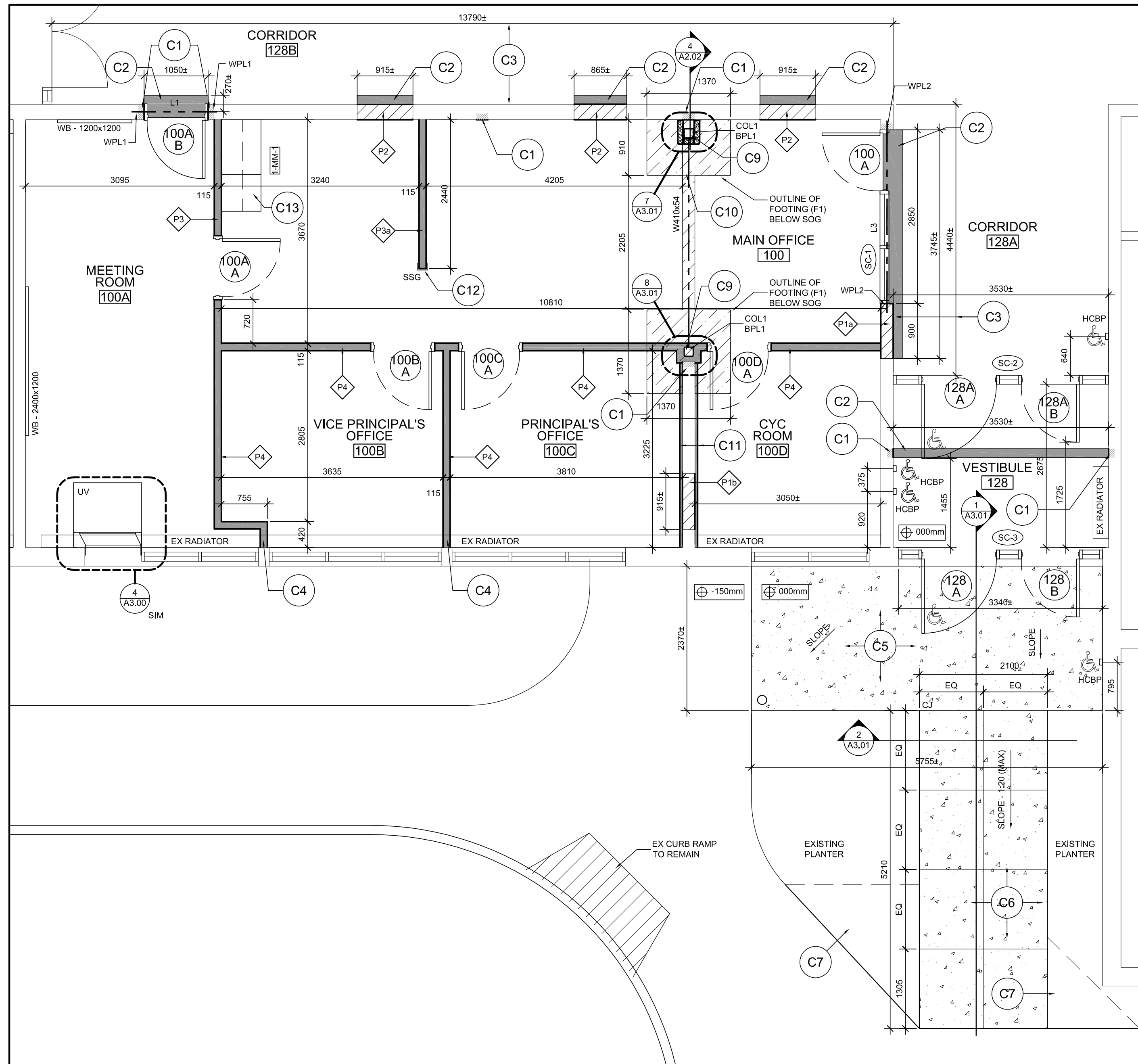
### 4 DETAIL - COLUMN FOUNDATION

A2.02 SCALE: NTS



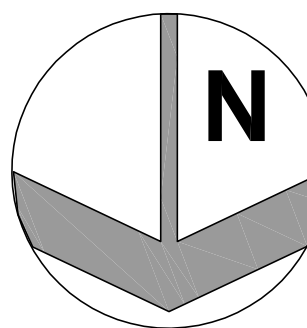
### 1 ENLARGED DEMOLITION PLAN - MAIN OFFICE (ROOM 100)

A2.02 SCALE: 1:50



### 2 ENLARGED FLOOR PLAN - MAIN OFFICE (ROOM 100)

A2.02 SCALE: 1:50



STRUCTURAL

## ABBREVIATIONS LEGEND

AFF	ABOVE FINISHED FLOOR
APPROX	APPROXIMATE
BLK	BLOCK
CJ	CONTROL JOINT
CONC	CONCRETE
CPT-T	CARPET TILE
CWT	CERAMIC WALL TILE
EX	EXISTING ITEM
GL	GLASS
GWB	GYPSUM WALLBOARD
HCBP	HANDICAP PUSH BUTTON
MAX	MAXIMUM
MIN	MINIMUM
O.C.	ON CENTER
SIM	SIMILAR
SSG	STAINLESS STEEL GUARD
TYP	TYPICAL
U/S	UNDERSIDE
UV	UNIT VENTILATOR
VCT	VINYL COMPOSITE TILE
WB	WHITE BOARD
WD	WOOD
W	WITH

NO	REVISIONS	DATE
3	ISSUED FOR TENDER	2021-05-07
2	ISSUED FOR BUILDING PERMIT	2021-05-07
1	ISSUED FOR ZONING CLEARANCE	2021-03-16

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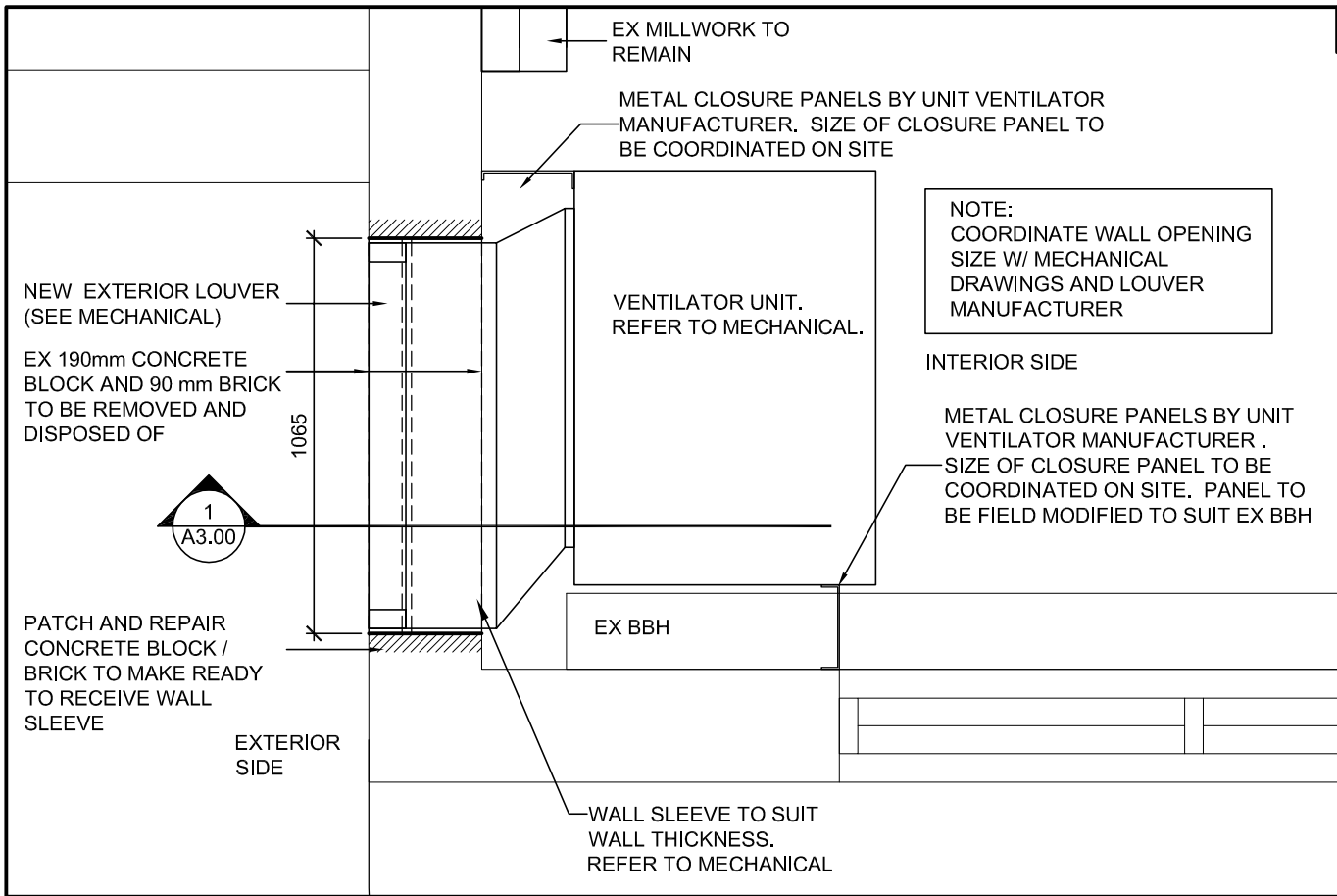
ROLLING MEADOWS  
PUBLIC ELEMENTARY  
SCHOOL  
INTERIOR RENOVATIONS  
1522 MOUNTAIN GROVE AVE.  
BURLINGTON, ONTARIO, L7P 2H5

ENLARGED MAIN OFFICE  
FLOOR PLANS

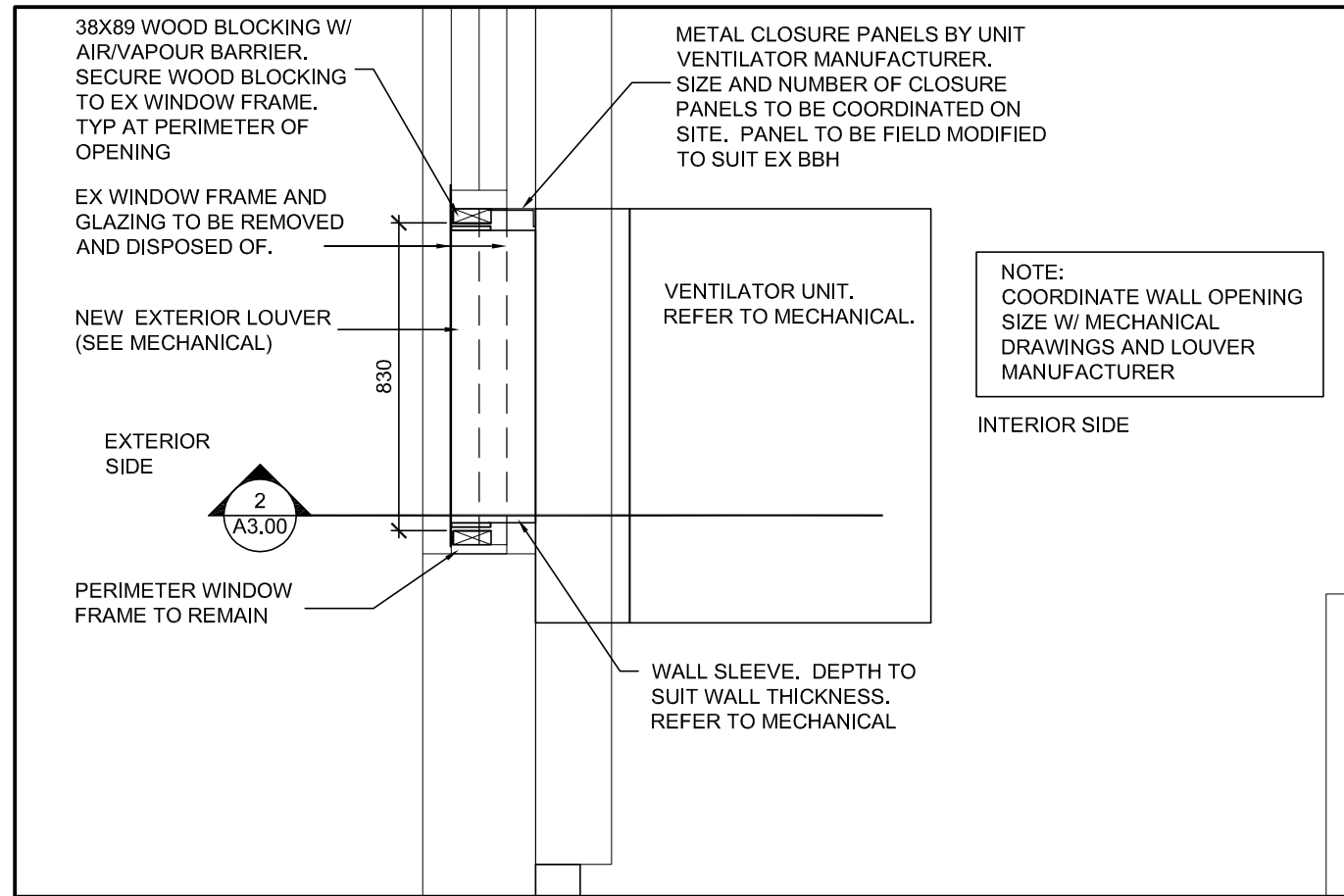
GRGURIC  
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28 KING STREET EAST, UNIT B  
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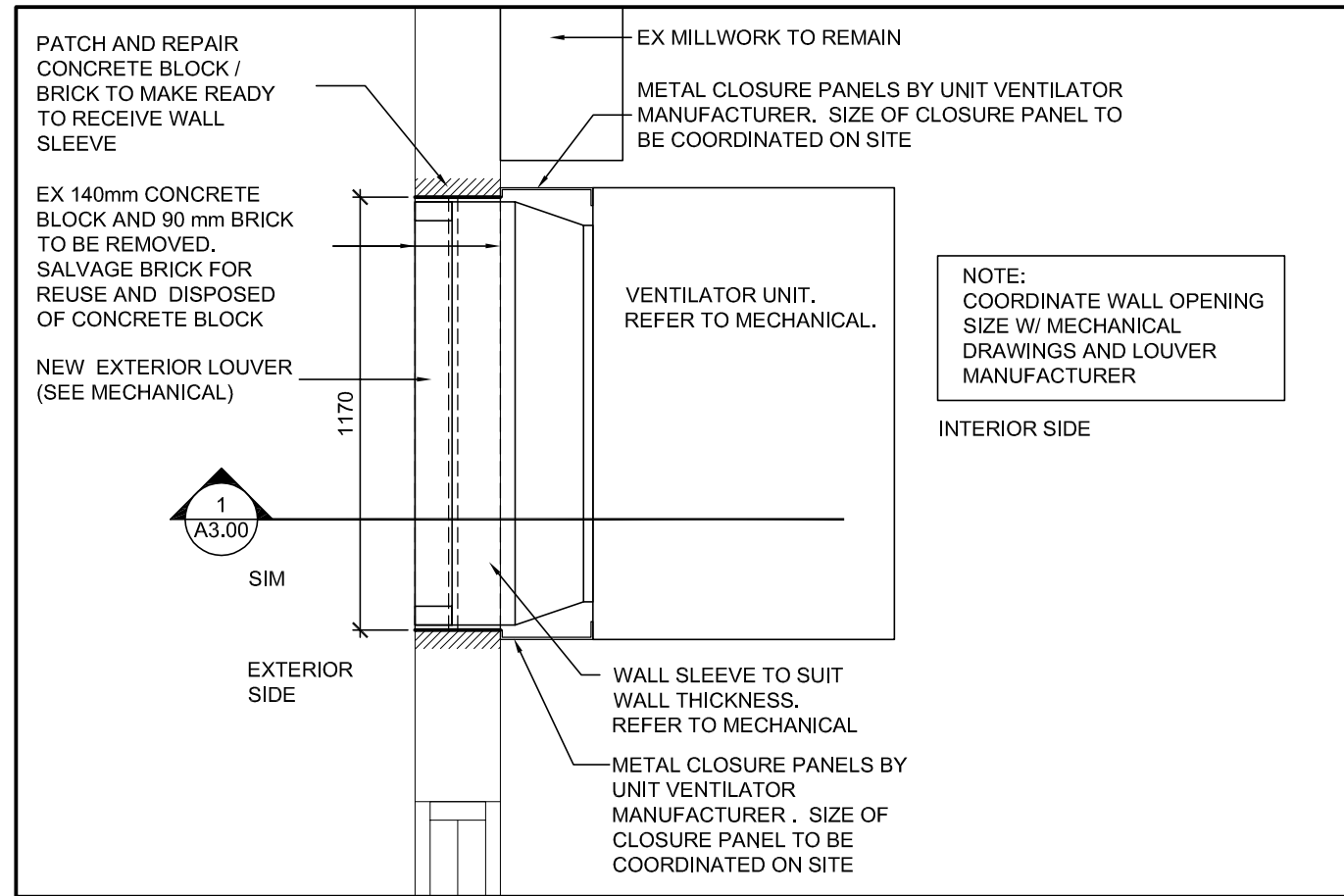
SCALE: AS NOTED	PROJECT: <b>2020-31</b>
DATE: JAN-2021	
DRAWN DW	DRAWING
CHECKED JG	<b>A2.02</b>
PRINT DATE	05/07/21



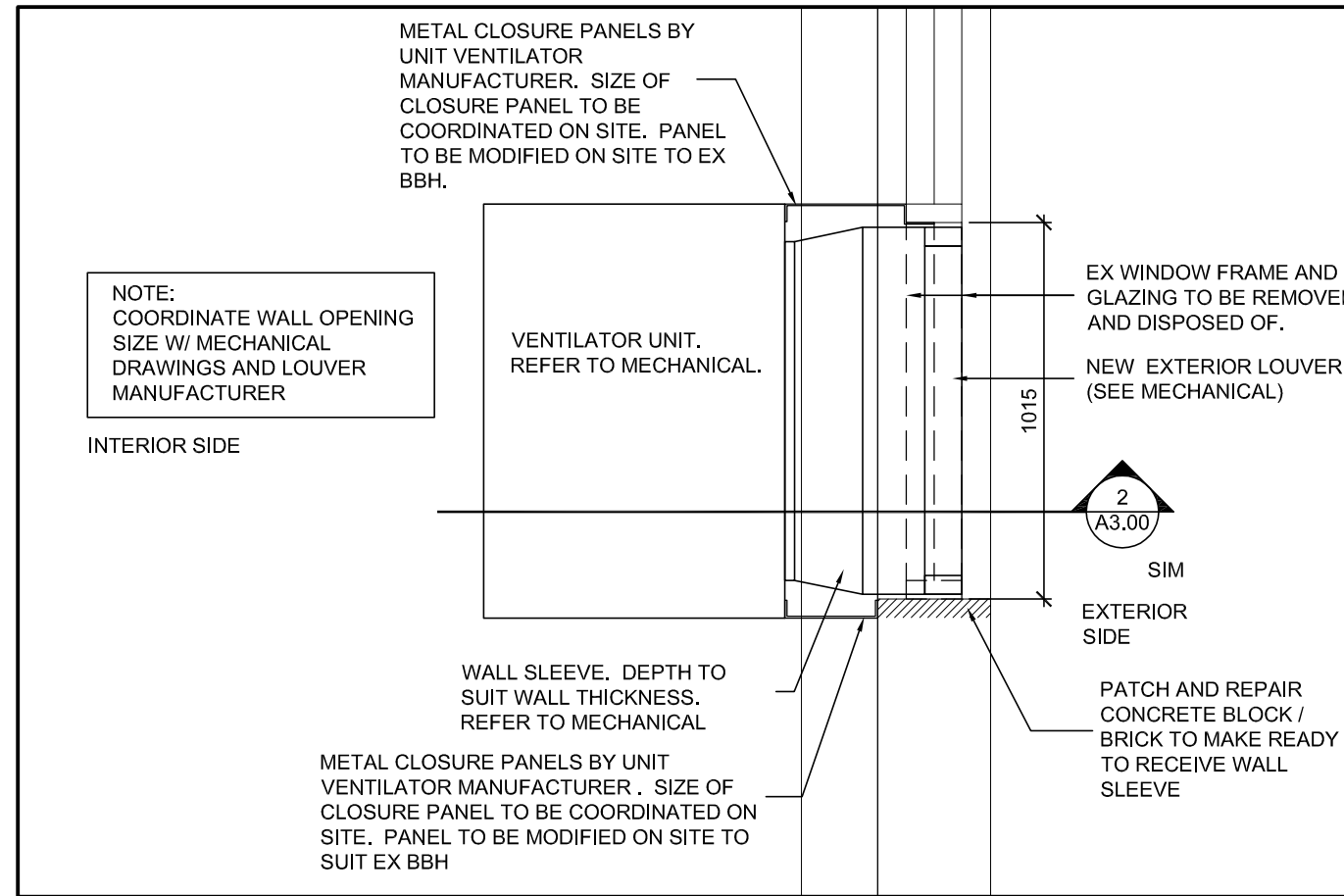
3 PLAN - TYPICAL UNIT VENTILATOR THRU WALL  
SCALE: 1:20



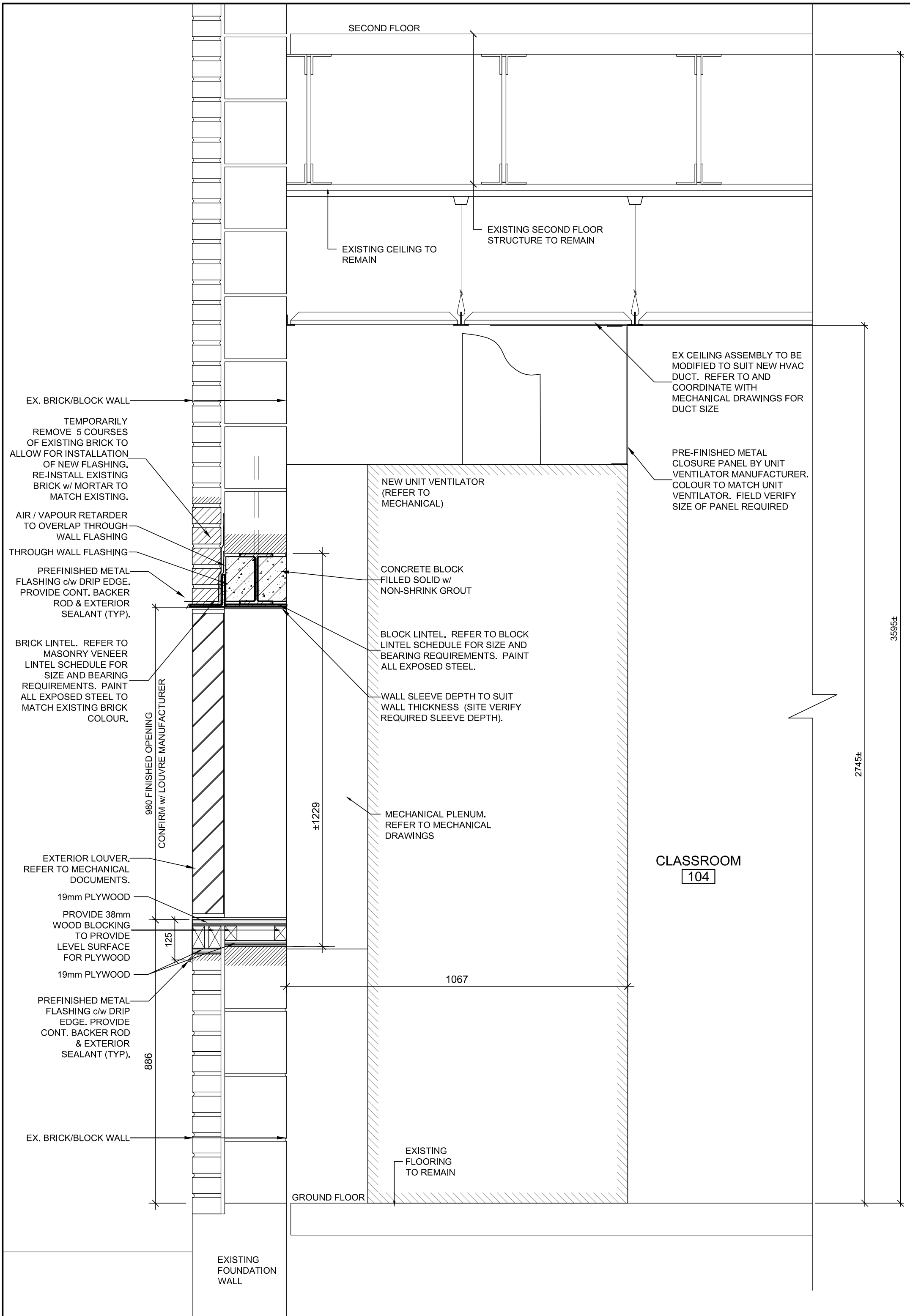
4 PLAN - TYPICAL UNIT VENTILATOR THRU WINDOW  
SCALE: 1:20



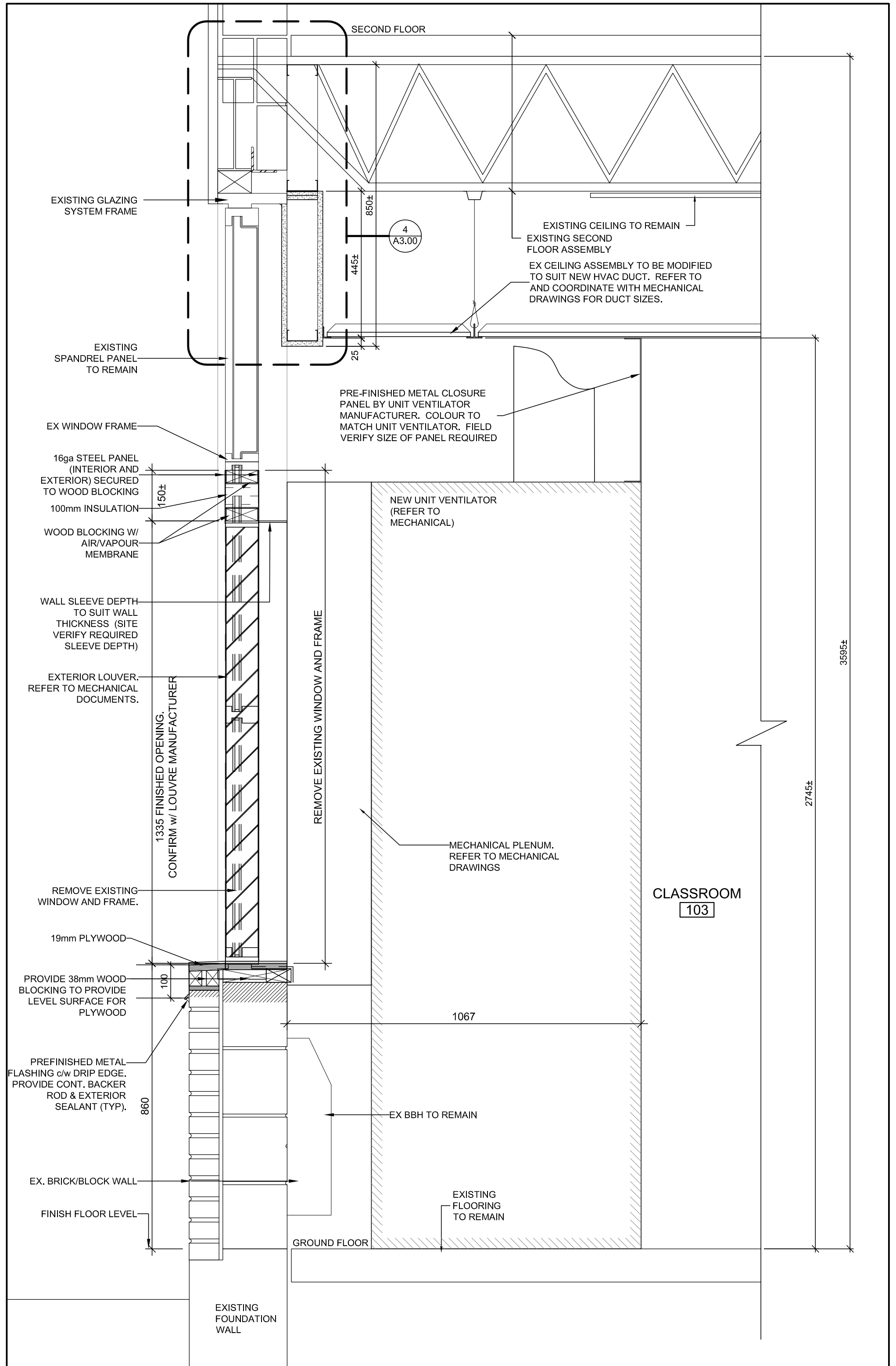
5 PLAN - LIBRARY UNIT VENTILATOR  
SCALE: 1:20



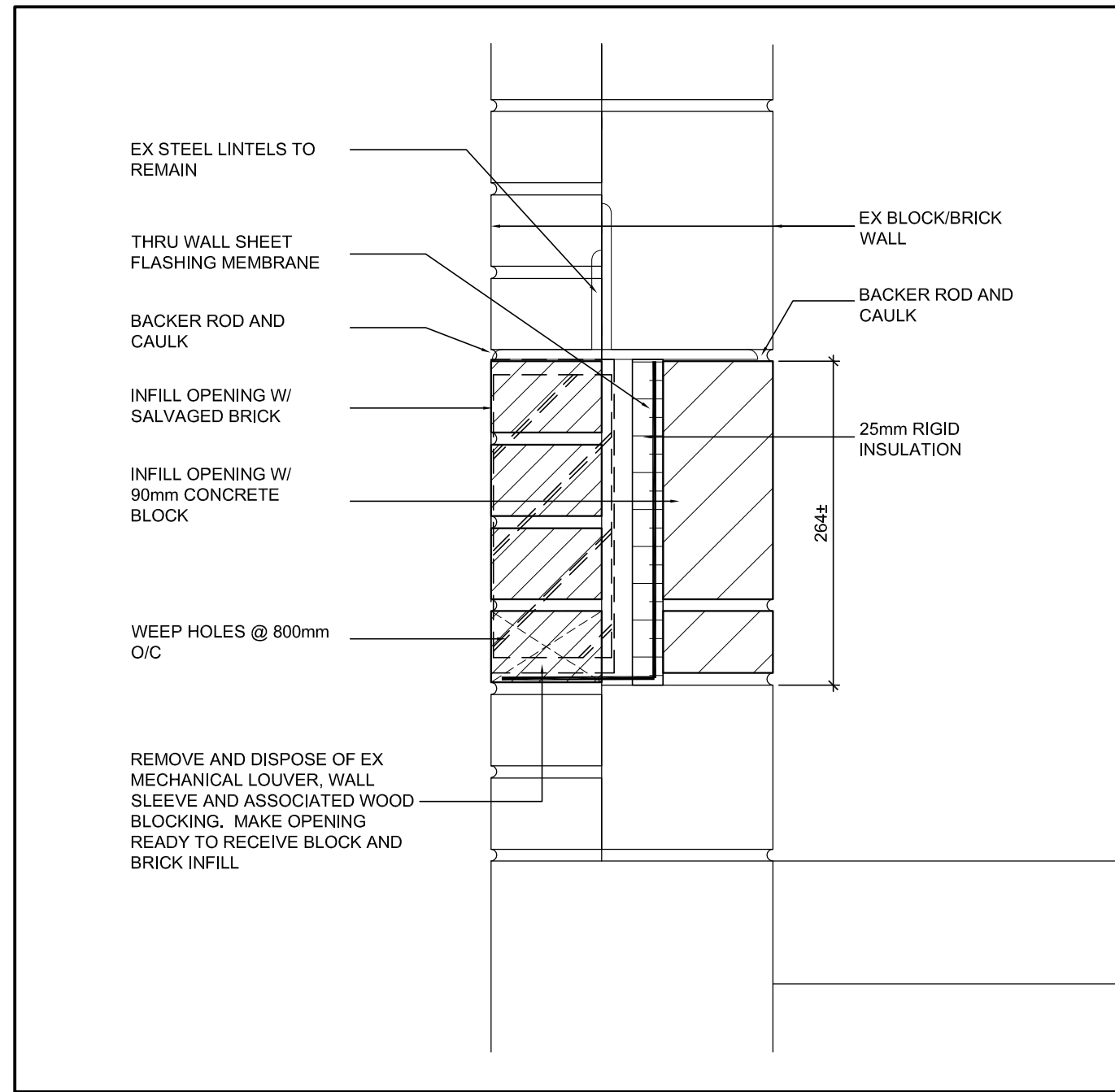
6 PLAN- MUSIC ROOM (ROOM 119) UNIT VENTILATOR  
SCALE: 1:20



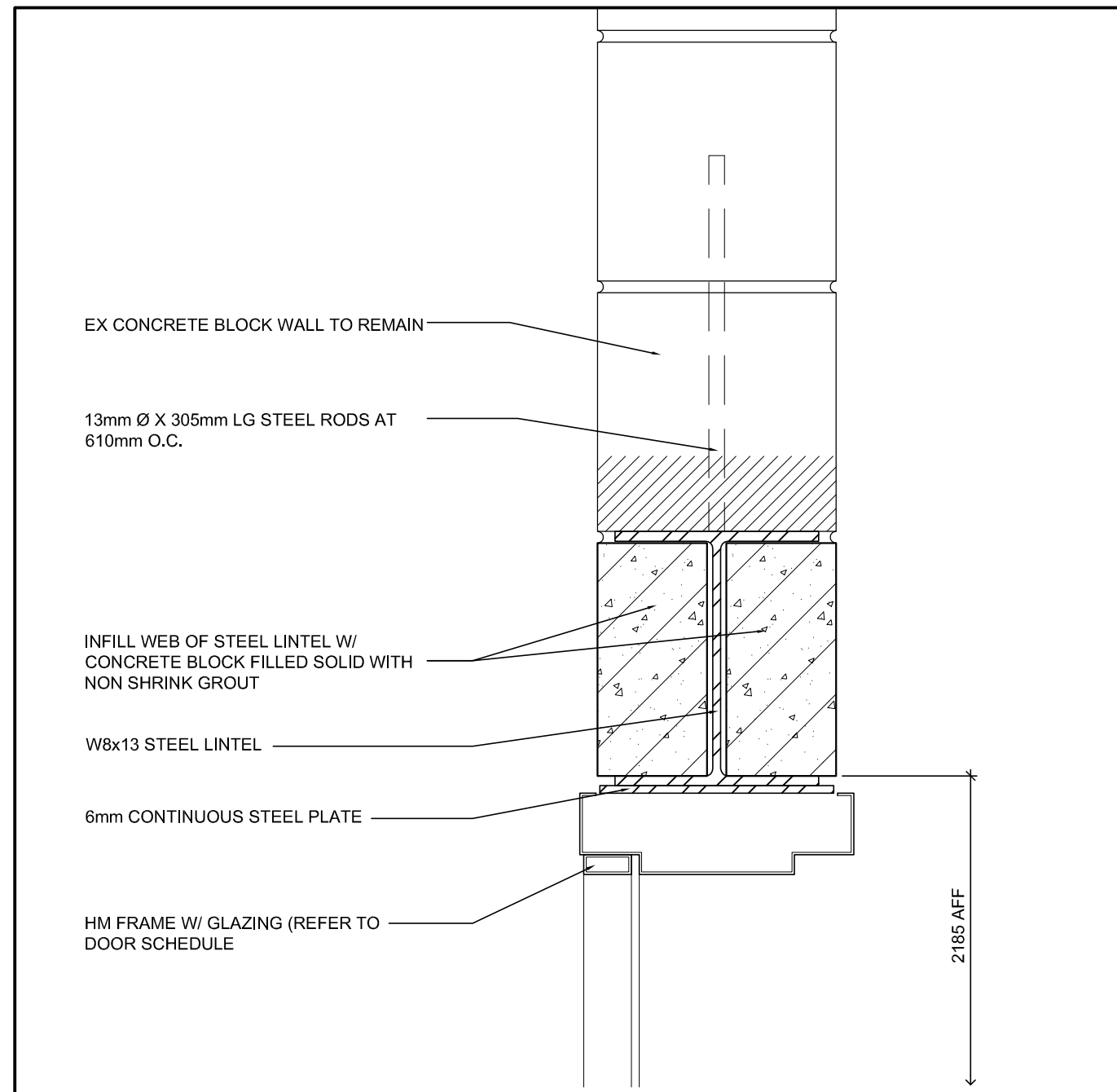
1 TYPICAL LOUVER DETAIL THRU WALL  
SCALE: 1:10



2 TYPICAL LOUVER DETAIL THRU WINDOW  
SCALE: 1:10



7 LIBRARY - INFILL OF MECHANICAL OPENINGS  
SCALE: 1:5



8 DETAIL - MAIN OFFICE (ROOM 100) AT CORRIDOR (ROOM 128A)  
SCALE: 1:5

Halton District School Board

ABBREVIATIONS LEGEND

BBH	BASE BOARD HEATER
C/W	COMPLETE WITH
EX	EXISTING ITEM
MIN	MINIMUM
O/C	ON CENTER
SIM	SIMILAR
TYP	TYPICAL
W/	WITH

2	ISSUED FOR TENDER	2021-05-07
1	ISSUED FOR BUILDING PERMIT	2021-05-07

NO	REVISIONS	DATE
1	ISSUED FOR TENDER	2021-05-07

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ROLLING MEADOWS PUBLIC ELEMENTARY SCHOOL INTERIOR RENOVATIONS

1522 MOUNTAIN GROVE AVE, BURLINGTON, ONTARIO, L7P 2H5

SECTION AND PLAN DETAILS

GRGURIC ARCHITECTS INCORPORATED

28 KING STREET EAST, UNIT B STONEY CREEK, ONTARIO, L8G 1J8 Tel. 905-664-8735 Fax. 905-664-8737 Web: www.2gai.com

SCALE: AS NOTED	PROJECT: 2020-31
DATE: JAN-2021	
DRAWN DW	DRAWING
CHECKED JG	A3.00
PRINT DATE	05/07/21

S:\Data\2020\2020-31\HSSB-Rolling Meadows\HVAC-WRM-Renov\Draws\Building\_Sections.dwg





ROOM FINISH SCHEDULE

RM. NO.	ROOM NAME	FLOOR FINISH		WALLS		CEILING		FINISH		HEIGHT	REMARKS
		FINISH	BASE	MAT'L		FINISH	MAT'L				
100	OFFICE	LVT	RB	EX CONC. BLK. GWB	PNT PNT	ACT-1		-		2745	
100A	MEETING ROOM	LVT	RB	EX CONC.BLK GWB	PNT PNT	ACT-1 GYPSUM		-	PNT	2745	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 1 HR FIRE RATED CEILING (ULC G243)
100B	VICE PRINCIPAL'S OFFICE	CPT-T	RB	EX CONC. BLK GWB	PNT	ACT-1 GYPSUM		-	PNT	2745	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 1 HR FIRE RATED CEILING (ULC G243)
100C	PRINCIPAL'S OFFICE	CPT-T	RB	EX CONC. BLK GWB	PNT	ACT-1 GYPSUM		-	PNT	2745	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 1 HR FIRE RATED CEILING (ULC G243)
100D	CYC ROOM	CPT-T	RB	EX CONC. BLK GWB	PNT	ACT-1 GYPSUM		-	PNT	2745	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS
103	CLASSROOM	EX	EX	EX CONC. BLK	-	ACT-2 GYPSUM		-	PNT	2745	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 1 HR FIRE RATED CEILING (ULC G243)
103A	WASHROOM	EX	EX	EX CONC. BLK	-	ACT-2 GYPSUM		-	PNT	2745	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 1 HR FIRE RATED CEILING (ULC G243)
103B	VESTIBULE	EX	EX	EX CONC. BLK	-	ACT-2 GYPSUM		-	PNT	2745	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 1 HR FIRE RATED CEILING (ULC G243)
113	CLASSROOM	EX	EX	EX CONC. BLK	-	ACT-2 GYPSUM		-	PNT	2745	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 1 HR FIRE RATED CEILING (ULC G243)
114	CLASSROOM	EX	EX	EX CONC. BLK	-	ACT-2 GYPSUM		-	PNT	2745	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 1 HR FIRE RATED CEILING (ULC G243)
115	GIRL'S WASHROOM	EX TERR	EX TERR	EX CONC. BLK	PNT	GYPSUM		PNT		2655	-
116	BOY'S WASHROOM	EX TERR	EX TERR	EX CONC. BLK	PNT	GYPSUM		PNT		2655	1 HR FIRE RATED CEILING (OBC SB-2 TABLE 2.3.12)
117	SCIENCE ROOM	EX	EX	EX CONC. BLK	-	EX		-		EX	PAINT NEW SPIRAL DUCT
118	LIBRARY	EX	EX	EX CONC. BLK	PNT	EX		-	EX		REPAINT EX WALL AT WALL INFILL ONLY. REFER TO A1.01
119	MUSIC ROOM	EX	EX	EX CONC. BLK	-	EX		-		EX	PAINT NEW SPIRAL DUCT
123	CLASSROOM	EX	EX	EX CONC. BLK	-	ACT-2 GYPSUM		-	PNT	2745	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 1 HR FIRE RATED CEILING (ULC G243)
124	STAFF ROOM	EX	EX	EX CONC. BLK	-	ACT-2 GYPSUM		-	PNT	2745	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 1 HR FIRE RATED CEILING (ULC G243)
127	AUDITORIUM	EX	EX	EX CONC. BLK	-	EX		-		EX	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 1 HR FIRE RATED CEILING (ULC G243)
128	VESTIBULE	EX	EX	EX CONC. BLK GWB	PNT PNT	ACT-1		-		3075(EX)	PAINT NEW SPIRAL DUCT
128A	CORRIDOR	EX	EX	EX CONC. BLK GWB	PNT PNT	ACT-1		-		3075(EX)	HEIGHT OF NEW ACT CEILING TO MATCH EXISTING
128H	CORRIDOR	EX	EX	EX CONC. BLK	-	ACT-1		-		2440	
128J	CORRIDOR	EX	EX	EX CONC. BLK	-	ACT-1		-		2440	
128K	STAIR	EX	EX	EX CONC. BLK	-	GYPSUM		PNT		3400	

SECOND FLOOR

200F	CORRIDOR	EX	EX	EX CONC. BLK	-	ACT-1		-		3400	
200G	STAIR	EX	EX	EX CONC. BLK	-	ACT-1		-		3400	
201	CLASSROOM	EX	EX	EX CONC. BLK	-	ACT-2		-		2970	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 3/4 HR FIRE RATED CEILING (ULC G243)
202	CLASSROOM	EX	EX	EX CONC. BLK	-	ACT-2 GYPSUM		-	PNT	2970	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 3/4 HR FIRE RATED CEILING (ULC G243)
203	CLASSROOM	EX	EX	EX CONC. BLK	-	ACT-2		-	PNT	2970	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 3/4 HR FIRE RATED CEILING (ULC G243)
205	CLASSROOM	EX	EX	EX CONC. BLK	-	ACT-2 GYPSUM		-	PNT	2970	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 3/4 HR FIRE RATED CEILING (ULC G243)
206	HOME ECONOMICS ROOM	EX	EX	EX CONC. BLK	-	EX GYPSUM		-	PNT	EX	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS
207	CLASSROOM	EX	EX	EX CONC. BLK	-	ACT-2 GYPSUM		-	PNT	2970	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS 3/4 HR FIRE RATED CEILING (ULC G243)
208	CLASSROOM	EX	EX	EX CONC. BLK	-	EX GYPSUM		-	PNT	EX	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS
210	CLASSROOM	EX	EX	EX CONC. BLK	-	EX GYPSUM		-	PNT	EX	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS
211	CLASSROOM	EX	EX	EX CONC. BLK	-	EX GYPSUM		-	PNT	EX	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS
212	BOY'S WASHROOM	EX	EX	EX CONC. BLK	-	GYPSUM		PNT		2450	1 HR FIRE RATED CEILING (OBC SB-2 TABLE 2.3.12)
214	GIRL'S WASHROOM	EX	EX	EX CONC. BLK	-	GYPSUM		PNT		2450	1 HR FIRE RATED CEILING (OBC SB-2 TABLE 2.3.12)
215	CLASSROOM	EX	EX	EX CONC. BLK	-	EX GYPSUM		-	PNT	EX	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS
216	CLASSROOM	EX	EX	EX CONC. BLK	-	EX GYPSUM		-	PNT	EX	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS
217	CLASSROOM	EX	EX	EX CONC. BLK	-	EX GYPSUM		-	PNT	EX	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS
218	CLASSROOM	EX	EX	EX CONC. BLK	-	EX GYPSUM		-	PNT	EX	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS
219	CLASSROOM	EX	EX	EX CONC. BLK	-	EX GYPSUM		-	PNT	EX	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS
220	CLASSROOM	EX	EX	EX CONC. BLK	-	EX GYPSUM		-	PNT	EX	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS
222	CLASSROOM	EX	EX	EX CONC. BLK	-	EX GYPSUM		-	PNT	EX	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS
223	CLASSROOM	EX	EX	EX CONC. BLK	-	EX GYPSUM		-	PNT	EX	REFER TO REFLECTED CEILING PLAN FOR BULKHEAD HEIGHTS

ROOM FINISH LEGEND

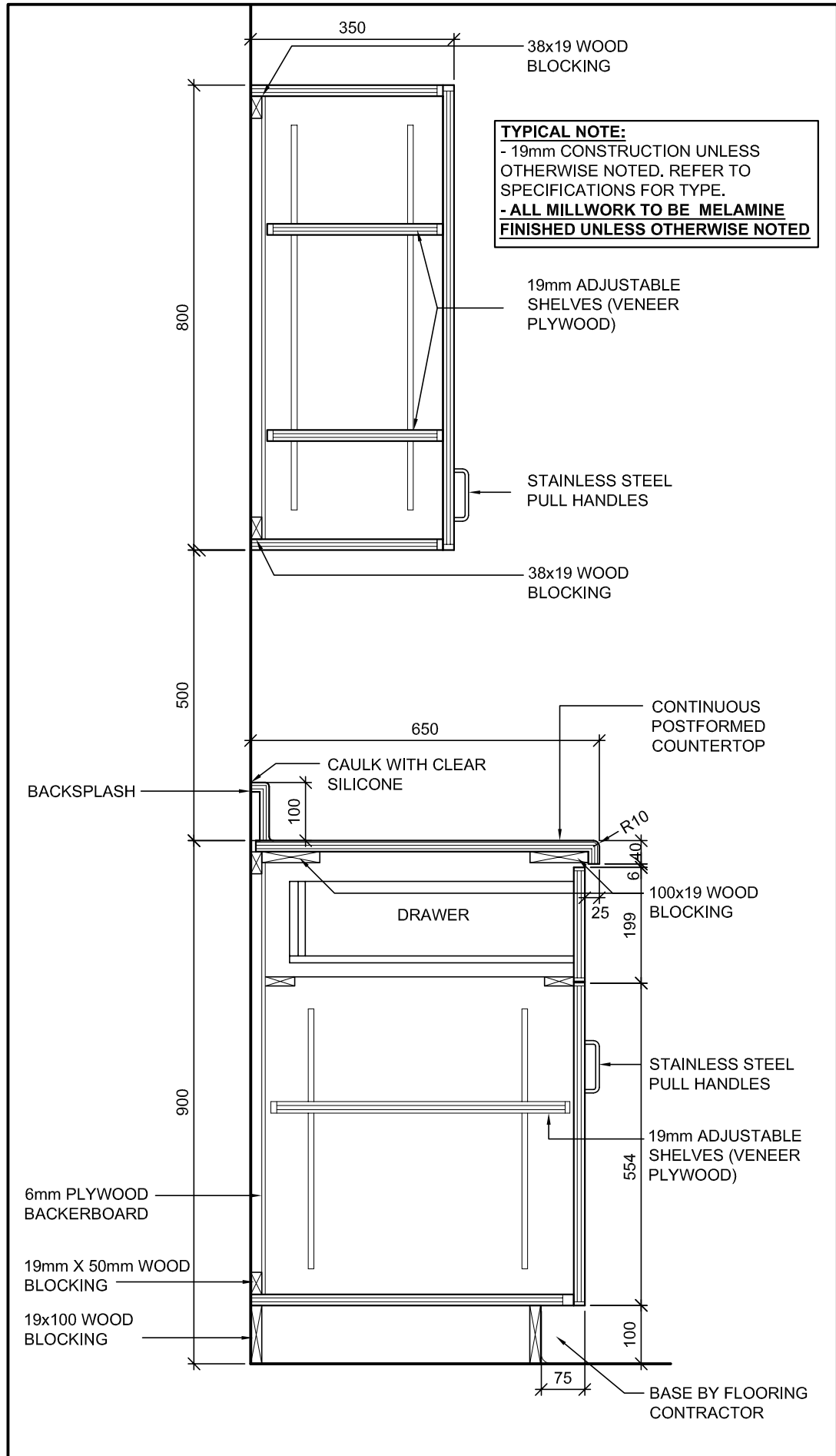
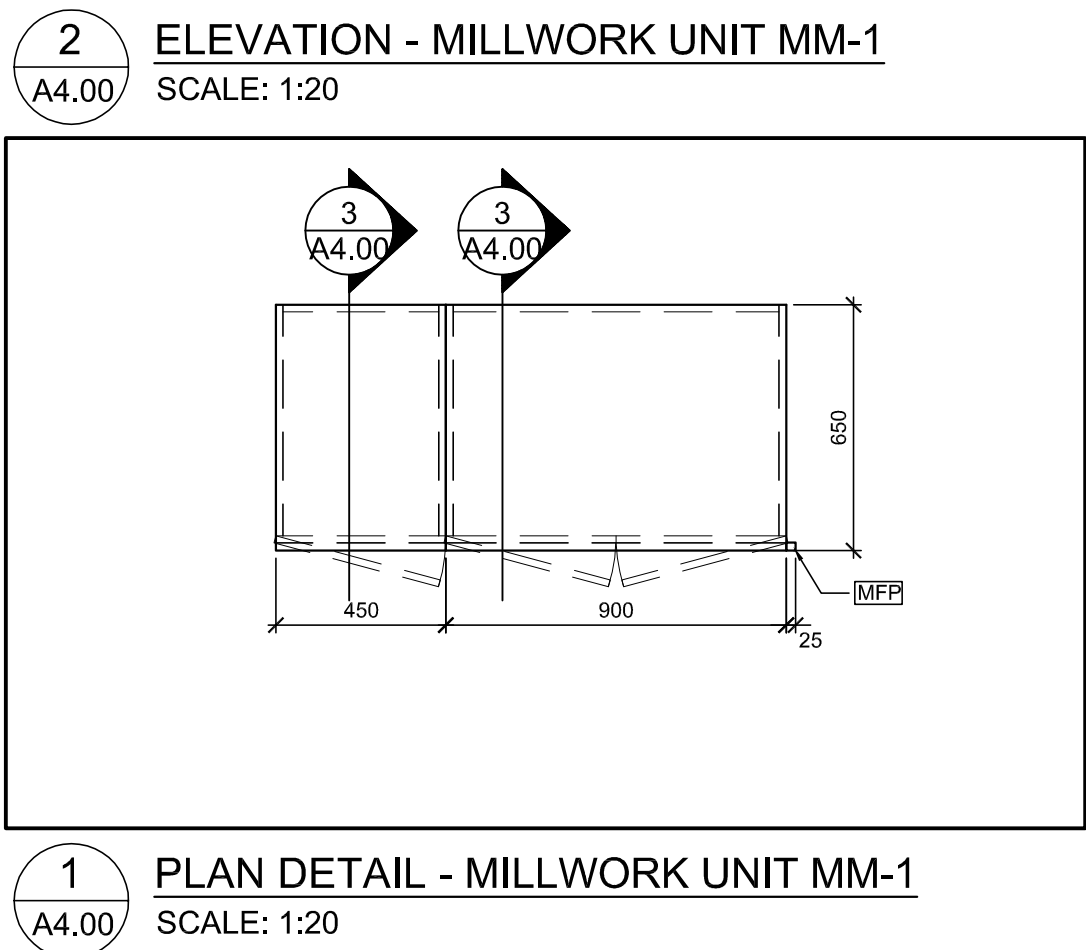
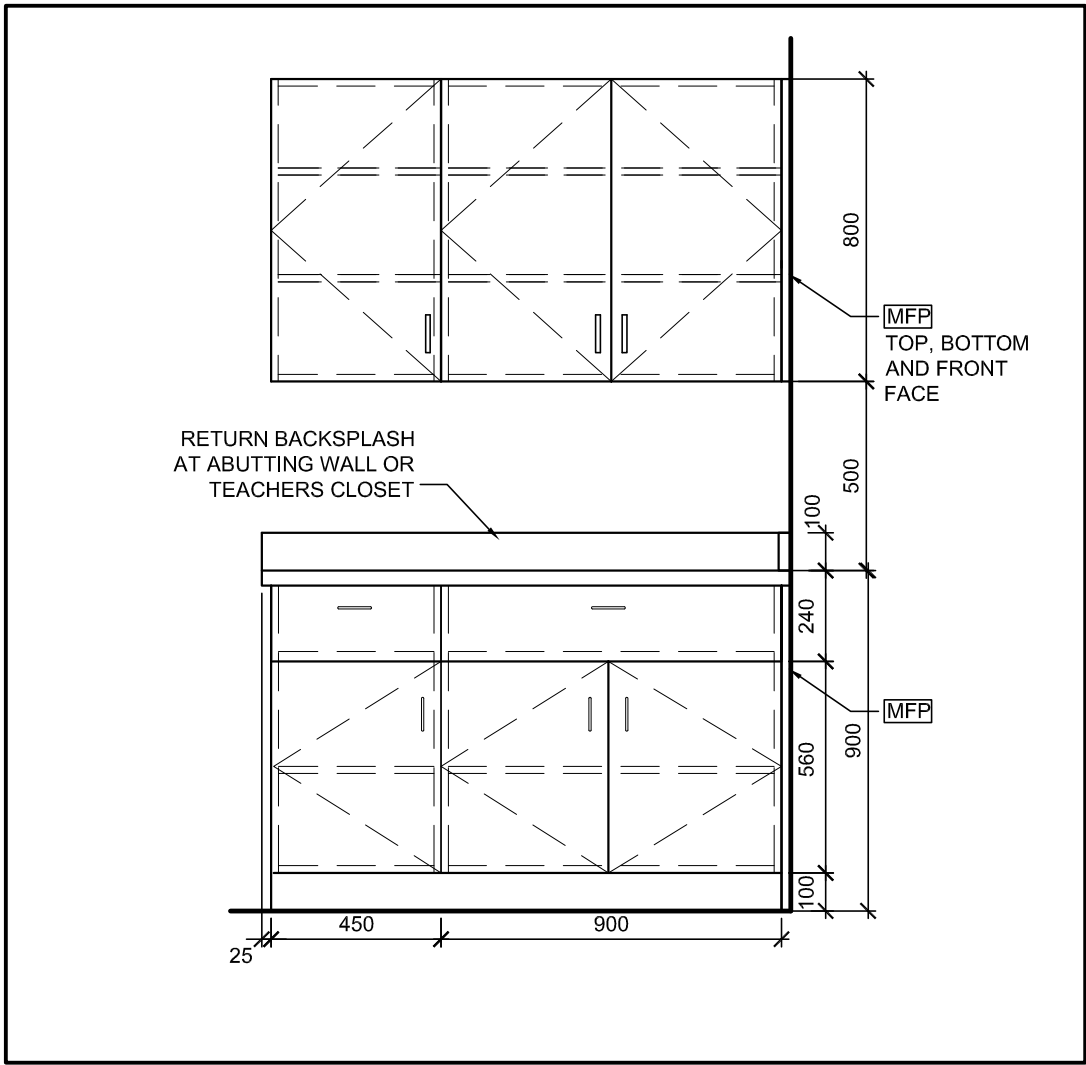
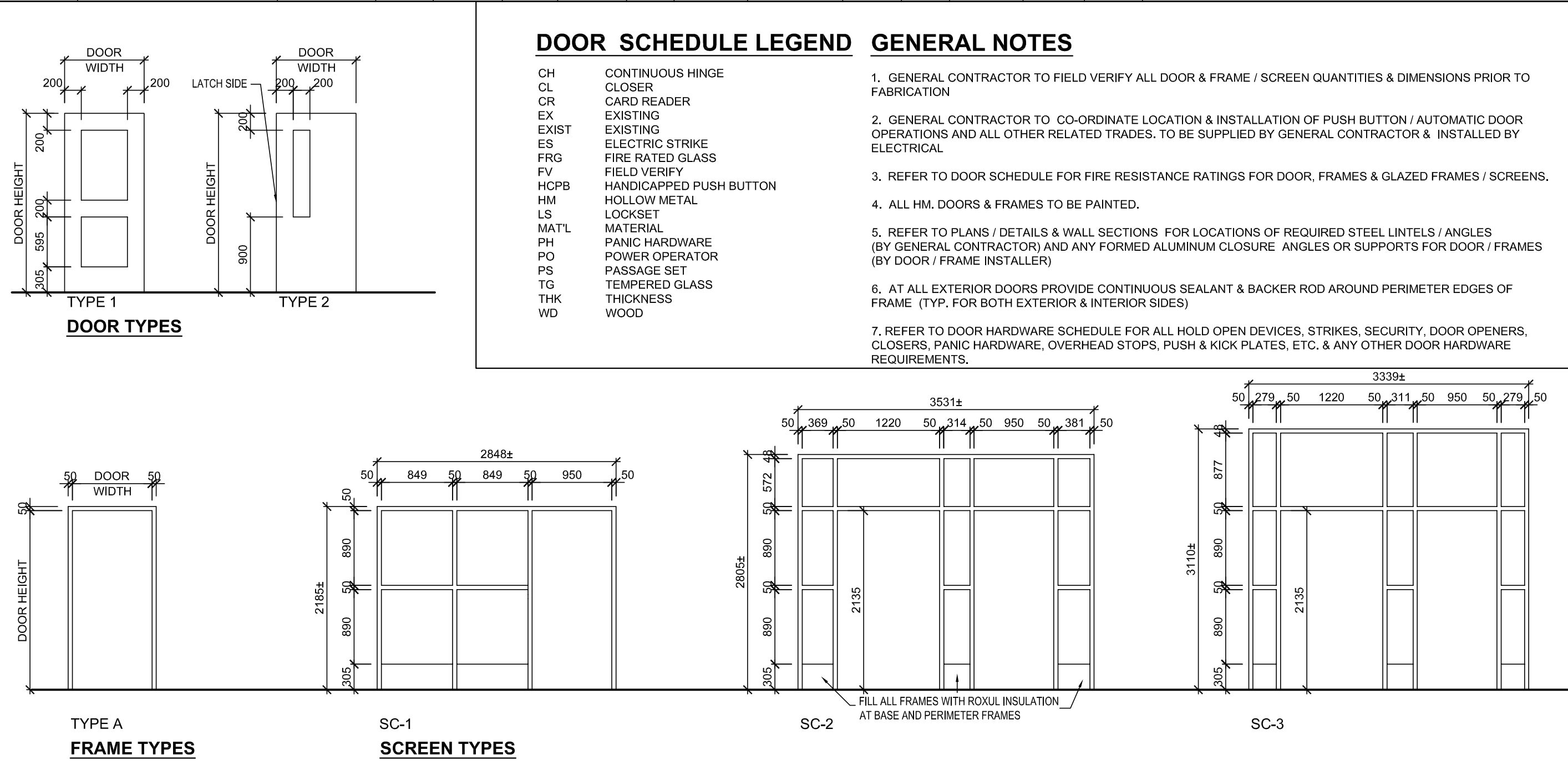
ACT-X	ACOUSTIC CEILING TILE	CPT-T	CARPET TILE	MTL	METAL	UNO	UNLESS NOTED OTHERWISE
AFF	ABOVE FINISHED FLOOR	CWT	CERAMIC WALL TILE	PNT	PAINT	VCT	VINYL COMPOSITE TILE
BLK	BLOCK	EX	EXISTING	PT	PORCELAIN TILE	w/	WITH
CONC	CONCRETE	GWB	GYPSON WALLBOARD	RB	RUBBER BASE		
CL'G	CEILING	LVT	LUXURY VINYL TILE	US	UNDERSIDE		

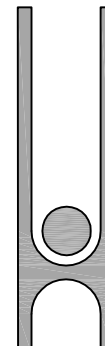
ROOM FINISH SCHEDULE NOTES

- GROUND FLOOR CEILING HEIGHT IS 2840mm UNO. SECOND FLOOR CEILING HEIGHT IS 2800mm UNO
- SCHEDULES ARE TO BE READ IN CONJUNCTION WITH ALL DRAWINGS AND SPECIFICATIONS.
- PAINT ALL EXPOSED MISCELLANEOUS METALS AND SERVICES (E.G. DUCTS, CONDUITS, PIPING, ETC.) WHERE CEILINGS AND WALLS ARE SCHEDULED TO BE PAINTED.
- EXISTING WALLS SHALL BE CHASED AND OPENINGS CREATED AS REQUIRED TO EXECUTE THE WORK.
- MAKE GOOD ALL MATERIALS AND FINISHED WHERE DISTURBED AND ALTERATIONS OCCUR. REFER TO MECHANICAL AND ELECTRICAL DOCUMENTS FOR FULL EXTENT OF WORK REQUIRED. NOTE THAT MAKING GOOD INCLUDES WORK ASSOCIATED WITH THE INSTALLATION OF SERVICES SHOWN ON DRAWINGS.

DOOR / SCREEN SCHEDULE

ROOM NO	ROOM NAME	DOOR / SCREEN NO.	DOOR / SCREEN								FRAME				REMARKS	
			WIDTH	HEIGHT	THK	FIRE	TYPE	MAT'L	FIN.	GLASS	TYPE	MAT'L	FIN.	GLASS		
GROUND FLOOR																
100	OFFICE	100 A	950	2150	44	20 MIN	1	HM	PAINT	FG	SC-1	HM	PAINT	FRG	DOOR FRAME THROAT WIDTH 190mm (FV)	
100A	MEETING ROOM	100A A	950	2150	44	-	2	HM	PAINT	TG	A	HM	PAINT	-		
100A	MEETING ROOM	100A B	950	2150	44	20 MIN	2	HM	PAINT	FG	A	HM	PAINT	-	DOOR FRAME THROAT WIDTH 240mm (FV)	
100B	VICE PRINCIPAL'S OFFICE	100B A	950	2150	44	-	2	HM	PAINT	TG	A	HM	PAINT	-		
100C	PRINCIPAL'S OFFICE	100C A	950	2150	44	-	2	HM	PAINT	TG	A	HM	PAINT	-	-	
100D	CYC ROOM	100D A	950	2150	44	-	2	HM	PAINT	TG	A	HM	PAINT	-	-	
128	VESTIBULE	128 A	1220	2150	44	-	1	HM	PAINT	TG	SC-3	HM	PAINT	TG	INS,WS,TH,CH,PO,HCPB,ES,CR	
128	VESTIBULE	128 B	950	2150	44	-	1	HM	PAINT	TG	SC-3	HM	PAINT	TG	INS,WS,TH,CH,ES	
128A	CORRIDOR	128A A	1220	2150	44	-	1	HM	PAINT	TG	SC-2	HM	PAINT	TG	CH,PO,HCPB	
128A	CORRIDOR	128A B	950	2150	44	-	1	HM	PAINT	TG	SC-2	HM	PAINT	TG	CH	





Halton District School Board

2	ISSUED FOR TENDER	2021-05-07
1	ISSUED FOR BUILDING PERMIT	2021-05-07
NO	REVISIONS	DATE

DRAWINGS ARE NOT TO BE SCALED. CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND CONDITIONS ON THE PROJECT, AND MUST REPORT ANY DISCREPANCIES TO THE ARCHITECTS BEFORE PROCEEDING WITH THE WORK.  
THE USE OF THIS DRAWING OR PART THEREOF IS FORBIDDEN WITHOUT THE WRITTEN APPROVAL OF THE ARCHITECTS.

ROLLING MEADOWS PUBLIC ELEMENTARY SCHOOL INTERIOR RENOVATIONS

1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7P 2H5

ROOM FINISH AND DOOR SCHEDULES

GRGURIC ARCHITECTS INCORPORATED

28 KING STREET EAST, UNIT B STONEY CREEK, ONTARIO, L8G 1J8  
Tel. 905-664-8735 Fax. 905-664-8737  
Web: www.2gai.com

SCALE: AS NOTED	PROJECT: 2020-31
DATE: JAN-2021	
DRAWN DW	DRAWING
CHECKED JG	A4.00
PRINT DATE 05/07/21	

S:\Data\2020\2020-31\HSSB-Rolling Meadows\HAC-WRM-Renov\Draws\RoomFinish\_schedule.dwg



GENERAL NOTES

1. CONFORM TO THE REQUIREMENTS OF THE LATEST ONTARIO BUILDING CODE (OBC) INCLUDING ALL THE LATEST STANDARDS REFERENCED THEREIN, AND ANY APPLICABLE ACTS OF AUTHORITY HAVING JURISDICTION. THE LATEST VERSION OF ALL STANDARDS AND CODES LISTED BELOW SHALL BE USED.

2. READ STRUCTURAL DRAWINGS IN CONJUNCTION WITH ALL OTHER SPECIFICATIONS AND CONTRACT DOCUMENTS.

3. WHERE DISCREPANCIES EXIST BETWEEN CONTRACT DOCUMENTS, INCLUDING DRAWINGS AND APPLICABLE CODES AND ACTS, THE MOST STRINGENT SHALL GOVERN. CONTRACTOR SHALL CHECK ALL DIMENSIONS ON WORKING DRAWINGS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

4. THESE DESIGN DOCUMENTS ARE PREPARED SOLELY FOR THE USE BY THE PARTY WITH WHOM THE DESIGN PROFESSIONAL HAS ENTERED INTO A CONTRACT AND THERE ARE NO REPRESENTATIONS OF ANY KIND MADE BY THE DESIGN PROFESSIONAL TO ANY PARTY WITH WHOM THE DESIGN PROFESSIONAL HAS NOT ENTERED INTO A CONTRACT.

5. THE USE OF THESE DRAWINGS IS LIMITED TO THAT IDENTIFIED IN THE REVISION COLUMN. DO NOT CONSTRUCT FROM THESE DRAWINGS UNLESS MARKED 'ISSUED FOR CONSTRUCTION' BY MTE CONSULTANTS.

6. UNDER NO CIRCUMSTANCES ARE THESE DRAWINGS TO BE SCALED, INCLUDING FOR PREPARATION OF SHOP DRAWINGS, CONSTRUCTION LAYOUT, OR BIDDING PURPOSES. ERRORS MADE BY PERSONS SCALING THESE DRAWINGS SHALL NOT BE THE RESPONSIBILITY OF MTE CONSULTANTS.

7. SEE ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS FOR LOCATIONS AND SIZES OF PITS, BASES, HOUSE KEEPING PADS, SUMPS, TRENCHES, DEPRESSIONS, GROOVES, CURBS, CHAMFERS AND SLOPES NOT SHOWN ON STRUCTURAL DRAWINGS.

8. BEFORE PROCEEDING WITH WORK, THE CONTRACTOR SHALL VISIT THE SITE AND BECOME FAMILIARIZED WITH ALL CHARACTERISTICS AFFECTING NEW AND EXISTING CONSTRUCTION. ANY CHANGES, ALTERATIONS OR REVISIONS MUST BE REPORTED TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

9. SUBSTITUTIONS FROM SPECIFIED PRODUCTS AND MATERIALS MUST BE APPROVED IN WRITING BY THE ENGINEER PRIOR TO ORDERING OF MATERIALS. THE CONTRACTOR SHALL REIMBURSE ALL CONSULTANTS FOR ADDITIONAL COSTS INCURRED AS A RESULT OF REVIEWING ANY CHANGES MADE TO THE CONTRACT DOCUMENTS.

10. ALL WORK IS TO BE PERFORMED IN ACCORDANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS - O.REG. 213/91.

11. IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO DESIGN ALL SHORING AND TEMPORARY BRACING AS PER O.REG 213/91 AND THE CONTRACTOR SHALL RETAIN AN ENGINEER AS REQUIRED.

12. THE CONTRACTOR SHALL RETAIN AN INDEPENDENT INSPECTION AND TESTING COMPANY TO ENSURE THAT ALL WORK IS DONE IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS. REQUIRED TESTING SHALL BE AS PER THE TESTING AND INSPECTION TABLE BELOW.

13. MTE CONSULTANTS WILL PROVIDE GENERAL REVIEW OF CONSTRUCTION IN ACCORDANCE WITH THE PERFORMANCE STANDARDS OF THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF ONTARIO BY MEANS OF A RATIONAL SAMPLING PROCEDURE TO DETERMINE WHETHER THE CONSTRUCTION OF THAT WORK SHOWN ON THE MTE DRAWINGS IS IN GENERAL CONFORMITY WITH THE PLANS, SKETCHES, DRAWINGS, AND SPECIFICATIONS FORMING PART OF THE CONTRACT DOCUMENTS PREPARED BY MTE; THE CONTRACTOR IS SOLELY RESPONSIBLE FOR QUALITY CONTROL AND THE PERFORMANCE OF THE WORK IN ACCORDANCE WITH THE CONTRACT. "MTE" SHALL NOT BE RESPONSIBLE FOR THE ACTS OR OMISSIONS OF THE CONTRACTOR, SUB-CONTRACTOR, OR ANY OTHER PERSON PERFORMING ANY OF THE WORK OR FOR THE FAILURE OF ANY OF THEM TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

14. IT IS THE RESPONSIBILITY OF BOTH THE OWNER AND THE CONTRACTOR TO NOTIFY THE ENGINEER OF CONSTRUCTION PROGRESS SO THE ENGINEER CAN COMPLETE GENERAL REVIEWS. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A CONSTRUCTION SCHEDULE PRIOR TO STARTING THE WORK. GENERALLY, REVIEWS BY THE ENGINEER WILL BE REQUIRED FOR REBAR PRIOR TO CONCRETE PLACEMENT, FOOTING AND FOUNDATIONS PRIOR TO BACKFILLING, AND ABOVE GRADE FRAMING PRIOR TO INSTALLATION OF INTERIOR FINISHES.

TESTING AND INSPECTION

THE FOLLOWING ITEMS REQUIRE TESTING OR INSPECTION BY A CERTIFIED INDEPENDENT TESTING OR INSPECTION AGENCY UNLESS NOTED OTHERWISE. THE AGENCY SHALL SEND COPIES OF ALL STRUCTURAL TESTING AND INSPECTION REPORTS TO THE ENGINEER FOR REVIEW.

ITEM	REQ'D	COMMENTS
SOIL BEARING CAPACITY	NO	
SOIL COMPACTION	NO	
HELICAL PIER INSTALLATION	NO	
REINFORCING STEEL PLACEMENT	YES	INSPECT FINAL PLACEMENT
CONC. COMPRESSIVE TESTS	NO	
CONCRETE SLUMP	NO	
STRUCTURAL STEEL BOLTING	NO	
STRUCTURAL STEEL WELDING	YES	INSPECT ALL FIELD WELDS
MORTAR CUBES	NO	

PROJECT DESIGN DATA TABLE			
BUILDING IMPORTANCE CATEGORY		NORMAL	
FLOOR AND ROOF DESIGN LOADS AS NOTED ON FRAMING PLANS			
SPECIFIED WIND LOADS			
HOURLY WIND PRESSURE (1/50) DESIGN DATA		0.46 kPa	
WIND DESIGN CATAGORY		CATAGORY 2	
TERRAIN		OPEN	
SPECIFIED SNOW LOADS			
BASIC ROOF SNOW LOAD	S	1.280 kPa	
	Ss	1.100 kPa	
SNOW AND RAIN LOADING (1/50) DESIGN DATA	Sr	0.400 kPa	
	24HR RAIN	103mm	
FACTORS USED FOR BASIC ROOF SNOW LOAD	Cb	0.8	
	Cw	1.0	
	Cs	1.0	
	Ca	1.0	
	ADDITIONAL SNOW ACCUMULATION AROUND OBSTRUCTIONS AND ADJACENT TO HIGHER ROOF LEVELS OR WALLS IS INDICATED ON THE DRAWINGS.		
SPECIFIED EARTHQUAKE LOADS			
SEISMIC LOADING DESIGN DATA	Sa (0.2)	0.2660	
	Sa (0.5)	0.1310	
	Sa (1.0)	0.0620	
	Sa (2.0)	0.0290	
	Sa (5.0)	0.0068	
	Sa (10.0)	0.0027	
	PGA	0.172	
	PGV	0.102	
SITE CLASS TO BE CONFIRMED BY GEOTECHNICAL ENGINEER		SITE CLASS	D
SEISMIC FORCE MODIFICATION FACTORS FOR SEISMIC FORCE RESISTING SYSTEM	Rd	1.5	
	Ro	1.5	
SEISMIC HAZARD INDEX		IeFaSa (0.2)	0.274
NOTES:			
1. ALL LOADS AND ANALYSIS CONFROM TO THE 2012 OBC DIV B PART 4 (INCLUDING AMENDMENTS MADE ON JANUARY 1, 2020) AND THE USER'S GUIDE - NBC 2010 STRUCTURAL COMMENTARIES.			
2. ALL DESIGN DATA ABOVE IS FROM THE 2012 OBC SUPPLEMENTARY STANDARD SB-1 TABLE 1.2.			
3. WIND LOADING IS BASED ON THE STATIC PROCEDURE.			
4. SEISMIC LOADING IS BASED ON THE EQUIVALENT STATIC FORCE PROCEDURE.			
5. THE STRUCTURE HAS NOT BEEN DESIGNED FOR ANY FUTURE EXTENSION UNLESS NOTED.			
6. THE FOUNDATION WALLS HAVE BEEN DESIGNED ASSUMING THAT THEY ARE NOT SUBJECT TO HYDROSTATIC PRESSURE. ENSURE PROVISIONS HAVE BEEN MADE FOR APPROPRIATE DRAINAGE OF GROUNDWATER.			

MASONRY

1. ALL MASONRY CONSTRUCTION SHALL CONFORM TO THE REQUIREMENTS OF CSA STANDARDS CAN/CSA-A370, CAN/CSA-A371 AND CSA S304.1.

2. ALL MASONRY UNITS OF CONCRETE SHALL CONFORM TO THE CSA STANDARD CAN/CSA-A165 AND SHALL HAVE A MINIMUM LOAD BEARING STRENGTH OF 15MPa BASED ON NET CROSS-SECTIONAL AREA.

3. REINFORCING BARS SHALL CONFORM TO THE REQUIREMENTS OF CAN/CSA G30 18 GRADE 400W FOR REINFORCING STEEL AND BE DEFORMED HI-BOND HARD GRADE WITH MINIMUM YIELD STRENGTH OF FY = 400 MPa.

4. TYPE S MORTAR SHALL BE USED THROUGHOUT FOR LOAD BEARING BLOCK. TYPE N MORTAR SHALL BE USED FOR BRICK VENEER OR DECORATIVE NON-LOAD BEARING BLOCK.  
LAB CURED MORTAR COMPRESSIVE STRENGTHS: (JOB PREPARED MIX)  
TYPE S: MIN. 28 DAY STRENGTH 12.0 MPa  
TYPE N: MIN. 28 DAY STRENGTH 7.5 MPa  
MORTAR MIX PROPORTIONS:  
MIX ACCORDING TO TABLE 9 OR 4 OF CSA A179. MORTAR MIX SHALL BE TESTED FOR STRENGTH AND APPROVED BY THE ENGINEER PRIOR TO USE ON THE JOB. GROUT; (WHERE CALLED FOR ON DRAWINGS) SHALL CONFORM TO CAN/CSA A179 MIN. 28 DAY STRENGTH 20 MPa

5. ALL MASONRY WALLS SHALL BE HORIZONTALLY REINFORCED WITH NO 9 (3.7mm) STANDARD DUR-O-WAL TRUSS JOINT REINFORCEMENT (OR APPROVED EQUAL) AND CONTINUOUS REINFORCEMENT AT EVERY SECOND COURSE (400 MM/16").  
a. ALL JOINT REINFORCEMENT SHALL BE HOT-DIPPED GALVANIZED.  
b. REINFORCEMENT SHALL BE LAPPED A MINIMUM OF 300mm (12") AT ALL JOINTS.  
c. PREFABRICATED CORNER AND TEE REINFORCEMENT SHALL BE USED AT ALL WALL INTERSECTIONS.  
d. REINFORCEMENT SHALL BE INSTALLED IN THE FIRST AND SECOND BED JOINTS 200 mm (8") APART, BELOW THE TOP OF WALLS.  
e. REINFORCEMENT SHALL BE INSTALLED IN THE FIRST AND SECOND BED JOINTS 200 mm (8") APART, IMMEDIATELY ABOVE LINTELS AND BELOW SILLS AND SHALL EXTEND 600 MM (2 FT.) BEYOND THE JAMB.  
f. REINFORCEMENT SHALL BE PLACED AS TO PROVIDE 16 MM (5/8") MORTAR COVER ON THE EXTERIOR FACE OF WALL AND 12 mm (1/2") COVER ON THE INTERIOR FACE OF WALL.

6. ALL TIES FOR MASONRY VENEER SHALL BE DESIGNED AND SUPPLIED BY THE MASONRY CONTRACTOR IN ACCORDANCE WITH CSA STANDARDS S304.1 AND CAN/CSA-A370.

7. PROVIDE COLD WEATHER PROTECTION AS REQUIRED BY CAN/CSA-A371 "MASONRY CONSTRUCTION FOR BUILDINGS".

8. ALL BLOCK MASONRY UNITS SHALL BE CONSTRUCTED WITH FULL HEAD JOINTS, AND FULL BED JOINTS UNDER THE FULL BEARING AREAS OF THE FACE SHELLS, AND UNDER WEBS SURROUNDING THOSE CELLS TO BE FILLED WITH GROUT.

9. THE INTERSECTION OF ALL MASONRY WALLS SHALL BE TOOTHED OR CONTINUOUSLY REINFORCED WITH JOINT REINFORCEMENT.

MASONRY

10. PROVIDE A MINIMUM DEPTH OF 200 mm (8") OF 100% SOLID MASONRY UNITS, OR FULLY GROUTED UNITS, FOR SLABS OR STEEL DECK BEARING ON MASONRY, UNLESS MORE IS SHOWN ON THE DRAWINGS.

11. ALL MASONRY BENEATH CONCENTRATED LOADS (SUCH AS BEAMS, LINTELS, AND JOISTS) SHALL HAVE VOIDS FILLED WITH 20 MPa GROUT FOR A MINIMUM DEPTH OF 400 mm (16") OR 3 TIMES THE LENGTH OF BEARING (WHICHEVER IS GREATER) AND PROJECTING A MINIMUM OF 200 mm (8") OR THE LENGTH OF BEARING BEYOND EACH EDGE OF BEARING (WHICHEVER IS GREATER), UNLESS OTHERWISE NOTED OR SHOWN.

12. WHERE STEEL BEARING PLATES ARE SHOWN ON THE DRAWINGS, THEY SHALL BE ANCHORED WITH A MINIMUM OF TWO 12MM DIA X 450mm LONG + 50mm (1/2" DIA X 18" LONG + 2") HOOKED ANCHOR RODS WELDED TO THE PLATES AND EMBEDDED INTO GROUT FILL AS NOTED ABOVE.

13. SEE PLANS AND SCHEDULES REGARDING LINTEL SIZES FOR MASONRY WALLS AND VENEER.  
FOR ALL OPENINGS OR RECESSES IN MASONRY NOT SHOWN ON DRAWINGS GREATER THAN 300mm (12") AND UP TO 1200mm (4 FT.), INCLUDING THOSE FOR MECHANICAL OR ELECTRICAL SERVICES OR EQUIPMENT, PROVIDE ONE L89X89X6.4 (L3 1/2 X 3 1/2 X 1/4") ANGLE FOR EACH 100 mm (4") THICKNESS OF WALL.

14. MAINTAIN SUPPORT OF MASONRY LINTELS FOR A MINIMUM OF SEVEN DAYS OR UNTIL SUFFICIENT STRENGTH IS GAINED TO SAFELY SUPPORT LOADS IMPOSED.

15. FULLY GROUT BLOCK CELLS AT PARAPETS.

16. ALL MASONRY WALLS SHALL BE ADEQUATELY BRACED DURING CONSTRUCTION UNTIL ADEQUATE DIAPHRAGM ACTION CAN BE DEVELOPED BY INSTALLED FLOOR AND ROOF STRUCTURAL COMPONENTS.

17. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATIONS OF MASONRY CONTROL JOINTS. SPACING OF CONTROL JOINTS IN ALL WALLS SHALL BE CONSTRUCTED AS PER PLAN, BUT SHALL NOT EXCEED 6000 mm (20'-0") O.C. ALL REINFORCING TO BE DISCONTINUOUS AT CONTROL JOINTS. CONTROL JOINTS SHALL BE CAULKED WITH FOAM BACKER ROD AND SHALL NOT BE FILLED WITH MORTAR.  
18. REINFORCED MASONRY:  
a. CELLS TO BE REINFORCED SHALL BE KEPT CLEAN OF MORTAR.  
b. GROUT FOR REINFORCED CELLS, BOND BEAMS, LINTELS AND CELLS CONTAINING DOWELS, ANCHOR BOLTS AND INSERTS PER NOTE #3C.  
c. PROVIDE MINIMUM 2-15M VERTICALS FULL HEIGHT AT ALL WALL ENDS, CORNERS, INTERSECTIONS AND OPENINGS UNLESS OTHERWISE NOTED ON DRAWINGS.  
d. PROVIDE 1-15M VERTICAL FULL HEIGHT EACH SIDE OF CONTROL JOINTS.  
e. DOWELS FROM FOUNDATIONS TO MATCH VERTICAL REINFORCEMENT IN WALL.  
f. PROVIDE THE FOLLOWING LAPS FOR THE REINFORCEMENT INDICATED:  
- 10M BARS = 450 mm (18")  
- 15M BARS = 600 mm (24")  
- 20M BARS = 900 mm (36")

EMBEDDED ITEMS ARE NOT TO INTERFERE WITH THE INTEGRITY OF THE MASONRY WALL OR LOCATION OF REINFORCEMENT. PROVIDE FULLY GROUTED LINTEL BEAM FOR CONDUITS AND PIPES RUNNING HORIZONTALLY WITHIN WALL.

OPEN WEB STEEL JOISTS

1. OPEN WEB STEEL JOISTS (OWSJ/S) SHALL CONFORM TO CSA STANDARDS S16 AND CAN/CSA-S136.

2. WELDING OF STRUCTURAL STEEL SHALL CONFORM TO THE REQUIREMENTS OF CSA STANDARD W59 AND SHALL BE UNDERTAKEN BY A FABRICATOR AND ERECTOR FULLY APPROVED BY THE CANADIAN WELDING BUREAU TO THE REQUIREMENTS OF CSA STANDARD W47, DIVISION 1 AND DIVISION 2. FABRICATOR TO SUPPLY CERTIFICATION OF FUSION WELDING AND WELDING MAY ONLY BE CARRIED OUT IN ACCORDANCE WITH OWNER'S SAFETY REGULATIONS REGARDING WELDING.

3. JOISTS TO BE DESIGNED FOR THE LOADS AS SPECIFIED ON DRAWINGS AND IN ACCORDANCE WITH THE 2012 OBC. DESIGN OF JOISTS SHALL ALSO INCLUDE ALL LOADS FROM MECHANICAL EQUIPMENT SUCH AS ROOF TOP UNITS, DUCTS AND PIPING.

4. SHOP DRAWINGS OF JOIST DETAILS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW BEFORE FABRICATION. JOIST DESIGN AND DETAILS SHALL BE STAMPED BY A PROFESSIONAL ENGINEER LICENSED IN ONTARIO. JOIST DESIGN CALCULATIONS SHALL BE SUBMITTED FOR RECORD PURPOSES.

5. PROVIDE SUFFICIENT CAMBER TO JOISTS TO ENSURE "0" CAMBER AFTER APPLICATION OF ALL DEAD LOADS SHOWN. ADJUST STIFFNESS AND REQUIRED CAMBER OF JOISTS ADJACENT TO MASONRY WALLS, STEEL BEAMS OF SHORTER SPAN AND THE LIKE TO PERMIT THE PROPER FASTENING OF THE STEEL DECK. AS A GUIDE, LIMIT THE DIFFERENTIAL DEFLECTION OF THE ADJACENT JOIST, UNDER ALL DEAD LOADS, TO L/120, WHERE 'L' IS THE SPAN OF THE STEEL DECK PERPENDICULAR TO THE JOISTS.

6. "TJ" ON PLANS DENOTES "TIE JOIST". BOTTOM CHORD TO BE FRAMED INTO COLUMNS, BEAMS OR WALLS. ALL JOISTS AT COLUMNS TO BE TIE JOISTS UNLESS OTHERWISE NOTED. TIE JOIST CONNECTIONS SHALL BE BOLTED.

7. WHERE THE JOISTS ARE INDICATED, DESIGN TOP AND BOTTOM CHORDS AND CONNECT TO COLUMNS TO SAFELY DEVELOP LOADS SHOWN OR A MINIMUM OF A 25 kN SPECIFIED LOAD IN TENSION OR COMPRESSION.

8. DESIGN AND INSTALLATION OF ALL OWSJ BRIDGING SHALL BE IN ACCORDANCE WITH CSA S16. COMBINED DIAGONAL AND HORIZONTAL BRIDGING SHALL BE PROVIDED AT THE ENDS OF BRIDGING LINES AS REQUIRED. ENDS OF BRIDGING LINES SHALL BE ANCHORED TO STEEL, MASONRY OR OTHERWISE SHOWN AND BE CAPABLE OF RESISTING AN AXIAL LOAD OF AT LEAST 3 kN.

9. BRIDGING SHOWN ON THE DRAWINGS IS INTENDED AS A GUIDELINE ONLY. DESIGN AND PROVIDE BRIDGING FOR ALL OWSJ AND TRUSSES AS PER CSA S16.

10. OWSJ/S SHALL HAVE 100 mm (4") SHOE (U.N.O.)

11. FOR OWSJ BEARING ON MASONRY, JOIST SUPPLIER SHALL DESIGN AND SUPPLY ALL BEARING PLATES AND BEARING PRESSURE SHALL NOT EXCEED 1.2 MPa (175 psi).

12. ALL STEEL JOISTS SHALL BE WELDED TO STEEL BEAMS OR BEARING PLATES WITH A MINIMUM 50 mm x 5 mm (2" x 3/16") FILLET ON BOTH SIDES OF SHOES.

13. ALL HANGERS, STUB COLUMNS, TRAPEZE BARS, ETC. THAT SUPPORT MECHANICAL, ELECTRICAL OR STRUCTURAL EQUIPMENTS, PIPES, DUCTS, CATWALKS, ETC. MUST BE CONNECTED TO AN OWSJ PANEL POINT OR WHERE THE WEB OF THE JOIST MEETS THE CHORD OF THE JOIST.

STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL AND CONNECTIONS SHALL BE FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST CSA STANDARD S16

2. STRUCTURAL STEEL SHALL CONFORM TO CAN/CSA-G40.20 FOR GENERAL REQUIREMENTS, AND CAN/CSA-G40.21 FOR QUALITY  
a. GRADE 350W CLASS C FOR H.S.S.  
b. GRADE 350W FOR W SHAPES, S SHAPES, AND TEES.  
c. ALL OTHER MISCELLANEOUS METAL SHALL BE MINIMUM GRADE 300W (U.N.O.)

3. BOLTED CONNECTIONS SHALL USE ASTM A325 BOLTS. ALL BOLTS, NUTS AND WASHERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A325 EXCEPT THAT ANCHOR BOLTS SHALL BE FABRICATED FROM STEEL ROD CONFORMING TO CSA STANDARD G40.21 OR ASTM F1554 WITH A MINIMUM YIELD STRENGTH OF 250 MPa.

4. STEEL COATINGS - UNLESS NOTED OTHERWISE ALL STRUCTURAL STEEL SHALL BE CLEANED AND PREPARED TO A MINIMUM LEVEL OF SSPC SP-3 AND IN ACCORDANCE WITH CSA STANDARD S16:

a. ALL INTERIOR STEEL THAT IS TO BE PROTECTED BY A SPRAY APPLIED CEMENTIOUS FIRE PROOFING SHALL BE CLEANED AND REMAIN UNCOATED STEEL.  
b. ALL OTHER INTERIOR STRUCTURAL STEEL SHALL BE SHOP PRIME PAINTED AS PER CSA/CAN S-16. SHOP PRIMER SHALL CONFORM TO CIS/C/CPMA 1-73A.  
c. ALL STEEL EXPOSED TO WEATHER IS TO BE HOT DIP GALVANIZED IN ACCORDANCE TO CAN/CSA-G164. TOUCH UP OF WELDS, CUTS OR SCRATCHES TO GALVANIZING SHALL BE DONE WITH A MINIMUM OF 3 COATS OF ZINC RICH PAINT.

5. WELDING OF STRUCTURAL STEEL SHALL CONFORM TO THE REQUIREMENTS OF CSA STANDARD W59 AND SHALL BE UNDERTAKEN BY A FABRICATOR AND ERECTOR FULLY APPROVED BY THE CANADIAN WELDING BUREAU TO THE REQUIREMENTS OF CSA STANDARD W47, DIVISION 1 AND DIVISION 2. FABRICATOR TO SUPPLY CERTIFICATION OF FUSION WELDING, AND WELDING MAY ONLY BE CARRIED OUT IN ACCORDANCE WITH OWNER'S SAFETY REGULATIONS REGARDING WELDING.

6. FABRICATOR SHALL DESIGN CONNECTIONS AND THE LIKE IN ACCORDANCE WITH THE 2012 OBC FOR THE FORCES SHOWN ON THE DRAWINGS. WHERE FORCES ARE NOT NOTED ON THE DRAWINGS, BEAM REACTIONS SHALL BE TAKEN AS ONE-HALF OF THE TOTAL UNIFORMLY DISTRIBUTED FACTORED LOADS NOTED ON THE BEAM LOAD TABLES OF PART FIVE OF CISC'S HANDBOOK OF STEEL CONSTRUCTION, LATEST EDITION. PROVIDED NO POINT LOADS ACT ON THE BEAM, ALL WELDS SHALL BE 5 mm (3/16") MIN. FILLET. ALL BOLTS SHALL BE MIN. M20 (3/4") DIAMETER AND PROVIDE MIN. (2) BOLTS PER CONNECTION.

7. WHERE MOMENT CONNECTIONS ARE CALLED FOR BUT VALUES ARE NOT INDICATED, DESIGN CONNECTIONS FOR FULL MOMENT CAPACITY OF THE SMALLER MEMBER JOINED.

8. SPLICES SHALL BE DESIGNED TO DEVELOP THE FULL CAPACITY OF THE MEMBER AT THE POINT OF THE SPLICE. MEMBERS SHALL NOT BE SPLICED AT POINTS OF MAXIMUM STRESS. NO SPLICES SHALL BE MADE UNLESS SHOWN ON THE DRAWINGS OR REVIEWED AND APPROVED BY THE ENGINEER.

9. MOMENT FRAME AND X-BRACE CONNECTIONS SHALL HAVE ASTM A325 FRICTION TYPE M20 (3/4") MINIMUM DIAMETER BOLTS (U.N.O.).

10. SHAPE AND SIZE GUSSET PLATES TO CLEAR ARCHITECTURAL FINISHES AND MECHANICAL DUCTS AND PIPES AND ELEVATOR SHAFTS.

11. SHOP DRAWINGS OF STRUCTURAL STEEL SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW BEFORE FABRICATION.

12. ALL BEAMS CANTILEVERED OR CONTINUOUS OVER A COLUMN OR OTHER SUPPORT, AND BEAMS SUPPORTING POINTS OF CONCENTRATED LOAD, SHALL HAVE A MIN. OF 2-10 mm (3/8") STIFFENERS EACH SIDE OF WEB UNLESS OTHERWISE NOTED.

13. TOP OF COLUMNS WHICH ARE NOT BRACED BY JOISTS OR BEAMS SHALL BE BRACED DIAGONALLY TO THE ROOF OR FLOOR BY A MINIMUM OF 4-L76 x 76 x 6.4 mm (L3 x 3 x 1/4") ANGLES FOR INTERIOR COLUMNS; A MINIMUM 2-L76 x 76 x 6.4 mm (L3 x 3 x 1/4") ANGLES FOR EXTERIOR COLUMNS. BRACING SHALL BE BETWEEN TOP OF COLUMN AND TOP CHORD OF JOISTS.

14. COLUMN BASE PLATES AND BEAM BEARING PLATES SHALL BE GROUTED WITH 40 mm (1.5") NON-SHRINK 40MPa GROUT.

15. ALL COLUMNS BUILT INTO MASONRY WALLS SHALL HAVE ADJUSTABLE ANCHORS AT MINIMUM 400 mm (16") O.C.

16. STEEL BEAMS AND LINTELS SHALL HAVE 200 mm (8") MINIMUM END BEARING ON MASONRY AND 65 mm (2 1/2") MINIMUM BEARING ON STEEL UNLESS INDICATED OTHERWISE.

17. FOR ALL BEAMS AND LINTELS ON STEEL BEARING PLATES.  
A. BEARING PLATES ARE TO BE CENTRED BELOW ALL BEAMS OR LINTELS U.N.O ON THE DRAWINGS.  
B. WELD TO BEARING PLATE WITH A MINIMUM 50 mm x 5 mm (2" x 3/16") FILLET ON BOTH SIDES OF BEAM.

18. WHERE BACK-TO-BACK ANGLES ARE USED AS LINTELS OR SUPPORTS. STITCH WELD TOGETHER AT A MAXIMUM SPACING OF 300mm (12") O.C.

19. ALL ROOF OPENINGS TO BE REINFORCED BY FRAMES COMPRISED OF C130X10 (CSX6.7) CHANNEL MEMBERS UNLESS NOTED OTHERWISE. MAXIMUM SPAN 2250 mm (7'-6").

20. SUPPORT AT COLUMNS AND IRREGULARITIES:  
a. INSTALL L76 x 76 x 6.4 mm (L3 x 3 x 1/4") ANGLE SEATS FOR STEEL DECK AT CONNECTIONS, AT COLUMNS OR OTHER IRREGULARITIES, TO PROVIDE SUPPORT TO THE RIBS OF THE DECK.  
b. INSTALL L102 x 102 x 7.9 mm (L4 x 4 x 5/16") ANGLE SEATS FOR PRECAST SUPPORT AT CONNECTIONS, AT COLUMNS OR OTHER IRREGULARITIES, TO PROVIDE BEARING FOR PRECAST PLANKS.

21. NO STRUCTURAL STEEL SHALL BE CUT IN THE FIELD UNLESS REVIEWED AND APPROVED BY THE ENGINEER.

22. MAINTAIN ERECTION BRACING UNTIL COMPLETION OF ENTIRE STRUCTURE, INCLUDING ROOF DECKS AND OTHER ELEMENTS WHICH ARE PART OF THE LATERAL LOAD RESISTING SYSTEM.

REQUIRED SUBMITTALS

THE FOLLOWING ITEMS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW PRIOR TO FABRICATION.

ITEM	REQ'D SUBMITTAL?	ENGINEER'S STAMP REQ'D?	NOTES
REBAR SHOP DRAWINGS	NO	NO	
CONCRETE MIX DESIGNS	NO	NO	
MASONRY GROUT MIX DESIGN	NO	NO	
BLOCK MILL REPORT	NO	NO	
STRUCTURAL STEEL SHOP DRAWINGS	YES	YES	FOR CONNECTIONS ONLY
STEEL JOIST SHOP DRAWINGS	YES	YES	
STEEL JOIST CALCULATIONS	YES	YES	
MISCELLANEOUS STEEL SHOP DRAWINGS	YES	YES	STAMP FOR STAIRS, LADDERS AND GUARDS
STEEL DECK SHOP DRAWINGS	YES	NO	
COLD FORMED STEEL FRAMING SHOP DWGS.	NO	NO	
SEISMIC RESTRAINT OF NON-STRUCTURAL ITEMS	NO	NO	

SHOP DRAWING REVIEW

1. ERECTION AND FABRICATION SHOP DRAWINGS FOR ALL BUILDING COMPONENTS AS LISTED IN THE REQUIRED SUBMITTALS TABLE AND ANY RELATED WORKS ARE TO BE SUBMITTED TO THE ENGINEER FOR APPROVAL BEFORE COMMENCING WITH FABRICATION.

2. AS PART OF THEIR FIELD SERVICES, MTE CONSULTANTS ("MTE") WILL REVIEW SHOP DRAWINGS PERTAINING TO WORK SHOWN ON MTE CONSULTANT'S DRAWINGS BY MEANS OF APPROPRIATE RATIONAL SAMPLING PROCEDURES AND COMMENT ON THE ACCURACY WITH WHICH THE CONTRACTOR PREPARED THE DRAWINGS.

3. REVIEW OF THE SHOP DRAWINGS IS FOR THE SOLE PURPOSE OF ASCERTAINING CONFORMANCE WITH THE GENERAL DESIGN CONCEPT AND IS NOT AN APPROVAL OF THE DETAIL DESIGN INHERENT IN THE SHOP DRAWINGS. RESPONSIBILITY FOR WHICH SHALL REMAIN WITH THE CONTRACTOR SUBMITTING THEM. SUCH REVIEW SHALL NOT RELIEVE THE CONTRACTOR OF THEIR RESPONSIBILITY FOR ERRORS AND OMISSIONS IN THE SHOP DRAWINGS OR FOR MEETING ALL REQUIREMENTS OF THE CONTRACT DOCUMENTS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR INFORMATION PERTAINING TO THE FABRICATION PROCESS TECHNIQUES OF CONSTRUCTION AND INSTALLATION AND FOR COORDINATION OF THE WORK OF ALL SUB-TRADES.

4. THE APPROVAL OF SHOP DRAWINGS DOES NOT RELIEVE THE CONTRACTOR FROM THE RESPONSIBILITY OF THE FITTING OF BUILDING COMPONENTS. ANY DISCREPANCIES IN THE SHOP DRAWINGS ARE THE RESPONSIBILITY OF THE CONTRACTOR.

5. ALL SHOP DRAWINGS MUST BEAR THE SEAL OF A PROFESSIONAL ENGINEER LICENSED IN ONTARIO UNLESS NOTED OTHERWISE IN THE SUBMITTALS TABLE BELOW. UNSEALED SHOP DRAWINGS WILL NOT BE REVIEWED UNLESS ALTERNATIVE ARRANGEMENTS HAVE BEEN AGREED UPON.

STEEL DECK

1. DESIGN METAL DECK IN CONFORMANCE WITH THE REQUIREMENTS OF CSA S136 FOR THE LOADS INDICATED ON THE DRAWINGS.

2. SUBMIT SHOP DRAWINGS INDICATING WELDS, MATERIALS AND FINISHES, AND BEARING THE SEAL OF A PROFESSIONAL ENGINEER LICENSED IN THE PROVINCE OF ONTARIO FOR REVIEW BY THE ENGINEER. SUBMIT SHOP DRAWINGS FOR REVIEW PRIOR TO PROCEEDING WITH ANY FABRICATION.

3. UNLESS NOTED OTHERWISE,  
A. ROOF DECK SHALL BE 38 mm x 0.76 mm (1.5" x .030") VIC WEST STEEL INC. RD 938 (OR APPROVED EQUAL), MINIMUM 3 SPANS CONTINUOUS.  
B. FLOOR DECK SHALL BE 38 mm x 0.76 mm (1.5" x .030") VIC WEST STEEL INC. HB 938 (OR APPROVED EQUAL), MINIMUM 3 SPANS CONTINUOUS.

4. METAL DECK SHALL BE LIGHT ZINC COATED STRUCTURAL STEEL SHEET FABRICATED AND ERECTED IN ACCORDANCE WITH CSSBI 10M, CAN/CSA-S136, AND CSSBI 101M. THE MINIMUM ZINC COATING DESIGNATION SHALL BE ZF075 (U.N.O.).

5. DECK SHALL OVERLAP A MINIMUM OF 50 mm (2") AT ALL END JOINTS AND HAVE A MINIMUM BEARING LENGTH OF 50 mm (2") ON ALL STRUCTURAL STEEL.

6. DECK HAS BEEN DESIGNED FOR DIAPHRAGM ACTION AND SHALL BE FASTENED AS FOLLOWS:  
WELD DECK TO SUPPORTING STEEL WITH 20 mm (3/4") DIAMETER PLUG WELD AT TRANSVERSE WELD SPACING =300 mm (12") O.C.  
PERIMETER WELD SPACING =300 mm (12") O.C.  
SIDE LAP BUTTON PUNCHING =300 mm (12") O.C.  
LONGITUDINAL WELD SPACING =300 mm (12") O.C

7. DECK WELDS SHALL BE TOUCHED UP WITH APPROVED PAINT BY THE DECK ERECTOR.

8. PROTECT ROOF AND FLOOR DECK FROM DAMAGE DURING SHIPPING STORAGE AND ERECTION. CONTRACTOR SHALL REPLACE ANY PUNCTURED, DENTED OR WELD PERFORATED DECK.

9. STEEL DECK WORK SHALL INCLUDE THE SUPPLY AND INSTALLATION OF ALL SHEET STEEL ANGLES, COVER PLATES, CLOSURES, STIFFENERS AND ANY OTHER ACCESSORIES REQUIRED.

10. CUT OPENINGS AND REINFORCE EDGES AS REQUIRED FOR PIPES, DUCTS, ETC.  
A. THE MAXIMUM SIZE OF AN UNREINFORCED OPENING IS 150 mm (6").  
B. REINFORCE ALL OPENINGS LARGER THAN 150mm (6"), BUT NOT EXCEEDING 450 mm (18"), AS INDICATED BY THE METAL DECK SUPPLIER.  
C. FOR OPENINGS GREATER THAN 450mm (18") NOT SHOWN ON THE DRAWINGS, CONTACT ENGINEER FOR DESIGN.

11. HANGER WIRE FOR SUSPENDED CEILINGS SHOULD PIERCE BOTH SIDES OF THE FLUTE AND BE LOOPED AROUND AND TIED.

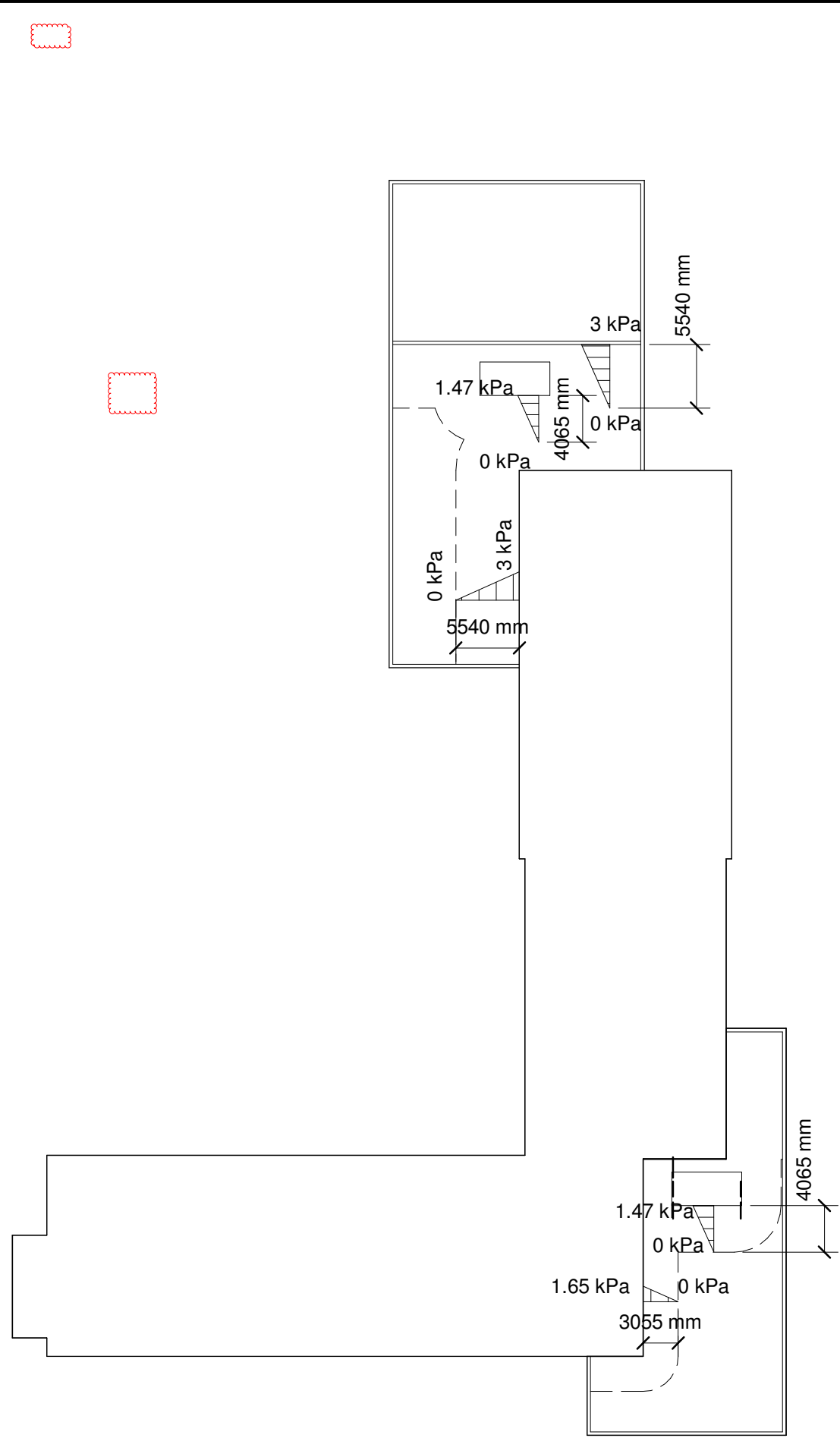
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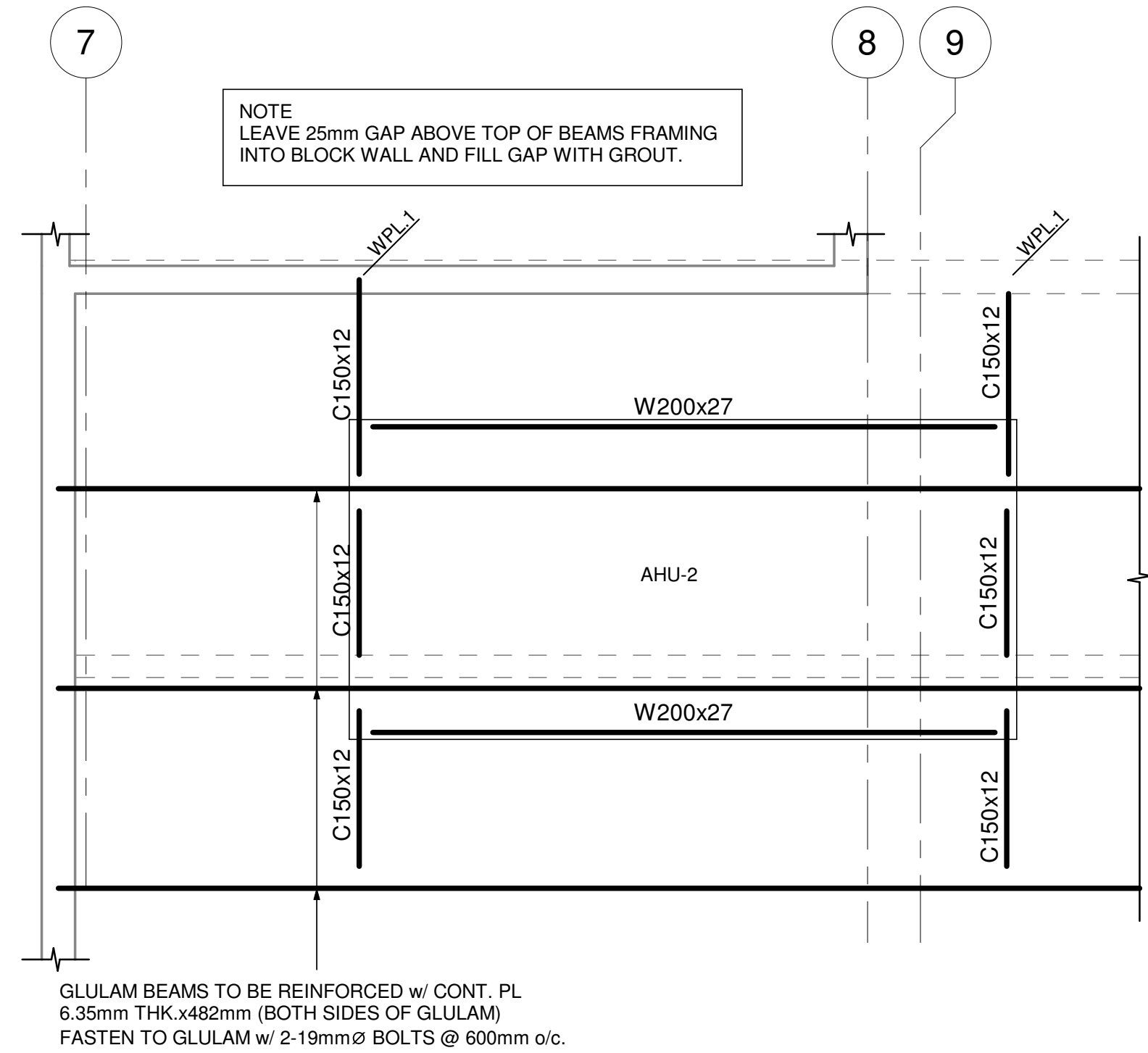
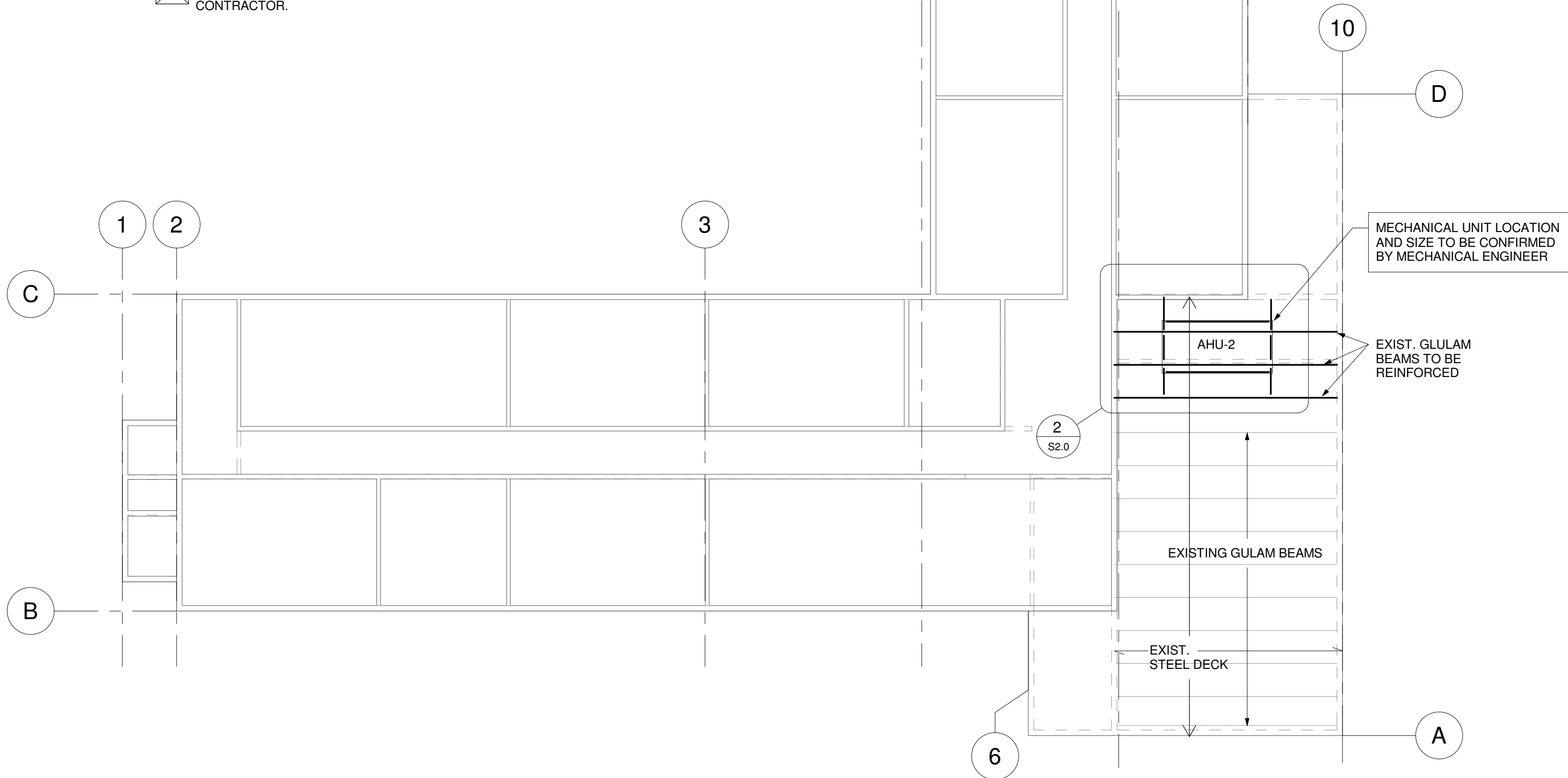



SPECIFIED SNOW LOAD ACCUMULATION DIAGRAM  
AT SECOND LEVEL (N.T.S.)

## SECOND FLOOR FRAMING PLAN

1 : 200

- NOTES:
1. T/O 2nd FLOOR EL.: (SEE ARCH. DWGS.)
  2. REFER TO ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS, OPENINGS AND SLOPES NOT SHOWN ON THIS DRAWING.
  3. REFER TO MECHANICAL DRAWINGS FOR ROOF TOP UNIT WEIGHTS AND LOCATIONS.
  4. REFER TO ELEVATION DETAILS IF APPLICABLE FOR VERTICAL BRACING AND GIRTS.
  5. DENOTES LOCATION OF ROUGH OPENING REFER TO ARCH. DWGS FOR DIMS AND OPENINGS NOT SHOWN AND CO-ORDINATE ALL FLOOR OPENINGS WITH MECH. CONTRACTOR.



## FRAMING PLAN AT AHU-2

1 : 50

CONC. BLOCK WALL PLATE SCHEDULE		
MARK	PLATE SIZE THK.xLG.xWD.	ANCHORAGE
WPL.1	9.5mmTHK.x152x152mm	1 - 12.7mm Ø ROD w/ 305mm EMBEDMENT

NOTES:

1. FULLY GROUT END COURSES BENEATH ALL BEARING PLATES.
2. PLATE DIMENSION NOTED AS "LENGTH" TO BE PARALLEL WITH BEAM WEB.
3. FIELD WELD BEAM TO BEARING PLATE w/ 2 - 6.35x38mm LG. FILLET WELDS (EACH SIDE)

"LENGTH"

"EMBEDMENT"

6mm

BAR/STRAP ANCHOR

50mm

TYP.

TYP. ELEVATION DETAIL @ WALL PLATE (N.T.S.)

"LENGTH"

"EMBEDMENT"

6mm

BAR/STRAP ANCHOR

50mm

TYP.

TYP. ELEVATION DETAIL @ WALL PLATE (N.T.S.)

90mm

6mm

BAR/STRAP ANCHOR

50mm

TYP.

TYP. SECTION DETAIL @ CONT. WELD PLATE (N.T.S.)

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ISSUED FOR PERMIT

1 MAR. 30, 2021



Engineers, Scientists, Surveyors

Burlington  
Building Structures Division

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CLIENT

PROJECT

Rolling MeadowsPublic School  
Interior Renovations

1522 MOUNTAIN GROVE AVE., BURLINGTON, ON

DRAWING

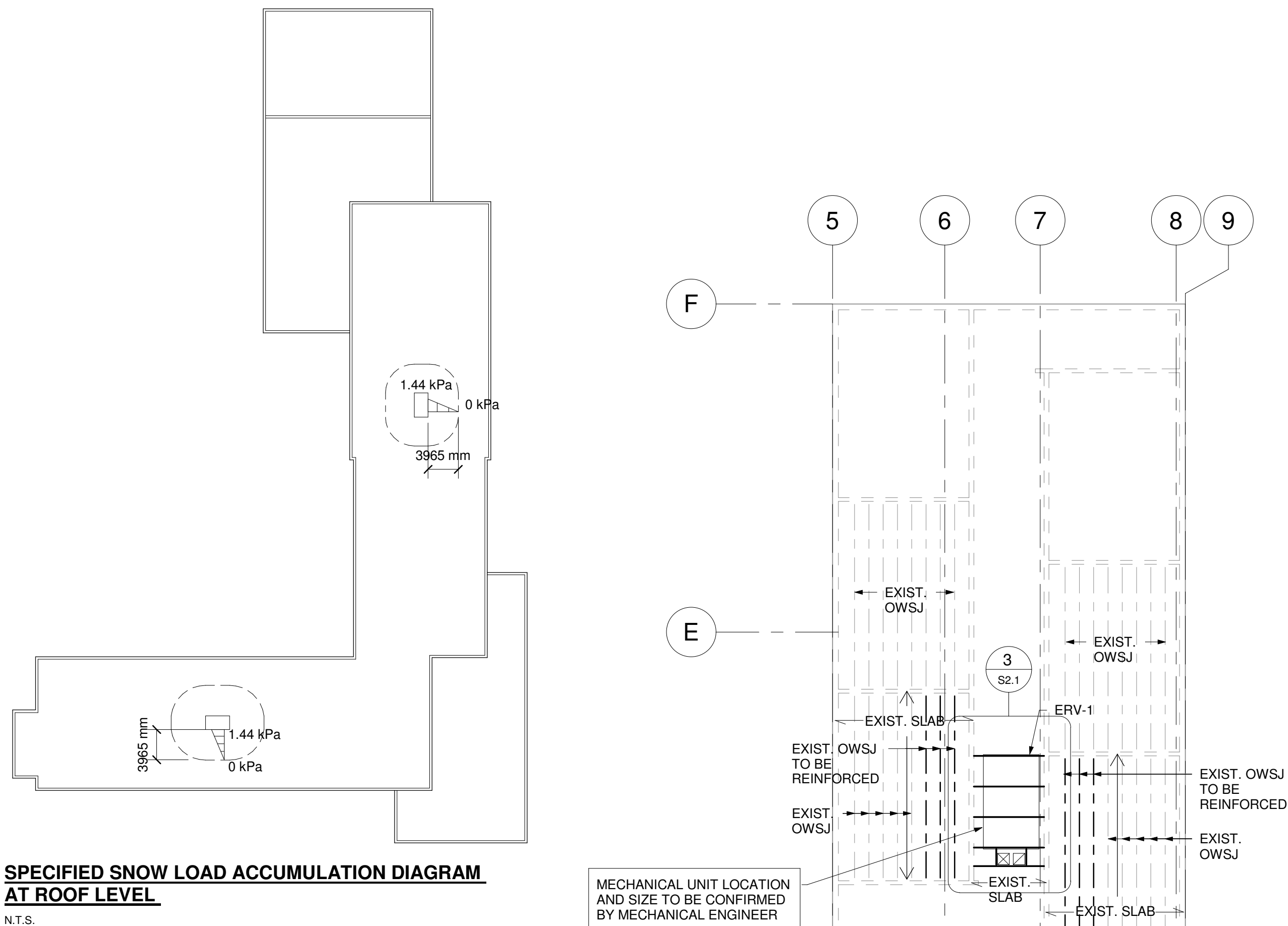
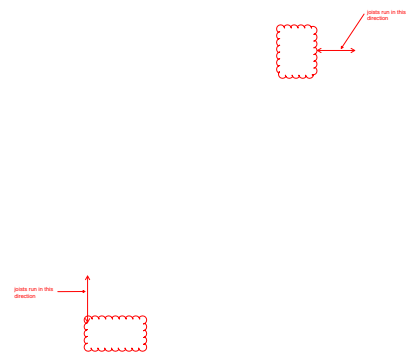
SECOND FLOOR FRAMING  
PLAN AND SCHEDULES

Project Manager: DXF Start Date: MAR. 2021

Design By: PVD Project No.: 37846-101

Drawn By: NXP Drawing No.:

Scale: AS NOTED S2.0



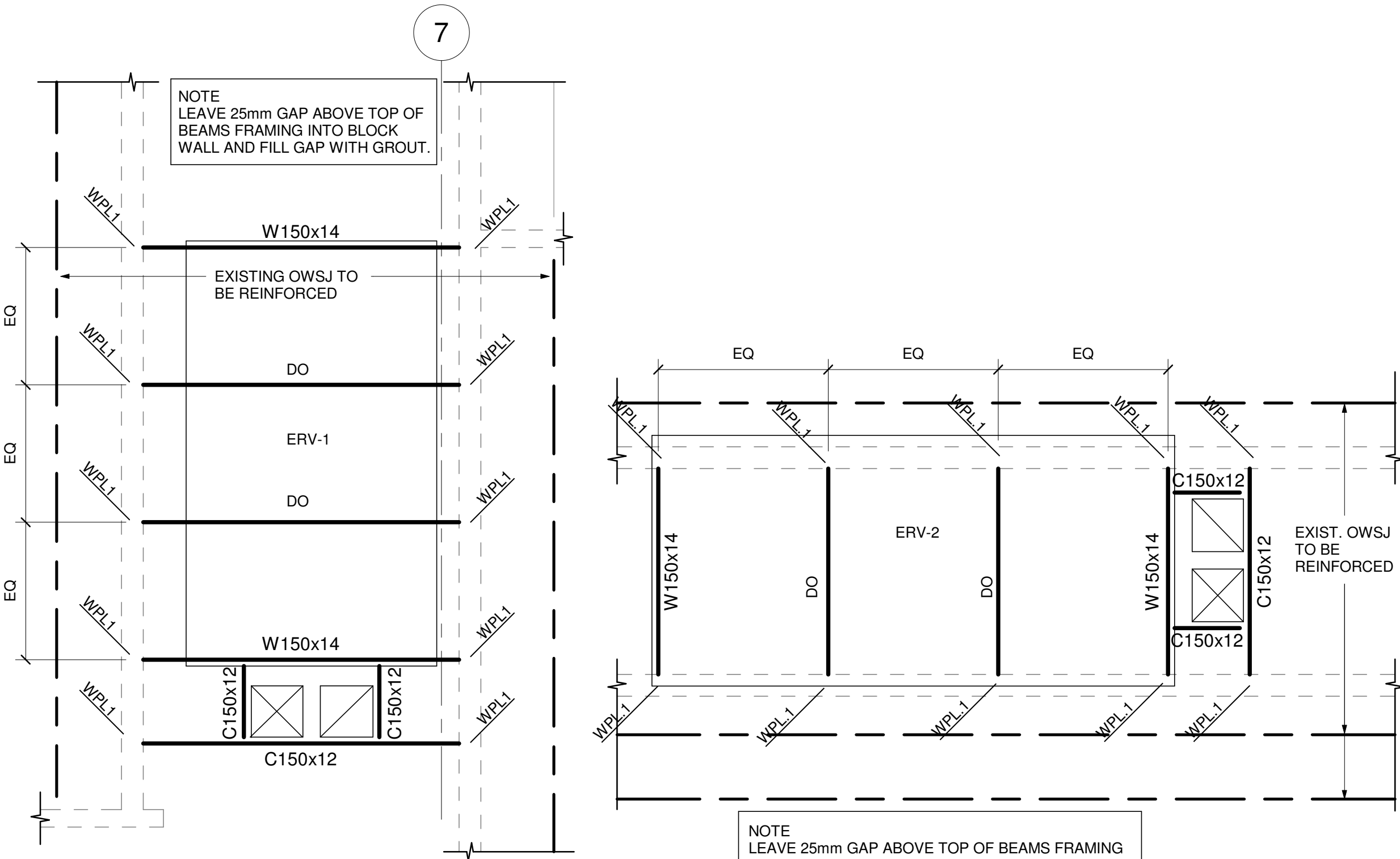
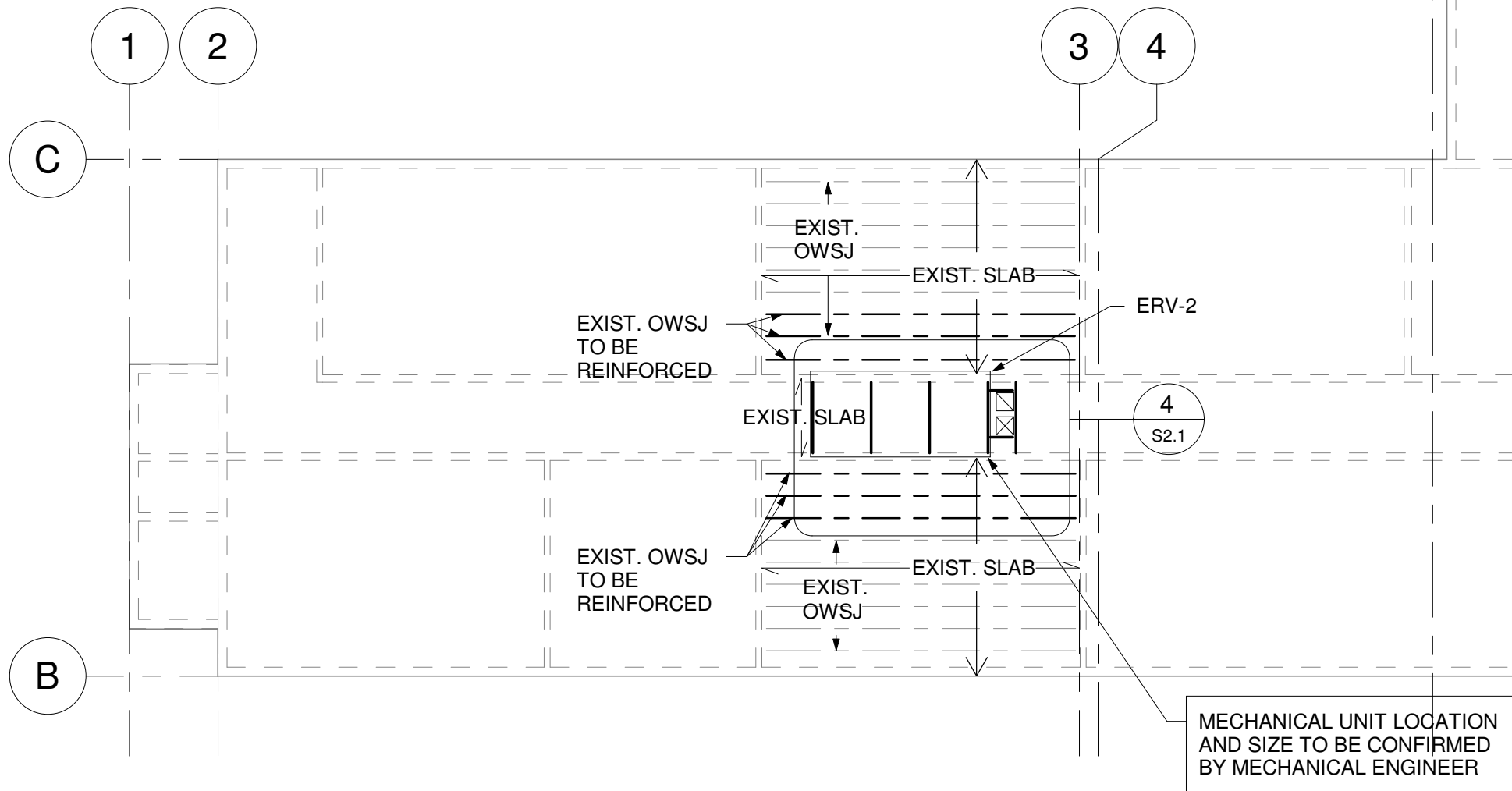
**SPECIFIED SNOW LOAD ACCUMULATION DIAGRAM AT ROOF LEVEL**

N.T.S.

- NOTES:
1. w/s ROOF DECK EL. = (SEE ARCH. DWGS.)
  2. REFER TO ARCHITECTURAL DRAWINGS FOR ALL DIMENSIONS, OPENINGS AND SLOPES NOT SHOWN ON THIS DRAWING.
  3. REFER TO MECHANICAL DRAWINGS FOR ROOF TOP UNIT WEIGHTS AND LOCATIONS.
  4. REFER TO ELEVATION DETAILS IF APPLICABLE FOR VERTICAL BRACING AND GIRTS.
  5. DENOTES LOCATION OF ROUGH OPENING. REFER TO ARCH. DWGS FOR DIMS AND OPENINGS NOT SHOWN AND CO-ORDINATE ALL FLOOR OPENINGS WITH MECH. CONTRACTOR.

**ROOF LEVEL FRAMING PLAN**

1:200



**FRAMING PLAN AT ERV1**

1 : 50

**FRAMING PLAN AT ERV2**

1 : 50

CONC. BLOCK WALL PLATE SCHEDULE		
MARK	PLATE SIZE THK.xLG.xWD.	ANCHORAGE
WPL.1	9.5mmTHK.x152x152mm	1 - 12.7mm Ø ROD w/ 305mm EMBEDMENT
<p>NOTES:</p> <ol style="list-style-type: none"><li>1. FULLY GROUT END COURSES BENEATH ALL BEARING PLATES.</li><li>2. PLATE DIMENSION NOTED AS "LENGTH" TO BE PARALLEL WITH BEAM WEB.</li><li>3. FIELD WELD BEAM TO BEARING PLATE w/ 2- 6.35x38mm LG. FILLET WELDS (EACH SIDE)</li></ol> <div><div><p>TYP. ELEVATION DETAIL @ WALL PLATE (N.T.S.)</p></div><div><p>TYP. ELEVATION DETAIL @ WALL PLATE (N.T.S.)</p></div><div><p>TYP. SECTION DETAIL @ CONT. WELD PLATE (N.T.S.)</p></div></div>		

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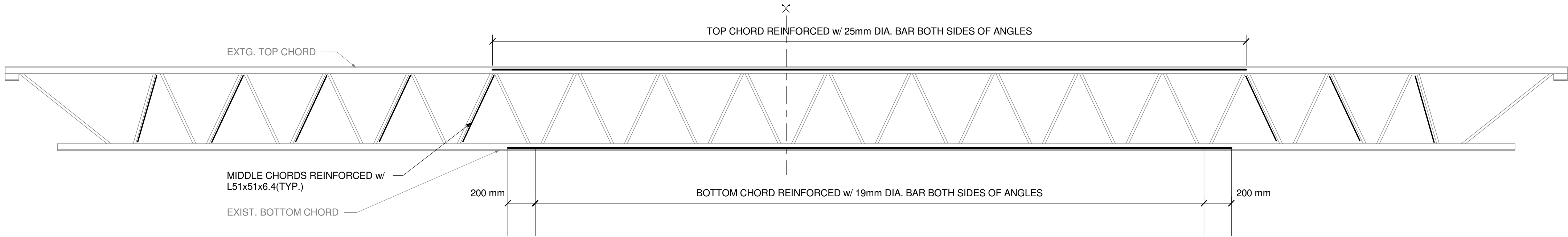
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PROJECT  
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**Interior Renovations**  
1522 MOUNTAIN GROVE AVE., BURLINGTON, ON  
DRAWING  
**ROOF FRAMING PLAN**

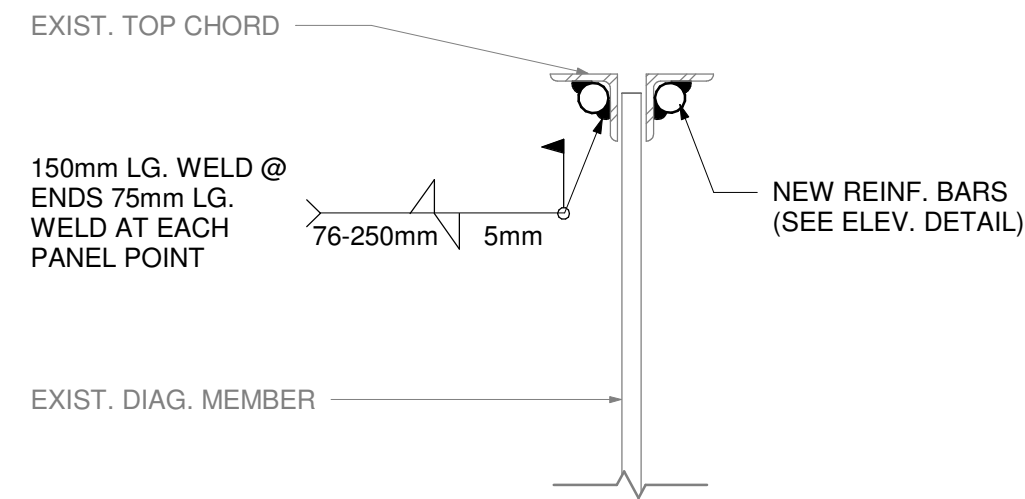
Project Manager:	DXF	Start Date:	01/13/20
Design By:	PVD	Project No.:	37846-101
Drawn By:	NXP	Drawing No.:	S2.1
Scale:	AS NOTED		





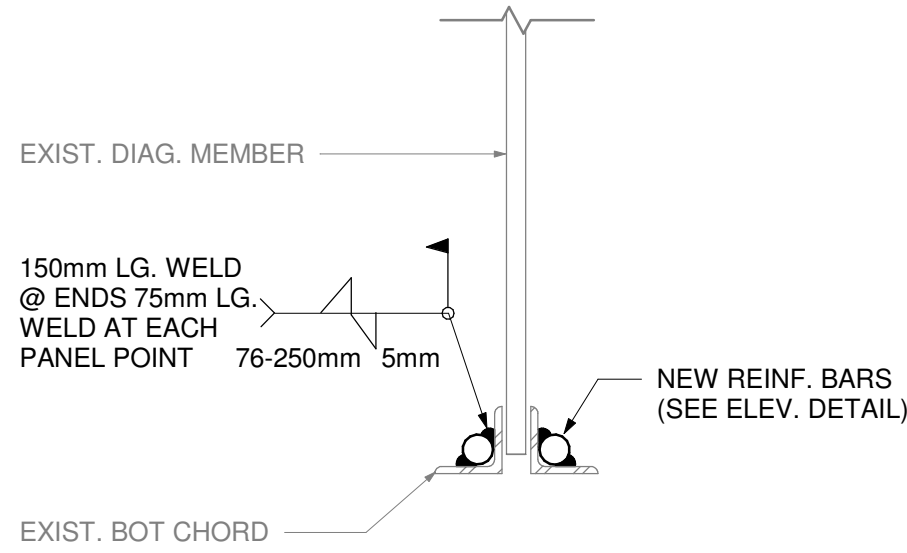
# JOIST REINFORCEMENT "TYPE 1"

1 : 20



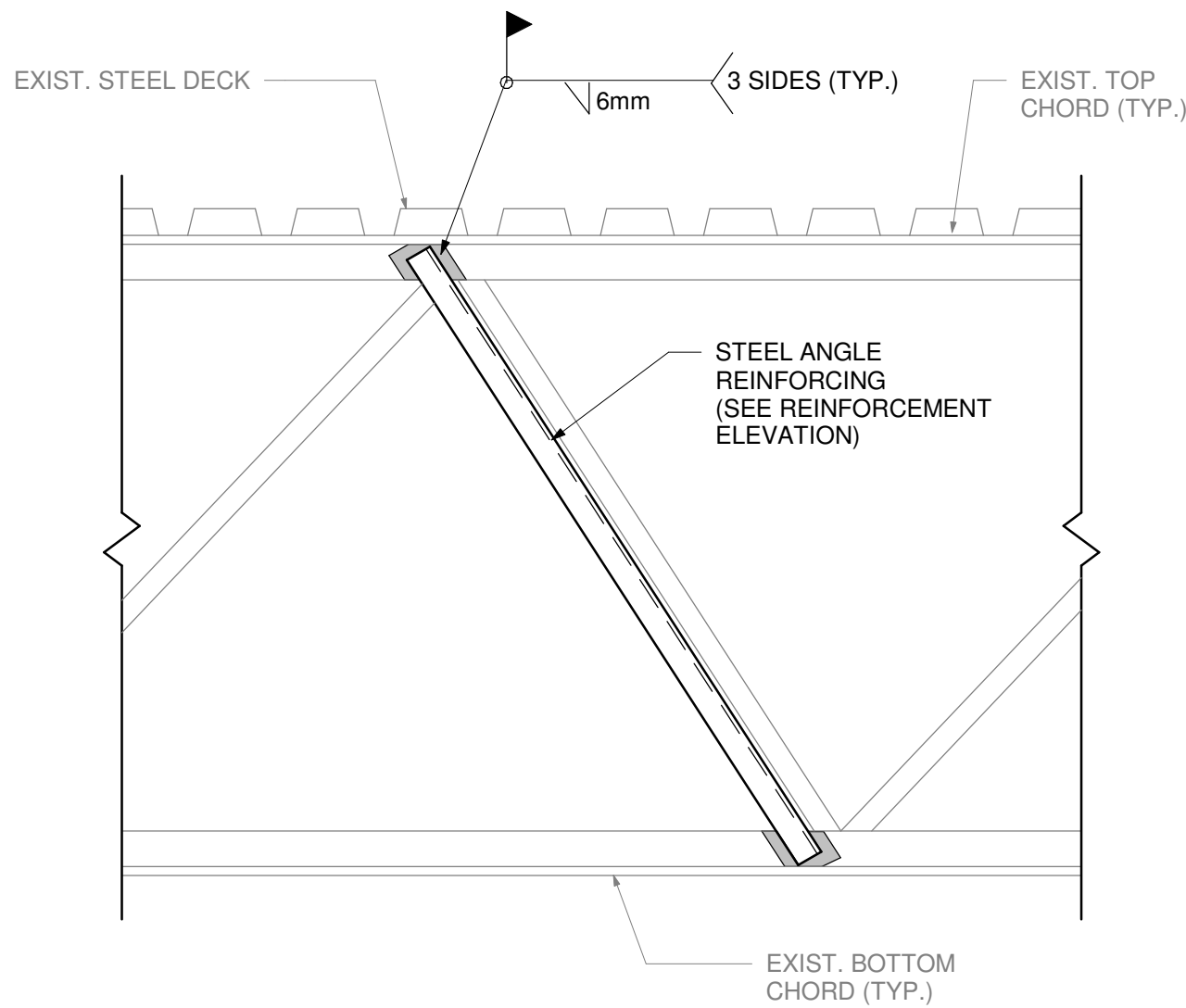
# OWSJ TOP CHORD REIN. DETAIL 1

1 : 5



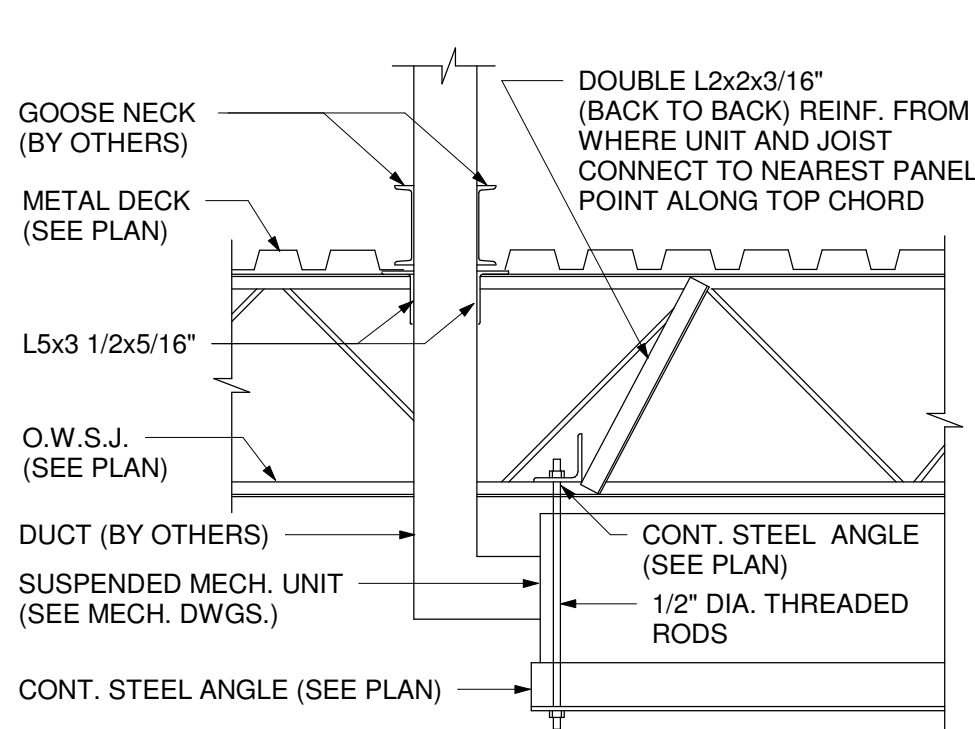
# OWSJ BOT. CHORD REIN. DETAIL

1 : 5



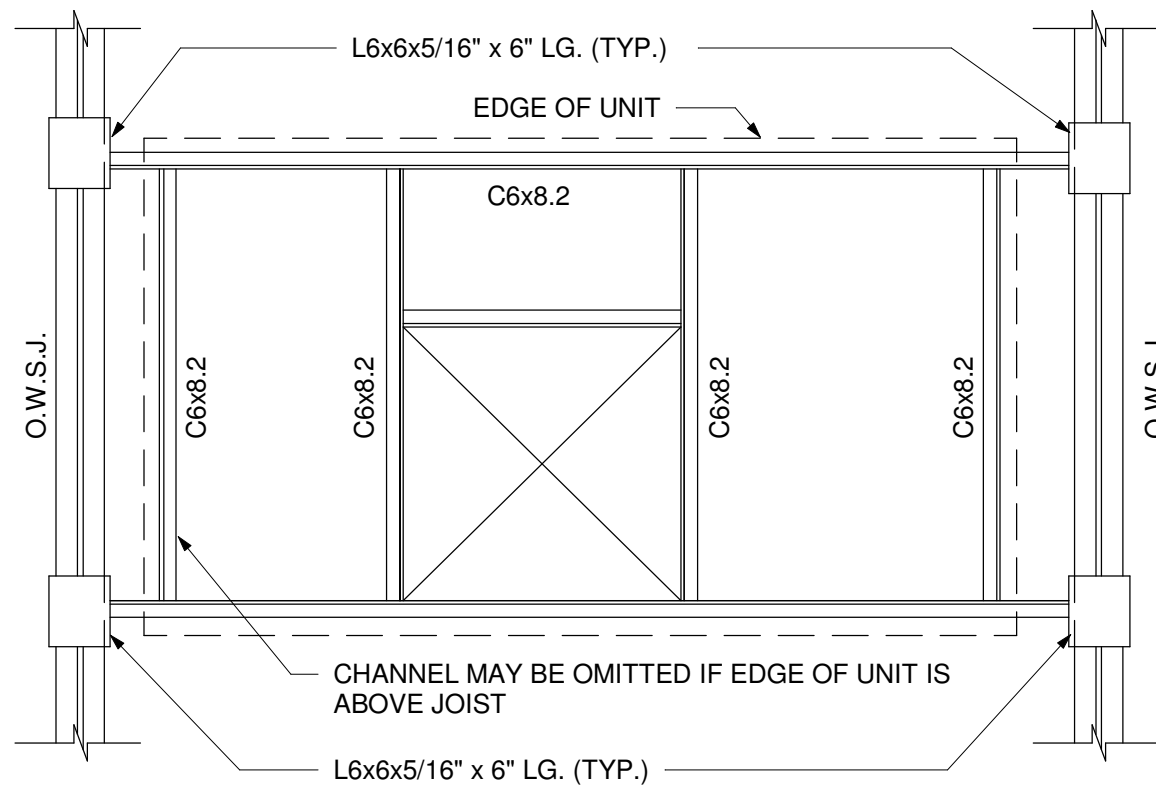
# OWSJ DIAGONAL REIN. DETAIL

1 : 10



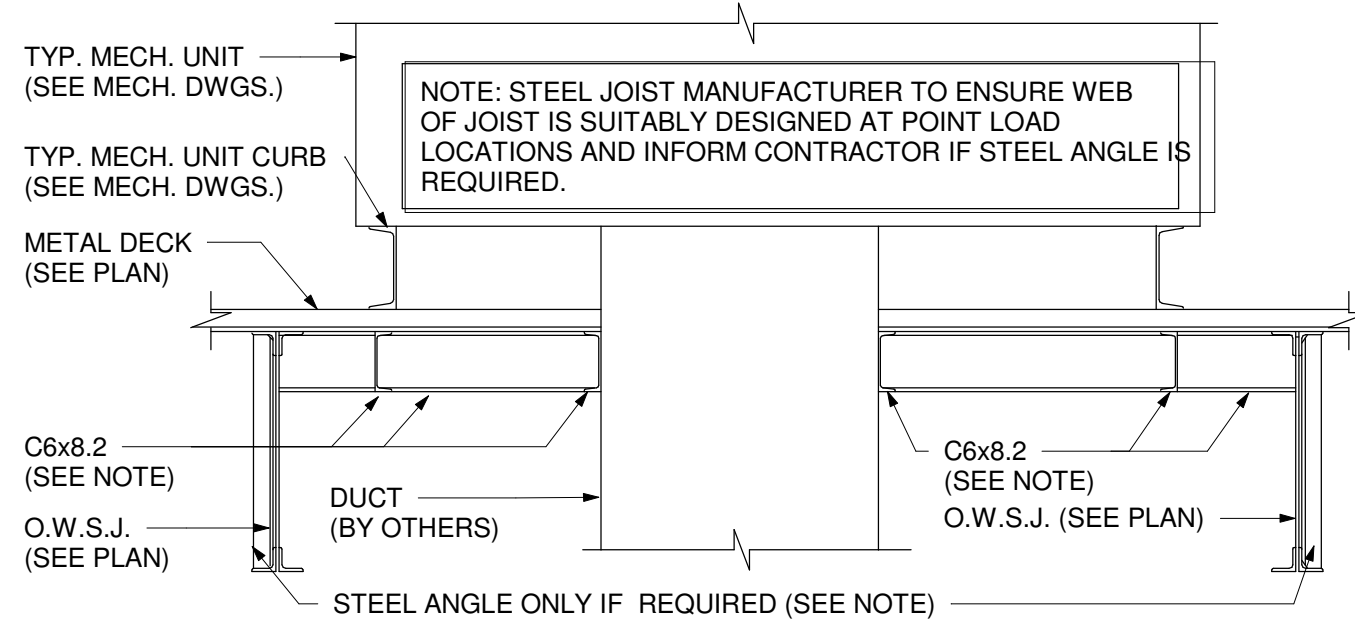
# TYPICAL SECTION DETAIL

FOR UNITS SUSPENDED BELOW JOISTS (N.T.S.)



# TYP. MECH. ROOF OPENING PLAN DETAIL

FOR UNITS ABOVE DECK AND BETWEEN JOISTS (N.T.S.)



# TYPICAL SECTION DETAIL

FOR UNITS ABOVE DECK AND BETWEEN JOISTS (N.T.S.)

**NOTE TO CONTRACTOR:**  
DO NOT SCALE DRAWINGS. CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.  
ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.  
THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

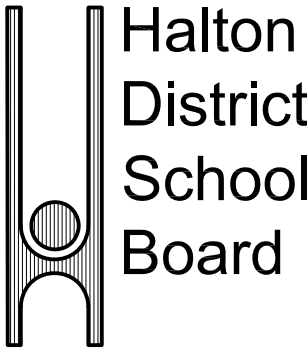


**Burlington**  
Building Structures Division  
Ph. (905) 639-2552  
www.mte85.com



CLIENT  
  
PROJECT  
**Rolling MeadowsPublic School**  
Interior Renovations  
1522 MOUNTAIN GROVE AVE., BURLINGTON, ON  
DRAWING  
**JOIST REINFORCEMENT**  
ELEVATION AND DETAILS

Project Manager: DXF Start Date: 01/13/20  
Design By: PVD Project No.: 37846-101  
Drawn By: NXP Drawing No.:  
Scale: AS NOTED **S3.0**



2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO.	ISSUANCES & REVISIONS	DATE



PHASING PLAN:

PHASE 1

- TO BE COMPLETED AUGUST 31, 2021  
(REFER TO DRAWINGS FOR AREA OF WORK FOR EACH ITEM)
1. PREPARATION TO INSTALL ROOFTOP EQUIPMENT (AHU-1, AHU-2, ERV-1 AND ERV-2)
  2. GROUND AND SECOND FLOOR HVAC MODIFICATIONS (DUCTS, PIPING)
  3. GROUND AND SECOND FLOOR - CEILING MODIFICATIONS
  4. GROUND AND SECOND FLOOR - LIGHTING MODIFICATIONS
  5. GROUND AND SECOND FLOOR - WASHROOM RENOVATIONS
  6. MAIN OFFICE RENOVATIONS
  7. MAIN ENTRANCE RENOVATIONS

PHASE 2

- TO BE COMPLETED AUGUST 31, 2022  
(REFER TO DRAWINGS FOR AREA OF WORK FOR EACH ITEM)
1. DEMOLITION OF EXISTING GYMNASIUM AHU
  2. DEMOLITION OF EXISTING EXHAUST FANS FOR CLASSROOMS
  3. DEMOLITION OF EXISTING LIBRARY UNIT VENTILATORS
  4. INSTALLATION AND FINAL CONNECTIONS OF GROUND FLOOR UNIT VENTILATORS
  5. HVAC MODIFICATIONS (DUCTS AND GRILLES) IN GYMNASIUM, LIBRARY AND AUDITORIUM
  6. ROOF UNIT SUPPORTS AND ROOF OPENINGS FOR AHU-1, AHU-2, ERV-1 AND ERV-2
  7. INSTALLATION AND FINAL CONNECTIONS FOR AHU-1, AHU-2, ERV-1 AND ERV-2
  8. BOILER PLANT UPGRADE
  9. INSTALLATION OF NEW BUILDING AUTOMATION SYSTEM (BAS)

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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : PHASING PLAN

Designed: N.P.  
Checked: Y.N.  
Scale: AS SHOWN  
Date: JAN 2021

PNF Project No. 20041

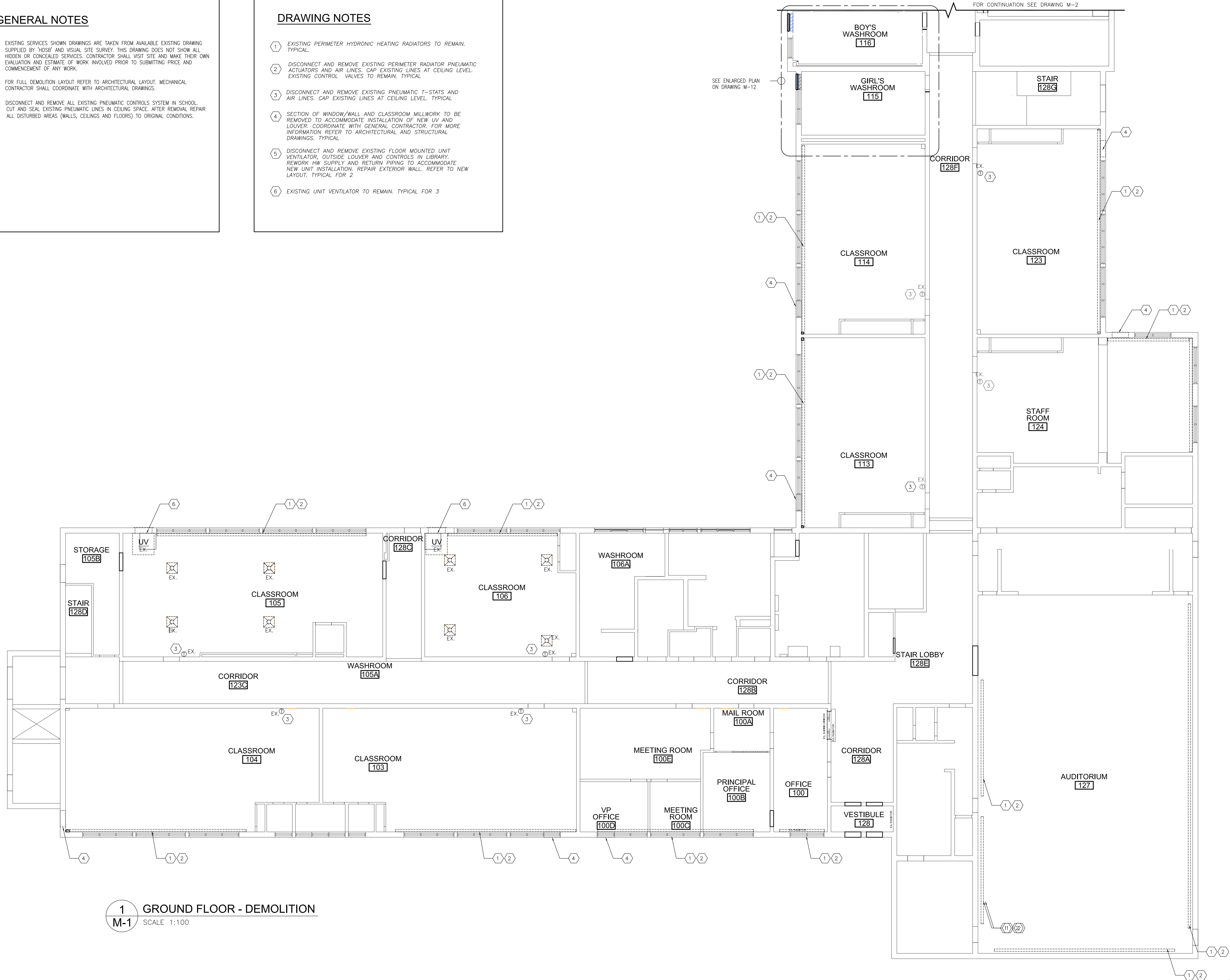
Dwg.No. M-0

## GENERAL NOTES

- EXISTING SERVICES SHOWN DRAWINGS ARE TAKEN FROM AVAILABLE EXISTING DRAWING SUPPLIED BY "HDSB" AND VISUAL SITE SURVEY. THIS DRAWING DOES NOT SHOW ALL HIDDEN OR CONCEALED SERVICES. CONTRACTOR SHALL VISIT SITE AND MAKE THEIR OWN EVALUATION AND ESTIMATE OF WORK INVOLVED PRIOR TO SUBMITTING PRICE AND COMMENCEMENT OF ANY WORK.
- FOR FULL DEMOLITION LAYOUT REFER TO ARCHITECTURAL LAYOUT, MECHANICAL CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS.
- DISCONNECT AND REMOVE ALL EXISTING PNEUMATIC CONTROLS SYSTEM IN SCHOOL. CUT AND SEAL EXISTING PNEUMATIC LINES IN CEILING SPACE AFTER REMOVAL. REPAIR ALL DISTURBED AREAS (WALLS, CEILINGS AND FLOORS) TO ORIGINAL CONDITIONS.

## DRAWING NOTES

- EXISTING PERIMETER HYDRONIC HEATING RADIATORS TO REMAIN. TYPICAL.
- DISCONNECT AND REMOVE EXISTING PERIMETER RADIATOR PNEUMATIC ACTUATORS AND AIR LINES. CAP EXISTING LINES AT CEILING LEVEL. EXISTING CONTROL VALVES TO REMAIN. TYPICAL.
- DISCONNECT AND REMOVE EXISTING PNEUMATIC T-STATS AND AIR LINES. CAP EXISTING LINES AT CEILING LEVEL. TYPICAL.
- SECTION OF WINDOW/WALL AND CLASSROOM MILLWORK TO BE REMOVED TO ACCOMMODATE INSTALLATION OF NEW UV AND LOUVER. COORDINATE WITH GENERAL CONTRACTOR FOR MORE INFORMATION REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS. TYPICAL.
- DISCONNECT AND REMOVE EXISTING FLOOR MOUNTED UNIT VENTILATOR, OUTSIDE LOUVER AND CONTROLS IN LIBRARY. REWORK HW SUPPLY AND RETURN PIPING TO ACCOMMODATE NEW UNIT INSTALLATION. REPAIR EXTERIOR WALL. REFER TO NEW LAYOUT. TYPICAL FOR 2.
- EXISTING UNIT VENTILATOR TO REMAIN. TYPICAL FOR 3.



NO.	ISSUANCES & REVISIONS	DATE
2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021

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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : GROUND FLOOR  
CEILING  
DEMOLITION

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

PNF Project No.

20041

Dwg.No.

**M-1**

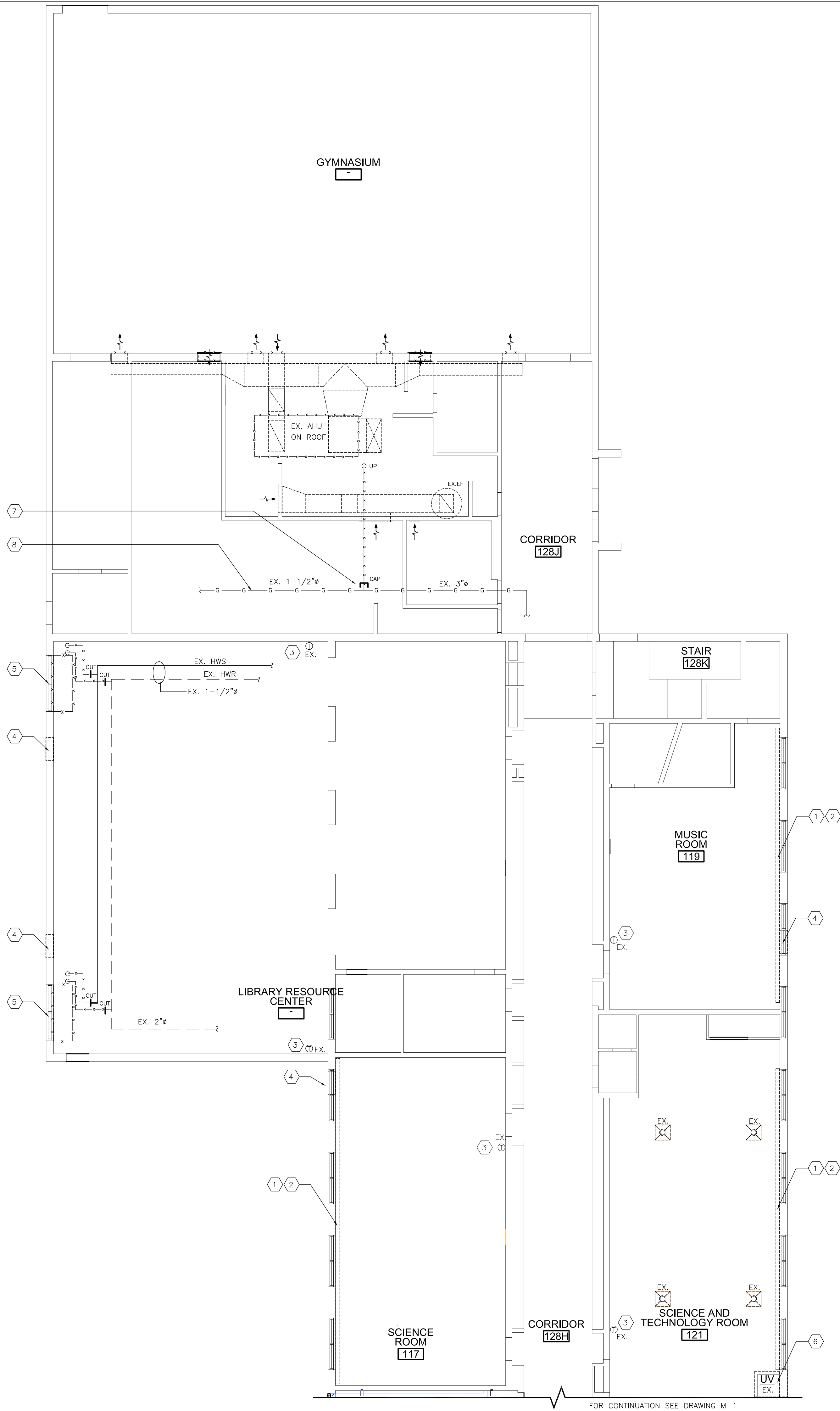


GENERAL NOTES

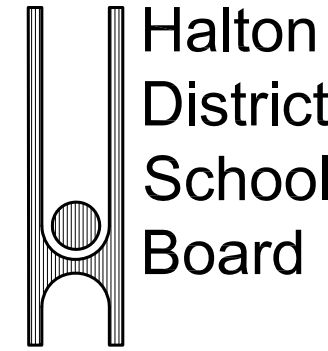
1. EXISTING SERVICES SHOWN DRAWINGS ARE TAKEN FROM AVAILABLE EXISTING DRAWING SUPPLIED BY 'HDSB' AND VISUAL SITE SURVEY. THIS DRAWING DOES NOT SHOW ALL HIDDEN OR CONCEALED SERVICES. CONTRACTOR SHALL VISIT SITE AND MAKE THEIR OWN EVALUATION AND ESTIMATE OF WORK INVOLVED PRIOR TO SUBMITTING PRICE AND COMMENCEMENT OF ANY WORK.
2. FOR FULL DEMOLITION LAYOUT REFER TO ARCHITECTURAL LAYOUT. MECHANICAL CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS.
3. DISCONNECT AND REMOVE ALL EXISTING PNEUMATIC CONTROLS SYSTEM IN SCHOOL. CUT AND SEAL EXISTING PNEUMATIC LINES IN CEILING SPACE. AFTER REMOVAL REPAIR ALL DISTURBED AREAS (WALLS, CEILINGS AND FLOORS) TO ORIGINAL CONDITIONS.

DRAWING NOTES

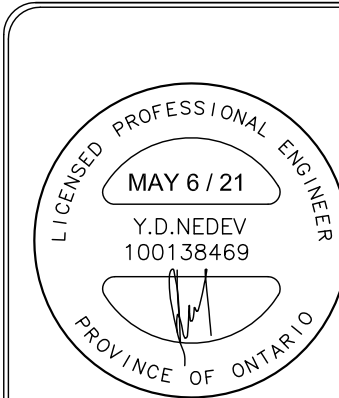
- ① EXISTING PERIMETER HYDRONIC HEATING RADIATORS TO REMAIN. TYPICAL.
- ② DISCONNECT AND REMOVE EXISTING PERIMETER RADIATOR PNEUMATIC ACTUATORS AND AIR LINES. EXISTING CONTROL VALVES TO REMAIN. TYPICAL
- ③ DISCONNECT AND REMOVE EXISTING PNEUMATIC T-STATS AND AIR LINES. CAP EXISTING LINES AT CEILING LEVEL. TYPICAL
- ④ SECTION OF WINDOW/WALL AND CLASSROOM MILLWORK TO BE REMOVED TO ACCOMMODATE INSTALLATION OF NEW UV AND LOUVER. COORDINATE WITH GENERAL CONTRACTOR. FOR MORE INFORMATION REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS. TYPICAL
- ⑤ DISCONNECT AND REMOVE EXISTING FLOOR MOUNTED UNIT VENTILATOR, OUTSIDE LOUVER AND CONTROLS IN LIBRARY. REWORK HW SUPPLY AND RETURN PIPING TO ACCOMMODATE NEW UNIT INSTALLATION. REPAIR EXTERIOR WALL. REFER TO NEW LAYOUT. TYPICAL FOR 2
- ⑥ EXISTING UNIT VENTILATOR TO REMAIN. TYPICAL FOR 3
- ⑦ CUT AND CAP OFF EXISTING GAS PIPING IN CEILING SPACE. REMOVE PART OF PIPING DOWNSTREAM IN CEILING AND ROOF. EXACT LOCATION OF EXISTING PIPING TO BE CONFIRMED ON SITE. REPAIR ROOF. SEE ROOF PLAN FOR CONTINUATION.
- ⑧ EXISTING GAS PIPING IN CEILING



1 GROUND FLOOR - DEMOLITION  
M-2 SCALE 1:100



2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO.	ISSUANCES & REVISIONS	DATE



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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : GROUND FLOOR  
CEILING  
DEMOLITION

Designed: N.P.  
Checked: Y.N.  
Scale: AS SHOWN  
Date: JAN 2021

PNF Project No.

20041

Dwg.No.

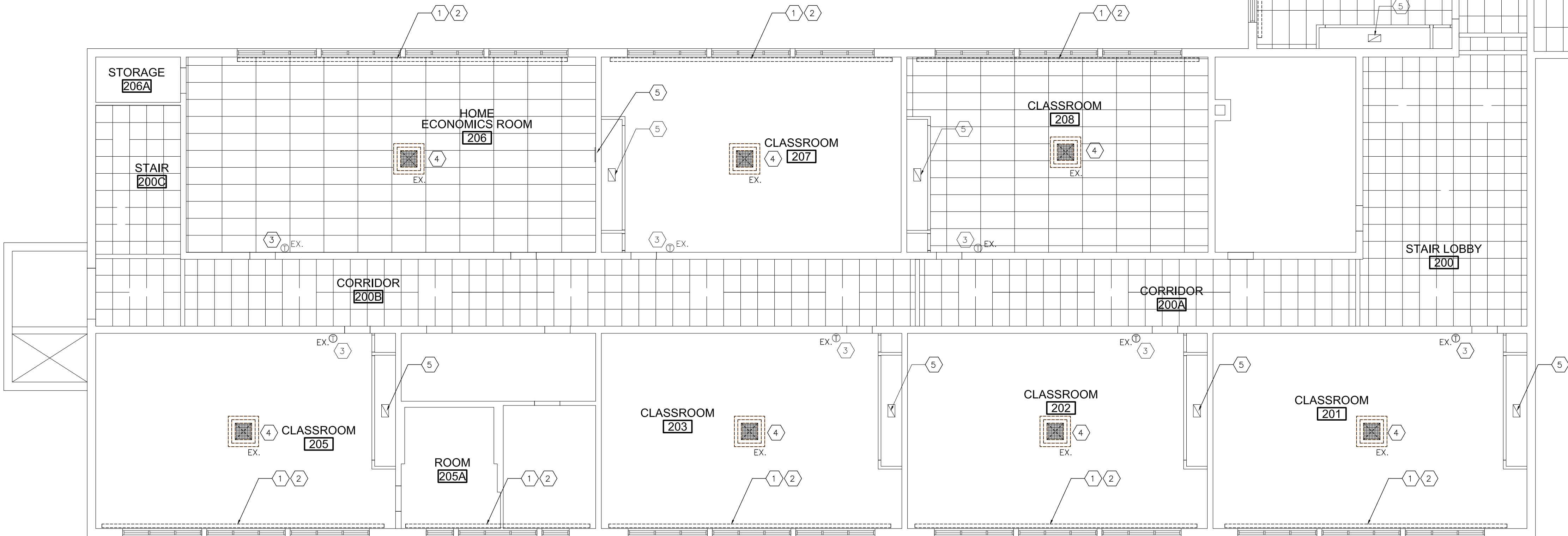
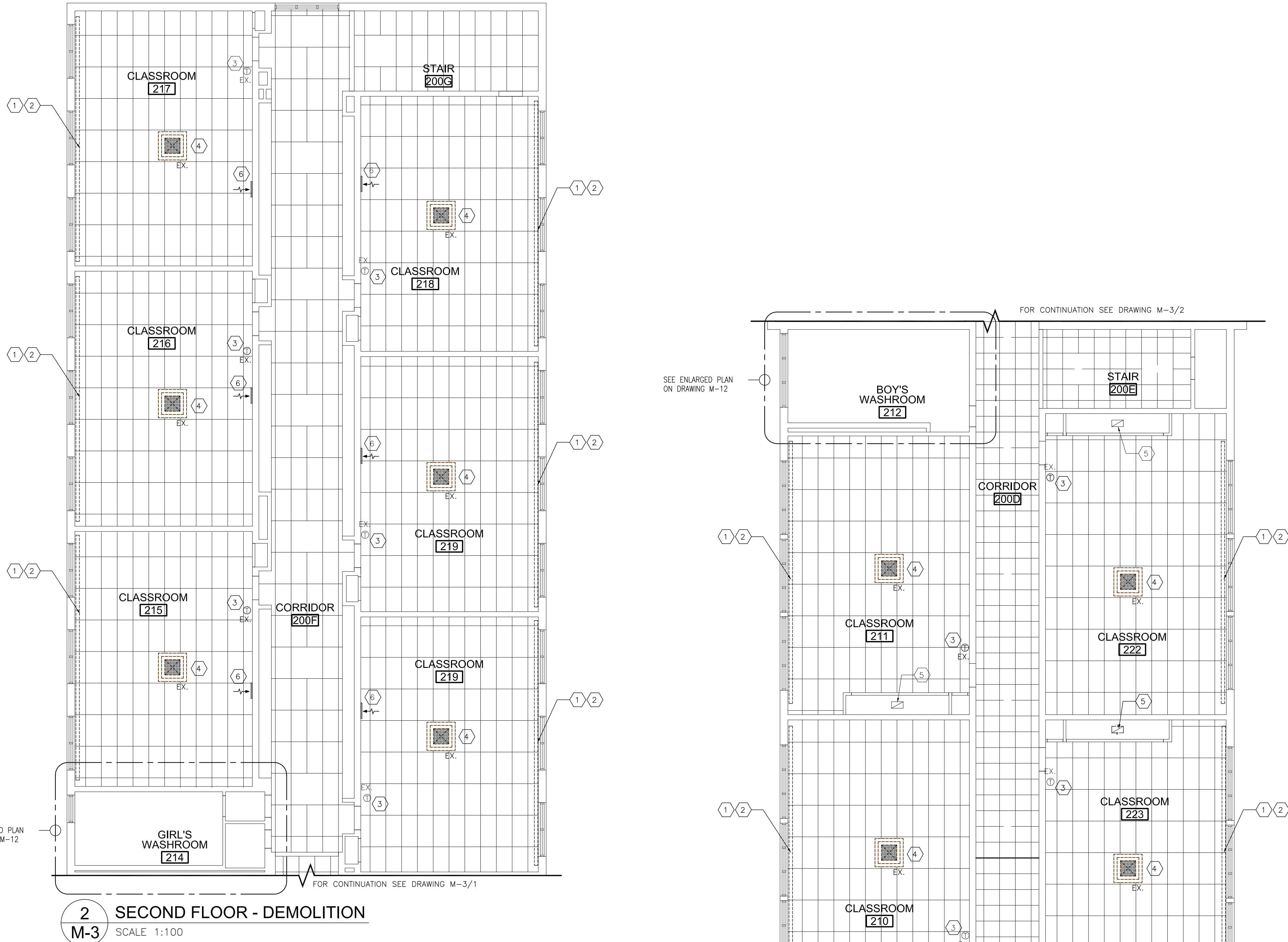
M-2

GENERAL NOTES

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- FOR FULL DEMOLITION LAYOUT REFER TO ARCHITECTURAL LAYOUT. MECHANICAL CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS.
- DISCONNECT AND REMOVE ALL EXISTING PNEUMATIC CONTROLS SYSTEM IN SCHOOL. OUT AND SEAL EXISTING PNEUMATIC LINES IN CEILING SPACE. AFTER REMOVAL REPAIR ALL DISTURBED AREAS (WALLS, CEILINGS AND FLOORS) TO ORIGINAL CONDITIONS.

DRAWING NOTES

- EXISTING PERIMETER HYDRONIC HEATING RADIATORS TO REMAIN. TYPICAL.
- DISCONNECT AND REMOVE EXISTING PERIMETER RADIATOR PNEUMATIC ACTUATORS AND AIR LINES. CAP EXISTING LINES AT CEILING LEVEL. EXISTING CONTROL VALVES TO REMAIN. TYPICAL.
- DISCONNECT AND REMOVE EXISTING PNEUMATIC T-STATS AND AIR LINES. CAP EXISTING LINES AT CEILING LEVEL. TYPICAL.
- EXISTING HEAT PUMP CEILING UNIT TO REMAIN.
- DISCONNECT EXISTING CLASSROOM EXHAUST FANS ON ROOF. REMOVE EXISTING GRILL AND CAP OF EXISTING DUCTWORK WITH INSULATED PANEL AT CEILING LEVEL. PATCH AND REPAIR DISTURBED CEILING AREA.
- DISCONNECT EXISTING CLASSROOM EXHAUST FANS ON ROOF. REMOVE EXISTING GRILL. REUSE EXISTING WALL OPENING FOR NEW SUPPLY AIR DUCT. REPAIR WALL AFTER NEW INSTALLATION. REFER TO NEW LAYOUT.



NO.	ISSUANCES & REVISIONS	DATE
2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021

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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : SECOND FLOOR CEILING DEMOLITION

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

PNF Project No.

20041

Dwg.No.

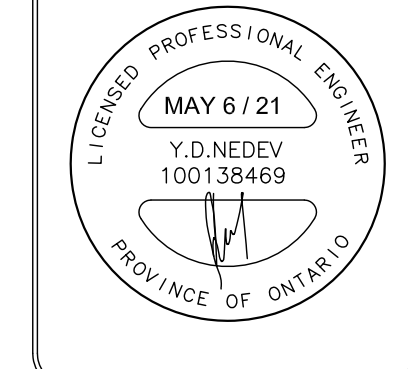
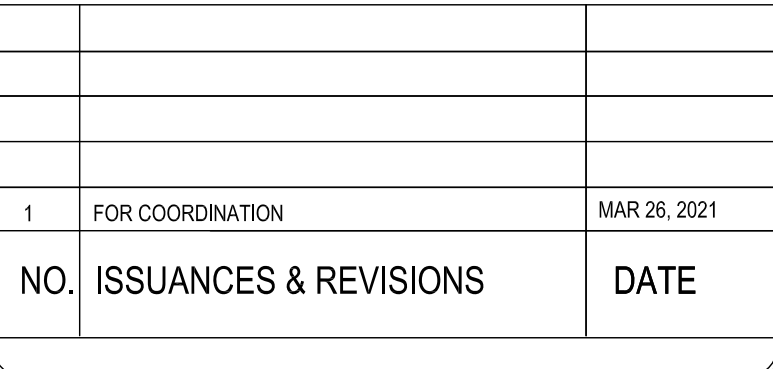
M-3



1. EXISTING SERVICES SHOWN DRAWINGS ARE TAKEN FROM AVAILABLE EXISTING DRAWING SUPPLIED BY "HDSB" AND VISUAL SITE SURVEY. THIS DRAWING DOES NOT SHOW ALL HIDDEN OR CONCEALED SERVICES. CONTRACTOR SHALL VISIT SITE AND MAKE THEIR OWN EVALUATION AND ESTIMATE OF WORK INVOLVED PRIOR TO SUBMITTING PRICE AND COMMENCEMENT OF ANY WORK.
2. CONTRACTOR TO PROVIDE ACCESS TO MECHANICAL SERVICES, AND REPAIR ALL AFFECTED AREAS TO ORIGINAL CONDITIONS UPON COMPLETION OF WORK - ALL REQUIRED WALLS/CeILING/FLOOR CUTTING, REPAIRS, PATCHING, PAINTING, ETC. TO MATCH EXISTING FINISHES AND FIRE RATING. REINSTALL ALL SERVICES AND ACCESSORIES.
3. PERFORM ALL CUTTING AND PATCHING REQUIRED FOR ACCESSING, REMOVING AND REPLACING MECHANICAL EQUIPMENT AS REQUIRED IN DRAWINGS. BEFORE PERFORMING CUTTING, PROTECT ALL SURROUNDING AREAS IN COMMON SPACES FROM DAMAGE, DUST, ETC. MAINTAIN BUILDING CLEAN AT ALL TIMES.
4. FOLLOWING INSTALLATION REPAIR, PATCH PRIME, AND PAINT TO MATCH EXISTING ALL DAMAGED AND DISTURBED COMMON AREAS.
5. CONTRACTOR TO VERIFY ALL EXISTING SITE CONDITIONS INCLUDING SIZES AND EQUIPMENT PRIOR TO ORDERING.
6. RELOCATE EXISTING SERVICES AS REQUIRED TO ALLOW FOR NEW EQUIPMENT INSTALLATION.
7. FIRESTOP AND SEAL ALL DUCTWORK AND PIPING WALL/CeILING/FLOOR PENETRATIONS THROUGH FIRE RATED ASSEMBLIES.
8. DISCONNECT ALL SERVICES (GAS, ELECTRICAL, CONTROLS, ETC.) PRIOR TO COMMENCING ANY WORK.
9. CONTRACTOR TO VERIFY AND ADJUST GAS PRESSURE TO ACCOMMODATE NEW ROOFTOP UNITS INSTALLATION. COORDINATE WITH LOCAL GAS COMPANY.
10. ENSURE ALL PLUMBING VENT STACKS LOCATED NEAR NEW UNIT INTAKE ARE EXTENDED TO BE ABOVE THE LEVEL OF THE NEW UNIT INTAKE.
11. SUPPLY AND INSTALL ALL NECESSARY DUCTWORK, INSULATION, DEFUSERS AND GRILLES. PROVIDE THERMAL INSULATION AND ACOUSTICALLY LINING ON ALL NEW DUCTWORK. INCREASE ALL DUCT SIZES WITH "1" (25mm) TO ALLOW FOR ACOUSTICALLY LINING INSTALLATION. APPLY 2" TK. WEATHERPROOF INSULATION ON OUTDOOR DUCTS; 1" TK. THERMAL INSULATION ON INDOOR DUCTS.

- 1 EXISTING PERIMETER HYDRONIC HEATING RADIATORS TO REMAIN. TYPICAL.
- 2 REPLACE EXISTING PNEUMATIC ACTUATORS WITH ELECTRONICALLY CONTROLLED ACTUATOR AND CONNECT TO NEW BAS. EXISTING CONTROL VALVES TO REMAIN. TYPICAL.
- 3 REPLACE EXISTING PNEUMATIC T'STAT WITH NEW HEATING/COOLING T'STAT C/W TEMPERATURE SENSOR. T'STAT TO MODULATE RADIATOR CONTROL VALVES IN HEATING MODE AND CONTROL UNIT VENTILATOR IN COOLING MODE. T'STAT C/W MANUAL OVERRIDE FUNCTION, LOCKABLE TRANSPARENT GUARD AND CONNECTED TO NEW BAS. TYPICAL.
- 3A REPLACE EXISTING PNEUMATIC T'STAT WITH NEW HEATING/COOLING T'STAT C/W TEMPERATURE SENSOR IN LIBRARY. T'STAT TO CONTROL UNIT VENTILATOR IN HEATING AND COOLING MODE. T'STAT C/W MANUAL OVERRIDE FUNCTION, LOCKABLE TRANSPARENT GUARD AND CONNECTED TO NEW BAS. TYPICAL FOR 2 (UV-10 AND UV-11).
- 4 NEW UNIT VENTILATOR (UV) AS SPECIFIED. REFER TO TYPICAL INSTALLATION DETAIL.
- 5 NEW WALL LOUVER THROUGH EXISTING WINDOW. LOUVER SUPPLIED BY UNIT MANUFACTURER. FOR WINDOW MODIFICATIONS SEE ARCHITECTURAL DRAWINGS. TYPICAL.
- 6 EXISTING UNIT VENTILATOR TO REMAIN. TYPICAL FOR 3
- 7 ACOUSTICALLY LINED SPIRAL DUCT. PROVIDE PROPER SUPPORT FROM CEILING STRUCTURE AND PAINT DUCT AS PER 'HDSB' INSTRUCTIONS.
- 8 NEW DUCT STAT WITH SENSOR TO CONTROL UNIT VENTILATOR HEATING. SET AT 70°F AND CONNECTED TO NEW BAS. SUPPLIED AND INSTALLED BY BAS CONTRACTOR. TYPICAL FOR UV-1 TO UV-9.
- 9 NEW AIR HANDLING UNIT (AHU-1) ON ROOF SERVING GYM AS SPECIFIED.
- 10 NEW AIR HANDLING UNIT (AHU-2) ON ROOF SERVING AUDITORIUM AS SPECIFIED.
- 11 DROP DOWN NEW SUPPLY AIR DUCT AND NEW HEATING PIPING UNDER BEAM. PROVIDE DRYWALL ENCLOSURE. REFER TO ARCHITECTURAL DRAWINGS.

SEE BAS NOTES ON DRAWING M-5



Dwg.No.  
**M-4**



## GENERAL NOTES

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- CONTRACTOR TO PROVIDE ACCESS TO MECHANICAL SERVICES, AND REPAIR ALL AFFECTED AREAS TO ORIGINAL CONDITIONS UPON COMPLETION OF WORK - ALL REQUIRED WALLS/CEILING/FLOOR CUTTING, REPAIRS, PATCHING, PAINTING, ETC. TO MATCH EXISTING FINISHES AND FIRE RATING. REINSTALL ALL SERVICES AND ACCESSORIES.
- PERFORM ALL CUTTING AND PATCHING REQUIRED FOR ACCESSING, REMOVING AND REPLACING MECHANICAL EQUIPMENT AS REQUIRED IN DRAWINGS. BEFORE PERFORMING CUTTING, PROTECT ALL SURROUNDING AREAS IN COMMON SPACES FROM DAMAGE, DUST, ETC. MAINTAIN BUILDING CLEAN AT ALL TIMES.
- FOLLOWING INSTALLATION REPAIR, PATCH PRIME, AND PAINT TO MATCH EXISTING ALL DAMAGED AND DISTURBED COMMON AREAS.
- CONTRACTOR TO VERIFY ALL EXISTING SITE CONDITIONS INCLUDING SIZES AND EQUIPMENT PRIOR TO ORDERING.
- RELOCATE EXISTING SERVICES AS REQUIRED TO ALLOW FOR NEW EQUIPMENT INSTALLATION.
- FIRESTOP AND SEAL ALL DUCTWORK AND PIPING WALL/CEILING/FLOOR PENETRATIONS THROUGH FIRE RATED ASSEMBLIES.
- DISCONNECT ALL SERVICES (GAS, ELECTRICAL, CONTROLS, ETC.) PRIOR TO COMMENCING ANY WORK.
- CONTRACTOR TO VERIFY AND ADJUST GAS PRESSURE TO ACCOMMODATE NEW ROOFTOP UNITS INSTALLATION. COORDINATE WITH LOCAL GAS COMPANY.
- ENSURE ALL PLUMBING VENT STACKS LOCATED NEAR NEW UNIT INTAKE ARE EXTENDED TO BE ABOVE THE LEVEL OF THE NEW UNIT INTAKE.
- SUPPLY AND INSTALL ALL NECESSARY DUCTWORK, INSULATION, DIFFUSERS AND GRILLES. PROVIDE THERMAL INSULATION AND ACOUSTICALLY LINING ON ALL NEW DUCTWORK. INCREASE ALL DUCT SIZES WITH 1" (25mm) TO ALLOW FOR ACOUSTICALLY LINING INSTALLATION. APPLY 2" TK. WEATHERPROOF INSULATION ON OUTDOOR DUCTS; 1" TK. THERMAL INSULATION ON INDOOR DUCTS.

## DRAWING NOTES

- EXISTING PERIMETER HYDRONIC HEATING RADIATORS TO REMAIN. TYPICAL.
- REPLACE EXISTING PNEUMATIC ACTUATORS WITH ELECTRONICALLY CONTROLLED ACTUATOR AND CONNECT TO NEW BAS. EXISTING CONTROL VALVES TO REMAIN. TYPICAL
- REPLACE EXISTING PNEUMATIC T'STAT WITH NEW HEATING/COOLING T'STAT C/W TEMPERATURE SENSOR. T'STAT TO MODULATE RADIATOR CONTROL VALVES IN HEATING MODE AND CONTROL UNIT VENTILATOR IN COOLING MODE. T'STAT C/W MANUAL OVERRIDE FUNCTION, LOCKABLE TRANSPARENT GUARD AND CONNECTED TO NEW BAS. TYPICAL.
- REPLACE EXISTING PNEUMATIC T'STAT WITH NEW HEATING/COOLING T'STAT C/W TEMPERATURE SENSOR IN LIBRARY. T'STAT TO CONTROL UNIT VENTILATOR IN HEATING AND COOLING MODE. T'STAT C/W MANUAL OVERRIDE FUNCTION, LOCKABLE TRANSPARENT GUARD AND CONNECTED TO NEW BAS. TYPICAL FOR 2 (UV-10 AND UV-11).
- NEW UNIT VENTILATOR (UV) AS SPECIFIED. REFER TO TYPICAL INSTALLATION DETAIL.
- NEW WALL LOUVER THROUGH EXISTING WINDOW. LOUVER SUPPLIED BY UNIT MANUFACTURER. FOR WINDOW MODIFICATIONS SEE ARCHITECTURAL DRAWINGS. TYPICAL.
- EXISTING UNIT VENTILATOR TO REMAIN. TYPICAL FOR 3
- ACOUSTICALLY LINED SPIRAL DUCT. PROVIDE PROPER SUPPORT FROM CEILING STRUCTURE AND PAINT DUCT AS PER 'HDSB' INSTRUCTIONS.
- NEW DUCT STAT WITH SENSOR TO CONTROL UNIT VENTILATOR HEATING. SET AT 70°F AND CONNECTED TO NEW BAS. SUPPLIED AND INSTALLED BY BAS CONTRACTOR. TYPICAL FOR UV-1 TO UV-9.
- NEW AIR HANDLING UNIT (AHU-1) ON ROOF SERVING GYM AS SPECIFIED.
- NEW AIR HANDLING UNIT (AHU-2) ON ROOF SERVING AUDITORIUM AS SPECIFIED.
- MODIFY EXISTING SUPPLY AND RETURN DUCTWORK IN CHANGE ROOM CEILING IN ORDER TO ACCOMMODATE NEW INSTALLATION.

## NEW BUILDING AUTOMATION SYSTEM (BAS)

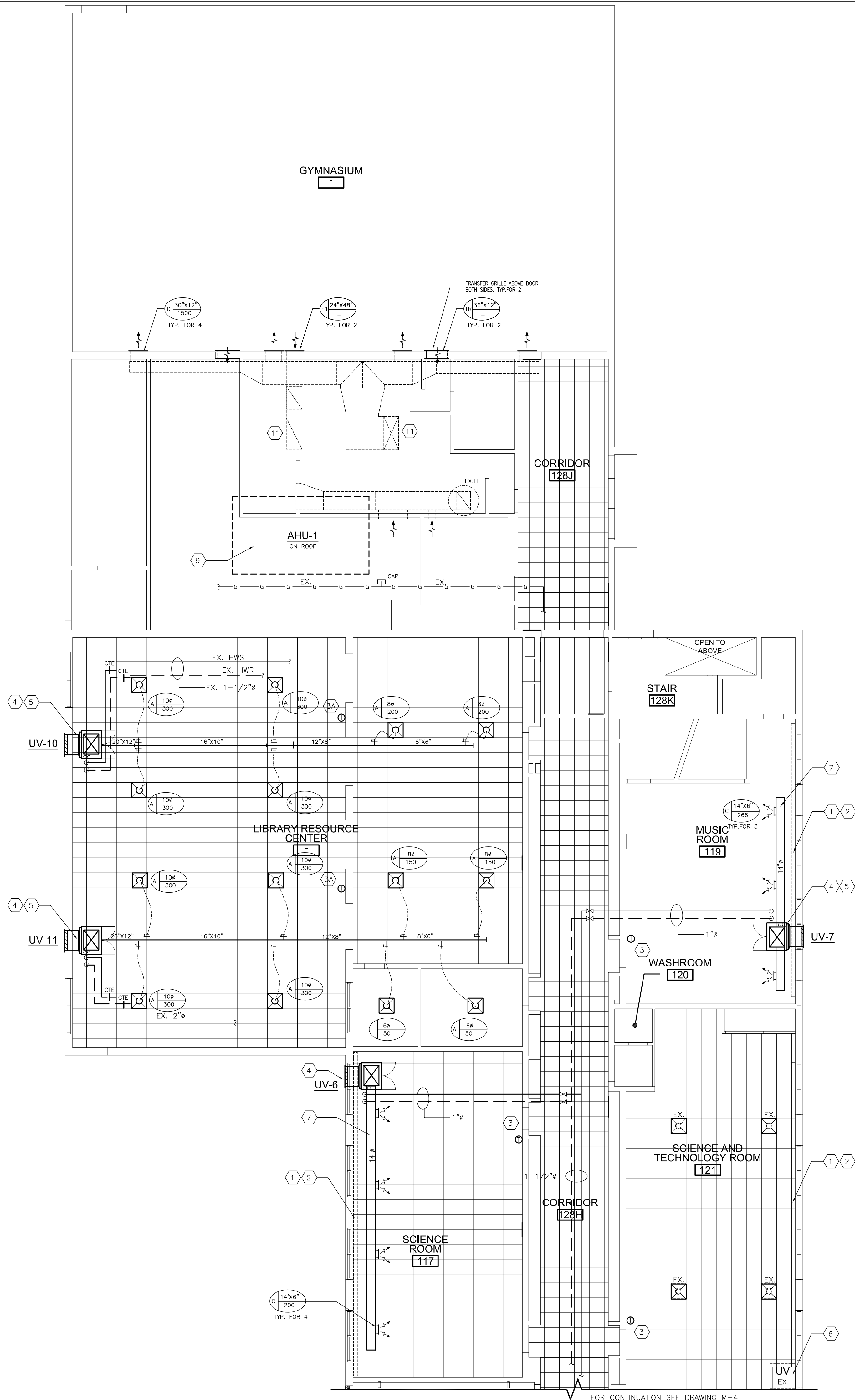
- ALL BAS WORK SHALL BE PERFORMED BY 'HDSB' APPROVED BAS CONTRACTOR.
- BAS CONTRACTOR SHALL SUPPLY AND INSTALL COMPLETE NEW BAS AS PER WRITTEN SPECIFICATIONS.
- REPLACE ALL EXISTING SENSORS, RELAYS, PNEUMATIC ACTUATORS, CONTROLLERS, WIRING, ETC., AND CONNECT TO NEW BAS. FOR MORE DETAILS OF EXISTING BAS CONTROLS REFER TO EXISTING CONTROL DRAWINGS ATTACHED TO WRITTEN SPECIFICATIONS.
- SUPPLY AND INSTALL NEW CONTROLLERS, SENSORS, RELAYS, ACTUATORS, AND WIRING, FOR ALL EXISTING AND NEW EQUIPMENT.
- CONTROL CONTRACTOR SHALL SUBMIT CONTROL SHOP DRAWINGS, WIRING, DIAGRAMS AND SCHEMATICS FOR REVIEW BEFORE PROCEEDING WITH WORK.
- PROVIDE NEW WIRING AND CONDUITS REQUIRED FOR BAS SYSTEM. ALL ELECTRICAL WORK ASSOCIATED WITH BAS INSTALLATION SHALL BE DONE BY LICENSED AND UNIONIZED ELECTRICIAN. PROVE OF CERTIFICATION SHALL BE PRESENTED DURING TENDER
- REPLACE ALL EXISTING VALVES, PNEUMATIC ACTUATORS AND THERMOSTATS WITH NEW 2-WAY MODULATING CONTROL VALVE, ELECTRONIC ACTUATORS AND THERMOSTAT. VALVES SUPPLIED BY CONTROL CONTRACTOR INSTALLED BY MECHANICAL CONTRACTOR. CONNECT TO NEW BAS. PROVIDE UNIT PRICE FOR AREA OUTSIDE OF CLASSROOMS (1-CONTROL VALVE, 1-ACTUATOR AND 1-THERMOSTAT REPLACEMENT)
- RECONNECT ALL EXISTING EQUIPMENT TO NEW BAS. FOR MORE DETAILS OF EXISTING BAS AND SEQUENCE OF OPERATION REFER TO EXISTING BAS DRAWINGS ATTACHED TO WRITTEN SPECIFICATIONS.

1

M-5

GROUND FLOOR - NEW LAYOUT

SCALE 1:100



FOR CONTINUATION SEE DRAWING M-4

1	FOR COORDINATION	MAR 26, 2021
NO.	ISSUANCES & REVISIONS	DATE

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Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : GROUND FLOOR  
NEW LAYOUT

Designed: **R.P.**

Checked: **D.R.**

Scale: AS SHOWN

Date: **SEP 2020**

PNF Project No.

**20083**

Dwg.No.

**M-5**



GENERAL NOTES

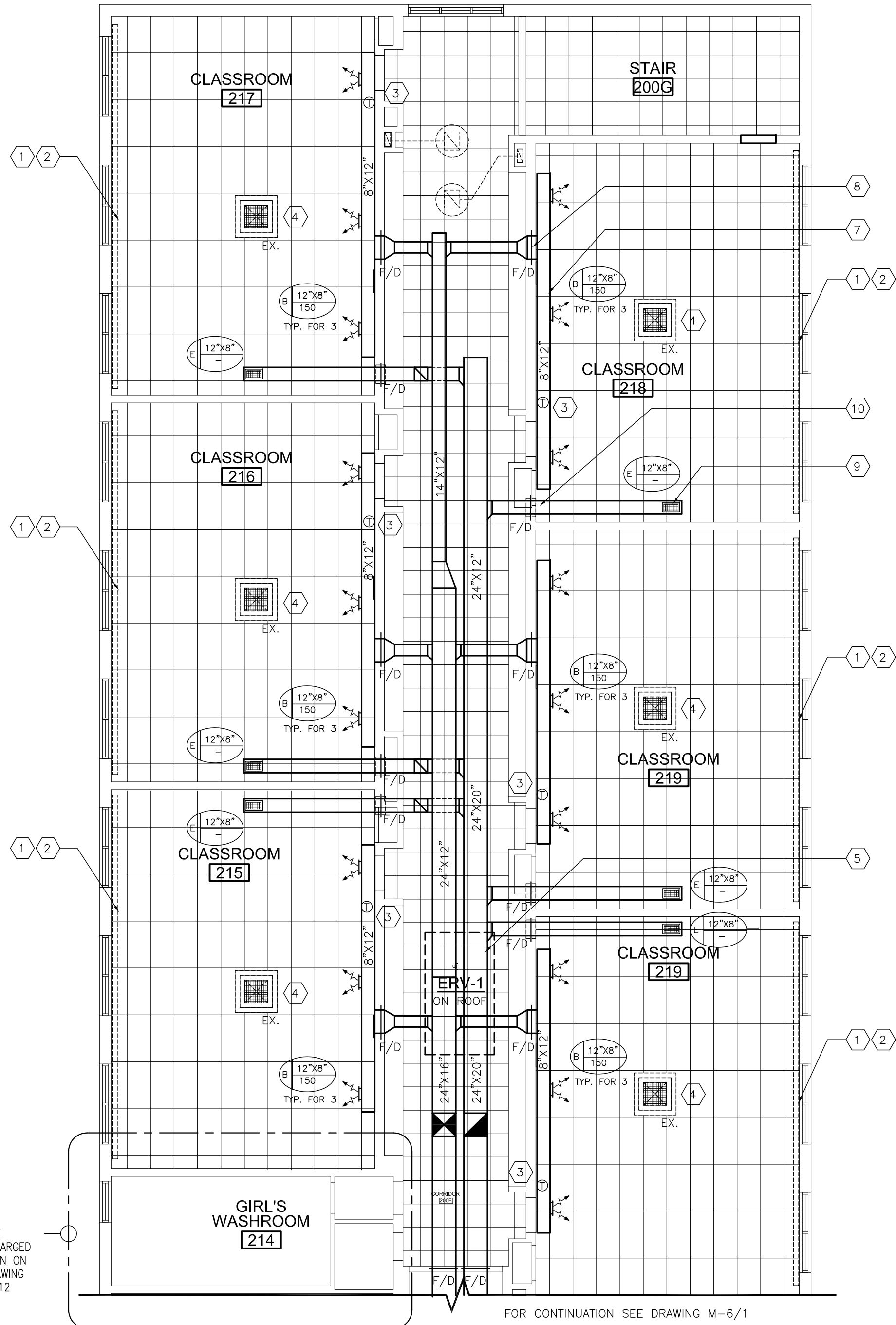
- EXISTING SERVICES SHOWN DRAWINGS ARE TAKEN FROM AVAILABLE EXISTING DRAWING SUPPLIED BY 'HDSB' AND VISUAL SITE SURVEY. THIS DRAWING DOES NOT SHOW ALL HIDDEN OR CONCEALED SERVICES. CONTRACTOR SHALL VISIT SITE AND MAKE THEIR OWN EVALUATION AND ESTIMATE OF WORK INVOLVED PRIOR TO SUBMITTING PRICE AND COMMENCEMENT OF ANY WORK.
- CONTRACTOR TO PROVIDE ACCESS TO MECHANICAL SERVICES, AND REPAIR ALL AFFECTED AREAS TO ORIGINAL CONDITIONS UPON COMPLETION OF WORK - ALL REQUIRED WALLS/CEILING/FLOOR CUTTING, REPAIRS, PATCHING, PAINTING, ETC. TO MATCH EXISTING FINISHES AND FIRE RATING. REINSTALL ALL SERVICES AND ACCESSORIES.
- PERFORM ALL CUTTING AND PATCHING REQUIRED FOR ACCESSING, REMOVING AND REPLACING MECHANICAL EQUIPMENT AS REQUIRED IN DRAWINGS. BEFORE PERFORMING CUTTING, PROTECT ALL SURROUNDING AREAS IN COMMON SPACES FROM DAMAGE, DUST, ETC. MAINTAIN BUILDING CLEAN AT ALL TIMES.
- FOLLOWING INSTALLATION REPAIR, PATCH PRIME, AND PAINT TO MATCH EXISTING ALL DAMAGED AND DISTURBED COMMON AREAS.
- CONTRACTOR TO VERIFY ALL EXISTING SITE CONDITIONS INCLUDING SIZES AND EQUIPMENT PRIOR TO ORDERING.
- RELOCATE EXISTING SERVICES AS REQUIRED TO ALLOW FOR NEW EQUIPMENT INSTALLATION.
- FIRESTOP AND SEAL ALL DUCTWORK AND PIPING WALL/CEILING/FLOOR PENETRATIONS THROUGH FIRE RATED ASSEMBLIES.
- DISCONNECT ALL SERVICES (GAS, ELECTRICAL, CONTROLS, ETC.) PRIOR TO COMMENCING ANY WORK.
- CONTRACTOR TO VERIFY AND ADJUST GAS PRESSURE TO ACCOMMODATE NEW ROOFTOP UNITS INSTALLATION. COORDINATE WITH LOCAL GAS COMPANY.
- ENSURE ALL PLUMBING VENT STACKS LOCATED NEAR NEW UNIT INTAKE ARE EXTENDED TO BE ABOVE THE LEVEL OF THE NEW UNIT INTAKE.
- SUPPLY AND INSTALL ALL NECESSARY DUCTWORK, INSULATION, DIFFUSERS AND GRILLES. PROVIDE THERMAL INSULATION AND ACOUSTICALLY LINING ON ALL NEW DUCTWORK. INCREASE ALL DUCT SIZES WITH 1" (25mm) TO ALLOW FOR ACOUSTICALLY LINING INSTALLATION. APPLY 2" TK. WEATHERPROOF INSULATION ON OUTDOOR DUCTS; 1" TK. THERMAL INSULATION ON INDOOR DUCTS.

DRAWING NOTES

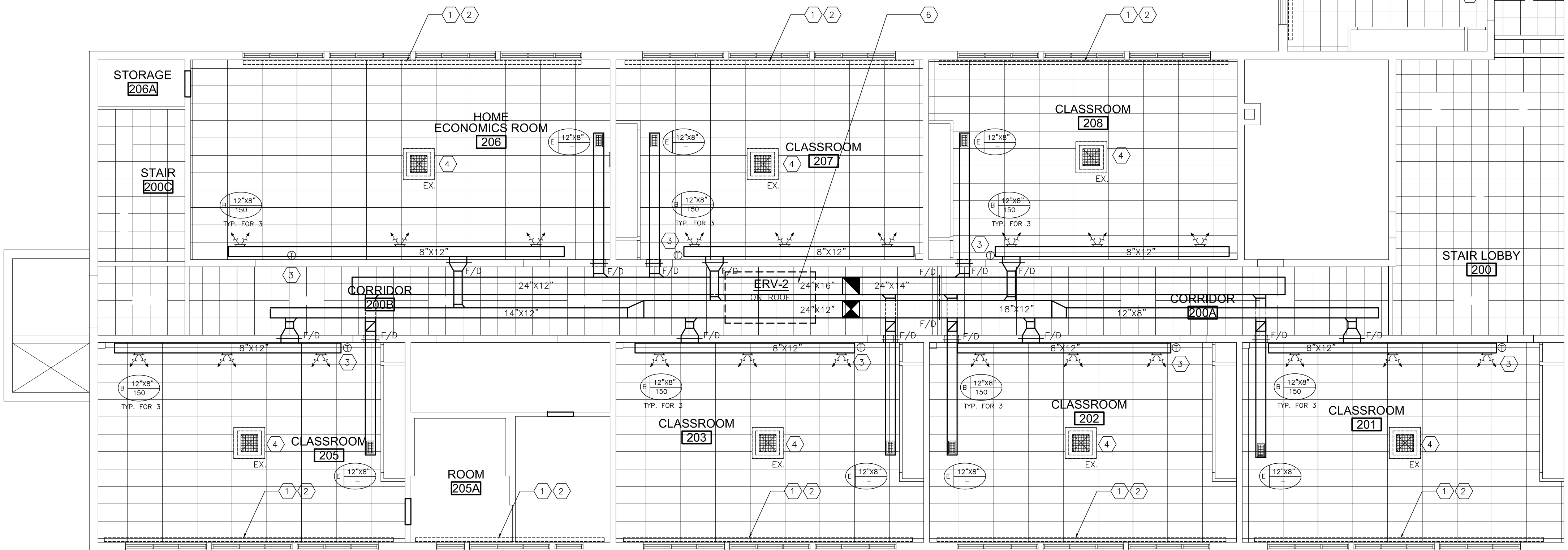
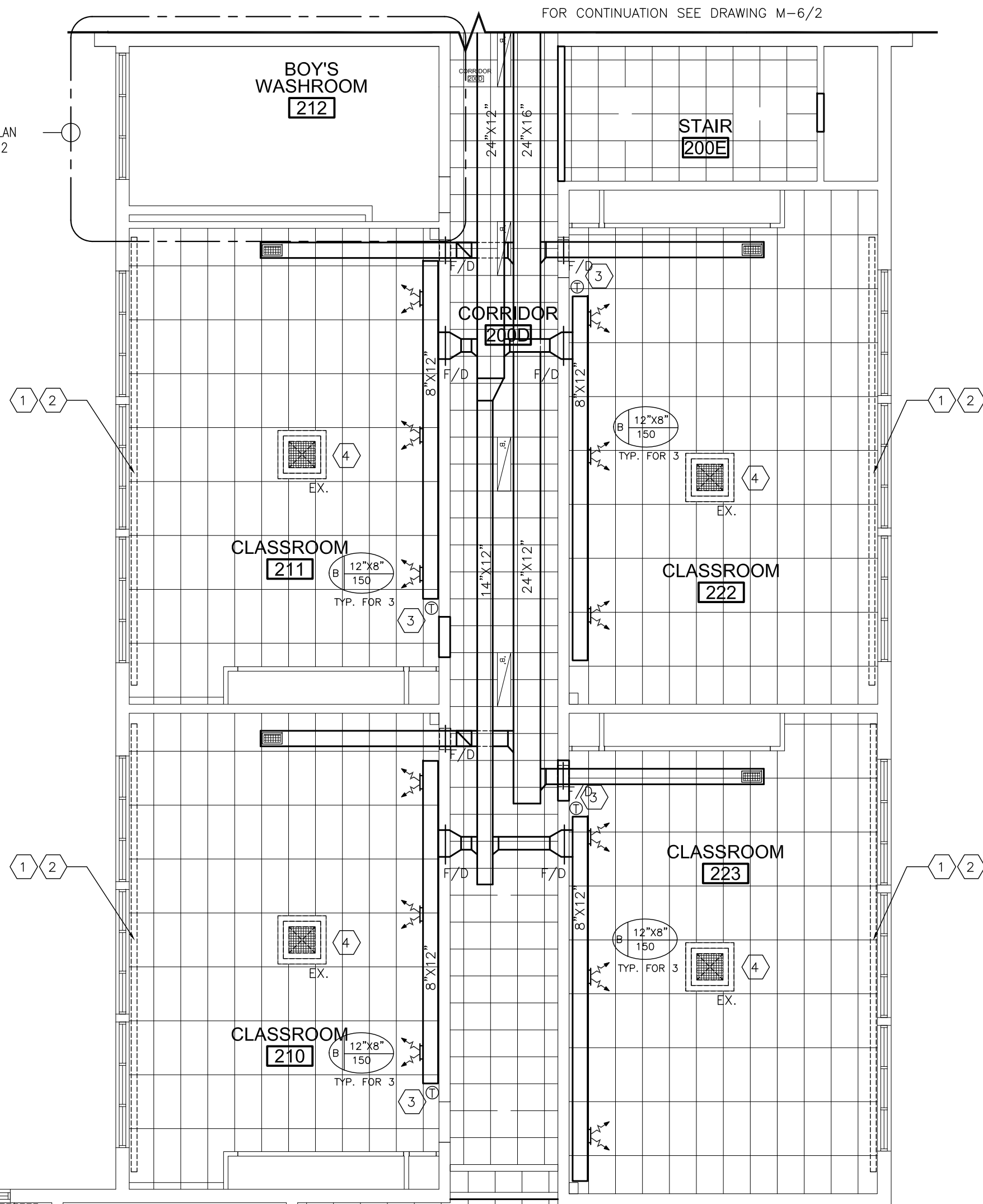
- EXISTING PERIMETER HYDRONIC HEATING RADIATORS TO REMAIN. TYPICAL.
- REPLACE EXISTING PNEUMATIC ACTUATORS WITH ELECTRONICALLY CONTROLLED ACTUATOR AND CONNECT TO NEW BAS. EXISTING CONTROL VALVES TO REMAIN.TYPICAL.
- REPLACE EXISTING PNEUMATIC T'STAT WITH NEW HEATING T'STAT C/W TEMPERATURE SENSOR FOR PERIMETER RADIATORS. T'STAT TO MODULATE RADIATOR CONTROL VALVES. T'STAT C/W MANUAL OVERRIDE FUNCTION, LOCKABLE TRANSPARENT GUARD AND CONNECTED TO NEW BAS. TYPICAL.
- EXISTING HEAT PUMP CEILING UNIT TO REMAIN.
- NEW ENERGY RECOVERY UNIT (ERV-1) ON ROOF AS SPECIFIED.
- NEW ENERGY RECOVERY UNIT (ERV-1) ON ROOF AS SPECIFIED.
- NEW SUPPLY AIR DUCT IN BULKHEAD DUCT. PROVIDE PROPER DUCT SUPPORT FROM CEILING STRUCTURE. REFER TO ARCHITECTURAL DRAWINGS FOR DUCT ENCLOSURE. TYPICAL FOR CLASSROOMS.
- REUSE EXISTING WALL OPENING FOR NEW SUPPLY AIR DUCT. PROVIDE FIRE DAMPER. REPAIR WALL AFTER NEW INSTALLATION. TYPICAL
- NEW EXHAUST AIR GRILLE AND DUCT ABOVE SUSPENDED CEILING. TYPICAL FOR CLASSROOMS.
- PROVIDE NEW 16"x8" WALL OPENING FOR NEW EXHAUST AIR DUCT. PROVIDE FIRE DAMPER. REPAIR WALL AFTER NEW INSTALLATION. TYPICAL

NEW BUILDING AUTOMATION SYSTEM (BAS)

SEE BAS NOTES ON DRAWING M-5



SEE ENLARGED PLAN ON DRAWING M-12



1	FOR COORDINATION	MAR 26, 2021
NO.	ISSUANCES & REVISIONS	DATE

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Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : SECOND FLOOR CEILING NEW LAYOUT

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

PNF Project No.

20041

Dwg.No.

M-6

**GENERAL NOTES**

1. EXISTING SERVICES SHOWN DRAWINGS ARE TAKEN FROM AVAILABLE EXISTING DRAWING SUPPLIED BY 'HDSB' AND VISUAL SITE SURVEY. THIS DRAWING DOES NOT SHOW ALL HIDDEN OR CONCEALED SERVICES. CONTRACTOR SHALL VISIT SITE AND MAKE THEIR OWN EVALUATION AND ESTIMATE OF WORK INVOLVED PRIOR TO SUBMITTING PRICE AND COMMENCEMENT OF ANY WORK.

2. FOR FULL DEMOLITION LAYOUT REFER TO ARCHITECTURAL LAYOUT. MECHANICAL CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS.

3. DISCONNECT AND REMOVE ALL EXISTING ROOFTOP EXHAUST FANS SERVING CLASSROOMS AND AUDITORIUM AS INDICATED. AFTER REMOVAL REPAIR ROOF TO ORIGINAL CONDITIONS.

**DRAWING NOTES**

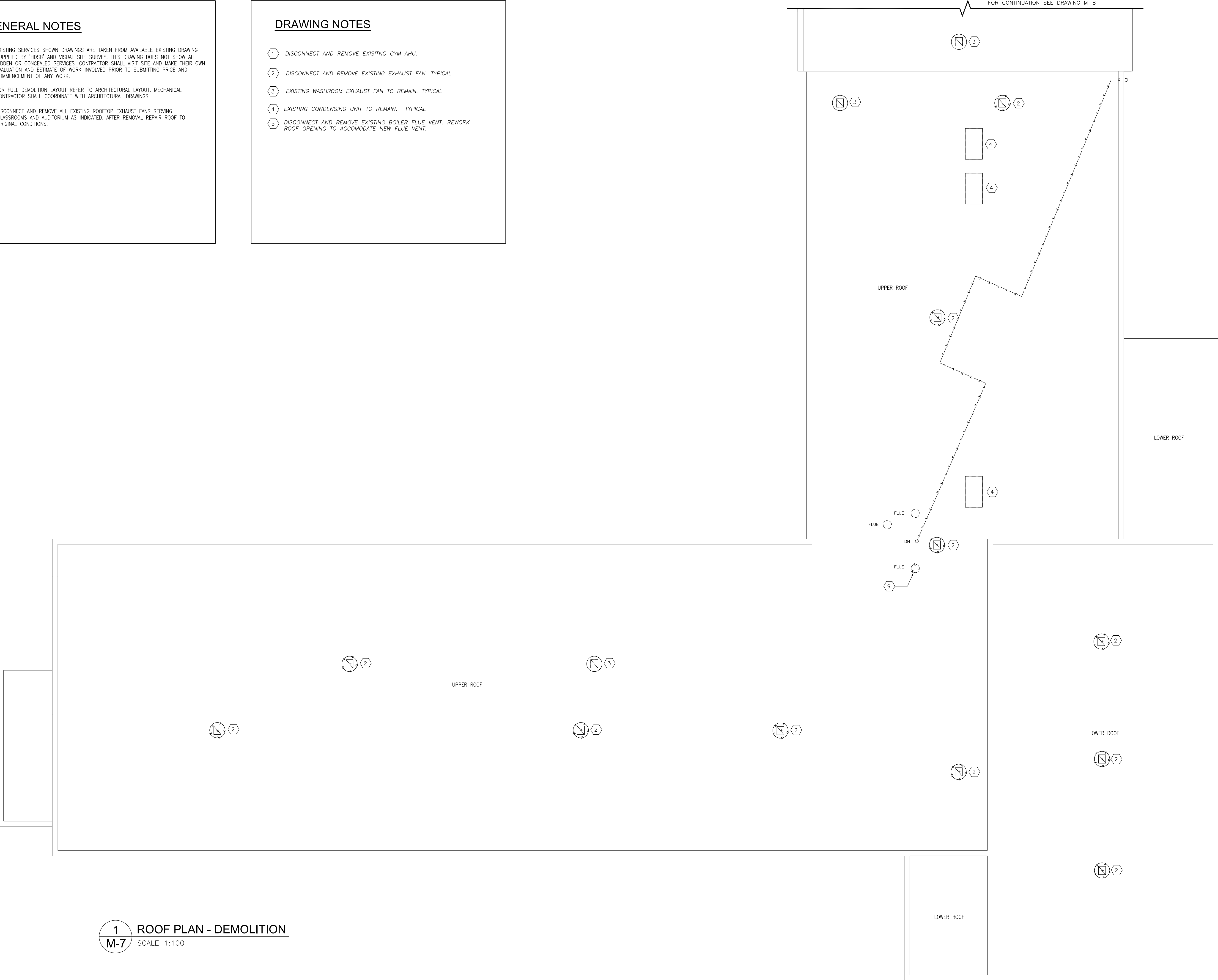
① DISCONNECT AND REMOVE EXISITNG GYM AHU.

② DISCONNECT AND REMOVE EXISTING EXHAUST FAN. TYPICAL

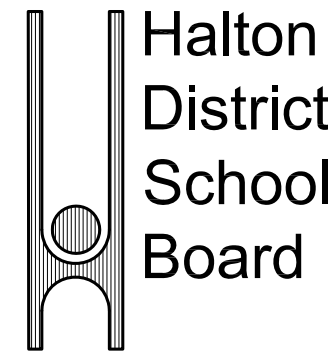
③ EXISTING WASHROOM EXHAUST FAN TO REMAIN. TYPICAL

④ EXISTING CONDENSING UNIT TO REMAIN. TYPICAL

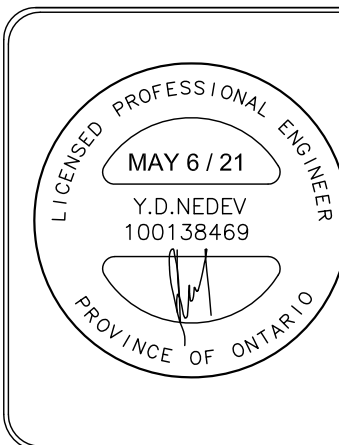
⑤ DISCONNECT AND REMOVE EXISTING BOILER FLUE VENT. REWORK ROOF OPENING TO ACCOMMODATE NEW FLUE VENT.



**1**  
**M-7** **ROOF PLAN - DEMOLITION**  
SCALE 1:100



2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO.	ISSUANCES & REVISIONS	DATE



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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : ROOF PLAN DEMOLITION

Designed: N.P.  
Checked: Y.N.  
Scale: AS SHOWN  
Date: JAN 2021

PNF Project No.

20041

Dwg.No.

**M-7**

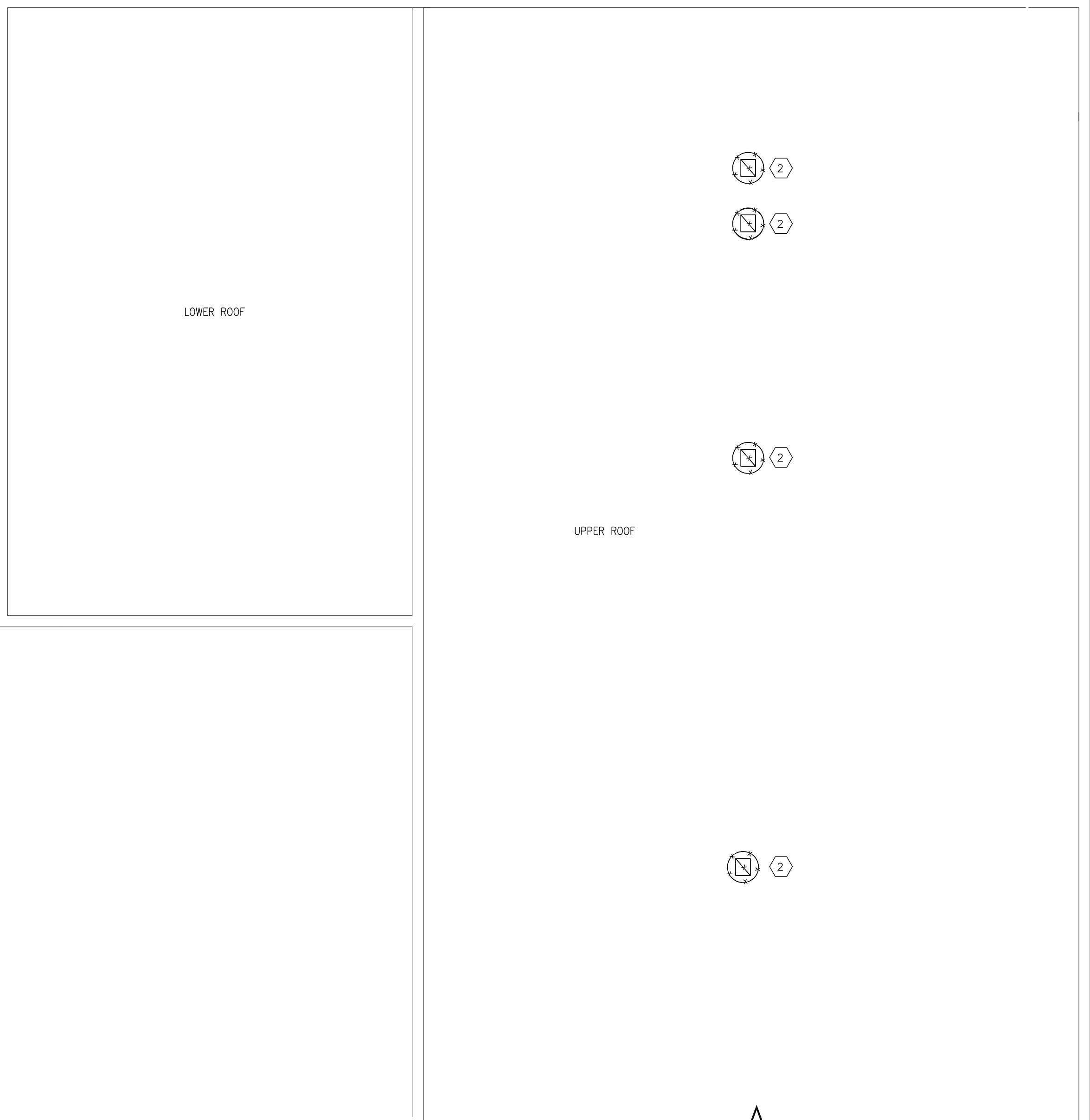
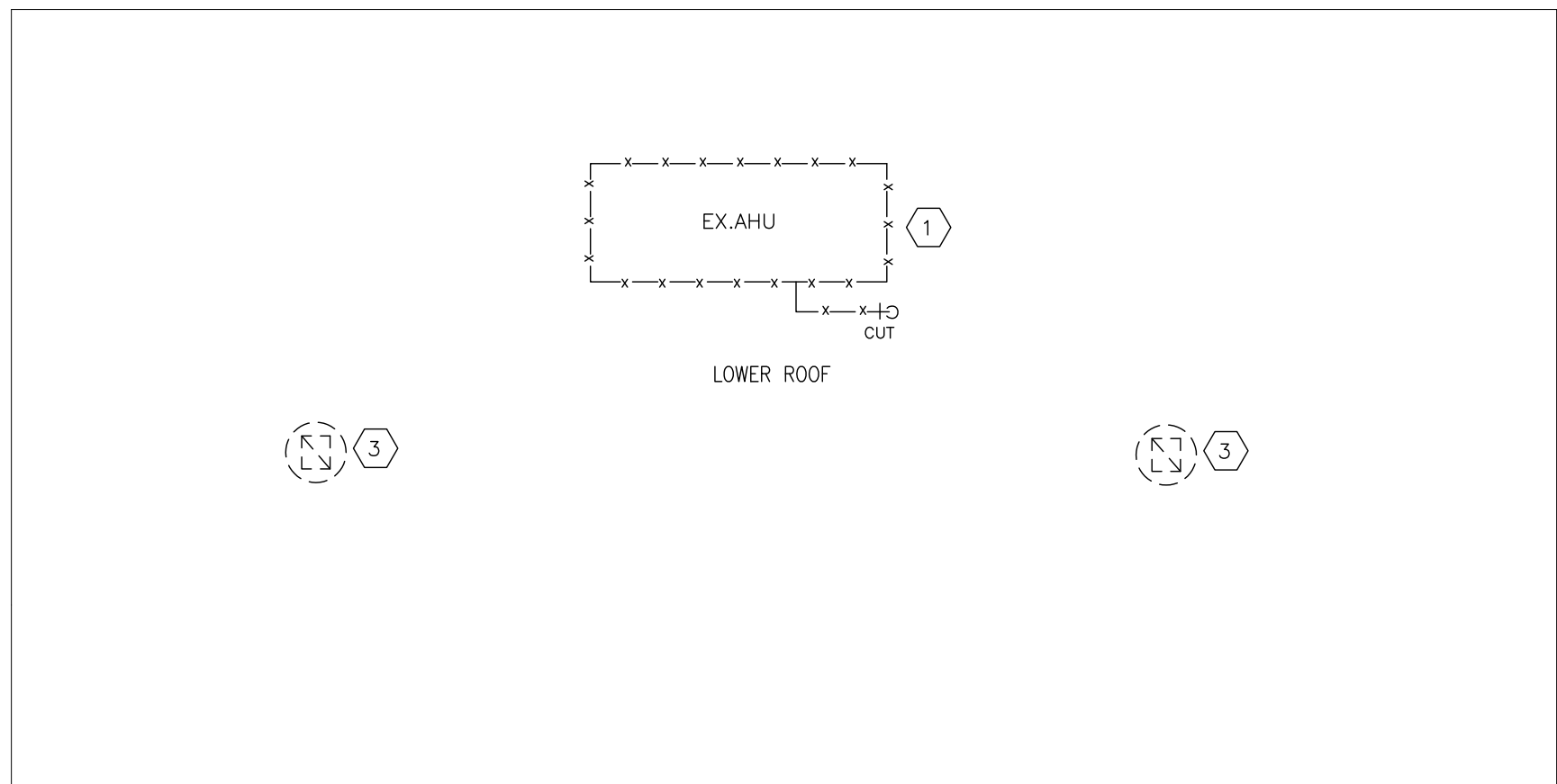


GENERAL NOTES

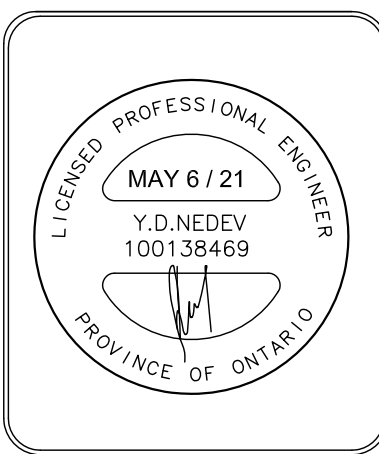
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2.
- FOR FULL DEMOLITION LAYOUT REFER TO ARCHITECTURAL LAYOUT. MECHANICAL CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS.
3.
- DISCONNECT AND REMOVE ALL EXISTING ROOFTOP EXHAUST FANS SERVING CLASSROOMS AND AUDITORIUM AS INDICATED. AFTER REMOVAL REPAIR ROOF TO ORIGINAL CONDITIONS.

DRAWING NOTES

- 1
- DISCONNECT AND REMOVE EXISITNG GYM AHU.
- 2
- DISCONNECT AND REMOVE EXISTING EXHAUST FAN SERVING CLASSROOMS. CAP OFF EXISTING ROOF OPENING. REPAIR ROOF. TYPICAL
- 3
- EXISTING WASHROOM EXHAUST FAN TO REMAIN. TYPICAL
- 4
- EXISTING CONDENSING UNIT TO REMAIN. TYPICAL
- 5
- DISCONNECT AND REMOVE EXISTING BOILER FLUE VENT. REWORK ROOF OPENING TO ACCOMODATE NEW FLUE VENT.



2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO.	ISSUANCES & REVISIONS	DATE



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Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : ROOF PLAN DEMOLITION

Designed:	N.P.
Checked:	Y.N.
Scale:	AS SHOWN
Date:	JAN 2021

PNF Project No.	Dwg.No.
20041	M-8

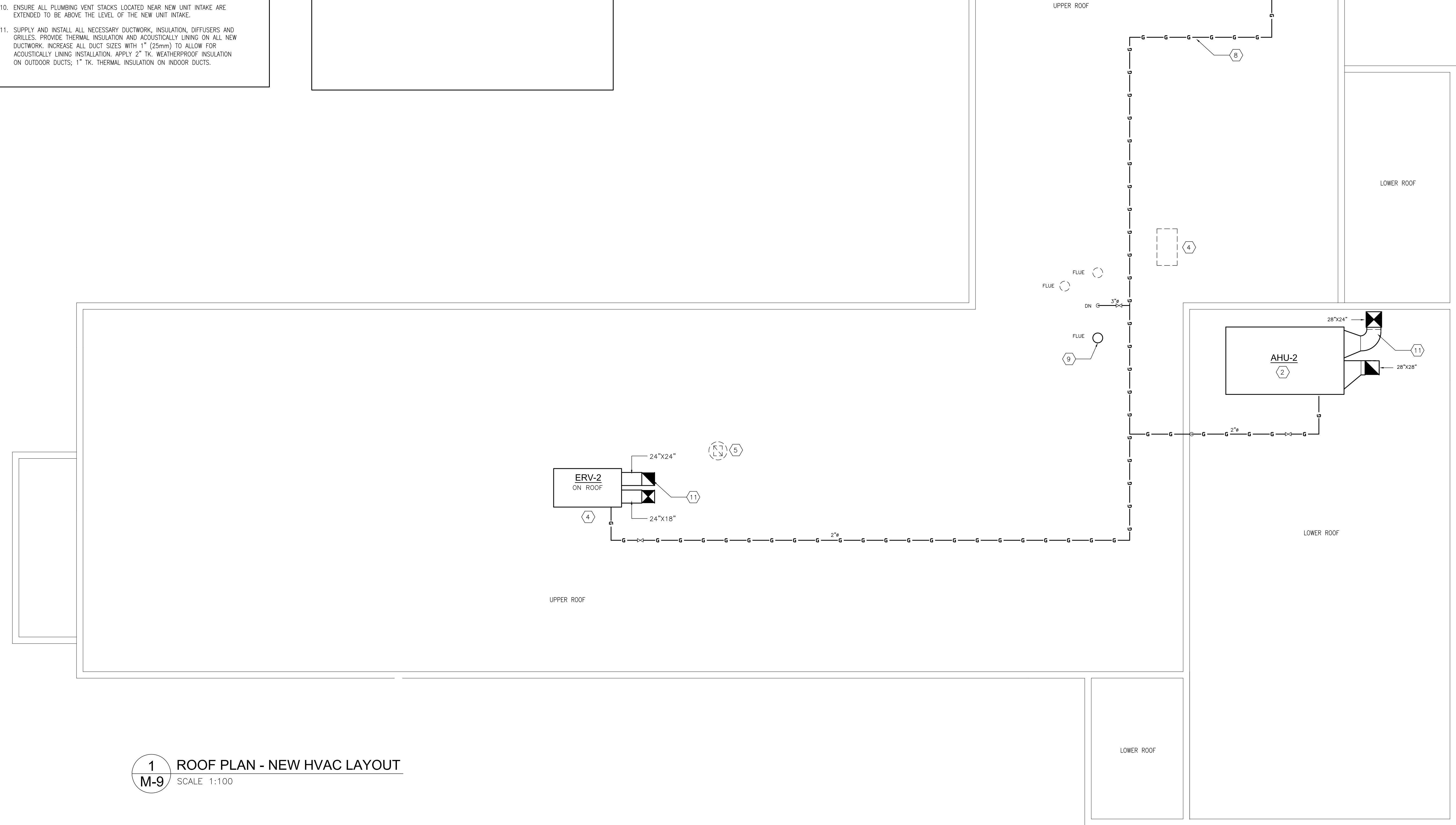
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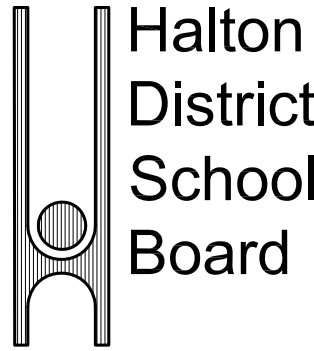
DRAWING NOTES:

- SUPPLY AND INSTALL NEW AHU-1 AS SPECIFIED.
- SUPPLY AND INSTALL NEW AHU-2 AS SPECIFIED.
- SUPPLY AND INSTALL NEW ERV-1 AS SPECIFIED.
- SUPPLY AND INSTALL NEW ERV-2 AS SPECIFIED.
- EXISTING WASHROOM EXHAUST FAN TO REMAIN. TYPICAL
- EXISTING CONDENSING UNIT TO REMAIN. TYPICAL
- EXISTING GAS SERVICES ON GROUND. CONTRACTOR TO COORDINATE WITH LOCAL GAS COMPANY TO ADJUST EXISTING GAS SERVICES FOR ADDITIONAL LOAD OF 2,000 CFH
- NEW GAS PIPING ON ROOF. PROVIDE PROPER ROOF SUPPORT. SEE DETAIL.
- NEW DOUBLE WALL STAINLESS STEEL VENTING THROUGH ROOF FOR NEW BOILER. REPAIR ROOF AFTER INSTALLATION.
- MODIFY EXISTING SUPPLY AND RETURN DUCTWORK IN CHANGE ROOM CEILING IN ORDER TO ACCOMMODATE NEW INSTALLATION.
- NEW DUCTWORK ON ROOF. PROVIDE PROPER DUCT SUPPORT.

FOR CONTINUATION SEE DRAWING M-10



1 ROOF PLAN - NEW HVAC LAYOUT  
M-9 SCALE 1:100



2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO. ISSUANCES & REVISIONS		DATE



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Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : ROOF PLAN  
NEW HVAC LAYOUT

Designed: N.P.  
Checked: Y.N.  
Scale: AS SHOWN  
Date: JAN 2021

PNF Project No.

20041

Dwg.No.

M-9

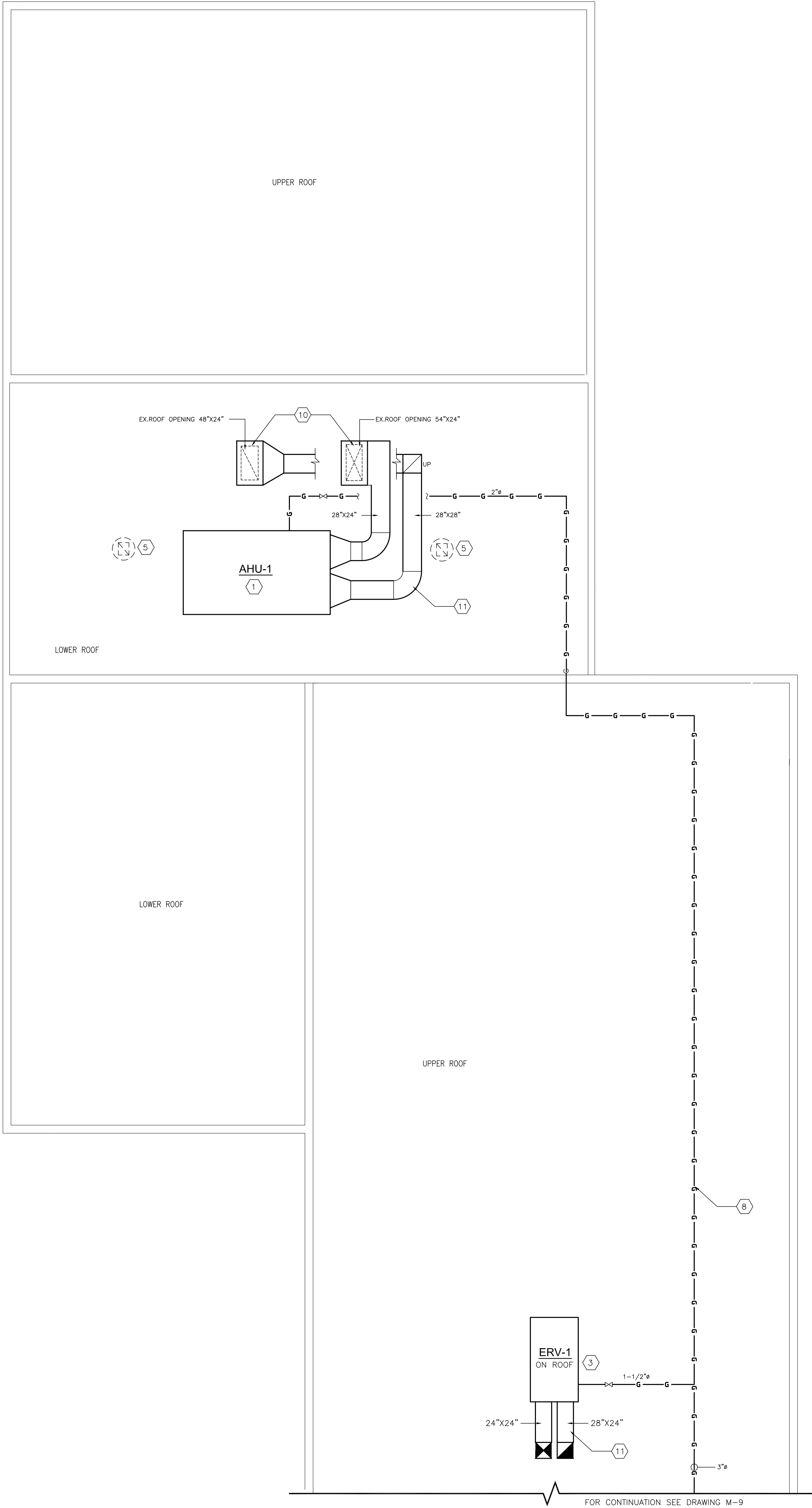
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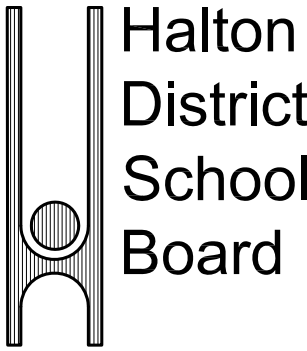
DRAWING NOTES

- SUPPLY AND INSTALL NEW AHU-1 AS SPECIFIED.
- SUPPLY AND INSTALL NEW AHU-2 AS SPECIFIED.
- SUPPLY AND INSTALL NEW ERV-1 AS SPECIFIED.
- SUPPLY AND INSTALL NEW ERV-2 AS SPECIFIED.
- EXISTING WASHROOM EXHAUST FAN TO REMAIN. TYPICAL
- EXISTING CONDENSING UNIT TO REMAIN. TYPICAL
- EXISTING GAS SERVICES ON GROUND. CONTRACTOR TO COORDINATE WITH LOCAL GAS COMPANY TO ADJUST EXISTING GAS SERVICES FOR ADDITIONAL LOAD OF 2,000 CFH
- NEW GAS PIPING ON ROOF. PROVIDE PROPER ROOF SUPPORT. SEE DETAIL.
- NEW DOUBLE WALL STAINLESS STEEL VENTING THROUGH ROOF FOR NEW BOILER. REPAIR ROOF AFTER INSTALLATION.
- MODIFY EXISTING SUPPLY AND RETURN DUCTWORK IN CHANGE ROOM CEILING IN ORDER TO ACCOMMODATE NEW INSTALLATION.
- NEW DUCTWORK ON ROOF. PROVIDE PROPER DUCT SUPPORT.

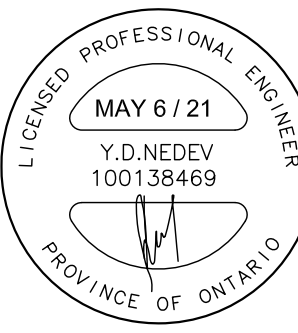
1 ROOF PLAN - NEW HVAC LAYOUT  
M-10 SCALE 1:100



FOR CONTINUATION SEE DRAWING M-9



2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO.	ISSUANCES & REVISIONS	DATE



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Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : ROOF PLAN  
NEW HVAC LAYOUT

Designed: N.P.  
Checked: Y.N.  
Scale: AS SHOWN  
Date: JAN 2021

PNF Project No. 20041

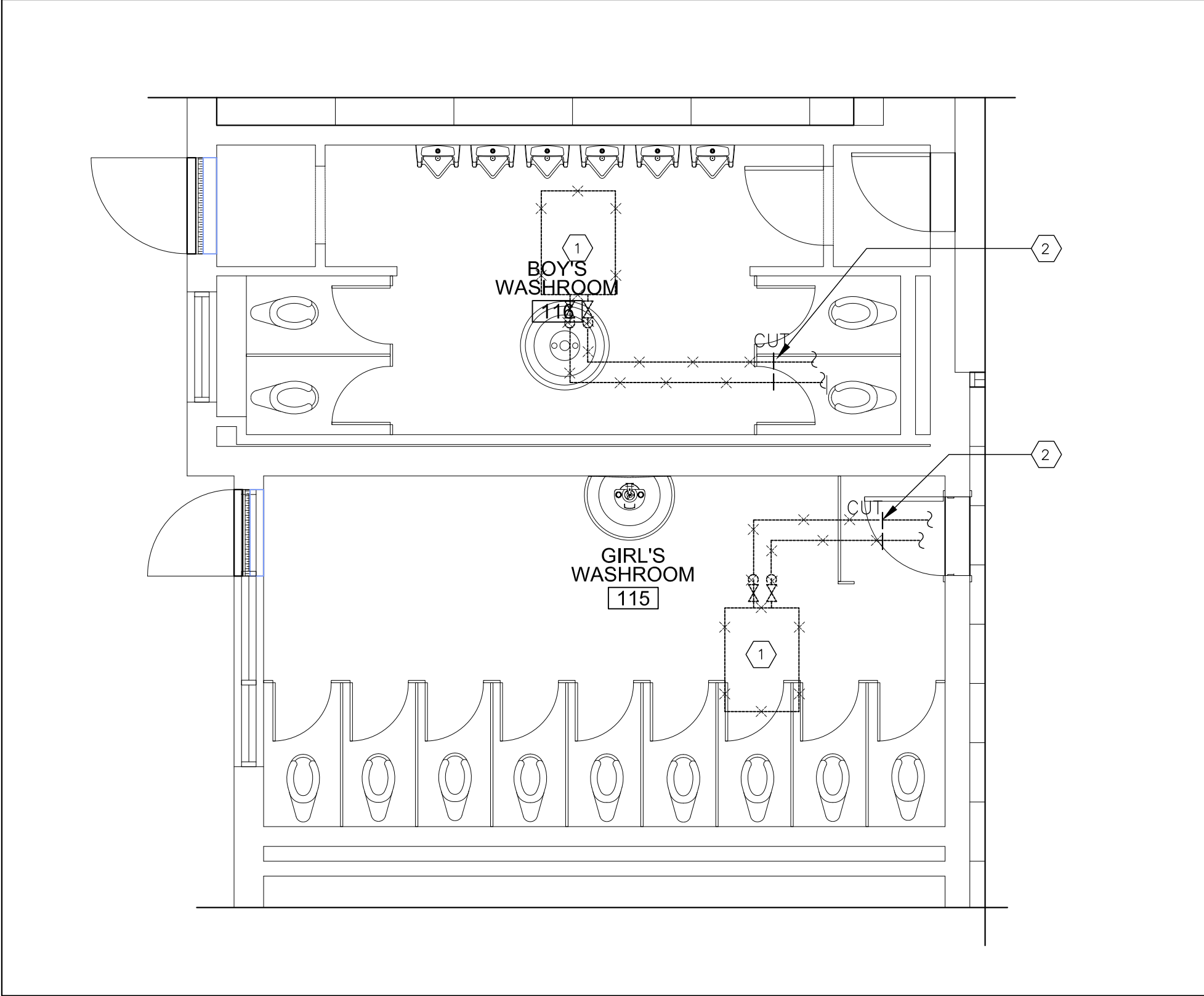
Dwg.No.

M-10

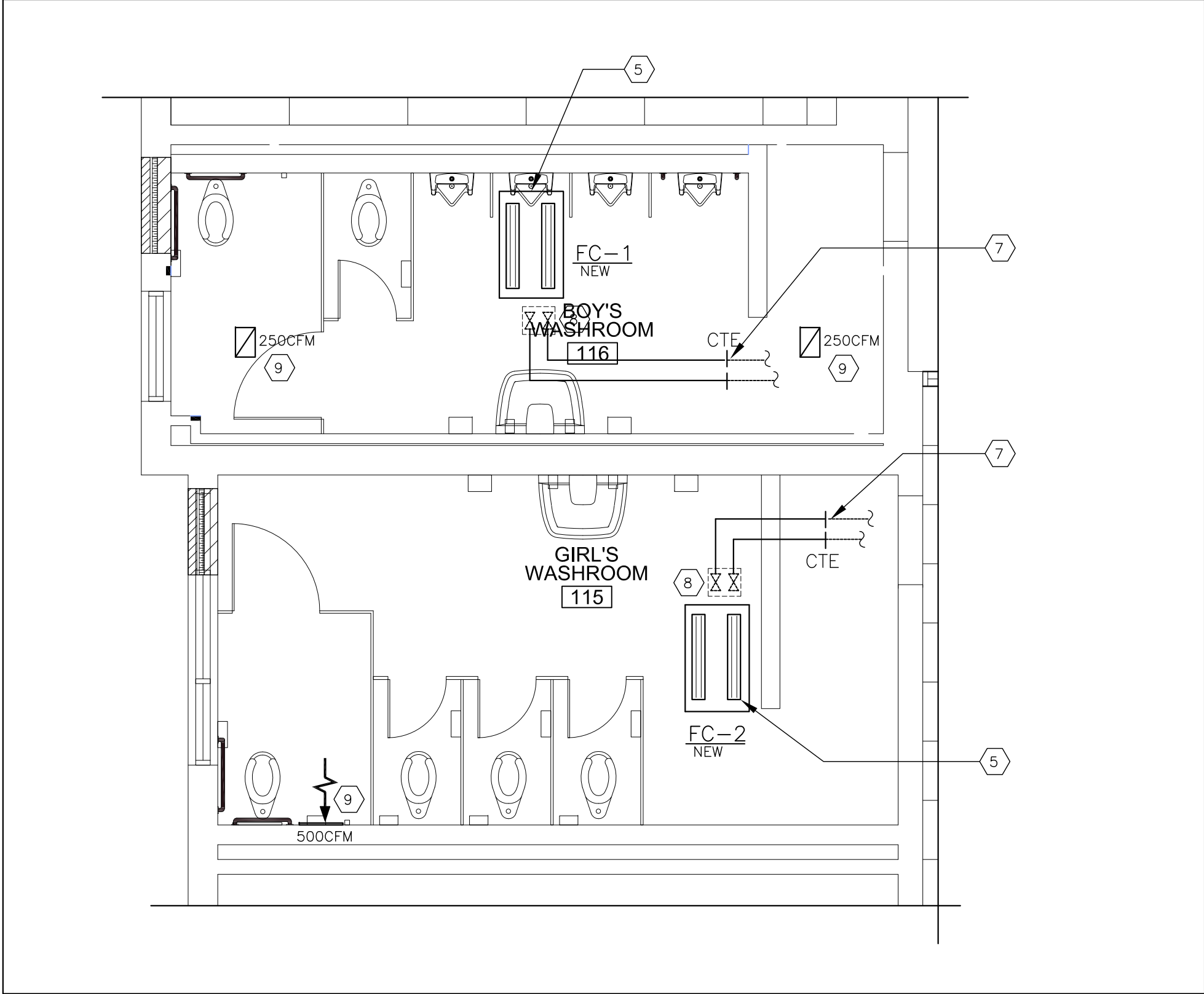








1 HVAC DEMOLITION LAYOUT - GROUND FLOOR WASHROOMS  
M-12 SCALE 1:50



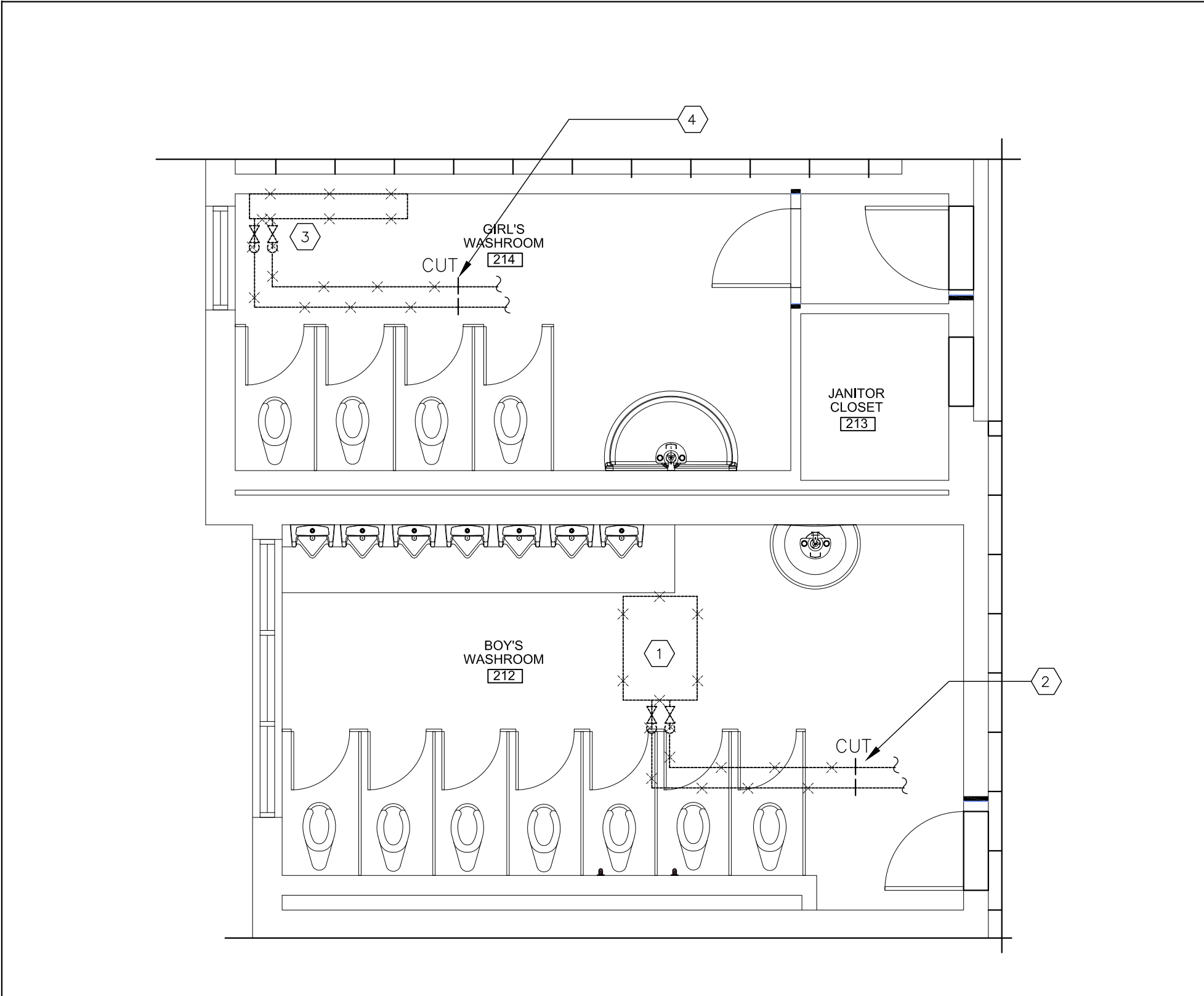
3 HVAC NEW LAYOUT - GROUND FLOOR WASHROOMS  
M-12 SCALE 1:50

DRAWING NOTES

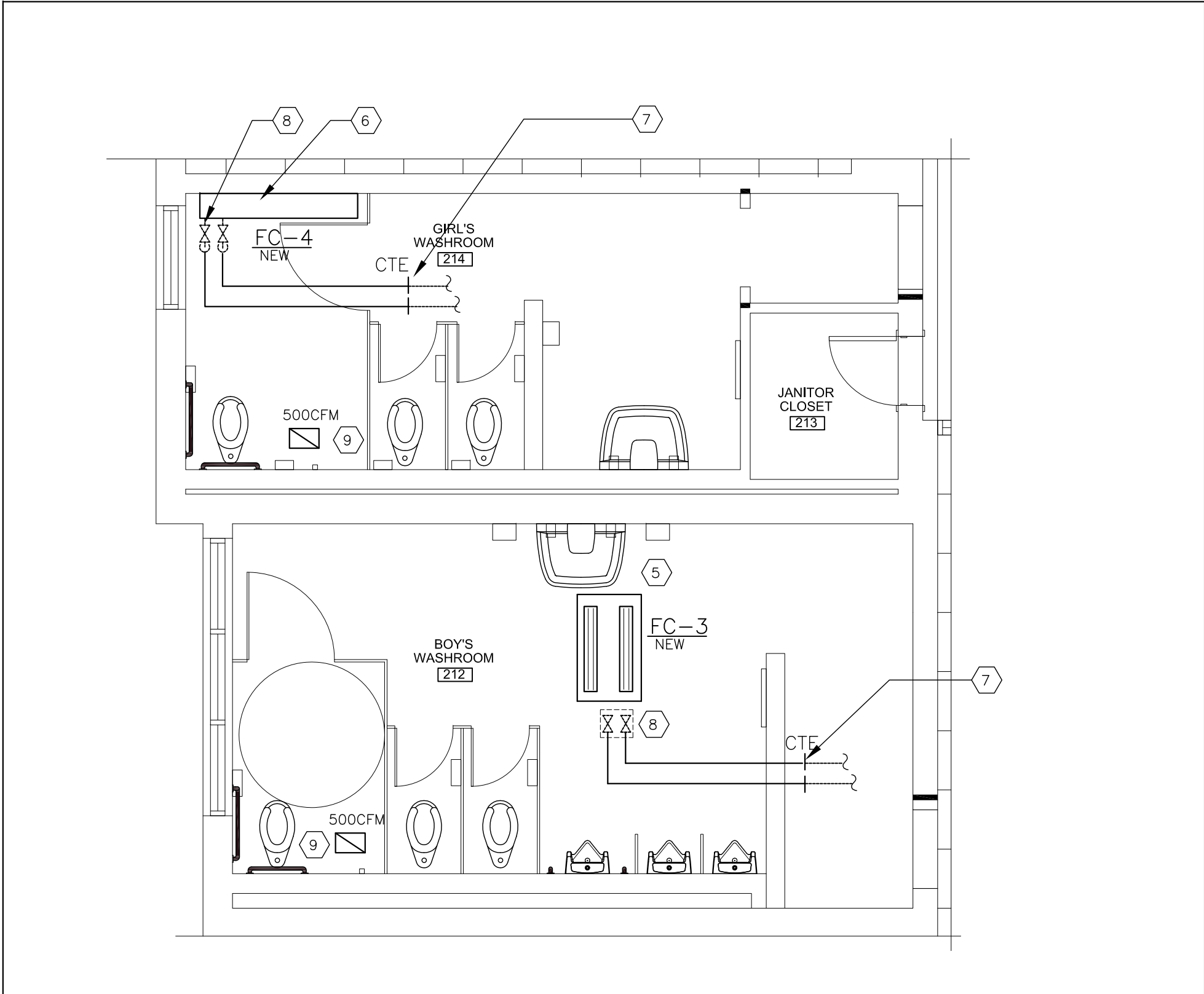
- 1 DISCONNECT AND REMOVE EXISTING CEILING SUSPENDED HYDRONIC FORCE FLOW HEATER AND CONTROLS.
- 2 CUT EXISTING HEATING SUPPLY AND RETURN PIPING IN CEILING SPACE. REMOVE PART OF PIPING DOWNSTREAM. EXACT LOCATION OF EXISTING PIPING TO BE CONFIRMED ON SITE.
- 3 DISCONNECT AND REMOVE EXISTING FLOOR MOUNTED HYDRONIC FORCE FLOW HEATER AND CONTROLS.
- 4 CUT EXISTING HEATING SUPPLY AND RETURN PIPING. REMOVE PART OF PIPING DOWNSTREAM. EXACT LOCATION OF EXISTING PIPING TO BE CONFIRMED ON SITE.
- 5 SUPPLY AND INSTALL NEW CEILING RECESSED HYDRONIC HEATER AND CONTROLS WITH BUILT-IN T'STAT.
- 6 SUPPLY AND INSTALL NEW FLOOR MOUNTED HYDRONIC HEATER AND CONTROLS WITH BUILT-IN T'STAT.
- 7 EXTEND EXISTING HEATING SUPPLY AND RETURN TO SERVE NEW FORCE FLOW HEATER.
- 8 NEW SHUT OFF VALVES. INSTALL NEW CEILING ACCESS PANEL.
- 9 REPLACE ALL EXISTING WASHROOM EXHAUST GRILLES WITH NEW GRILLE AND BALANCING DAMPER. SIZE TO MATCH EXISTING. BALANCE EXISTING EXHAUST GRILLES. MINIMUM AIR FLOW FOR EACH GRILLE IS SHOWN ON DRAWING. SERVICE AND ADJUST EXISTING EXHAUST FAN AS NECESSARY FOR PROPER OPERATION.

FC-1 CEILING RECESSED HYDRONIC CABINET FORCE FLOW HEATER AND CONTROLS 'ROSEMEX' MODEL 'F-300C' HEATING OUTPUT: 30.6 MBH, EWT 200°F AND EAT 160°F, 300 CFM. C/W HINGED PANEL. FINISHING COLOUR WHITE. 115V/1/60, 1.2A. COONNECT HEATER TO BAS CONTROL.

FC-2  
FC-3 FLOOR MOUNTED HYDRONIC CABINET FORCE FLOW HEATER AND CONTROLS 'ROSEMEX' MODEL 'F-300C' HEATING OUTPUT: 30.6 MBH, EWT 200°F AND EAT 160°F, 300 CFM. FINISHING COLOUR WHITE. 115V/1/60, 1.2A. COONNECT HEATER TO BAS CONTROL.



2 HVAC DEMOLITION LAYOUT - SECOND FLOOR WASHROOMS  
M-12 SCALE 1:50



4 HVAC NEW LAYOUT - SECOND FLOOR WASHROOMS  
M-12 SCALE 1:50

NO.	ISSUANCES & REVISIONS	DATE
2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021

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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : WASHROOMS HVAC LAYOUT

Designed: N.P.  
Checked: Y.N.  
Scale: AS SHOWN  
Date: JAN 2021

PNF Project No. 20041  
Dwg.No. M-12



PLUMBING FIXTURES SCHEDULE:

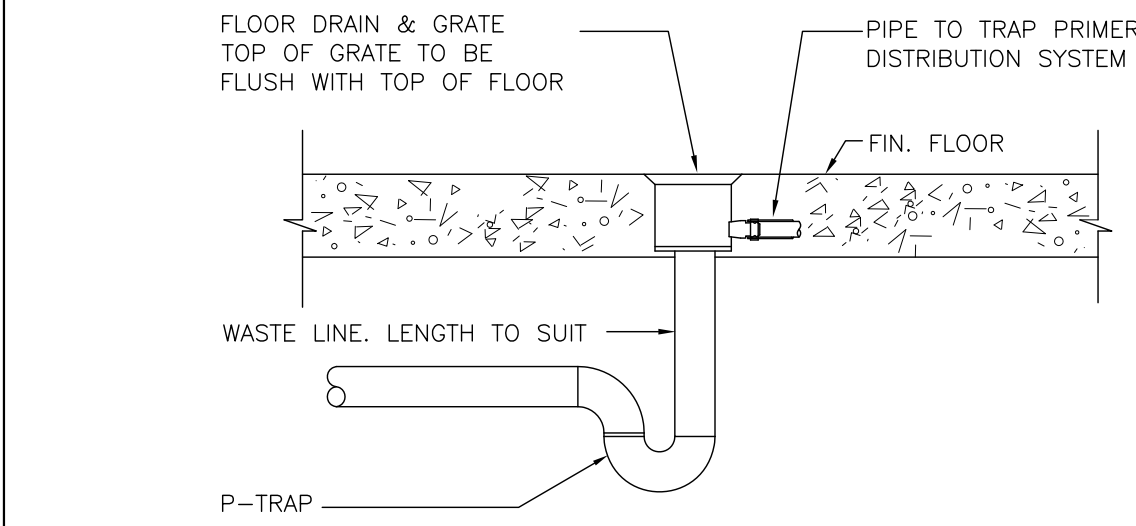
**WC-1** WATER CLOSET BOWL: AMERICAN STANDARD "MADERA" ELONGATED # 3451-128 VITREOUS CHINA FLOOR MOUNTED ELONGATED SYPHON JET ACTION BOWL, 1- $\frac{3}{4}$ " (38MM) TOP SPUD, BOLT CAPS. FLUSH VALVE: SLOAN 111-1.28YD "REGAL" FACTORY SET, INTERNAL ADJ. 1.28 GAL (4.8 L) FLUSH C.P. QUIET ACTION DIAPHRAGM TYPE WITH VACUUM BREAKER, SEAT BUMPER ON ANGLE STOP, PRESSURE LOSS CHECK AND NON-HOLD OPEN FEATURE. SEAT: CENTOCO #500STSC, ELONGATED HEAVY DUTY SOLID PLASTIC OPEN FRONT LESS COVER WITH CHECK HINGES AND CHROMATED STEEL POSTS, WASHERS AND NUTS.

**WC-2** WATER CLOSET: (BARRIER FREE) BOWL-AMERICAN STANDARD "MADERA" ELONGATED # 3461-128, 16- $\frac{3}{4}$ " HIGH VITREOUS CHINA FLOOR MOUNTED ELONGATED SYPHON JET ACTION BOWL, 1- $\frac{3}{4}$ " (38MM) TOP SPUD, BOLT CAPS. FLUSH VALVE: SLOAN 111-1.28YD "REGAL" FACTORY SET, OR TECK #81T201-5, EXTERNAL ADJ. 1.28 GAL (4.8 L) C.P. QUIET ACTION DIAPHRAGM TYPE WITH VACUUM BREAKER, PRESSURE LOSS CHECK AND NON-HOLD OPEN FEATURE. SEAT: CENTOCO #500STSC, ELONGATED HEAVY DUTY SOLID PLASTIC OPEN FRONT, COMPLETE WITH COVER (LID), CHECK HINGES AND CHROMATED STEEL POSTS, WASHERS AND NUTS. INSTALLATION: TO MEET CODE REQUIREMENTS FOR BARRIER FREE ACCESS.

**UR-1** WALL HUNG URINAL - FOR FLUSHOMETER - EXPOSED - MANUAL AMERICAN STANDARD WASHBROOK FLOWISE #6590.001.020 URINAL, VITREOUS CHINA, OPERATES IN THE RANGE OF 0.5 L TO 3.8 L (0.125 US GAL TO 1.0 US GAL) PER FLUSH, WALL HUNG, EXTENDED SIDES FOR PRIVACY, WASHDOWN ACTION, WASHBROOK FLOWISE, FLUSHING RIM, 19 MM (3/4") DIA. TOP SPUD, ELONGATED RIM, INTEGRAL P-TRAP, OUTLET CONNECTION 51 MM (2") 2 WALL HANGERS, #7301242-100 CHROME PLATED, NON-METALLIC STRAINER, WHITE FINISH, SLOAN REGAL, 186-0.5-XL, EXPOSED MANUAL FLUSHOMETER FOR TOP SPUD URINAL, 1.9 L (0.5 US GAL) FACTORY SET FLOW, QUIET ACTION DIAPHRAGM TYPE, NON-HOLD OPEN FEATURE, ADA OSCILLATING HANDLE, BACK-CHECK ANGLE STOP (SCREWDRIVER OPERATED), FLUSH TUBE FOR 202 MM (11-1/2") ROUGH-IN, VACUUM BREAKER, WATTS #CA-321 FIXTURE CARRIER, MOUNTED ON CONCRETE FLOOR, STEEL HANGER PLATE, HEAVY GAUGE EPOXY COATED STEEL OFFSET UPRIGHTS WITH WELDED FEET SUPPORTS. FOR ONE UNIT: 102 MM (4") FOR TWO TO SIX UNITS IN A ROW: 152 MM (6") FINISHED METAL STUD WALL TO BACK OF PIPE SPACE, WATTS INWCO URINAL WALL ACCESS CLEANOUT, TWO (2) PIECE EXPANDABLE PLUG WITH 102 MM (4") DIAMETER STAINLESS STEEL ACCESS COVER, SECURED WITH VANDAL PROOF STAINLESS STEEL SCREW, CHAMPION M-X SERIES #M-XHUB-2150 DRAIN COUPLING, COUPLING, NO-HUB, TYPE 304 AISI STAINLESS STEEL BAND, TYPE 304 AISI STAINLESS STEEL EYELET, ELASTOMERIC COMPOUND GASKET MEETING THE REQUIREMENTS OF ASTM D-3564, TYPE 304 AISI STAINLESS STEEL SHIELDS PAINTED RED FOR EASY IDENTIFICATION, TESTED TO MAINTAIN 15 PSI MAXIMUM LINE PRESSURE AT 60 INCH LB MIN TO 100 INCH LB MAXIMUM TORQUE BOLT TIGHTNESS, TESTED BY IAPMO TO COMPLY TO FM 1680-1989 STANDARD (EXCEPT FOR MARKINGS) AND CSA B602-2010 STANDARD (UP TO 10"), THEY ARE TESTED AND CERTIFIED TO ASTM C1540-2011 STANDARD, PER OSHPD CODE APPLICATION NOTICE 5-311-9 REVISED 6/29/2011, SIGNED BY PAUL COLEMAN, SECTION 1 (A) STATES THAT: "THE USE OF COUPLINGS THAT HAVE BEEN TESTED TO CONFORM TO THE PERFORMANCE REQUIREMENTS OF FM APPROVALS, APPROVAL STANDARD 1680, CLASS I, BY FM APPROVALS OR BY A NATIONALLY RECOGNIZED INDEPENDENT TESTING AGENCY" ARE ACCEPTABLE.

**HB-1** WASH FOUNTAIN "BRADLEY" TERREON QUADRA-FOUNT MF2944 INFRARED TO ACCOMMODATE 4 USERS. BARRIER-FREE AND VANDAL RESISTANT.

**HB-2** WASH FOUNTAIN "BRADLEY" TERREON TRI-FOUNT MF2933 INFRARED TO ACCOMMODATE 3 USERS. BARRIER-FREE AND VANDAL RESISTANT.



**3** FLOOR DRAIN TYPICAL INSTALLATION DETAIL  
**M-2** N.T.S.

FIXTURE	PIPING CONNECTION SIZE			
	CW	HW	DRAIN	VENT
WC-1	1"	-	3"	1-1/2"
WC-2	1"	-	3"	1-1/2"
UR-1	3/4"	-	2"	1-1/2"
HB-1	1/2"	1/2"	1-1/2"	1-1/4"
HB-2				

GENERAL NOTES:

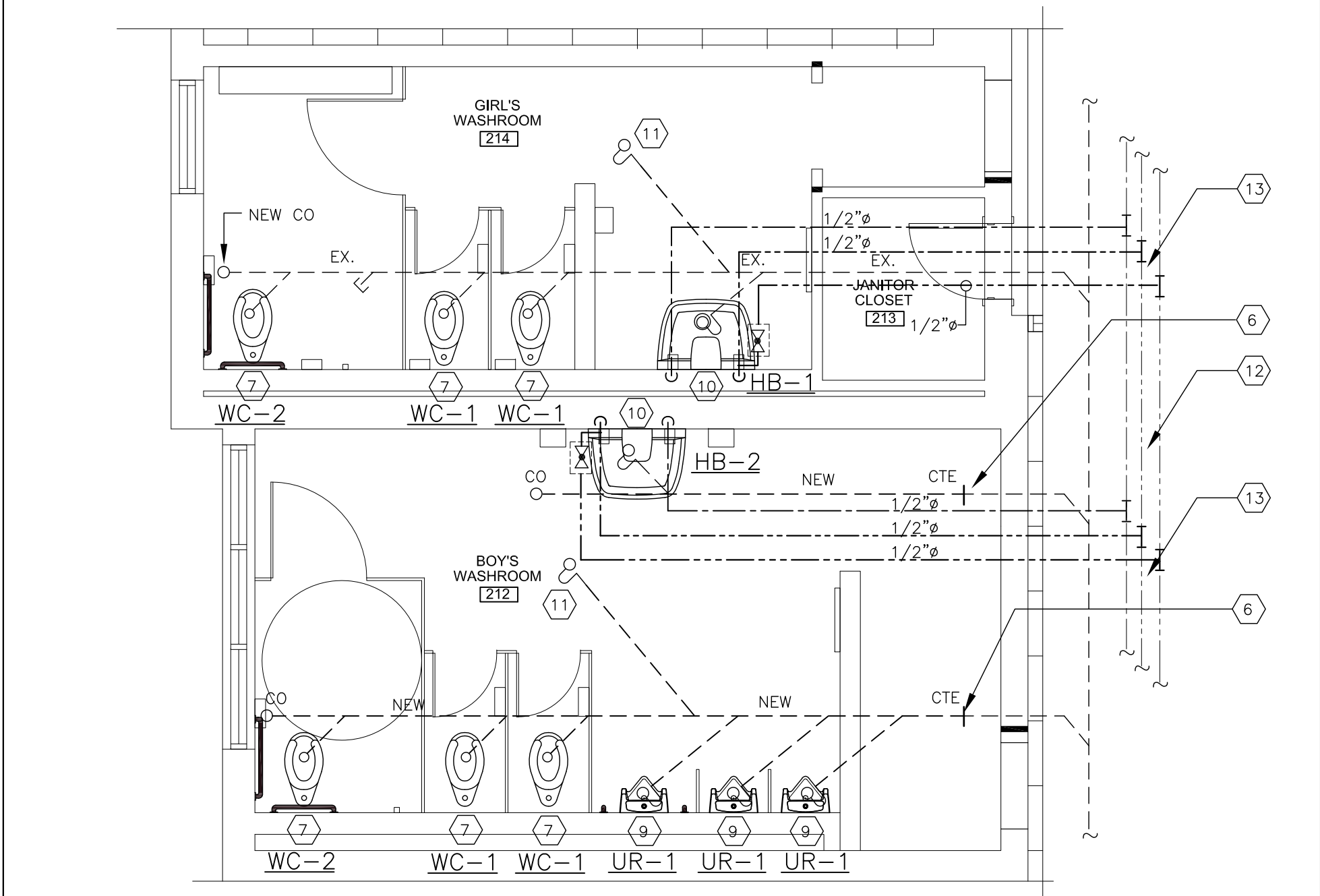
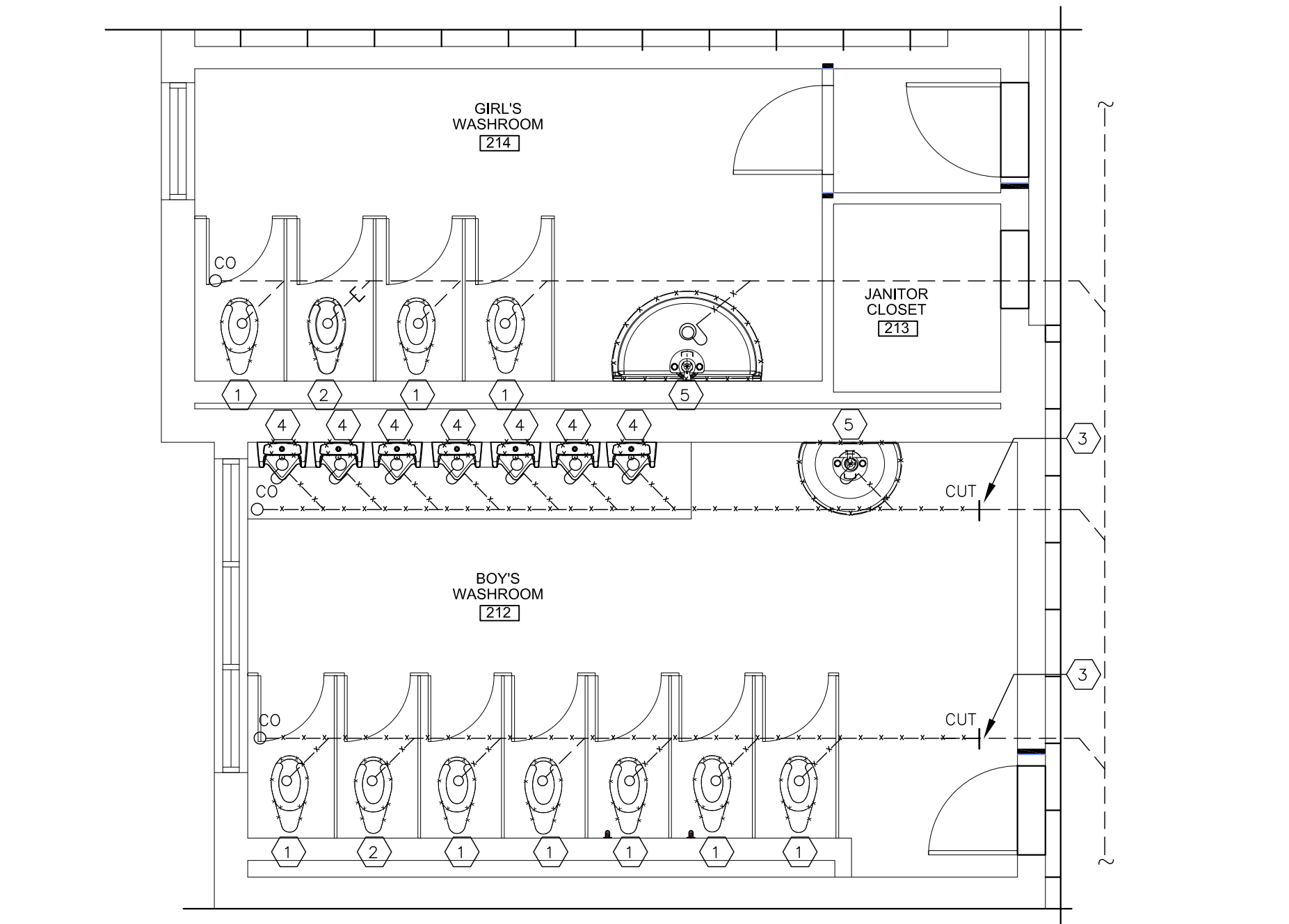
- FOR FULL DEMOLITION LAYOUT REFER TO ARCHITECTURAL LAYOUT. PLUMBING CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS, DISCONNECT AND REMOVE ALL UNUSED PLUMBING FIXTURES, WATER SUPPLY, VENT AND DRAINAGE PIPING.
- REMOVE ALL UNUSED PLUMBING, DRAINAGE AND VENT PIPING. AFTER REMOVAL OF PIPING AND EXISTING PLUMBING FIXTURES REPAIR ALL DISTURBED AREAS.
- LOCATION OF EXISTING PLUMBING SERVICES SHOWN ON DRAWINGS ARE TAKEN FROM AVAILABLE EXISTING PLUMBING DRAWINGS. EXACT LOCATION SHALL BE CONFIRMED ON SITE BY CONTRACTOR.
- CLEAN AND FLUSH ALL RE-USED EXISTING DRAINAGE PIPING BEFORE CONNECTING NEW PLUMBING FIXTURES.

DRAWING NOTES

- DISCONNECT AND REPLACE EXISTING WC, REWORK AND REUSE EXISTING DRAINAGE AND WATER CONNECTION FOR NEW FIXTURE. FOR MORE DETAILS SEE NEW PLUMBING LAYOUT.
- DISCONNECT AND REMOVE EXISTING WC, CUT AND CAP OFF EXISTING UNUSED WATER, DRAINAGE AND VENT PIPING.
- CUT EXISTING SANITARY DRAIN, REMOVE PART OF DRAIN UPSTREAM AS SHOWN, FOR CONTINUATION SEE NEW PLUMBING LAYOUT.
- DISCONNECT AND REMOVE EXISTING URINALS. REMOVE EXISTING WATER TANK, CUT AND CAP OFF EXISTING UNUSED WATER, DRAINAGE AND VENT PIPING.
- DISCONNECT AND REPLACE EXISTING HALF-BRADLEY, REWORK AND REUSE EXISTING DRAINAGE AND FOR NEW FIXTURE. FOR MORE DETAILS SEE NEW PLUMBING LAYOUT.
- CONNECT NEW DRAIN TO EXISTING, EXTEND DRAIN TO SERVE NEW PLUMBING FIXTURES AS SHOWN, SIZE TO MATCH EXISTING.
- REPLACE EXISTING TOILET WITH NEW, RECONNECT EXISTING PLUMBING AND DRAINAGE PIPING, REPLACE EXISTING ISOLATION VALVES.
- SUPPLY AND INSTALL NEW TOILET AS SPECIFIED, REWORK EXISTING AND PROVIDE NEW DRAINAGE, VENT AND WATER CONFECTION AS REQUIRED TO ACCOMMODATE NEW FIXTURE.
- SUPPLY AND INSTALL NEW URINAL AS SPECIFIED, REWORK EXISTING AND PROVIDE NEW DRAINAGE, VENT AND WATER CONFECTION AS REQUIRED TO ACCOMMODATE NEW FIXTURE.
- SUPPLY AND INSTALL NEW HB-1 AND HB-2 AS SPECIFIED, REWORK EXISTING AND PROVIDE NEW DRAINAGE AND VENT AS REQUIRED TO ACCOMMODATE NEW FIXTURE, PROVIDE NEW PLUMBING
- SUPPLY AND INSTALL NEW 3" FD, SEE TYPICAL INSTALLATION DETAIL ON THIS DRAWING.
- EXISTING CW, HW AND REIR LINES IN CEILING, EXACT LOCATION TO BE CONFIRMED ON SITE.
- EXTEND NEW CW, HW AND REIRC. LINES TO SERVE NEW PLUMBING FIXTURES AS SHOWN.
- INSTALL NEW BALANCING VALVE, RE-BALANCE ENTIRE EXISTING REIRC. HOT WATER LINES, INSTALL ACCESS PANEL IN NEW DRYWALL CEILING TO ACCESS BALANCING VALVE.

**1** PLUMBING DEMOLITION LAYOUT - GROUND FLOOR WASHROOMS  
**M-13** SCALE 1:50

**3** PLUMBING NEW LAYOUT - GROUND FLOOR WASHROOMS  
**M-13** SCALE 1:50



**2** PLUMBING DEMOLITION LAYOUT - SECOND FLOOR WASHROOMS  
**M-13** SCALE 1:50

**4** PLUMBING NEW LAYOUT - SECOND FLOOR WASHROOMS  
**M-13** SCALE 1:50

NO.	ISSUANCES & REVISIONS	DATE
2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021

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Project Address : 1522 MOUNTAIN GROVE AVE, BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : WASHROOMS PLUMBING LAYOUT

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

PNF Project No.

20041

Dwg.No.

**M-13**



ROOFTOP EQUIPMENT SCHEDULE																						
UNIT No.	MANUFACTURER	MODEL No.	SUPPLY AIR			RETURN/EXHAUST AIR			HEATING CAPACITY		COOLING CAPACITY				HEAT RECOVERY (HEAT PIPE)		ELECTRICAL			APPROXIMATELY OPERATING WEIGHT (lbs)	REMARKS	
			FLOW (CFM)	ESP (in. W.C.)	FAN (HP)	FLOW (CFM)	ESP (in. W.C.)	FAN (HP)	INPUT (MBH)	OUTPUT (MBH)	EAT DB (°F)	WB (°F)	TOTAL (MBH)	SENS. (MBH)	EER	SUMMER EFF.	WINTER EFF.	MCA	MOP			(V/Ph/Hz)
AHU-1	ENGINEERED AIR	FWE285/DJ560	6,000	0.5	7.5HP	6,000	0.5	5HP	600	486	81	70	310	170	11.6	58.6%	61.5%	61.4	70	575/3/60	10,000	
AHU-2	ENGINEERED AIR	FWE285/DJ560	6,000	0.5	7.5HP	6,000	0.5	5HP	600	486	81	70	310	170	11.6	58.6%	61.5%	61.4	70	575/3/60	10,000	
ERV-1	ENGINEERED AIR	FWE103/DJ560	4,500	0.5	5HP	4,500	0.5	3HP	500	405	81	70	133	75	11.6	59.0%	62.1%	30.0	35	575/3/60	8,800	
ERV-2	ENGINEERED AIR	FWE73/DJ540	3,200	0.5	5HP	3,200	0.5	2HP	375	304	81	70	99	56	12.9	59.8%	63.0%	26.4	30	575/3/60	8,100	
NOTES: 1. UNITS SHALL BE SUPPLIED WITH VARIABLE FREQUENCY DRIVES (VFD), 120V POWERED GFI SERVICE RECEPTACLE, ECONOMIZER, REMOTE CONTROL PANEL C/W SYSTEM ON/OFF, HEAT ON/OFF, FAN ON LIGHT, BURNER ON LIGHT, S/A TEMPERATURE SELECTOR, CO ALARM ON LIGHT; AND DISCHARGE AIR TEMPERATURE SENSOR. 2. CONNECT NEW UNITS TO EXISTING FIRE ALARM SYSTEM. PERFORM TESTING AND VERIFICATION 3. NEW UNIT SHALL BE CONNECTED TO BUILDING AUTOMATION SYSTEM (BAS) 4. UNITS SHALL BE INSTALLED ON ROOF SLEEPERS. SEE STRUCTURAL DRAWINGS FOR DETAILS.																						

UNIT VENTILATORS SCHEDULE																										
EQUIPMENT TAG	AREA SERVED	MANUFACTURER AND MODEL	EQUIPMENT DESCRIPTION	AIR FLOW (CFM)	MINIMUM OUTSIDE AIR (CFM)	ESP (IN.WC)	HOT WATER COIL						PACKAGED A/C					MOTOR (HP)	ELECTRICAL	MCA (A)	MOP (A)	APPROXIMATE WEIGHT (LBS)	CONTROLS	REMARKS		
							ROWS	FLOW (GPM)	EAT (°F)	LAT (°F)	EW (°F)	LWT (°F)	TOTAL (MBH)	EAT DB (°F)	WB (°F)	TOTAL (MBH)	SENS. (MBH)								EER	
UV-1 TO UV-9	CLASSROOMS	'SOPHOMORE' HPAIQ	VERTICAL SELF CONTAINED A/C UNIT VENTILATOR	800	400	0.25	2	5.0	28.8	88.6	180	160	55.7	80	67	24.0	16.3	11.1	1/2	208/3/60	16.7	20	900	BAS	UNIT SHALL BE C/W ECONOMIZER, BACK PLENUM, 24"H INSULATED TOP DISCHARGE PLENUM (OPENING FOR DUCTWORK TO BE CUT ON SITE BY HVAC CONTRACTOR), AND WALL LOUVER.	
UV-10 UV-11	LIBRARY	'SOPHOMORE' HPAIQ	VERTICAL SELF CONTAINED A/C UNIT VENTILATOR	1,500	450	0.25	2	6.0	49	89.3	180	160	67.4	80	67	45.0	30.6	10.2	3/4	208/3/60	28	40	1200	BAS		
<u>NOTES:</u> 1. UNITS SHALL BE CONNECTED AND CONTROLLED BY NEW BAS. ALL CONTROL WIRING AND PROGRAMMING BY CONTROL CONTRACTOR AS PER SEQUENCE OF OPERATION OUTLINE IN WRITTEN SPECIFICATION. 2. CONTROL CONTRACTOR SHALL SUPPLY: UNIT CONTROLLER, ROOM INTERFACE INCLUDING ROOM TEMPERATURE SENSOR, CO2 MONITORING SENSOR, MIXED AIR TEMPERATURE SENSOR, DISCHARGED AIR TEMPERATURE SENSOR.																										

BOILER TAG	MANUFACTURER AND MODEL NO.	HEATING INPUT (MBH)	HEATING OUTPUT (MBH)	BURNER CONTROL	POWER V/Ph/Hz	REMARKS
HB-1 (EXISTING)	P-K 'THERMIFIC' N-1000	1,000	850	ON/OFF		VERIFY PROPER OPERATION, REPLACE EXISTING PRV, PROVIDE STARTUP AND COMMISSIONING. DISCONNECT EXISTING BAS CONTROL AND PROVIDE CONNECTION TO NEW BAS.
HB-2 (NEW)	P-K 'MODU-FIRE' N-1500	1,500	1,275	MODULATING WITH TURNDOWN RATIO 5:1	120V/60 10A	C/W DOUBLE WALL STAINLESS STEEL VENT KIT (AL-29C), CIRCULATING PUMP, REFER TO PUMP SCHEDULE FOR DETAILS, DRAIN TO NEAREST FLOOR DRAIN. BOILER SHALL BE CONNECTED AND CONTROLLED BY NEW BAS.
NOTE: BOILER SHALL BE INSTALLED AS PER MANUFACTURERS INSTRUCTIONS AND RECOMMENDATIONS						

NEW PUMP SCHEDULE								
PUMP TAG	SERVICE	MANUFACTURER AND MODEL NO.	CAP. USGPM	HEAD FT.	MOTOR			REMARKS
					HP	RPM	V/Ph/Hz <sup>(1)</sup>	
P-1	PRIMARY LOOP PUMP	ARMSTRONG SERIES 4380	220	20	2	1800	230/1/60	VERTICAL INLINE PUMP
P-2 (STAND-BY)	PRIMARY LOOP PUMP	ARMSTRONG SERIES 4380	220	20	2	1800	230/1/60	VERTICAL INLINE PUMP
P-3	HEATING PUMP	ARMSTRONG SERIES 4380	150	70	5	3400	575/3/60	VERTICAL INLINE PUMP C/W VFD, SENSORLESS
P-4 (STAND-BY)	HEATING PUMP	ARMSTRONG SERIES 4300	150	70	5	3400	575/3/60	VERTICAL INLINE PUMP C/W VFD, SENSORLESS
BP-1	BOILER PUMP		125				230/1/60	PUMP SELECTION BY BOILER MANUFACTURER
BP-2 (EX)	BOILER PUMP		85				230/1/60	EXISTING TO REMAIN

DIFFUSER, GRILLE AND REGISTER SCHEDULE				
TYPE	MODEL # 'E.H. PRICE'	DESCRIPTION OR APPLICATION	VOLUME CONTROL DAMPER	REMARKS
'A'	SCD SERIES	SQUIRE CONE DIFFUSER	YES	24"x24" FIRE RATED STEEL DIFFUSER C/W FUSIBLE LINK AND ADJUSTABLE VOLUME DAMPER
'B'	SERIES 520D	SUPPLY AIR	YES	STEEL DOUBLE DEFLECTION C/W OPPOSED BLADE VOLUME DAMPER
'C'	SERIES 520D	SUPPLY AIR	YES	STEEL DOUBLE DEFLECTION C/W OPPOSED BLADE VOLUME DAMPER AND SPIRAL DUCT FRAME
'D'	SERIES 920	SUPPLY AIR GYM	YES	HEAVY DUTY GRILLE, STEEL DOUBLE DEFLECTION C/W OPPOSED BLADE VOLUME DAMPER
'D1'	SERIES 920	SUPPLY AIR AUDITORIUM	YES	HEAVY DUTY GRILLE, STEEL DOUBLE DEFLECTION C/W OPPOSED BLADE VOLUME DAMPER AND SPIRAL DUCT FRAME
'E'	80	RETURN AIR	-	EGGRATE FACE RETURN
'E1'	SERIES 90	RETURN AIR GYM	-	HEAVY DUTY GRILLE, STEEL DOUBLE DEFLECTION
'TR'	SERIES STG	TRANSFER AIR	-	HEAVY DUTY TRANSFER GRILLE, STEEL

LEGEND	
SYMBOL	DESCRIPTION
	DOUBLE OR SINGLE LINE DUCTWORK
	SUPPLY AIR DUCT UP
	SUPPLY AIR DUCT DOWN
	RETURN/EXHAUST AIR DUCT UP
	RETURN/EXHAUST AIR DUCT DOWN
	ROUND DUCT UP
	ROUND DUCT DOWN
	THERMALLY LINED DUCTWORK
	EXISTING DUCTWORK TO BE REMOVED
	FLEXIBLE DUCT CONNECTION
	FLEXIBLE DUCT
	UNDERCUT 3/4"
	VOLUME DAMPER
	BACKDRAFT DAMPER
	FIRE DAMPER
	FIRE/SMOKE DAMPER
	THERMOSTAT
	THERMOSTAT WITH COVER GUARD AND LOCK
	S/MOKE DETECTOR
	TEMPERATURE SENSOR
	DIFFUSER SYMBOL
S/A	SUPPLY AIR
R/A	RETURN AIR
E/A	EXHAUST AIR
O/A	OUTSIDE AIR
G	GAS LINE
AFF	ABOVE FINISH FLOOR
C/W	COMPLETE WITH
W/	WITH
N	NEW
EX.	EXISTING TO REMAIN
CTE	CONNECT TO EXISTING
TYPE  cfm SIZE (in)	DIFFUSER/GRILLE SYMBOL
	EXISTING TO BE REMOVED
	EXISTING TO REMAIN
	NEW WORK
	CONTROL WIRE

ABBREVIATIONS	
ABB.	DESCRIPTION
BAS	BUILDING AUTOMATION SYSTEM
CBV	CIRCUIT BALANCING VALVE
CTE	CONNECT TO EXISTING
VFD	VARIABLE FREQUENCY DRIVE
TYP	TYPICAL
FC	FLEXIBLE CONNECTION
N.I.C.	NOT IN CONTRACT

#### GENERAL NOTES:

- PRIOR TO DEMOLITION ASBESTOS TO BE REMOVED BY LICENCE ASBESTOS CONTRACTOR, IF ANY.
- CONTRACTOR SHALL VERIFY ALL EXISTING PIPING AND DUCTWORK ON SITE PRIOR TO STARTING NEW WORK.
- DRAIN ALL AFFECTED SYSTEMS AND REFILL AFTER WORK IS DONE.
- PRESSURE TEST, FLUSH, CLEAN AND REFILL SYSTEM AFTER WORK IS DONE. PURGE ALL AIR FROM HEATING SYSTEM.
- MAKE GOOD ALL SURFACES AFTER COMLETION OF WORK.
- REMOVE ALL DEBRIS AND RUBBISH FROM SITE DAILY.
- PROVIDE THERMAL INSULATION OF NEW PIPING. REPAIR DAMAGED INSULATION OF EXISTING PIPING AS REQUIRED.
- CONTRACTOR TO ALLOW FOR RELOCATION OF EXISTING SERVICES AS REQUIRED TO ACCOMMODATE NEW EQUIPMENT.

#### INSTALLATION NOTE:

DESIGN DRAWINGS ARE PREPARED BASED ON INFORMATION AVAILABLE FROM EXISTING DRAWINGS AND GENERAL SITE REVIEW OF EXISTING INSTALLATION. CONTRACTOR SHALL CONFIRM ALL INFORMATION ON SITE AND MAKE NECESSARY ADJUSTMENTS TO SUIT SITE CONDITIONS.

2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO.	ISSUANCES & REVISIONS	DATE

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Project Address : 1522 MOUNTAIN GROVE AVE, BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : SCHEDULES AND LEGEND

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

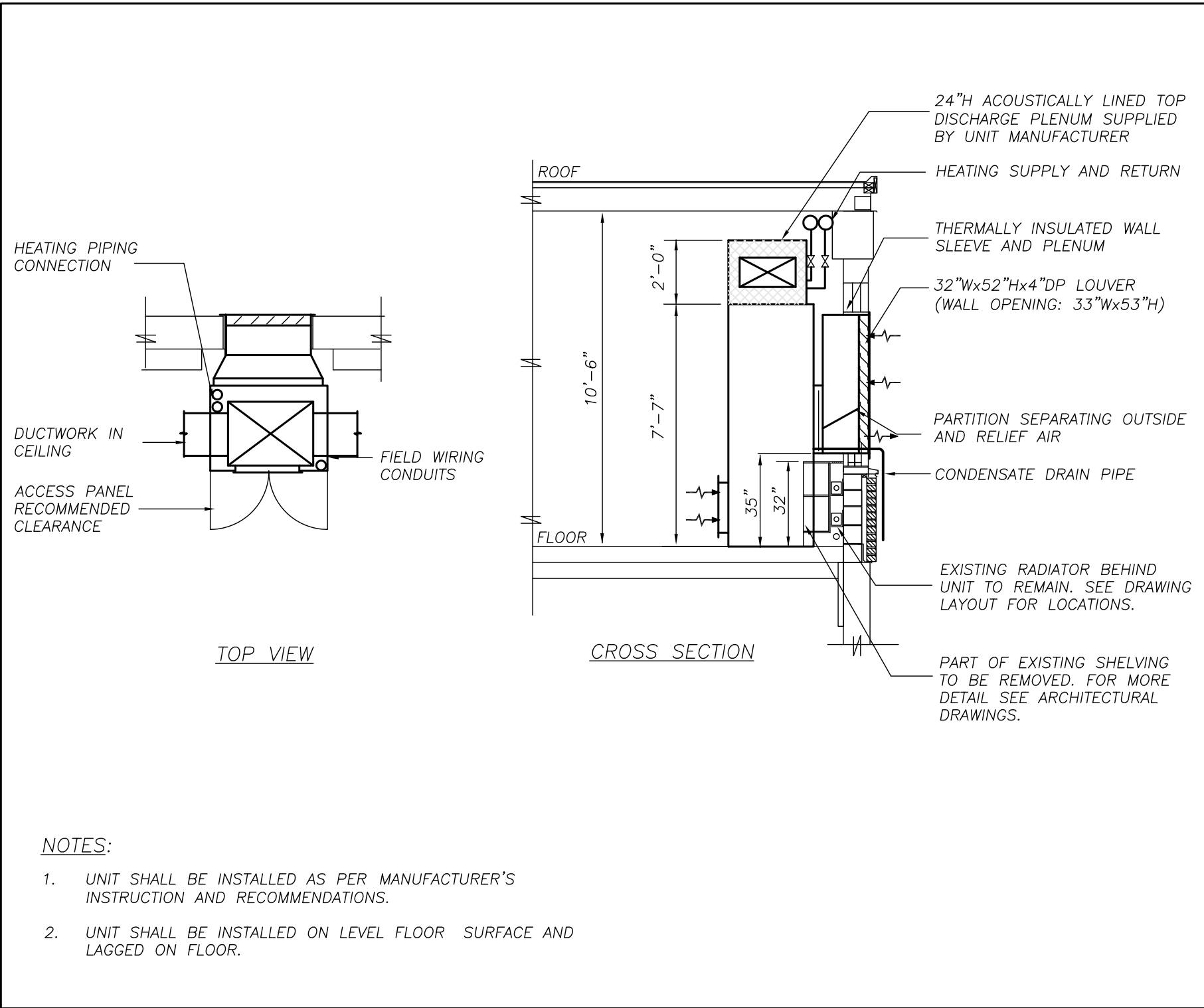
PNF Project No.

20041

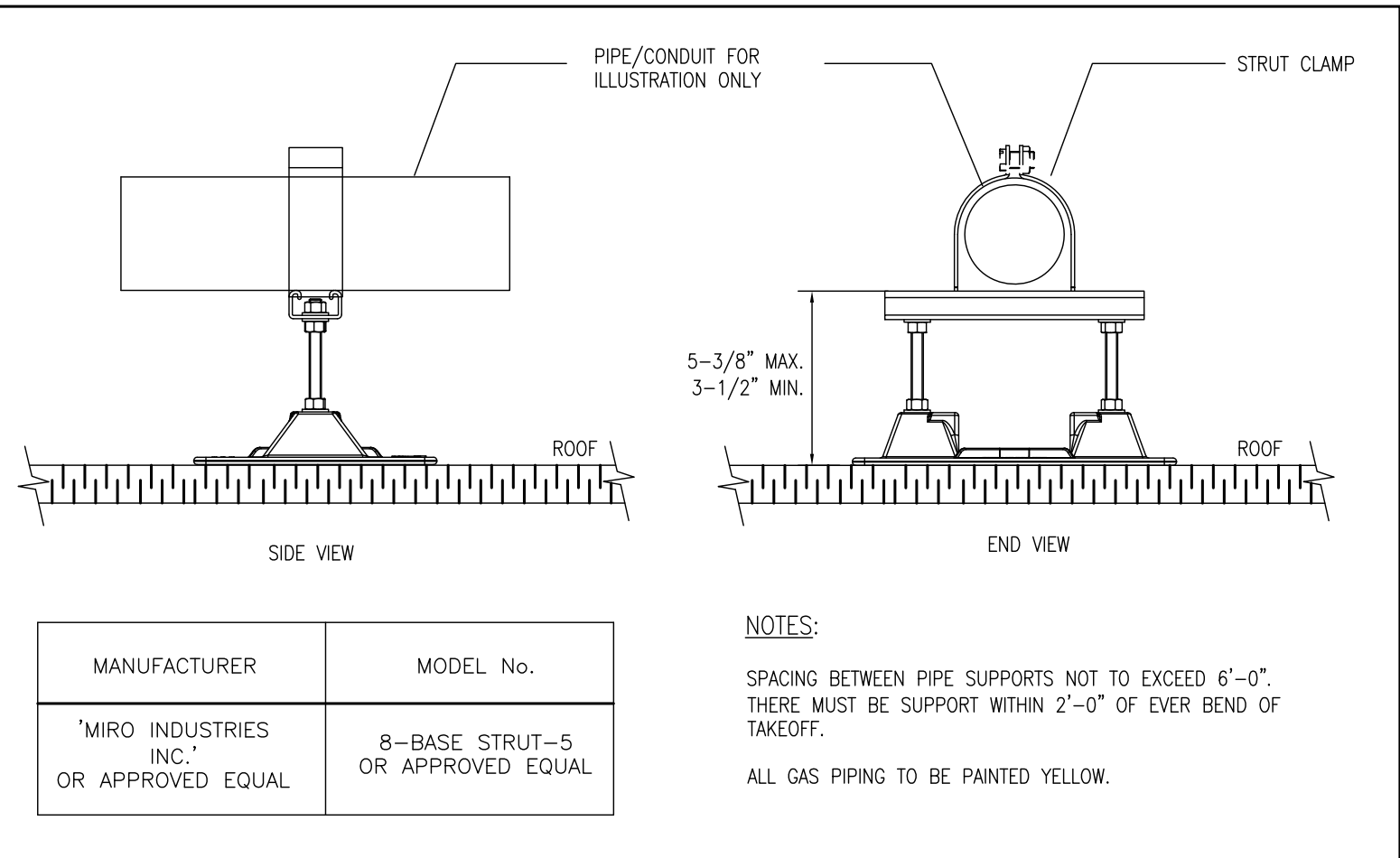
Dwg.No.

M-14

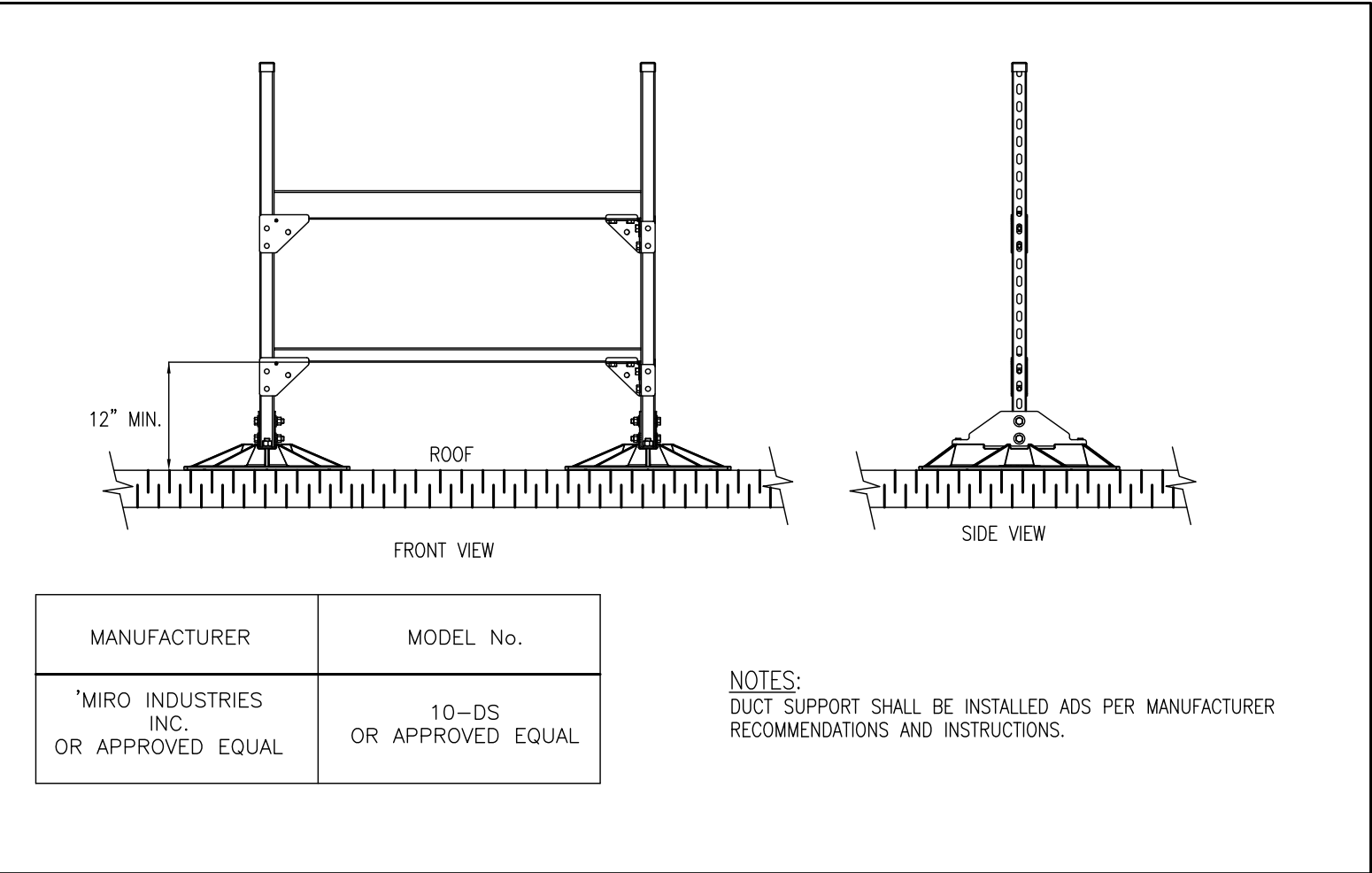




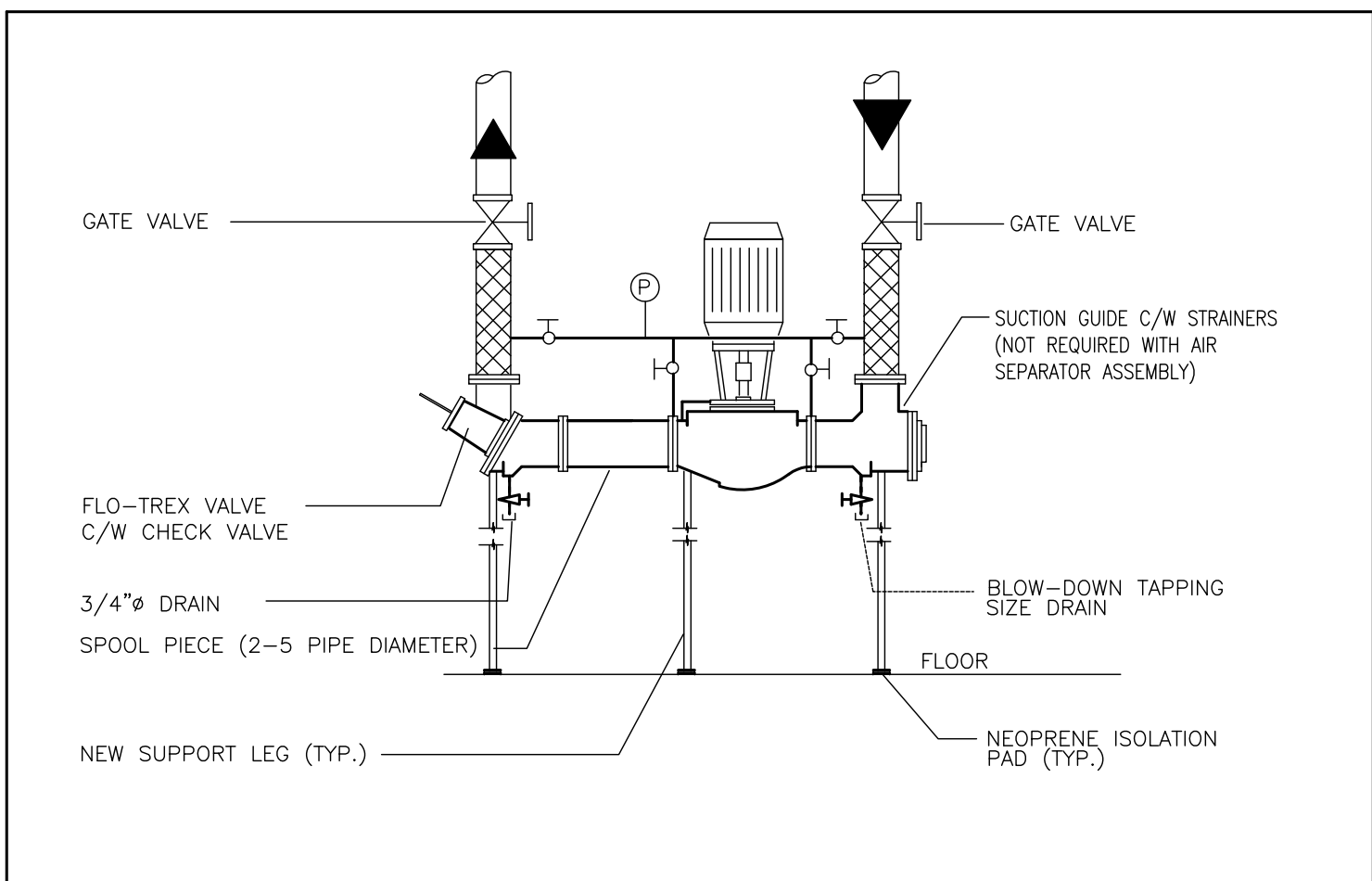
1 UNIT VENTILATOR - TYPICAL INSTALLATION DETAIL  
M-15 N.T.S.



5 GAS PIPING SUPPORT DETAIL  
M-15 SCALE: N.T.S.

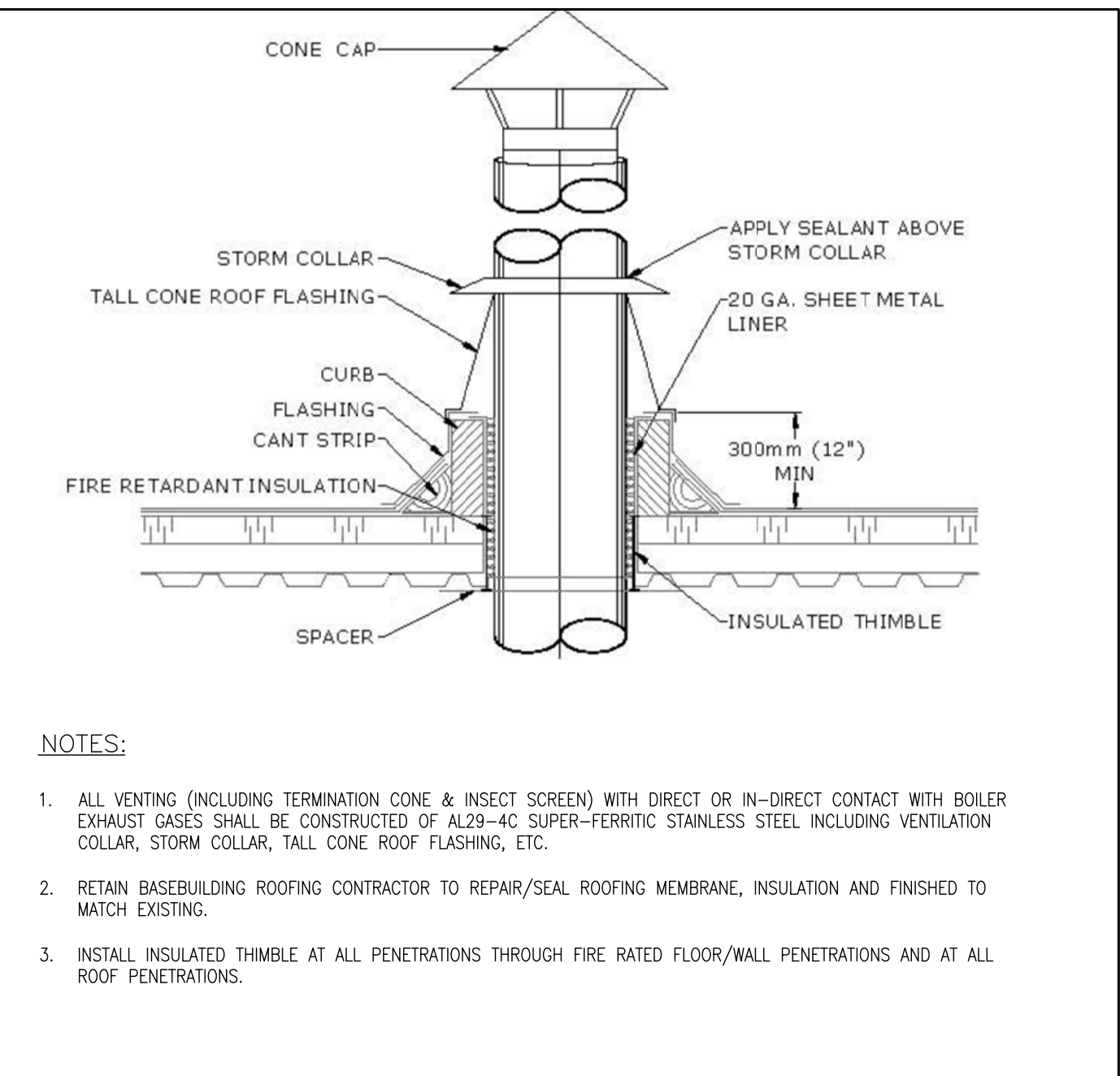


6 DUCT SUPPORT DETAIL  
M-15 SCALE: N.T.S.

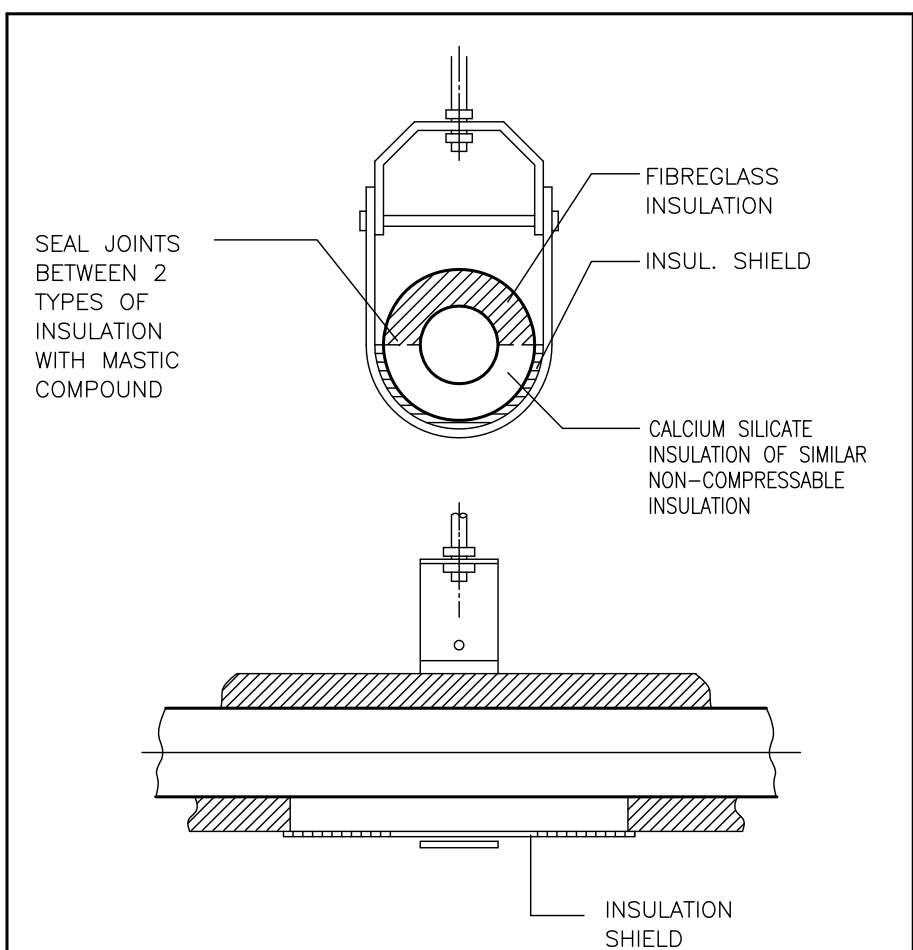


2 VERTICAL PUMP DETAIL  
M-15 SCALE: N.T.S.

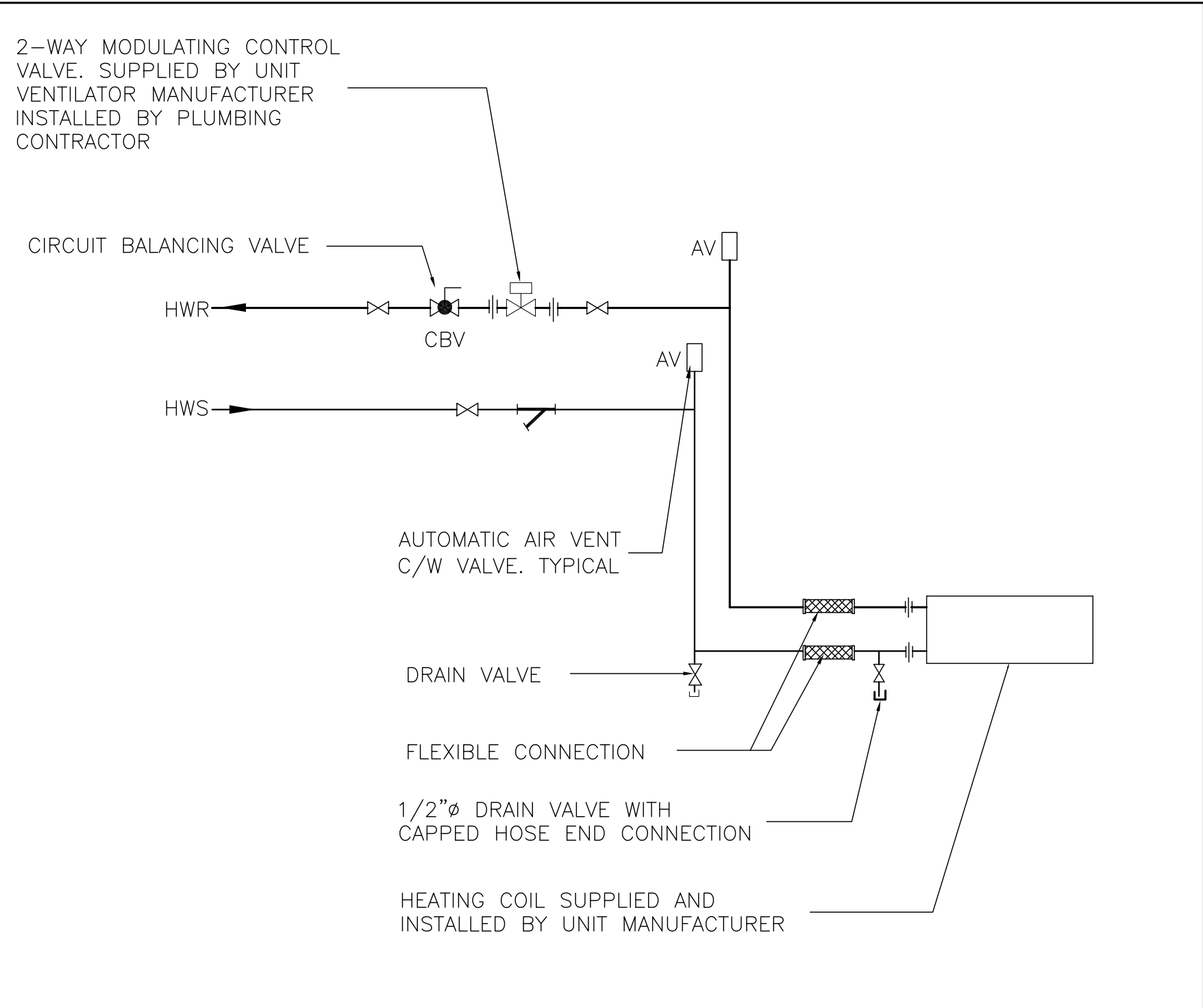
MINIMUM PIPING INSULATION						
TEMP. RANGE (°F)	INSULATION CONDUCTIVITY Btu*in/(hr*ft²*°F)	NOMINAL PIPE DIAMETER (in)				
		<=1"Ø	1 1/4"-2"Ø	2 1/2"-4"Ø	5-6"Ø	>=8"Ø
201-250	0.27-0.30	1.5	1.5	2.0	2.0	3.5
140-200	0.25-0.29	1.5	1.5	1.5	2.0	2.0
40-55	0.23-0.27	0.5	0.75	1.0	1.0	-



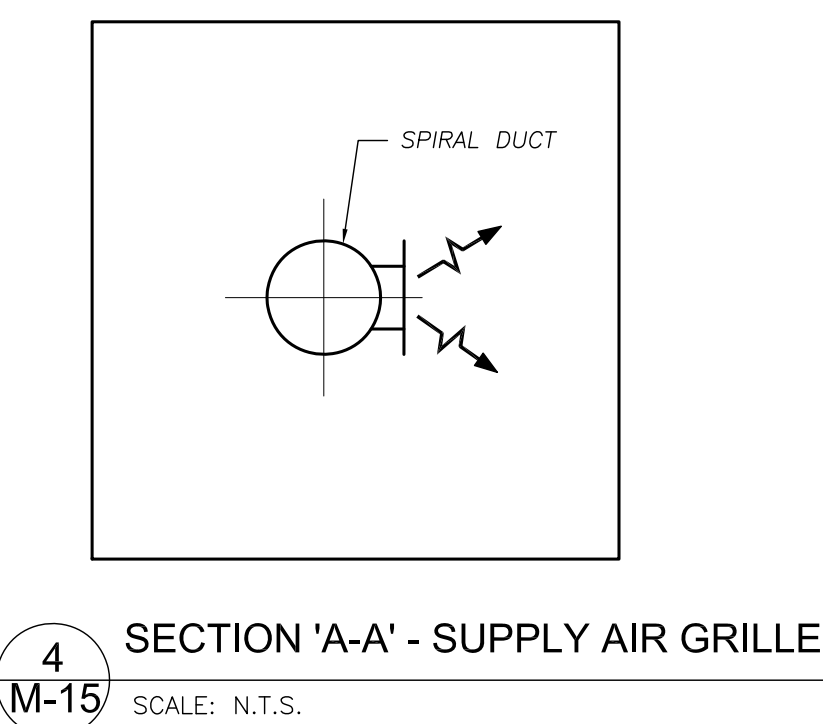
7 TYPICAL VENTING DETAIL  
M-15 N.T.S.



3 PIPING HANGER DETAIL  
M-15 SCALE: N.T.S.



8 UNIT VENTILATOR HOT WATER COIL - PIPING SCHEMATIC  
M-15 N.T.S.



2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO. ISSUANCES & REVISIONS		DATE

**PNF ENGINEERING INC.**  
BUILDING SERVICES ENGINEERS  
4-1290 EGLINTON AVE. EAST  
MISSISSAUGA ONT. L4W 1K8  
T. (905) 625-5322, www.pnfeng.com

LICENSED PROFESSIONAL ENGINEER  
MAY 6 / 21  
Y.D.NEDEV  
100138469  
PROVINCE OF ONTARIO

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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : DETAILS

Designed:	N.P.
Checked:	Y.N.
Scale:	AS SHOWN
Date:	JAN 2021

PNF Project No.	Dwg.No.
20041	M-15

2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO.	ISSUANCES & REVISIONS	DATE



PHASING PLAN:

PHASE 1

- TO BE COMPLETED AUGUST 31, 2021  
(REFER TO DRAWINGS FOR AREA OF WORK FOR EACH ITEM)
1. PREPARATION TO INSTALL ROOFTOP EQUIPMENT (AHU-1, AHU-2, ERV-1 AND ERV-2)
  2. GROUND AND SECOND FLOOR HVAC MODIFICATIONS (DUCTS, PIPING)
  3. GROUND AND SECOND FLOOR - CEILING MODIFICATIONS
  4. GROUND AND SECOND FLOOR - LIGHTING MODIFICATIONS
  5. GROUND AND SECOND FLOOR - WASHROOM RENOVATIONS
  6. MAIN OFFICE RENOVATIONS
  7. MAIN ENTRANCE RENOVATIONS

PHASE 2

- TO BE COMPLETED AUGUST 31, 2022  
(REFER TO DRAWINGS FOR AREA OF WORK FOR EACH ITEM)
1. DEMOLITION OF EXISTING GYMNASIUM AHU
  2. DEMOLITION OF EXISTING EXHAUST FANS FOR CLASSROOMS
  3. DEMOLITION OF EXISTING LIBRARY UNIT VENTILATORS
  4. INSTALLATION AND FINAL CONNECTIONS OF GROUND FLOOR UNIT VENTILATORS
  5. HVAC MODIFICATIONS (DUCTS AND GRILLES) IN GYMNASIUM, LIBRARY AND AUDITORIUM
  6. ROOF UNIT SUPPORTS AND ROOF OPENINGS FOR AHU-1, AHU-2, ERV-1 AND ERV-2
  7. INSTALLATION AND FINAL CONNECTIONS FOR AHU-1, AHU-2, ERV-1 AND ERV-2
  8. BOILER PLANT UPGRADE
  9. INSTALLATION OF NEW BUILDING AUTOMATION SYSTEM (BAS)

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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : PHASING PLAN

Designed: N.P.  
Checked: Y.N.  
Scale: AS SHOWN  
Date: JAN 2021

PNF Project No. 20041

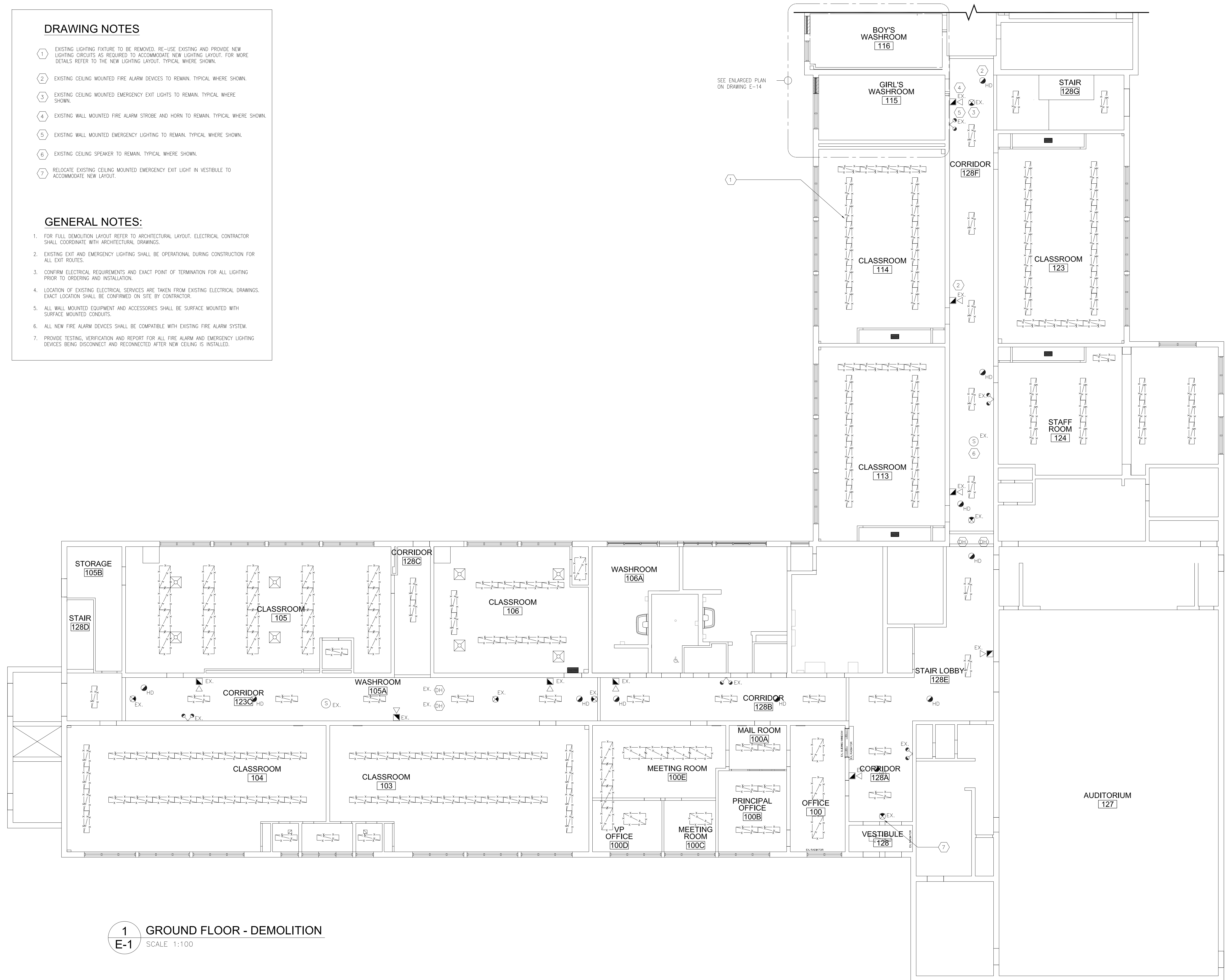
Dwg.No. E-0

## DRAWING NOTES

- EXISTING LIGHTING FIXTURE TO BE REMOVED, RE-USE EXISTING AND PROVIDE NEW LIGHTING CIRCUITS AS REQUIRED TO ACCOMMODATE NEW LIGHTING LAYOUT. FOR MORE DETAILS REFER TO THE NEW LIGHTING LAYOUT, TYPICAL WHERE SHOWN.
- EXISTING CEILING MOUNTED FIRE ALARM DEVICES TO REMAIN. TYPICAL WHERE SHOWN.
- EXISTING CEILING MOUNTED EMERGENCY EXIT LIGHTS TO REMAIN. TYPICAL WHERE SHOWN.
- EXISTING WALL MOUNTED FIRE ALARM STROBE AND HORN TO REMAIN. TYPICAL WHERE SHOWN.
- EXISTING WALL MOUNTED EMERGENCY LIGHTING TO REMAIN. TYPICAL WHERE SHOWN.
- EXISTING CEILING SPEAKER TO REMAIN. TYPICAL WHERE SHOWN.
- RELOCATE EXISTING CEILING MOUNTED EMERGENCY EXIT LIGHT IN VESTIBULE TO ACCOMMODATE NEW LAYOUT.

## GENERAL NOTES:

- FOR FULL DEMOLITION LAYOUT REFER TO ARCHITECTURAL LAYOUT. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS.
- EXISTING EXIT AND EMERGENCY LIGHTING SHALL BE OPERATIONAL DURING CONSTRUCTION FOR ALL EXIT ROUTES.
- CONFIRM ELECTRICAL REQUIREMENTS AND EXACT POINT OF TERMINATION FOR ALL LIGHTING PRIOR TO ORDERING AND INSTALLATION.
- LOCATION OF EXISTING ELECTRICAL SERVICES ARE TAKEN FROM EXISTING ELECTRICAL DRAWINGS. EXACT LOCATION SHALL BE CONFIRMED ON SITE BY CONTRACTOR.
- ALL WALL MOUNTED EQUIPMENT AND ACCESSORIES SHALL BE SURFACE MOUNTED WITH SURFACE MOUNTED CONDUITS.
- ALL NEW FIRE ALARM DEVICES SHALL BE COMPATIBLE WITH EXISTING FIRE ALARM SYSTEM.
- PROVIDE TESTING, VERIFICATION AND REPORT FOR ALL FIRE ALARM AND EMERGENCY LIGHTING DEVICES BEING DISCONNECT AND RECONNECTED AFTER NEW CEILING IS INSTALLED.



NO.	ISSUANCES & REVISIONS	DATE
2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021

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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : GROUND FLOOR  
CEILING  
DEMOLITION

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

PNF Project No.

20041

Dwg.No.

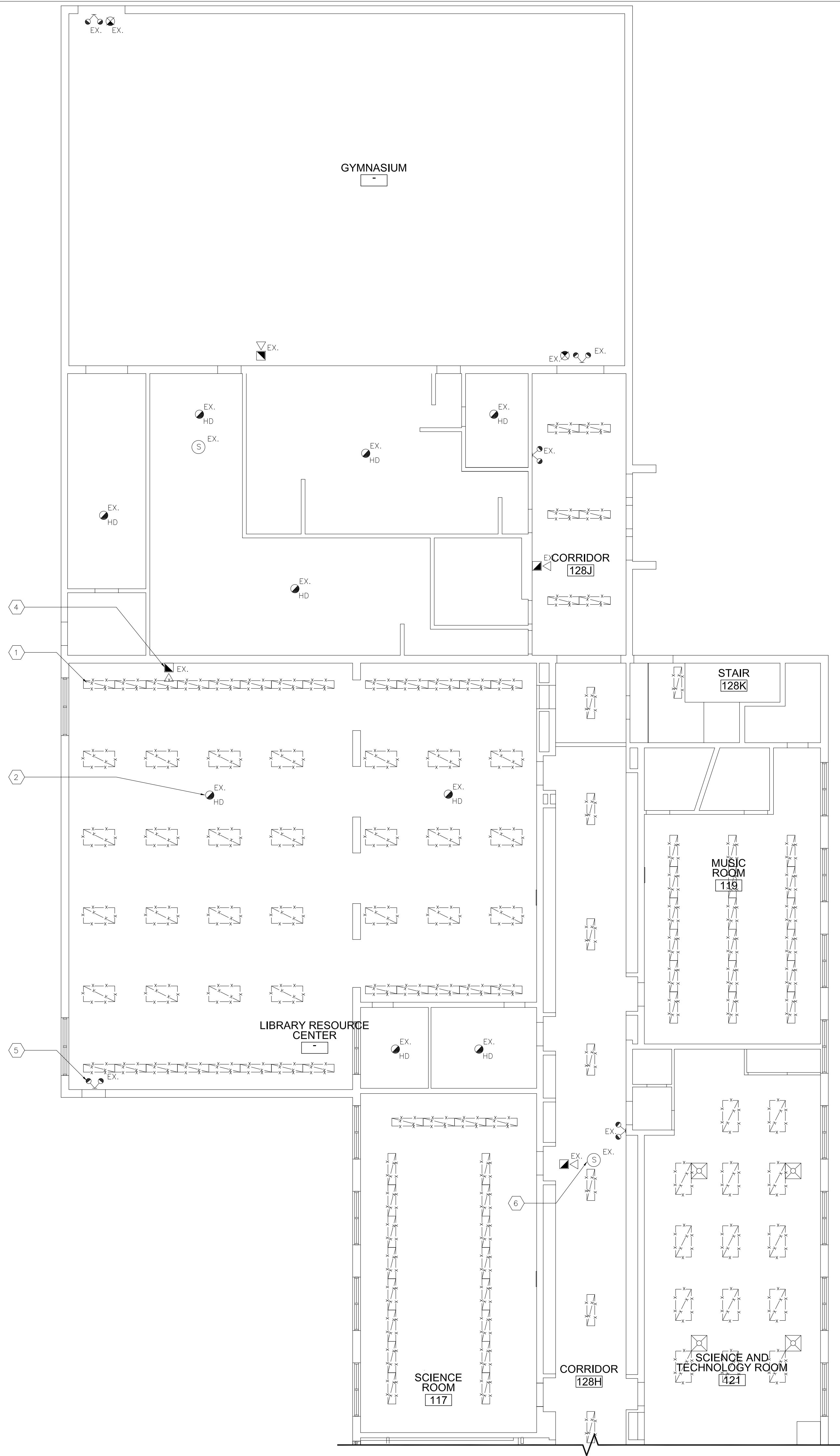
**E-1**

DRAWING NOTES

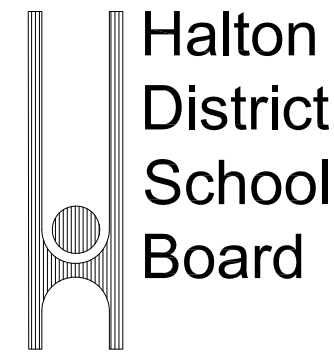
- 1
- EXISTING LIGHTING FIXTURE TO BE REMOVED. RE-USE EXISTING AND PROVIDE NEW LIGHTING CIRCUITS AS REQUIRED TO ACCOMMODATE NEW LIGHTING LAYOUT. FOR MORE DETAILS REFER TO THE NEW LIGHTING LAYOUT. TYPICAL WHERE SHOWN.
- 2
- EXISTING CEILING MOUNTED FIRE ALARM DEVICES TO REMAIN. TYPICAL WHERE SHOWN.
- 3
- EXISTING CEILING MOUNTED EMERGENCY EXIT LIGHTS TO REMAIN. TYPICAL WHERE SHOWN.
- 4
- EXISTING WALL MOUNTED FIRE ALARM STROBE AND HORN TO REMAIN. TYPICAL WHERE SHOWN.
- 5
- EXISTING WALL MOUNTED EMERGENCY LIGHTING TO REMAIN. TYPICAL WHERE SHOWN.
- 6
- EXISTING CEILING SPEAKER TO REMAIN. TYPICAL WHERE SHOWN.

GENERAL NOTES:

1.
- FOR FULL DEMOLITION LAYOUT REFER TO ARCHITECTURAL LAYOUT. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS.
2.
- EXISTING EXIT AND EMERGENCY LIGHTING SHALL BE OPERATIONAL DURING CONSTRUCTION FOR ALL EXIT ROUTES.
3.
- CONFIRM ELECTRICAL REQUIREMENTS AND EXACT POINT OF TERMINATION FOR ALL LIGHTING PRIOR TO ORDERING AND INSTALLATION.
4.
- LOCATION OF EXISTING ELECTRICAL SERVICES ARE TAKEN FROM EXISTING ELECTRICAL DRAWINGS. EXACT LOCATION SHALL BE CONFIRMED ON SITE BY CONTRACTOR.
5.
- ALL WALL MOUNTED EQUIPMENT AND ACCESSORIES SHALL BE SURFACE MOUNTED WITH SURFACE MOUNTED CONDUITS.
6.
- ALL NEW FIRE ALARM DEVICES SHALL BE COMPATIBLE WITH EXISTING FIRE ALARM SYSTEM.
7.
- PROVIDE TESTING, VERIFICATION AND REPORT FOR ALL FIRE ALARM AND EMERGENCY LIGHTING DEVICES BEING DISCONNECT AND RECONNECTED AFTER NEW CEILING IS INSTALLED.



1  
E-2 GROUND FLOOR - DEMOLITION  
SCALE 1:100



2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO.	ISSUANCES & REVISIONS	DATE



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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : GROUND FLOOR  
CEILING  
DEMOLITION

Designed: N.P.  
Checked: Y.N.  
Scale: AS SHOWN  
Date: JAN 2021

PNF Project No. 20041

Dwg.No. E-2

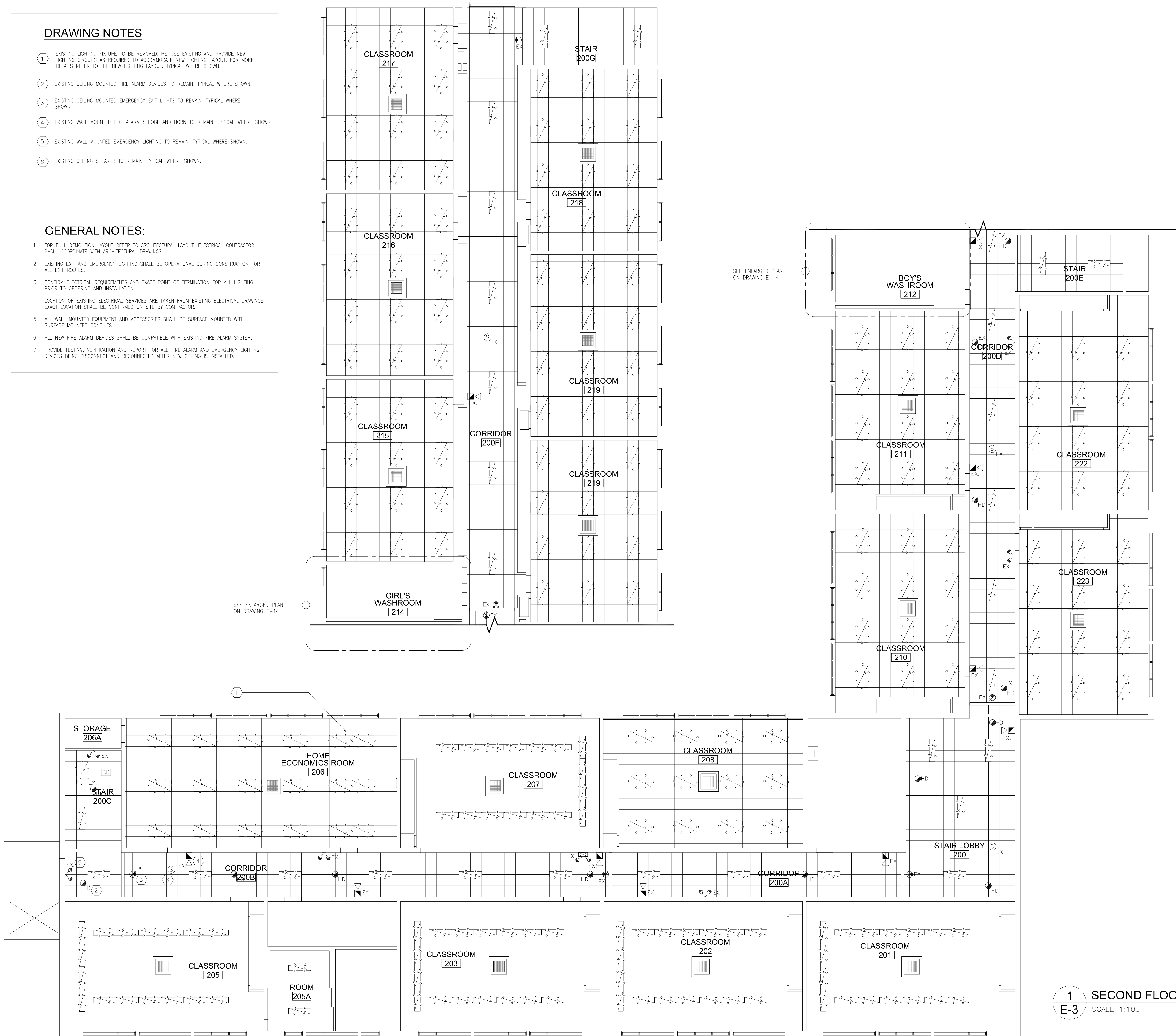


DRAWING NOTES

1. EXISTING LIGHTING FIXTURE TO BE REMOVED. RE-USE EXISTING AND PROVIDE NEW LIGHTING CIRCUITS AS REQUIRED TO ACCOMMODATE NEW LIGHTING LAYOUT. FOR MORE DETAILS REFER TO THE NEW LIGHTING LAYOUT. TYPICAL WHERE SHOWN.
2. EXISTING CEILING MOUNTED FIRE ALARM DEVICES TO REMAIN. TYPICAL WHERE SHOWN.
3. EXISTING CEILING MOUNTED EMERGENCY EXIT LIGHTS TO REMAIN. TYPICAL WHERE SHOWN.
4. EXISTING WALL MOUNTED FIRE ALARM STROBE AND HORN TO REMAIN. TYPICAL WHERE SHOWN.
5. EXISTING WALL MOUNTED EMERGENCY LIGHTING TO REMAIN. TYPICAL WHERE SHOWN.
6. EXISTING CEILING SPEAKER TO REMAIN. TYPICAL WHERE SHOWN.

GENERAL NOTES:

1. FOR FULL DEMOLITION LAYOUT REFER TO ARCHITECTURAL LAYOUT. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS.
2. EXISTING EXIT AND EMERGENCY LIGHTING SHALL BE OPERATIONAL DURING CONSTRUCTION FOR ALL EXIT ROUTES.
3. CONFIRM ELECTRICAL REQUIREMENTS AND EXACT POINT OF TERMINATION FOR ALL LIGHTING PRIOR TO ORDERING AND INSTALLATION.
4. LOCATION OF EXISTING ELECTRICAL SERVICES ARE TAKEN FROM EXISTING ELECTRICAL DRAWINGS. EXACT LOCATION SHALL BE CONFIRMED ON SITE BY CONTRACTOR.
5. ALL WALL MOUNTED EQUIPMENT AND ACCESSORIES SHALL BE SURFACE MOUNTED WITH SURFACE MOUNTED CONDUITS.
6. ALL NEW FIRE ALARM DEVICES SHALL BE COMPATIBLE WITH EXISTING FIRE ALARM SYSTEM.
7. PROVIDE TESTING, VERIFICATION AND REPORT FOR ALL FIRE ALARM AND EMERGENCY LIGHTING DEVICES BEING DISCONNECT AND RECONNECTED AFTER NEW CEILING IS INSTALLED.



2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO.	ISSUANCES & REVISIONS	DATE

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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : SECOND FLOOR CEILING DEMOLITION

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

PNF Project No.

20041

Dwg.No.

E-3

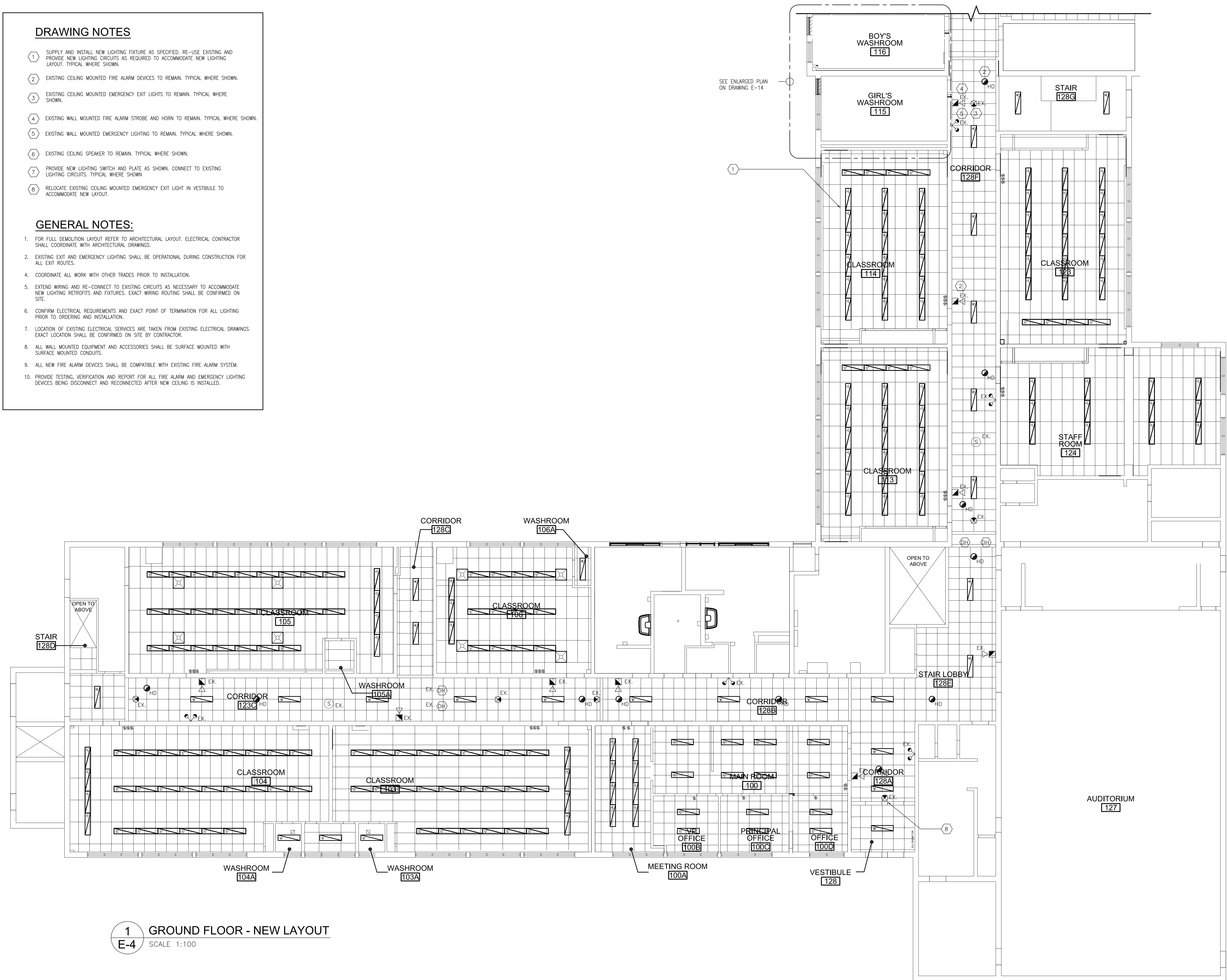


## DRAWING NOTES

- 1 SUPPLY AND INSTALL NEW LIGHTING FIXTURE AS SPECIFIED. RE-USE EXISTING AND PROVIDE NEW LIGHTING CIRCUITS AS REQUIRED TO ACCOMMODATE NEW LIGHTING LAYOUT. TYPICAL WHERE SHOWN.
- 2 EXISTING CEILING MOUNTED FIRE ALARM DEVICES TO REMAIN. TYPICAL WHERE SHOWN.
- 3 EXISTING CEILING MOUNTED EMERGENCY EXIT LIGHTS TO REMAIN. TYPICAL WHERE SHOWN.
- 4 EXISTING WALL MOUNTED FIRE ALARM STROBE AND HORN TO REMAIN. TYPICAL WHERE SHOWN.
- 5 EXISTING WALL MOUNTED EMERGENCY LIGHTING TO REMAIN. TYPICAL WHERE SHOWN.
- 6 EXISTING CEILING SPEAKER TO REMAIN. TYPICAL WHERE SHOWN.
- 7 PROVIDE NEW LIGHTING SWITCH AND PLATE AS SHOWN. CONNECT TO EXISTING LIGHTING CIRCUITS. TYPICAL WHERE SHOWN.
- 8 RELOCATE EXISTING CEILING MOUNTED EMERGENCY EXIT LIGHT IN VESTIBULE TO ACCOMMODATE NEW LAYOUT.

## GENERAL NOTES:

1. FOR FULL DEMOLITION LAYOUT REFER TO ARCHITECTURAL LAYOUT. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS.
2. EXISTING EXIT AND EMERGENCY LIGHTING SHALL BE OPERATIONAL DURING CONSTRUCTION FOR ALL EXIT ROUTES.
4. COORDINATE ALL WORK WITH OTHER TRADES PRIOR TO INSTALLATION.
5. EXTEND WIRING AND RE-CONNECT TO EXISTING CIRCUITS AS NECESSARY TO ACCOMMODATE NEW LIGHTING RETROFITS AND FIXTURES. EXACT WIRING ROUTING SHALL BE CONFIRMED ON SITE.
6. CONFIRM ELECTRICAL REQUIREMENTS AND EXACT POINT OF TERMINATION FOR ALL LIGHTING PRIOR TO ORDERING AND INSTALLATION.
7. LOCATION OF EXISTING ELECTRICAL SERVICES ARE TAKEN FROM EXISTING ELECTRICAL DRAWINGS. EXACT LOCATION SHALL BE CONFIRMED ON SITE BY CONTRACTOR.
8. ALL WALL MOUNTED EQUIPMENT AND ACCESSORIES SHALL BE SURFACE MOUNTED WITH SURFACE MOUNTED CONDUITS.
9. ALL NEW FIRE ALARM DEVICES SHALL BE COMPATIBLE WITH EXISTING FIRE ALARM SYSTEM.
10. PROVIDE TESTING, VERIFICATION AND REPORT FOR ALL FIRE ALARM AND EMERGENCY LIGHTING DEVICES BEING DISCONNECT AND RECONNECTED AFTER NEW CEILING IS INSTALLED.



NO.	ISSUANCES & REVISIONS	DATE
2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021

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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : GROUND FLOOR  
CEILING  
NEW LAYOUT

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

PNF Project No. 20041

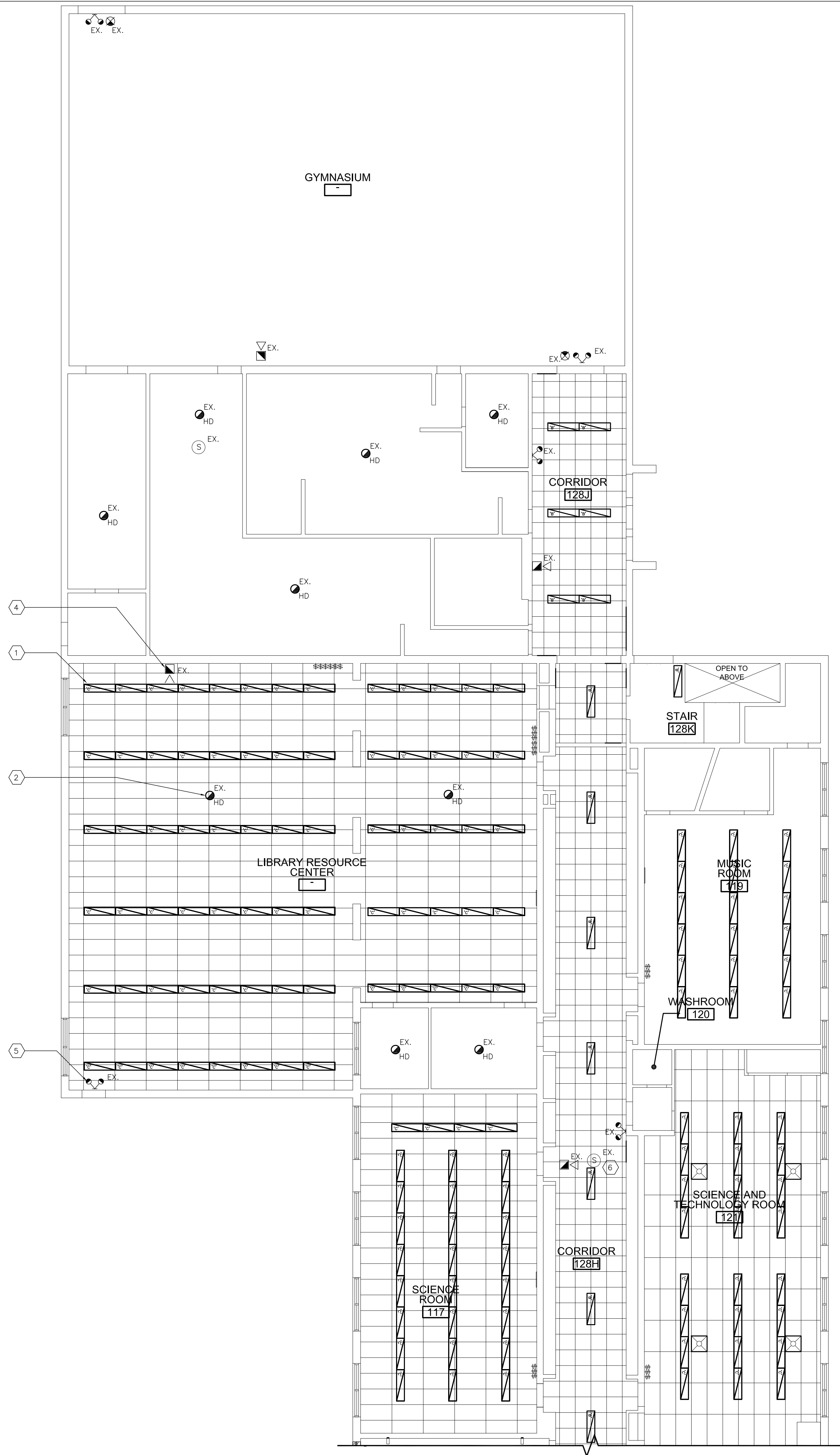
Dwg.No.  
**E-4**

DRAWING NOTES

- 1
- SUPPLY AND INSTALL NEW LIGHTING FIXTURE AS SPECIFIED. RE-USE EXISTING AND PROVIDE NEW LIGHTING CIRCUITS AS REQUIRED TO ACCOMMODATE NEW LIGHTING LAYOUT. TYPICAL WHERE SHOWN.
- 2
- EXISTING CEILING MOUNTED FIRE ALARM DEVICES TO REMAIN. TYPICAL WHERE SHOWN.
- 3
- EXISTING CEILING MOUNTED EMERGENCY EXIT LIGHTS TO REMAIN. TYPICAL WHERE SHOWN.
- 4
- EXISTING WALL MOUNTED FIRE ALARM STROBE AND HORN TO REMAIN. TYPICAL WHERE SHOWN.
- 5
- EXISTING WALL MOUNTED EMERGENCY LIGHTING TO REMAIN. TYPICAL WHERE SHOWN.
- 6
- EXISTING CEILING SPEAKER TO REMAIN. TYPICAL WHERE SHOWN.
- 7
- PROVIDE NEW LIGHTING SWITCH AND PLATE AS SHOWN. CONNECT TO EXISTING LIGHTING CIRCUITS. TYPICAL WHERE SHOWN.

GENERAL NOTES:

1.
- FOR FULL DEMOLITION LAYOUT REFER TO ARCHITECTURAL LAYOUT. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS.
2.
- EXISTING EXIT AND EMERGENCY LIGHTING SHALL BE OPERATIONAL DURING CONSTRUCTION FOR ALL EXIT ROUTES.
4.
- COORDINATE ALL WORK WITH OTHER TRADES PRIOR TO INSTALLATION.
5.
- EXTEND WIRING AND RE-CONNECT TO EXISTING CIRCUITS AS NECESSARY TO ACCOMMODATE NEW LIGHTING RETROFITS AND FIXTURES. EXACT WIRING ROUTING SHALL BE CONFIRMED ON SITE.
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9.
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10.
- PROVIDE TESTING, VERIFICATION AND REPORT FOR ALL FIRE ALARM AND EMERGENCY LIGHTING DEVICES BEING DISCONNECT AND RECONNECTED AFTER NEW CEILING IS INSTALLED.



2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO.	ISSUANCES & REVISIONS	DATE

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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : GROUND FLOOR  
CEILING  
NEW LAYOUT

Designed: **R.P.**

Checked: **D.R.**

Scale: AS SHOWN

Date: **SEP 2020**

PNF Project No. **20031**

Dwg.No. **E-5**



DRAWING NOTES

- 1 SUPPLY AND INSTALL NEW LIGHTING FIXTURE AS SPECIFIED. RE-USE EXISTING AND PROVIDE NEW LIGHTING CIRCUITS AS REQUIRED TO ACCOMMODATE NEW LIGHTING LAYOUT. TYPICAL WHERE SHOWN.
- 2 EXISTING CEILING MOUNTED FIRE ALARM DEVICES TO REMAIN. TYPICAL WHERE SHOWN.
- 3 EXISTING CEILING MOUNTED EMERGENCY EXIT LIGHTS TO REMAIN. TYPICAL WHERE SHOWN.
- 4 EXISTING WALL MOUNTED FIRE ALARM STROBE AND HORN TO REMAIN. TYPICAL WHERE SHOWN.
- 5 EXISTING WALL MOUNTED EMERGENCY LIGHTING TO REMAIN. TYPICAL WHERE SHOWN.
- 6 EXISTING CEILING SPEAKER TO REMAIN. TYPICAL WHERE SHOWN.
- 7 PROVIDE NEW LIGHTING SWITCH AND PLATE AS SHOWN. CONNECT TO EXISTING LIGHTING CIRCUITS. TYPICAL WHERE SHOWN

GENERAL NOTES:

1. FOR FULL DEMOLITION LAYOUT REFER TO ARCHITECTURAL LAYOUT. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS.
2. EXISTING EXIT AND EMERGENCY LIGHTING SHALL BE OPERATIONAL DURING CONSTRUCTION FOR ALL EXIT ROUTES.
4. COORDINATE ALL WORK WITH OTHER TRADES PRIOR TO INSTALLATION.
5. EXTEND WIRING AND RE-CONNECT TO EXISTING CIRCUITS AS NECESSARY TO ACCOMMODATE NEW LIGHTING RETROFITS AND FIXTURES. EXACT WIRING ROUTING SHALL BE CONFIRMED ON SITE.
6. CONFIRM ELECTRICAL REQUIREMENTS AND EXACT POINT OF TERMINATION FOR ALL LIGHTING PRIOR TO ORDERING AND INSTALLATION.
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8. ALL WALL MOUNTED EQUIPMENT AND ACCESSORIES SHALL BE SURFACE MOUNTED WITH SURFACE MOUNTED CONDUITS.
9. ALL NEW FIRE ALARM DEVICES SHALL BE COMPATIBLE WITH EXISTING FIRE ALARM SYSTEM.
10. PROVIDE TESTING, VERIFICATION AND REPORT FOR ALL FIRE ALARM AND EMERGENCY LIGHTING DEVICES BEING DISCONNECT AND RECONNECTED AFTER NEW CEILING IS INSTALLED.

NEW LIGHTING SCHEDULE		
Label	Catalog Number	Description
'A'	'COOPER LIGHTING' CORELATE CONTINUA CTA OR APPROVED EQUAL	LED LUMINAIRE 1'x4' 4000K 120V INPUT SUSPENDED MOUNTED DISTRIBUTION: 75% UP / 25% DOWN SPLIT INSTALLED AT 16" BELOW CEILING HEIGHT
'B'	'COOPER LIGHTING' METALUX 24FP4740C OR APPROVED EQUAL	VOLUMETRIC LED LUMINAIRE 1'x4' 4000K 120V INPUT RECESS MOUNTED
'C'	'COOPER LIGHTING' METALUX WSNLED OR APPROVED EQUAL	PREMIUM WRAPAROUND LED LUMINAIRE 1'x4' 4000K 120V INPUT SURFACE MOUNTED

SEE ENLARGED PLAN  
ON DRAWING E-14

SEE ENLARGED PLAN  
ON DRAWING E-14

1 SECOND FLOOR - NEW LAYOUT  
E-6 SCALE 1:100

NO.	ISSUANCES & REVISIONS	DATE
2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021

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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : SECOND FLOOR  
CEILING  
NEW LAYOUT

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

PNF Project No.

20041

Dwg.No.

E-6

**GENERAL NOTES**

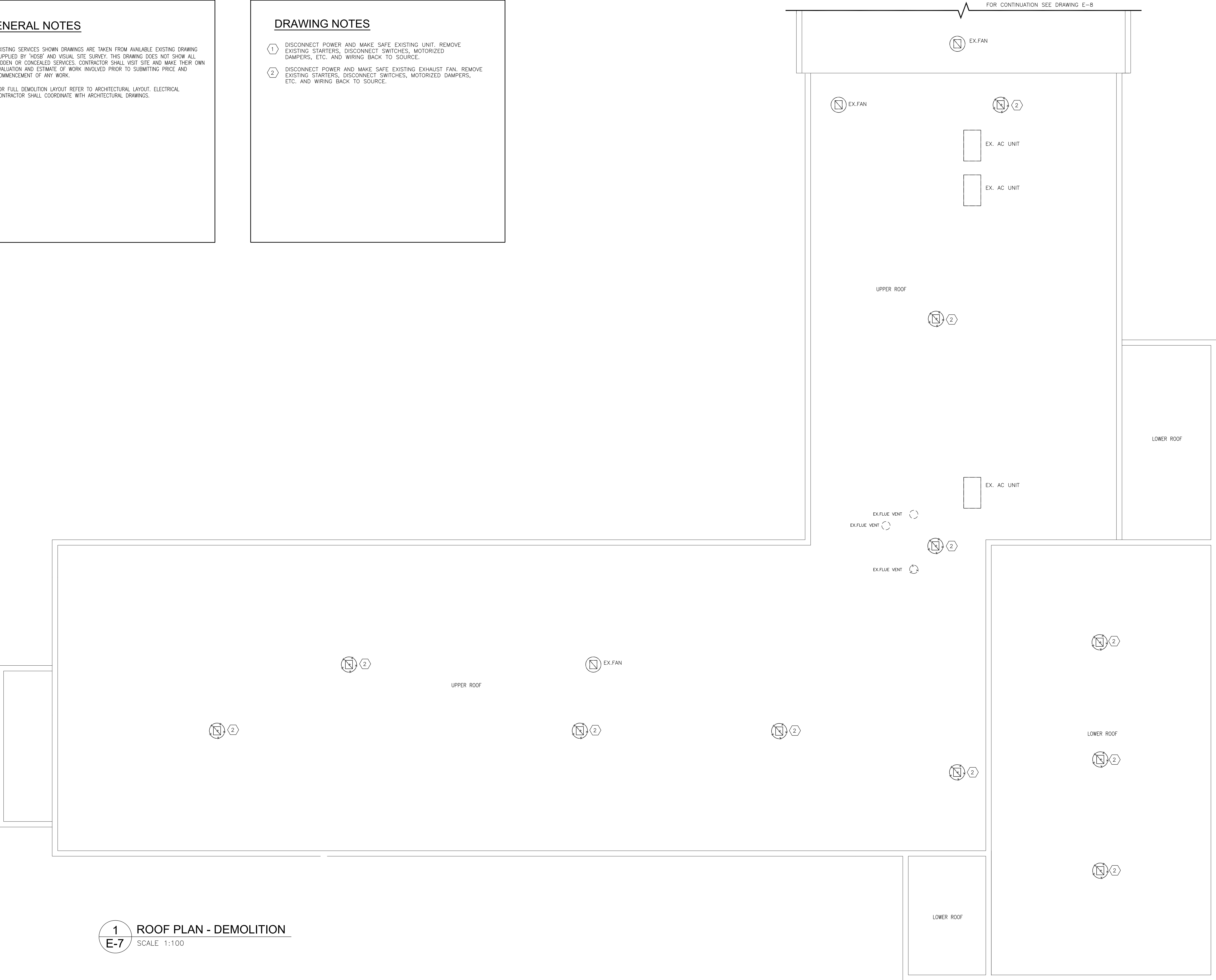
1. EXISTING SERVICES SHOWN DRAWINGS ARE TAKEN FROM AVAILABLE EXISTING DRAWING SUPPLIED BY 'MOSES' AND VISUAL SITE SURVEY. THIS DRAWING DOES NOT SHOW ALL HIDDEN OR CONCEALED SERVICES. CONTRACTOR SHALL VISIT SITE AND MAKE THEIR OWN EVALUATION AND ESTIMATE OF WORK INVOLVED PRIOR TO SUBMITTING PRICE AND COMMENCEMENT OF ANY WORK.

2. FOR FULL DEMOLITION LAYOUT REFER TO ARCHITECTURAL LAYOUT. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS.

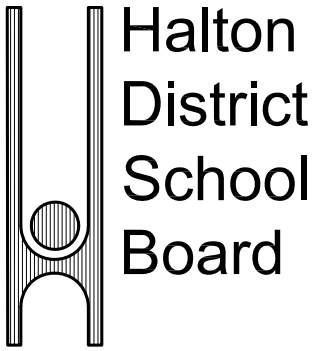
**DRAWING NOTES**

1. DISCONNECT POWER AND MAKE SAFE EXISTING UNIT. REMOVE EXISTING STARTERS, DISCONNECT SWITCHES, MOTORIZED DAMPERS, ETC. AND WIRING BACK TO SOURCE.

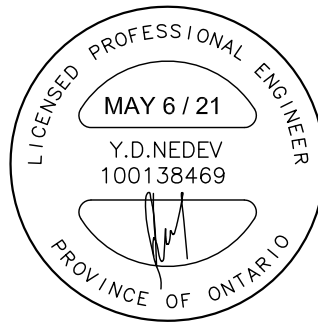
2. DISCONNECT POWER AND MAKE SAFE EXISTING EXHAUST FAN. REMOVE EXISTING STARTERS, DISCONNECT SWITCHES, MOTORIZED DAMPERS, ETC. AND WIRING BACK TO SOURCE.



**1**  
**E-7** **ROOF PLAN - DEMOLITION**  
SCALE 1:100



2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO.	ISSUANCES & REVISIONS	DATE



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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : ROOF PLAN DEMOLITION

Designed: N.P.  
Checked: Y.N.  
Scale: AS SHOWN  
Date: JAN 2021

PNF Project No.

20041

Dwg.No.

**E-7**

GENERAL NOTES

1.
- EXISTING SERVICES SHOWN DRAWINGS ARE TAKEN FROM AVAILABLE EXISTING DRAWING SUPPLIED BY 'HDSB' AND VISUAL SITE SURVEY. THIS DRAWING DOES NOT SHOW ALL HIDDEN OR CONCEALED SERVICES. CONTRACTOR SHALL VISIT SITE AND MAKE THEIR OWN EVALUATION AND ESTIMATE OF WORK INVOLVED PRIOR TO SUBMITTING PRICE AND COMMENCEMENT OF ANY WORK.

2.
- FOR FULL DEMOLITION LAYOUT REFER TO ARCHITECTURAL LAYOUT. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS.

DRAWING NOTES

- 1
- DISCONNECT POWER AND MAKE SAFE EXISTING UNIT. REMOVE EXISTING STARTERS, DISCONNECT SWITCHES, MOTORIZED DAMPERS, ETC. AND WIRING BACK TO SOURCE.

- 2
- DISCONNECT POWER AND MAKE SAFE EXISTING EXHAUST FAN. REMOVE EXISTING STARTERS, DISCONNECT SWITCHES, MOTORIZED DAMPERS, ETC. AND WIRING BACK TO SOURCE.

UPPER ROOF

LOWER ROOF

EX.AHU

1

EX.FAN

EX.FAN

LOWER ROOF

UPPER ROOF

2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO.	ISSUANCES & REVISIONS	DATE

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Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : ROOF PLAN DEMOLITION

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

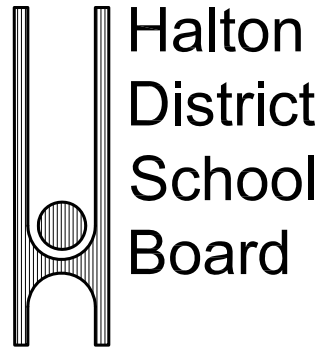
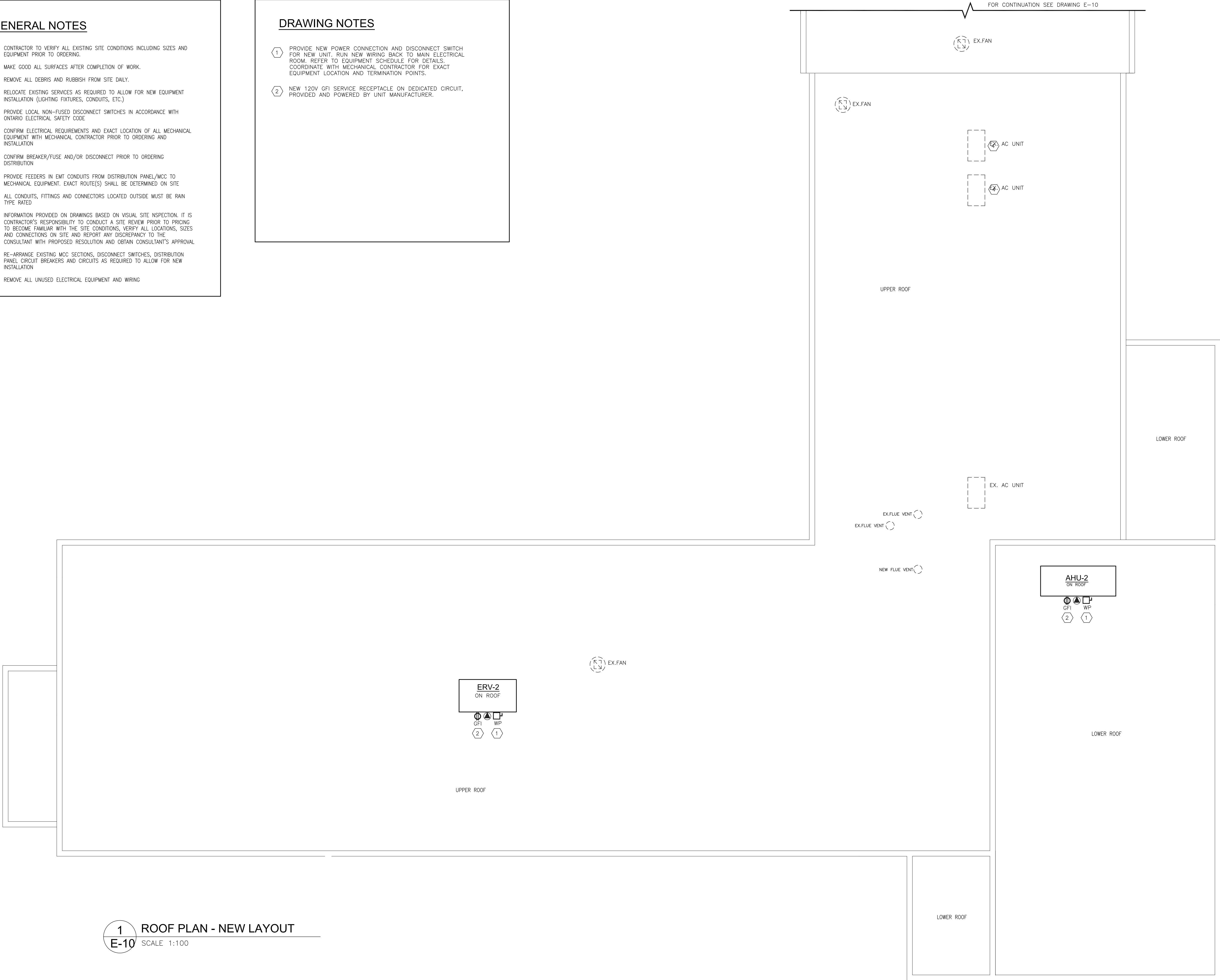
PNF Project No. 20041

Dwg.No. E-8

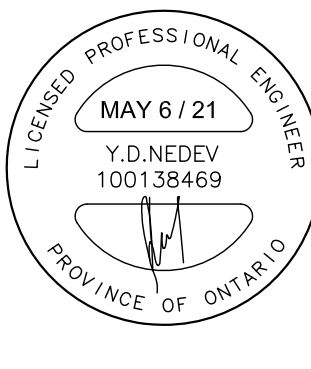


- GENERAL NOTES**
1. CONTRACTOR TO VERIFY ALL EXISTING SITE CONDITIONS INCLUDING SIZES AND EQUIPMENT PRIOR TO ORDERING.
  2. MAKE GOOD ALL SURFACES AFTER COMPLETION OF WORK.
  3. REMOVE ALL DEBRIS AND RUBBISH FROM SITE DAILY.
  4. RELOCATE EXISTING SERVICES AS REQUIRED TO ALLOW FOR NEW EQUIPMENT INSTALLATION (LIGHTING FIXTURES, CONDUITS, ETC.)
  5. PROVIDE LOCAL NON-FUSED DISCONNECT SWITCHES IN ACCORDANCE WITH ONTARIO ELECTRICAL SAFETY CODE
  6. CONFIRM ELECTRICAL REQUIREMENTS AND EXACT LOCATION OF ALL MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR PRIOR TO ORDERING AND INSTALLATION
  7. CONFIRM BREAKER/FUSE AND/OR DISCONNECT PRIOR TO ORDERING DISTRIBUTION
  8. PROVIDE FEEDERS IN EMT CONDUITS FROM DISTRIBUTION PANEL/MCC TO MECHANICAL EQUIPMENT. EXACT ROUTE(S) SHALL BE DETERMINED ON SITE
  9. ALL CONDUITS, FITTINGS AND CONNECTORS LOCATED OUTSIDE MUST BE RAIN TYPE RATED
  10. INFORMATION PROVIDED ON DRAWINGS BASED ON VISUAL SITE INSPECTION. IT IS CONTRACTOR'S RESPONSIBILITY TO CONDUCT A SITE REVIEW PRIOR TO PRICING TO BECOME FAMILIAR WITH THE SITE CONDITIONS, VERIFY ALL LOCATIONS, SIZES AND CONNECTIONS ON SITE AND REPORT ANY DISCREPANCY TO THE CONSULTANT WITH PROPOSED RESOLUTION AND OBTAIN CONSULTANT'S APPROVAL
  11. RE-ARRANGE EXISTING MCC SECTIONS, DISCONNECT SWITCHES, DISTRIBUTION PANEL CIRCUIT BREAKERS AND CIRCUITS AS REQUIRED TO ALLOW FOR NEW INSTALLATION
  12. REMOVE ALL UNUSED ELECTRICAL EQUIPMENT AND WIRING

- DRAWING NOTES**
1. PROVIDE NEW POWER CONNECTION AND DISCONNECT SWITCH FOR NEW UNIT. RUN NEW WIRING BACK TO MAIN ELECTRICAL ROOM. REFER TO EQUIPMENT SCHEDULE FOR DETAILS. COORDINATE WITH MECHANICAL CONTRACTOR FOR EXACT EQUIPMENT LOCATION AND TERMINATION POINTS.
  2. NEW 120V GFI SERVICE RECEPTACLE ON DEDICATED CIRCUIT, PROVIDED AND POWERED BY UNIT MANUFACTURER.



NO.	ISSUANCES & REVISIONS	DATE
2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021



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Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : ROOF PLAN  
NEW POWER LAYOUT

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

PNF Project No.

20041

Dwg.No.

E-9

GENERAL NOTES

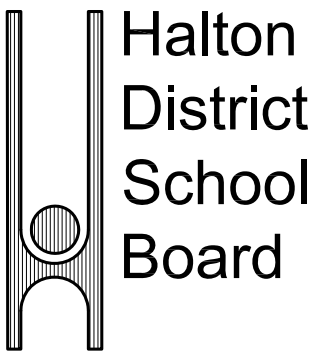
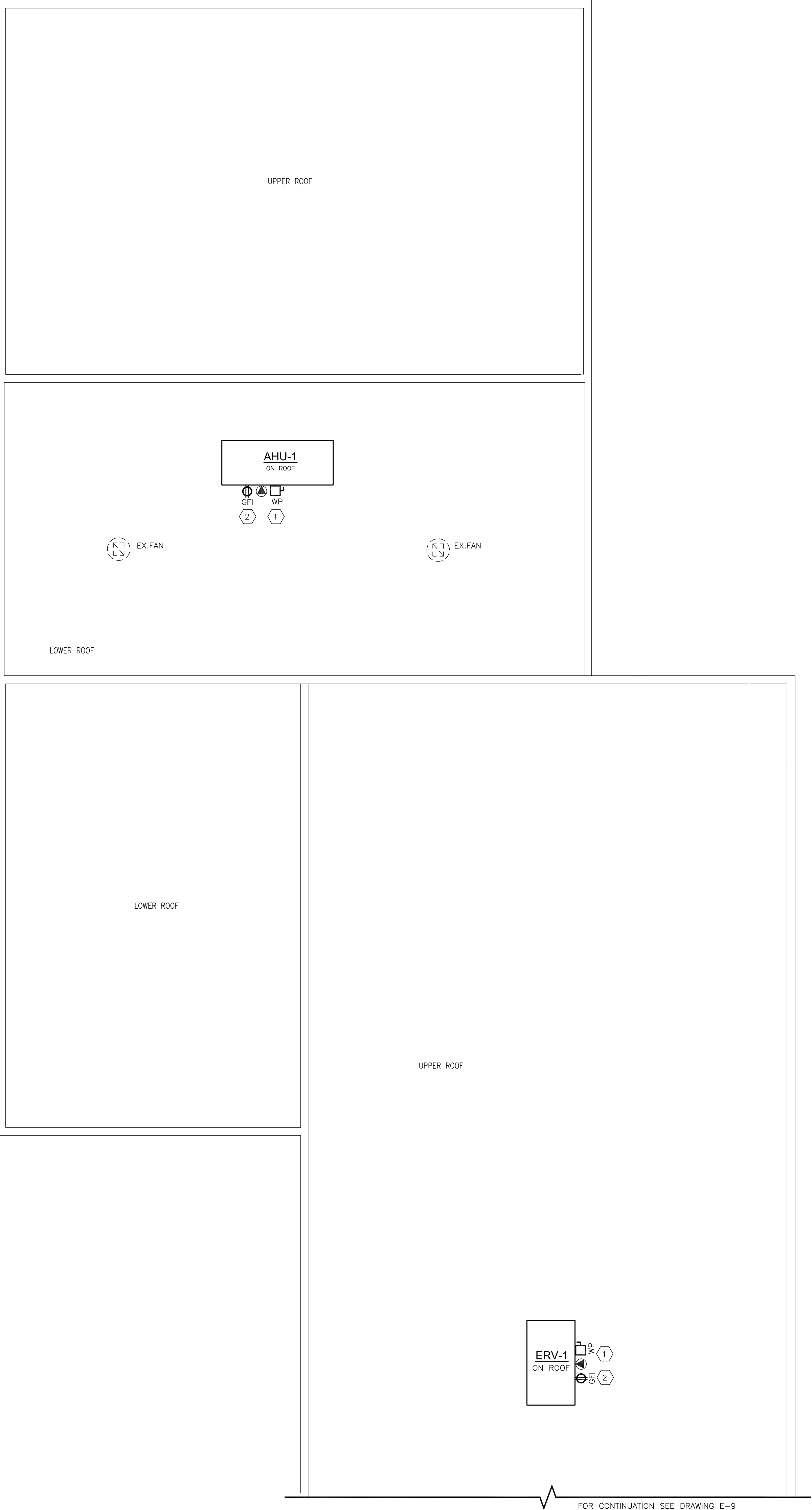
1. CONTRACTOR TO VERIFY ALL EXISTING SITE CONDITIONS INCLUDING SIZES AND EQUIPMENT PRIOR TO ORDERING.
2. MAKE GOOD ALL SURFACES AFTER COMPLETION OF WORK.
3. REMOVE ALL DEBRIS AND RUBBISH FROM SITE DAILY.
4. RELOCATE EXISTING SERVICES AS REQUIRED TO ALLOW FOR NEW EQUIPMENT INSTALLATION (LIGHTING FIXTURES, CONDUITS, ETC.)
5. PROVIDE LOCAL NON-FUSED DISCONNECT SWITCHES IN ACCORDANCE WITH ONTARIO ELECTRICAL SAFETY CODE
6. CONFIRM ELECTRICAL REQUIREMENTS AND EXACT LOCATION OF ALL MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR PRIOR TO ORDERING AND INSTALLATION
7. CONFIRM BREAKER/FUSE AND/OR DISCONNECT PRIOR TO ORDERING DISTRIBUTION
8. PROVIDE FEEDERS IN EMT CONDUITS FROM DISTRIBUTION PANEL/MCC TO MECHANICAL EQUIPMENT. EXACT ROUTE(S) SHALL BE DETERMINED ON SITE
9. ALL CONDUITS, FITTINGS AND CONNECTORS LOCATED OUTSIDE MUST BE RAIN TYPE RATED
10. INFORMATION PROVIDED ON DRAWINGS BASED ON VISUAL SITE INSPECTION. IT IS CONTRACTOR'S RESPONSIBILITY TO CONDUCT A SITE REVIEW PRIOR TO PRICING TO BECOME FAMILIAR WITH THE SITE CONDITIONS, VERIFY ALL LOCATIONS, SIZES AND CONNECTIONS ON SITE AND REPORT ANY DISCREPANCY TO THE CONSULTANT WITH PROPOSED RESOLUTION AND OBTAIN CONSULTANT'S APPROVAL
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12. REMOVE ALL UNUSED ELECTRICAL EQUIPMENT AND WIRING

DRAWING NOTES

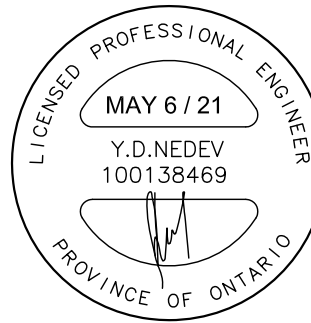
- 1

PROVIDE NEW POWER CONNECTION AND DISCONNECT SWITCH FOR NEW UNIT. RUN NEW WIRING BACK TO MAIN ELECTRICAL ROOM. REFER TO EQUIPMENT SCHEDULE FOR DETAILS. COORDINATE WITH MECHANICAL CONTRACTOR FOR EXACT EQUIPMENT LOCATION AND TERMINATION POINTS.
- 2

NEW 120V GFI SERVICE RECEPTACLE ON DEDICATED CIRCUIT, PROVIDED AND POWERED BY UNIT MANUFACTURER.



2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO.	ISSUANCES & REVISIONS	DATE



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Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : ROOF PLAN  
NEW POWER LAYOUT

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

PNF Project No.

20041

Dwg.No.

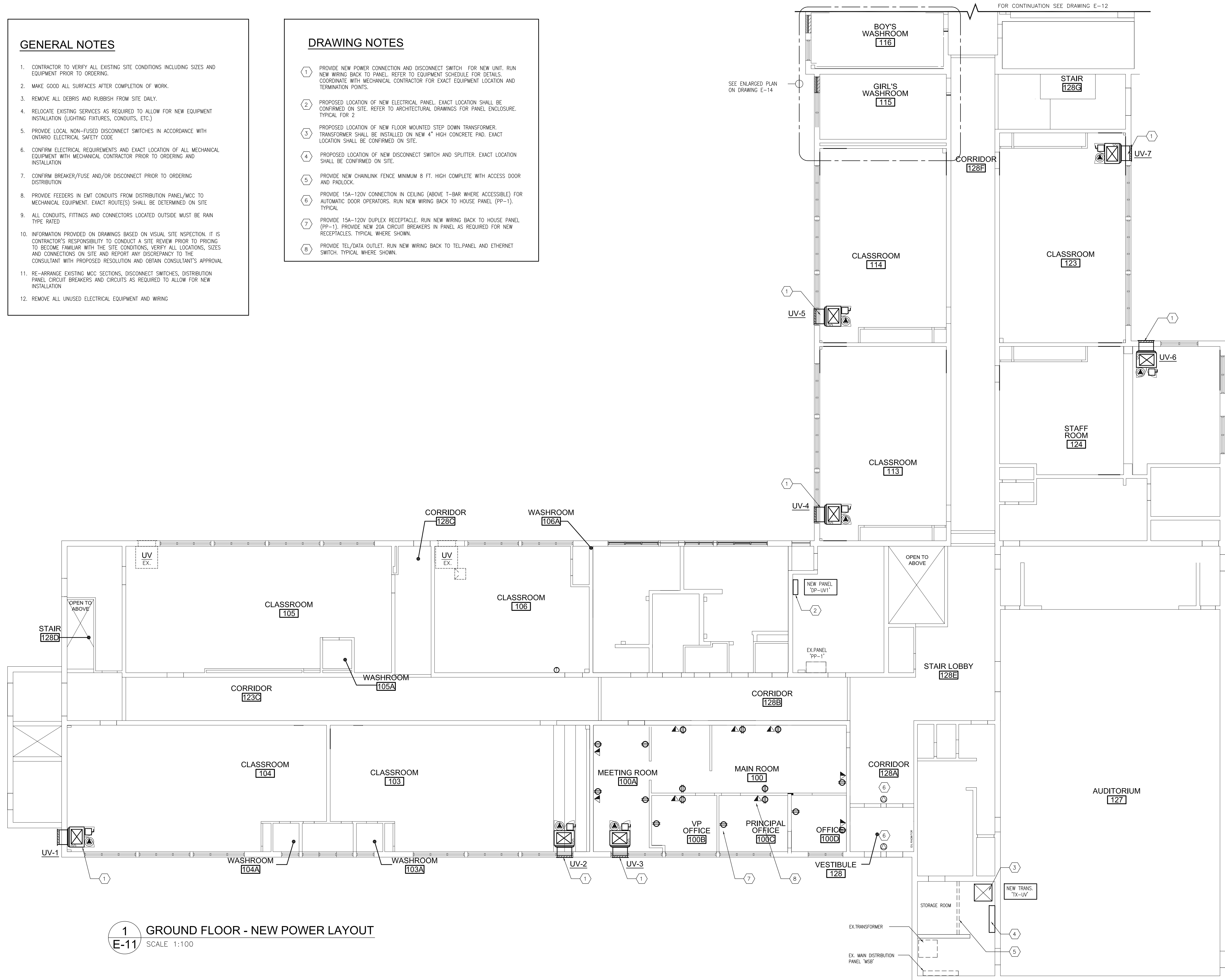
E-10

## GENERAL NOTES

1. CONTRACTOR TO VERIFY ALL EXISTING SITE CONDITIONS INCLUDING SIZES AND EQUIPMENT PRIOR TO ORDERING.
2. MAKE GOOD ALL SURFACES AFTER COMPLETION OF WORK.
3. REMOVE ALL DEBRIS AND RUBBISH FROM SITE DAILY.
4. RELOCATE EXISTING SERVICES AS REQUIRED TO ALLOW FOR NEW EQUIPMENT INSTALLATION (LIGHTING FIXTURES, CONDUITS, ETC.)
5. PROVIDE LOCAL NON-FUSED DISCONNECT SWITCHES IN ACCORDANCE WITH ONTARIO ELECTRICAL SAFETY CODE
6. CONFIRM ELECTRICAL REQUIREMENTS AND EXACT LOCATION OF ALL MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR PRIOR TO ORDERING AND INSTALLATION
7. CONFIRM BREAKER/FUSE AND/OR DISCONNECT PRIOR TO ORDERING DISTRIBUTION
8. PROVIDE FEEDERS IN EMT CONDUITS FROM DISTRIBUTION PANEL/MCC TO MECHANICAL EQUIPMENT. EXACT ROUTE(S) SHALL BE DETERMINED ON SITE
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12. REMOVE ALL UNUSED ELECTRICAL EQUIPMENT AND WIRING

## DRAWING NOTES

1. PROVIDE NEW POWER CONNECTION AND DISCONNECT SWITCH FOR NEW UNIT. RUN NEW WIRING BACK TO PANEL. REFER TO EQUIPMENT SCHEDULE FOR DETAILS. COORDINATE WITH MECHANICAL CONTRACTOR FOR EXACT EQUIPMENT LOCATION AND TERMINATION POINTS.
2. PROPOSED LOCATION OF NEW ELECTRICAL PANEL. EXACT LOCATION SHALL BE CONFIRMED ON SITE. REFER TO ARCHITECTURAL DRAWINGS FOR PANEL ENCLOSURE. TYPICAL FOR 2
3. PROPOSED LOCATION OF NEW FLOOR MOUNTED STEP DOWN TRANSFORMER. TRANSFORMER SHALL BE INSTALLED ON NEW 4" HIGH CONCRETE PAD. EXACT LOCATION SHALL BE CONFIRMED ON SITE.
4. PROPOSED LOCATION OF NEW DISCONNECT SWITCH AND SPLITTER. EXACT LOCATION SHALL BE CONFIRMED ON SITE.
5. PROVIDE NEW CHAINLINK FENCE MINIMUM 8 FT. HIGH COMPLETE WITH ACCESS DOOR AND PADLOCK.
6. PROVIDE 15A-120V CONNECTION IN CEILING (ABOVE T-BAR WHERE ACCESSIBLE) FOR AUTOMATIC DOOR OPERATORS. RUN NEW WIRING BACK TO HOUSE PANEL (PP-1). TYPICAL
7. PROVIDE 15A-120V DUPLEX RECEPTACLE. RUN NEW WIRING BACK TO HOUSE PANEL (PP-1). PROVIDE NEW 20A CIRCUIT BREAKERS IN PANEL AS REQUIRED FOR NEW RECEPTACLES. TYPICAL WHERE SHOWN.
8. PROVIDE TEL/DATA OUTLET. RUN NEW WIRING BACK TO TELPANEL AND ETHERNET SWITCH. TYPICAL WHERE SHOWN.



NO.	ISSUANCES & REVISIONS	DATE
2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021

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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : GROUND FLOOR NEW POWER LAYOUT

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

PNF Project No.

20041

Dwg.No.

E-11

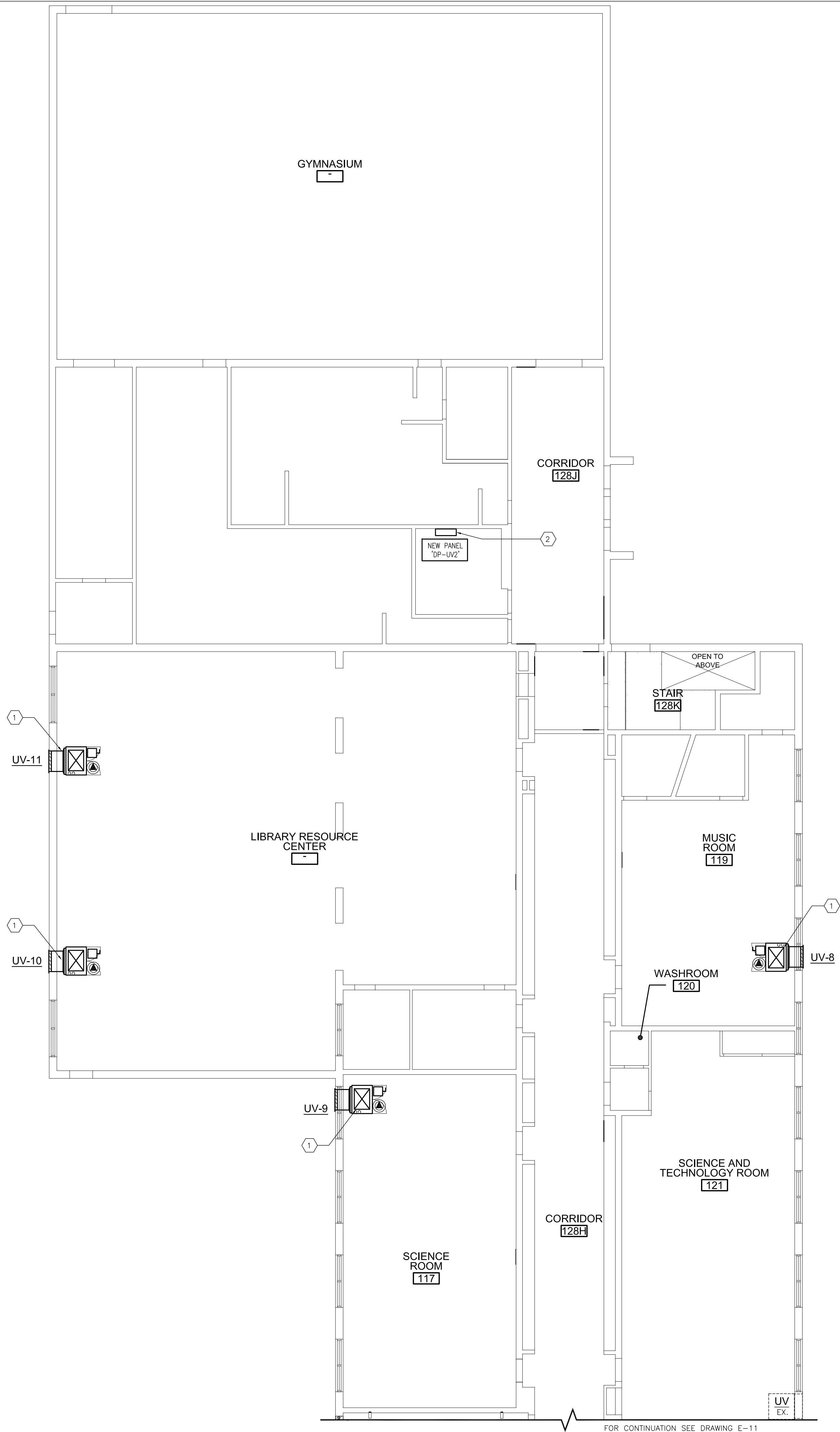


GENERAL NOTES

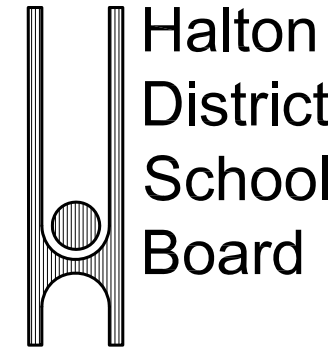
1. CONTRACTOR TO VERIFY ALL EXISTING SITE CONDITIONS INCLUDING SIZES AND EQUIPMENT PRIOR TO ORDERING.
2. MAKE GOOD ALL SURFACES AFTER COMPLETION OF WORK.
3. REMOVE ALL DEBRIS AND RUBBISH FROM SITE DAILY.
4. RELOCATE EXISTING SERVICES AS REQUIRED TO ALLOW FOR NEW EQUIPMENT INSTALLATION (LIGHTING FIXTURES, CONDUITS, ETC.)
5. PROVIDE LOCAL NON-FUSED DISCONNECT SWITCHES IN ACCORDANCE WITH ONTARIO ELECTRICAL SAFETY CODE
6. CONFIRM ELECTRICAL REQUIREMENTS AND EXACT LOCATION OF ALL MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR PRIOR TO ORDERING AND INSTALLATION
7. CONFIRM BREAKER/FUSE AND/OR DISCONNECT PRIOR TO ORDERING DISTRIBUTION
8. PROVIDE FEEDERS IN EMT CONDUITS FROM DISTRIBUTION PANEL/MCC TO MECHANICAL EQUIPMENT. EXACT ROUTE(S) SHALL BE DETERMINED ON SITE
9. ALL CONDUITS, FITTINGS AND CONNECTORS LOCATED OUTSIDE MUST BE RAIN TYPE RATED
10. INFORMATION PROVIDED ON DRAWINGS BASED ON VISUAL SITE NSPECTION. IT IS CONTRACTOR'S RESPONSIBILITY TO CONDUCT A SITE REVIEW PRIOR TO PRICING TO BECOME FAMILIAR WITH THE SITE CONDITIONS, VERIFY ALL LOCATIONS, SIZES AND CONNECTIONS ON SITE AND REPORT ANY DISCREPANCY TO THE CONSULTANT WITH PROPOSED RESOLUTION AND OBTAIN CONSULTANT'S APPROVAL
11. RE-ARRANGE EXISTING MCC SECTIONS, DISCONNECT SWITCHES, DISTRIBUTION PANEL CIRCUIT BREAKERS AND CIRCUITS AS REQUIRED TO ALLOW FOR NEW INSTALLATION
12. REMOVE ALL UNUSED ELECTRICAL EQUIPMENT AND WIRING

DRAWING NOTES

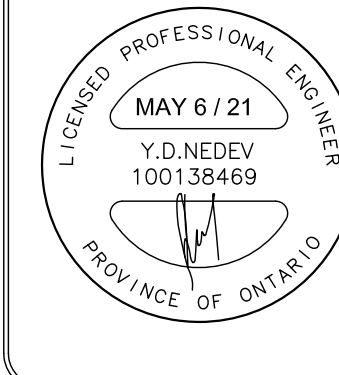
1. PROVIDE NEW POWER CONNECTION AND DISCONNECT SWITCH - FOR NEW UNIT. RUN NEW WIRING BACK TO PANEL. REFER TO EQUIPMENT SCHEDULE FOR DETAILS. COORDINATE WITH MECHANICAL CONTRACTOR FOR EXACT EQUIPMENT LOCATION AND TERMINATION POINTS.
2. PROPOSED LOCATION OF NEW ELECTRICAL PANEL. EXACT LOCATION SHALL BE CONFIRMED ON SITE. TYPICAL FOR 2
3. PROPOSED LOCATION OF NEW STEP DOWN TRANSFORMER. EXACT LOCATION SHALL BE CONFIRMED ON SITE.
4. PROVIDE 15A-120V CONNECTION IN CEILING (ABOVE T-BAR WHERE ACCESSIBLE) FOR AUTOMATIC DOOR OPERATORS. RUN NEW WIRING BACK TO HOUSE PANEL. TYPICAL



1 GROUND FLOOR - NEW POWER LAYOUT  
E-12 SCALE 1:100



NO.	ISSUANCES & REVISIONS	DATE
2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021



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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : GROUND FLOOR NEW POWER LAYOUT

Designed: **R.P.**  
Checked: **D.R.**  
Scale: AS SHOWN  
Date: **8/28/2020**

PNF Project No. 20041

Dwg.No. **E-12**

MECHANICAL EQUIPMENT SCHEDULE												
TAG	DESCRIPTION	LOCATION	HP	MCA (A)	VOLTS	PHASE	FEED FROM	MOP (A)	POLES	CONDUCTOR SIZE	CONDUIT SIZE	REMARKS
AHU-1	AHU	ROOF	–	61.4	575	3	MAIN ELECTRICAL ROOM	70	3	4#4	2"	
AHU-2	AHU	ROOF	–	61.4	575	3	MAIN ELECTRICAL ROOM	70	3	4#4	2"	
ERV-1	ERV	ROOF	–	30.0	575	3	MAIN ELECTRICAL ROOM	35	3	4#10	1"	
ERV-2	ERV	ROOF	–	26.4	575	3	MAIN ELECTRICAL ROOM	30	3	4#10	1"	
UV-1	UNIT VENTILATOR	CLASSROOM	1/2	16.7	208	3	PANEL 'UV-1'	20	3	4#12	3/4"	
UV-2	UNIT VENTILATOR	CLASSROOM	1/2	16.7	208	3	PANEL 'UV-1'	20	3	4#12	3/4"	
UV-3	UNIT VENTILATOR	CLASSROOM	1/2	16.7	208	3	PANEL 'UV-1'	20	3	4#12	3/4"	
UV-4	UNIT VENTILATOR	CLASSROOM	1/2	16.7	208	3	PANEL 'UV-1'	20	3	4#12	3/4"	
UV-5	UNIT VENTILATOR	CLASSROOM	1/2	16.7	208	3	PANEL 'UV-1'	20	3	4#12	3/4"	
UV-6	UNIT VENTILATOR	CLASSROOM	1/2	16.7	208	3	PANEL 'UV-1'	20	3	4#12	3/4"	
UV-7	UNIT VENTILATOR	CLASSROOM	1/2	16.7	208	3	PANEL 'UV-1'	20	3	4#12	3/4"	
UV-8	UNIT VENTILATOR	CLASSROOM	1/2	16.7	208	3	PANEL 'UV-2'	20	3	4#12	3/4"	
UV-9	UNIT VENTILATOR	CLASSROOM	1/2	16.7	208	3	PANEL 'UV-2'	20	3	4#12	3/4"	
UV-10	UNIT VENTILATOR	CLASSROOM	3/4	28.0	208	3	PANEL 'UV-2'	40	3	4#8	1-1/2"	
UV-11	UNIT VENTILATOR	CLASSROOM	3/4	28.0	208	3	PANEL 'UV-2'	40	3	4#8	1-1/2"	
HB-2	BOILER	BOILER ROOM	–	10	120	1	HOUSE PANEL IN BOILER ROOM	20	1	2#12	3/4"	
P-1	PRIMARY LOOP PUMP	BOILER ROOM	2	–	230	1	HOUSE PANEL IN BOILER ROOM	20	2	2#12	3/4"	
P-2 (STAND-BY)	PRIMARY LOOP PUMP	BOILER ROOM	2	–	230	1	HOUSE PANEL IN BOILER ROOM	20	2	2#12	3/4"	
P-3	HEATING PUMP	BOILER ROOM	5	–	575	3	ELECTRICAL ROOM	15	3	3#12	3/4"	
P-4 (STAND-BY)	HEATING PUMP	BOILER ROOM	5	–	575	3	ELECTRICAL ROOM	15	3	3#12	3/4"	
BP-1	BOILER PUMP	BOILER ROOM	2	–	230	1	HOUSE PANEL IN BOILER ROOM	15	2	2#12	3/4"	
1. PROVIDE LOCAL NON-FUSED DISCONNECT SWITCHES IN ACCORDANCE WITH LATEST EDITION OF ONTARIO ELECTRICAL SAFETY CODE. 2. CONFIRM ELECTRICAL REQUIREMENTS AND EXACT LOCATION OF ALL MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR PRIOR TO ORDERING AND INSTALLATION. 3. CONFIRM BREAKER/FUSE AND/OR DISCONNECT PRIOR TO ORDERING. 4. PROVIDE FEEDERS IN EMT CONDUITS FROM DISTRIBUTION PANEL/MCC TO MECHANICAL EQUIPMENT. EXACT ROUTE(S) SHALL BE DETERMINED ON SITE. 5. ALL FINAL CONNECTIONS TO MECHANICAL EQUIPMENT SHALL BE IN LIQUID TIGHT FLEXIBLE CONDUIT. 6. INFORMATION PROVIDED ON DRAWINGS BASED ON VISUAL SITE INSPECTION. IT IS CONTRACTOR'S RESPONSIBILITY TO CONDUCT A SITE REVIEW PRIOR TO PRICING TO BECOME FAMILIAR WITH THE SITE CONDITIONS, VERIFY ALL LOCATIONS, SIZES AND CONNECTIONS ON SITE AND REPORT ANY DISCREPANCY TO THE CONSULTANT WITH PROPOSED RESOLUTION AND OBTAIN CONSULTANT'S APPROVAL. 7. RE-ARRANGE EXISTING DISCONNECT SWITCHES, DISTRIBUTION PANEL CIRCUIT BREAKERS AND CIRCUITS AS REQUIRED TO ALLOW FOR NEW INSTALLATION. 8. REMOVE ALL REDUNDANT EQUIPMENT AND WIRING. 9. RELOCATE EXISTING SERVICES TO ALLOW FOR NEW EQUIPMENT INSTALLATION.												

NEW DISTRIBUTION PANEL  
'DP-UV1'

■ 120/208V/3 PH, 4W, 225 A

■ SURFACE MOUNTED

■ INSULATED GROUND BUS

C/W MAIN BREAKER

DESCRIPTION	LOAD	BKR	CCT	CCT	BKR	LOAD	DESCRIPTION
UV-1		20 3P	1	A	2	20	UV-3
			3	B	4		
			5	C	6	3P	
UV-2		20 3P	7	A	8	20	UV-4
			9	B	10		
			11	C	12	3P	
UV-5		20 3P	13	A	14	20	UV-6
			15	B	16		
			17	C	18	3P	
UV-7		20 3P	19	A	20	15	BAS CONNECTION
			21	B	22	15	BAS CONNECTION
			23	C	24	15	SPARE
			25	A	26	15	SPARE
			27	B	28		
			29	C	30		

NOTES:

EXACT CIRCUIT BREAKER AND POWER REQUIREMENT FOR UNIT VENTILATORS SHALL BE CONFIRMED WITH EQUIPMENT MANUFACTURER

NEW DISTRIBUTION PANEL

'DP-UV2'

■ 120/208V/3 PH, 4W, 225 A

■ SURFACE MOUNTED

■ INSULATED GROUND BUS

C/W MAIN BREAKER

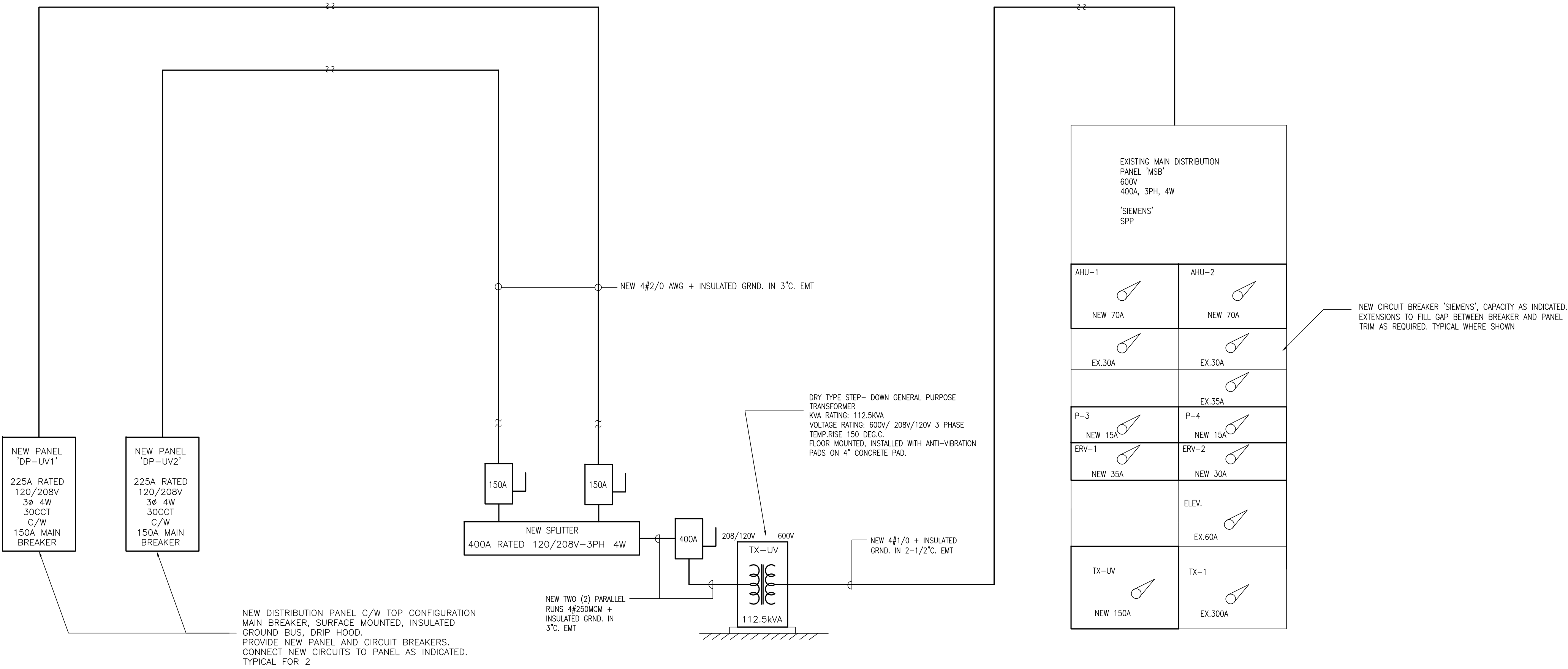
DESCRIPTION	LOAD	BKR	CCT	CCT	BKR	LOAD	DESCRIPTION
UV-8		20 3P	1	A	2	20	UV-9
			3	B	4		
			5	C	6	3P	
UV-10		45 3P	7	A	8	45	UV-11
			9	B	10		
			11	C	12	3P	
BAS CONNECTION		15	13	A	14	15	BAS CONNECTION
SPARE		15	15	B	16	15	SPARE
SPARE		15	17	C	18	15	SPARE
			19	A	20		
			21	B	22		
			23	C	24		
			25	A	26		
			27	B	28		
			29	C	30		

NOTES:

EXACT CIRCUIT BREAKER AND POWER REQUIREMENT FOR UNIT VENTILATORS SHALL BE CONFIRMED WITH EQUIPMENT MANUFACTURER

NOTES

- DISTRIBUTION PANELS SHALL BE INSTALLED ON 3/4" FIRE RETARDANT PLYWOOD BOARD.
- FOR SPRINKLED AREAS USE PANELS C/W DRIP HOOD. ANY CONDUIT PENETRATIONS ON THE TOP OF PANEL SHALL BE C/W LIQUID TIGHT FITTINGS.
- PANEL SCHEDULE SHOWN IS DIAGRAMATIC ONLY. CONTRACTOR TO REARRANGE CIRCUITS AS NECESSARY TO BALANCE PHASES WITHIN 5% BETWEEN.
- EACH PANEL BOARD SHALL BE COMPLETE WITH A DIRECTORY GIVING THE NUMBER AND DESCRIPTION OF EACH CIRCUIT CONTROLLED. THE DIRECTORIES SHALL BE CLEARLY TYPED, LEGIBLE AND OF SAMPLE SIZE AND SHALL BE MOUNTED IN A METAL FRAME WITH A CLEAR PLASTIC COVER ON THE INSIDE OF THE DOOR.



EXISTING ELECTRICAL SERVICE - MODIFICATION  
N.T.S.

2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO.	ISSUANCES & REVISIONS	DATE

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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

EQUIPMENT SCHEDULE  
Drawing Description : AND SINGLE LINE DIAGRAM

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

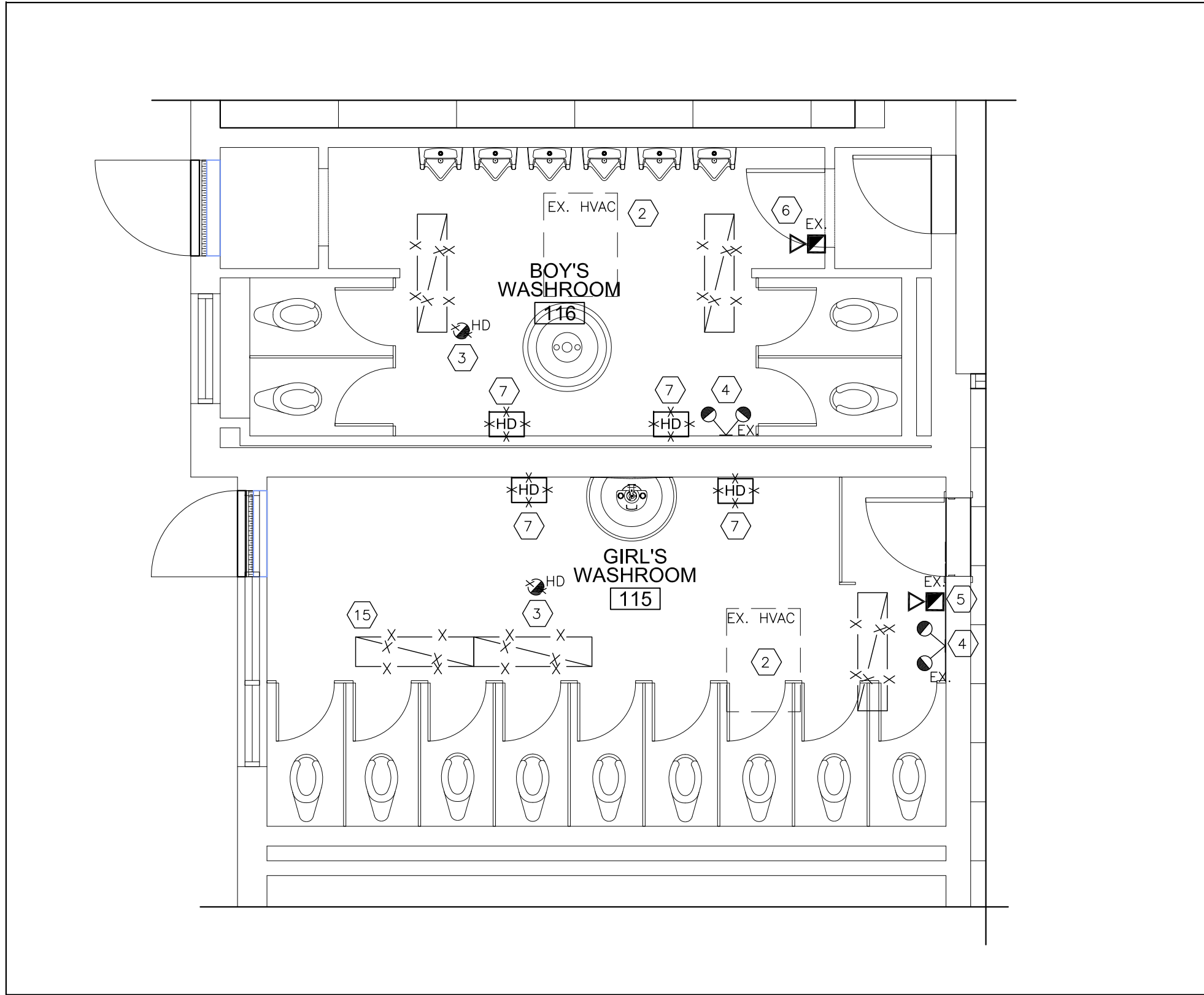
PNF Project No.

20041

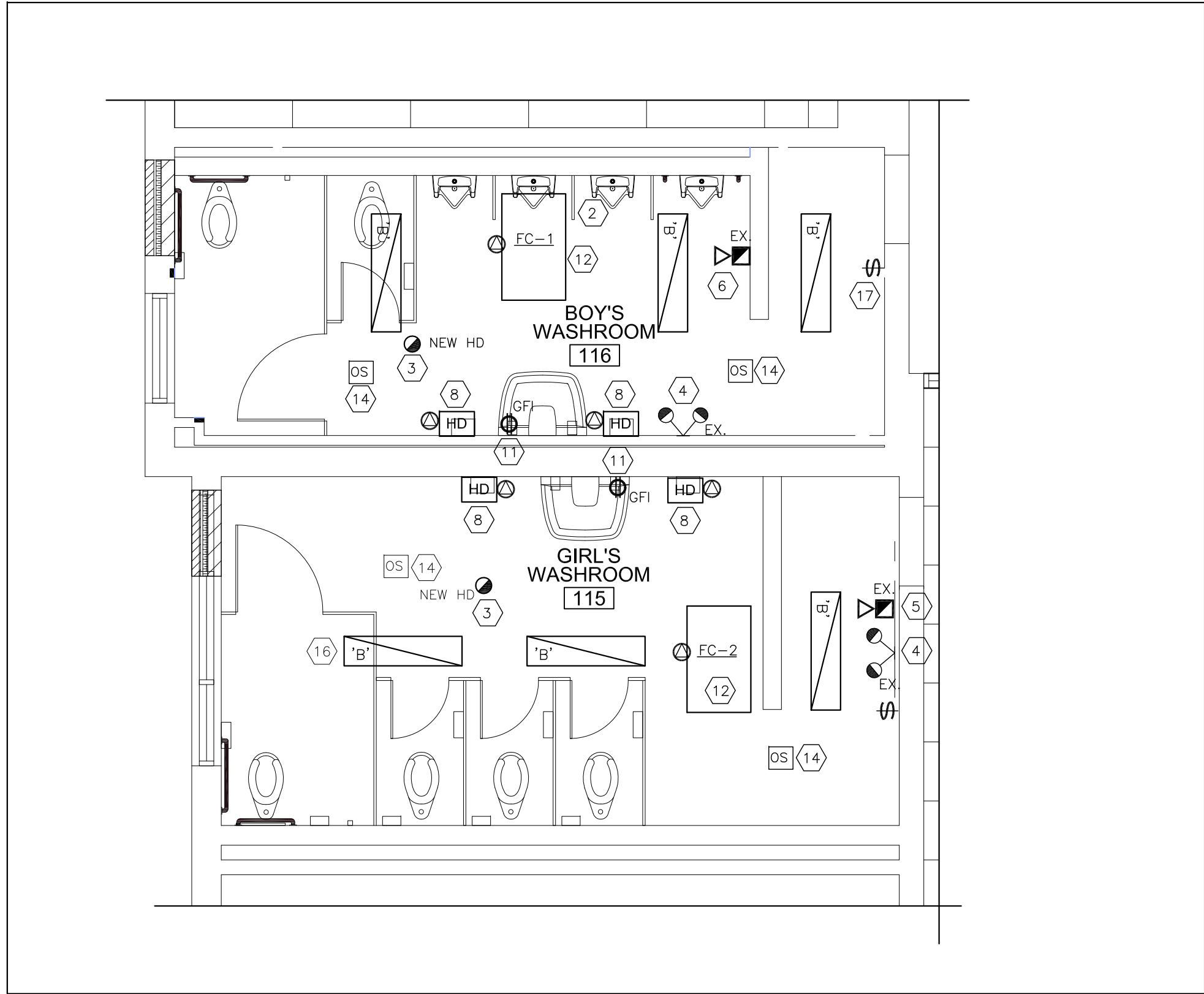
Dwg.No.

E-13

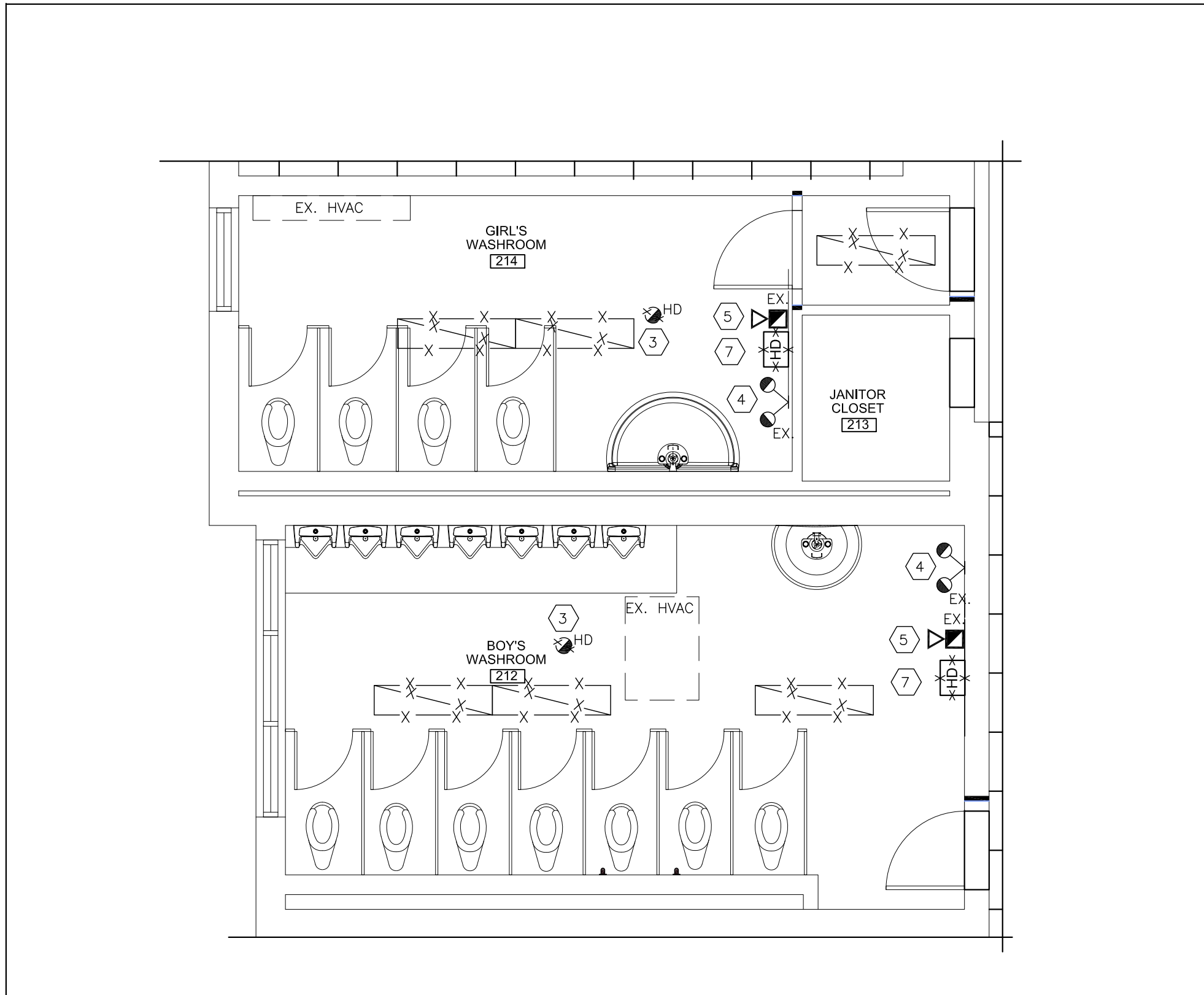




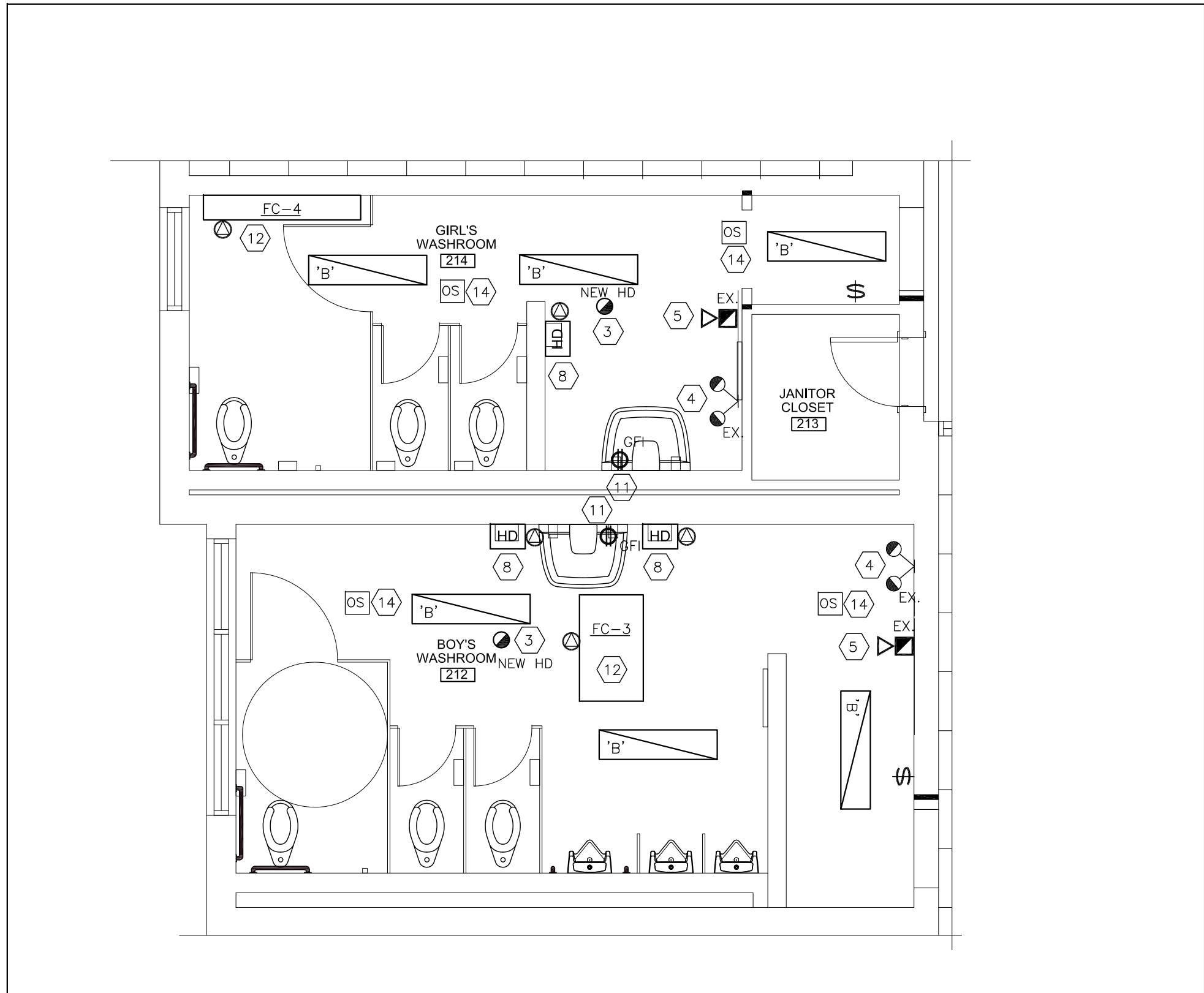
1 DEMOLITION LAYOUT - GROUND FLOOR WASHROOMS  
E-14 SCALE 1:50



3 NEW LAYOUT - GROUND FLOOR WASHROOMS  
E-14 SCALE 1:50



2 DEMOLITION LAYOUT - SECOND FLOOR WASHROOMS  
E-14 SCALE 1:50



4 NEW LAYOUT - SECOND FLOOR WASHROOMS  
E-14 SCALE 1:50

#### GENERAL NOTES:

- FOR FULL DEMOLITION LAYOUT REFER TO ARCHITECTURAL LAYOUT. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH ARCHITECTURAL DRAWINGS. DISCONNECT AND REMOVE ALL UNUSED ELECTRICAL SERVICES AND WIRING.
- LOCATION OF EXISTING ELECTRICAL SERVICES ARE TAKEN FROM EXISTING ELECTRICAL DRAWINGS. EXACT LOCATION SHALL BE CONFIRMED ON SITE BY CONTRACTOR.
- ALL WALL MOUNTED EQUIPMENT AND ACCESSORIES SHALL BE SURFACE MOUNTED WITH SURFACE MOUNTED CONDUITS.
- ALL NEW FIRE ALARM DEVICES SHALL BE COMPATIBLE WITH EXISTING FIRE ALARM SYSTEM.
- PROVIDE TESTING, VERIFICATION AND REPORT FOR ALL EXISTING AND NEW FIRE ALARM DEVICES.
- PROVIDE TESTING, VERIFICATIONS AND REPORT FOR ALL EXISTING AND NEW EMERGENCY LIGHTING.
- EXACT POWER REQUIREMENT FOR ALL EQUIPMENT SHALL BE VERIFIED WITH MANUFACTURERS MANUAL.

#### DRAWING NOTES

- EXISTING SURFACE MOUNTED FLUORESCENT LIGHTING FIXTURE AND SWITCH TO BE REMOVED. RE-USE EXISTING LIGHTING CIRCUITS AND EXTEND WIRING AS REQUIRED TO SUIT NEW LIGHTING FIXTURES. FOR MORE DETAILS REFER TO THE NEW LIGHTING LAYOUT. TYPICAL.
- DISCONNECT POWER CONNECTION FROM EXISTING HVAC UNIT. EXTEND AND REUSE EXISTING WIRING AND CIRCUITS FOR NEW HVAC UNITS. FOR MORE DETAILS REFER TO NEW HVAC LAYOUT.
- REPLACE EXISTING HEAT DETECTOR AFTER NEW CEILING IS INSTALLED.
- EXISTING EMERGENCY LIGHTING TO REMAIN. TYPICAL.
- EXISTING FIRE ALARM STROBE AND HORN TO REMAIN. TYPICAL WHERE SHOWN.
- RELOCATE EXISTING FIRE ALARM STROBE AND HORN AS SHOWN
- DISCONNECT POWER CONNECTION FROM EXISTING PANEL AND REMOVE EXISTING HAND DRYER. LABEL EXISTING BREAKER AS 'SPARE'.
- PROVIDE 154-120V CONNECTION FOR HAND DRYER. RUN NEW WIRING IN NEW BLOCK WALL UP TO CEILING AND BACK TO NEW SUB-PANEL.
- SPARE
- SPARE
- PROVIDE NEW 120V GFI RECEPTACLE FOR WASHFOUNTAIN PLUG-IN TRANSFORMER IN SPLASH PROOF BOX. EXACT LOCATION COORDINATE WITH PLUMBING CONTRACTOR.
- PROVIDE NEW POWER CONNECTION FOR NEW HVAC UNIT. EXTEND EXISTING WIRING AND PROVIDE NEW WIRING AS REQUIRED TO ACCOMMODATE NEW EQUIPMENT.
- SPARE
- NEW CEILING MOUNTED OCCUPANCY LIGHTING SENSOR (OS). CONNECT TO LIGHTING CIRCUIT. SEE LIGHTING LAYOUT FOR REFERENCE. TYPICAL FOR EIGHT (8).
- EXISTING LIGHTING FIXTURE TO BE REMOVED. RE-USE EXISTING AND PROVIDE NEW LIGHTING CIRCUITS AS REQUIRED TO ACCOMMODATE NEW LIGHTING LAYOUT. FOR MORE DETAILS REFER TO THE NEW LIGHTING LAYOUT. TYPICAL WHERE SHOWN.
- SUPPLY AND INSTALL NEW LIGHTING FIXTURE AS SPECIFIED. RE-USE EXISTING AND PROVIDE NEW LIGHTING CIRCUITS AS REQUIRED TO ACCOMMODATE NEW LIGHTING LAYOUT. TYPICAL WHERE SHOWN.
- PROVIDE NEW LIGHTING SWITCH AND PLATE AS SHOWN. CONNECT TO EXISTING LIGHTING CIRCUITS. TYPICAL WHERE SHOWN

#### ELECTRICAL NOTES:

- FOR NEW MECHANICAL EQUIPMENT PROVIDE LOCAL NON-FUSED DISCONNECT SWITCHES IN ACCORDANCE WITH ONTARIO ELECTRICAL SAFETY CODE.
- CONFIRM ELECTRICAL REQUIREMENTS AND EXACT LOCATION OF ALL MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR PRIOR TO ORDERING AND INSTALLATION.
- CONFIRM BREAKER/FUSE AND/OR DISCONNECT PRIOR TO ORDERING DISTRIBUTION.
- PROVIDE FEEDERS IN EMT CONDUITS FROM DISTRIBUTION PANEL TO MECHANICAL EQUIPMENT. EXACT ROUTE(S) SHALL BE DETERMINED ON SITE.
- INFORMATION PROVIDED ON DRAWINGS BASED ON VISUAL SITE INSPECTION. IT IS CONTRACTOR'S RESPONSIBILITY TO CONDUCT A SITE REVIEW PRIOR TO PRICING TO BECOME FAMILIAR WITH THE SITE CONDITIONS, VERIFY ALL LOCATIONS, SIZES AND CONNECTIONS ON SITE AND REPORT ANY DISCREPANCY TO THE CONSULTANT WITH PROPOSED RESOLUTION AND OBTAIN CONSULTANT'S APPROVAL.
- RE-ARRANGE EXISTING DISCONNECT SWITCHES, DISTRIBUTION PANEL CIRCUIT BREAKERS AND CIRCUITS AS REQUIRED TO ALLOW FOR NEW INSTALLATION.
- REMOVE ALL UNUSED ELECTRICAL WIRING AND CONDUITS.

NO.	ISSUANCES & REVISIONS	DATE
2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021

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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : WASHROOMS ELECTRICAL LAYOUT

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

PNF Project No.

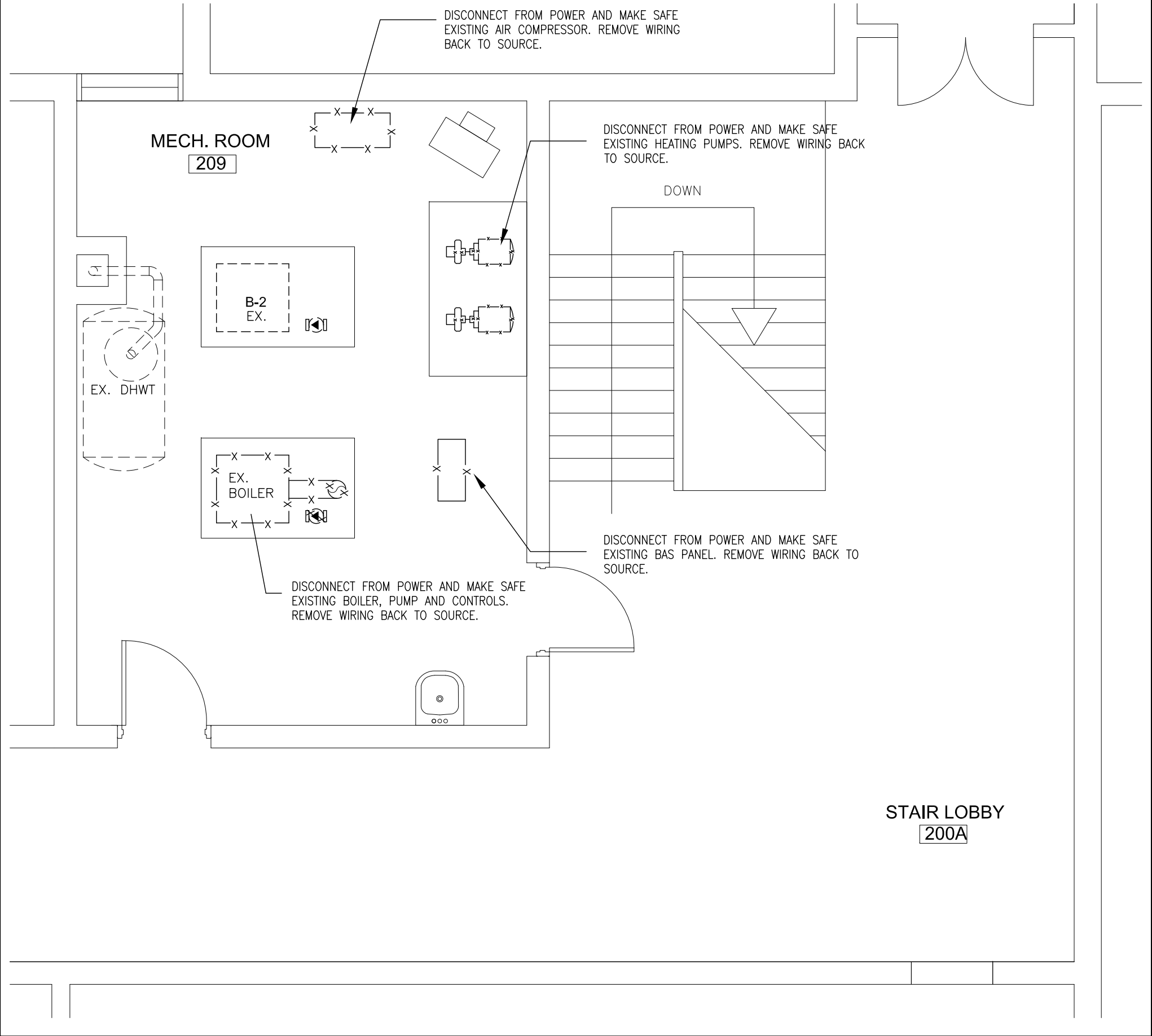
20041

Dwg.No.

E-14

ELECTRICAL NOTES:

1. FOR NEW MECHANICAL EQUIPMENT PROVIDE LOCAL NON-FUSED DISCONNECT SWITCHES IN ACCORDANCE WITH ONTARIO ELECTRICAL SAFETY CODE.
2. CONFIRM ELECTRICAL REQUIREMENTS AND EXACT LOCATION OF ALL MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR PRIOR TO ORDERING AND INSTALLATION.
3. CONFIRM BREAKER/FUSE AND/OR DISCONNECT PRIOR TO ORDERING DISTRIBUTION.
4. PROVIDE FEEDERS IN EMT CONDUITS FROM DISTRIBUTION PANEL TO MECHANICAL EQUIPMENT. EXACT ROUTE(S) SHALL BE DETERMINED ON SITE.
5. INFORMATION PROVIDED ON DRAWINGS BASED ON VISUAL SITE INSPECTION. IT IS CONTRACTOR'S RESPONSIBILITY TO CONDUCT A SITE REVIEW PRIOR TO PRICING TO BECOME FAMILIAR WITH THE SITE CONDITIONS, VERIFY ALL LOCATIONS, SIZES AND CONNECTIONS ON SITE AND REPORT ANY DISCREPANCY TO THE CONSULTANT WITH PROPOSED RESOLUTION AND OBTAIN CONSULTANT'S APPROVAL.
6. RE-ARRANGE EXISTING DISCONNECT SWITCHES, DISTRIBUTION PANEL CIRCUIT BREAKERS AND CIRCUITS AS REQUIRED TO ALLOW FOR NEW INSTALLATION.
7. REMOVE ALL UNUSED ELECTRICAL WIRING AND CONDUITS.

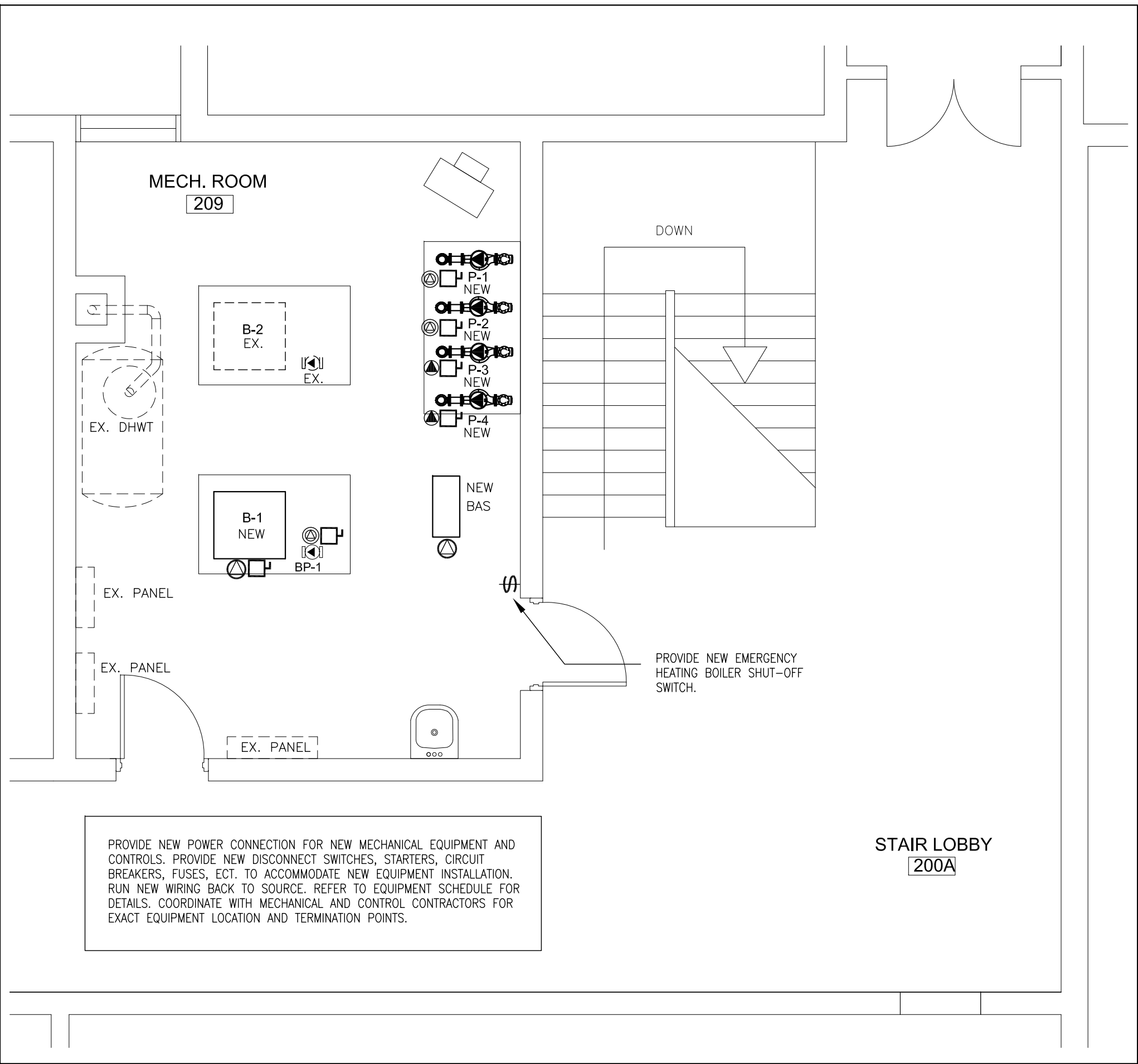


1

BOILER ROOM - DEMOLITION

E-15

SCALE 1:50

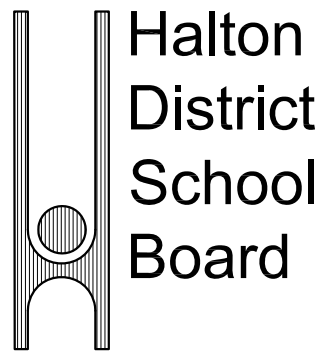


2

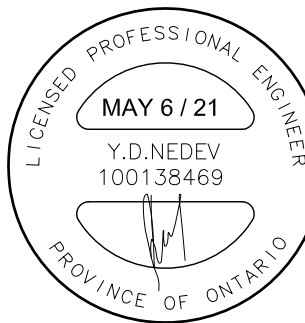
BOILER ROOM - MODIFICATION

E-15

SCALE 1:50



NO.	ISSUANCES & REVISIONS	DATE
2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021



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THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : BOILER ROOM UPGRADE

Designed: N.P.

Checked: Y.N.

Scale: AS SHOWN

Date: JAN 2021

PNF Project No.

20041

Dwg.No.

E-15



ELECTRICAL SPECIFICATION

1. PROVIDE EACH ITEM MENTIONED OR INDICATED OF QUALITY AND SUBJECT TO QUALIFICATIONS NOTED; PERFORM ACCORDING TO CONDITIONS STATED. EACH OPERATION PRESCRIBED; AND PROVIDE THEREFORE ALL LABOUR, MATERIAL, EQUIPMENT, INCIDENTALS AND SERVICES REQUIRED TO COMPLETE THE INSTALLATION.
2. EXAMINE THE SITE, EXISTING EQUIPMENT AND THE LOCAL CONDITIONS AFFECTING THE WORK UNDER THIS CONTRACT. NO ALLOWANCE WILL BE MADE SUBSEQUENTLY FOR ANY OBVIOUS CONSIDERATIONS OVERLOOKED. DISCREPANCIES SHALL BE REPORTED IMMEDIATELY.
3. AFTER THE WORK IS COMPLETE BUT BEFORE FINAL PAYMENT, GIVE THE OWNER A WRITTEN GUARANTEE THAT YOU WILL, AT NO CHARGE TO THE OWNER, REPLACE OR REPAIR ANY DEFECTS IN WORKMANSHIP AND MATERIALS NOT DUE, IN THE OPINION OF THE ARCHITECT, TO MISUSE OR NEGLIGENCE. GUARANTEE SHALL COVER A PERIOD OF 12 MONTHS FROM THE DATE OF ACCEPTANCE OF THE WORK BY THE ARCHITECT.
- THIS GUARANTEE SHALL IN NO WAY SUPPLANT ANY OTHER GUARANTEE OR GUARANTEES OF LONGER PERIOD, BUT SHALL BE BINDING ON ALL OTHER WORK NOT OTHERWISE COVERED.
4. ALL WORK SHALL COMPLY STRICTLY TO THE REQUIREMENTS OF THE LATEST EDITIONS OF THE CANADIAN ELECTRICAL "CSA" CODE AS ADOPTED AND AMENDED BY PROVINCIAL REGULATIONS AND THE BUILDING CODE. THESE CODES AND ANY ADDITIONAL REQUIREMENTS OF THE POWER UTILITY SHALL FORM AN INTEGRAL PART OF THIS SPECIFICATION. ALL EQUIPMENT SHALL BE CSA APPROVED, WHERE DRAWING CALLS FOR EQUIPMENT, WIRING OR OTHER REQUIREMENTS EXCEEDING THE MINIMUM REQUIREMENTS OF THE CODE, THE DRAWING SHALL BE FOLLOWED.
5. BEFORE STARTING ANY WORK, SUBMIT THE REQUIRED NUMBER OF COPIES OF THE ELECTRICAL DRAWING TO THE POWER AUTHORITY ELECTRICAL INSPECTION DEPARTMENT REGIONAL OFFICE, FOR THEIR APPROVAL AND COMMENTS.
6. PAY ALL FEES FOR EXAMINATION OF DRAWING AND OBTAIN ALL PERMITS REQUIRED AND PAY ALL PERMIT AND INSPECTION FEES.
7. ARRANGE FOR INSPECTION OF ALL WORK BY THE POWER AUTHORITY INSPECTION DEPARTMENT, ON COMPLETION OF THE WORK, PRESENT TO THE OWNER THE FINAL UNCONDITIONAL CERTIFICATE OF APPROVAL.
8. ON AWARD OF CONTRACT, SUBMIT FOR REVIEW LIST OF DELIVERY DATES AND SHOP DRAWINGS FOR ALL EQUIPMENT.
9. SCHEDULE AND CO-ORDINATE ALL WORK WITH OTHER TRADES.
10. EQUIPMENT SUPPLIED SHALL BE NEW, FREE OF OBJECTIONABLE NOISE AND VIBRATIONS.
11. TENANT SHALL HAVE TEMPORARY USE OF INSTALLATION PRIOR TO FINAL ACCEPTANCE.
12. ALL CLAIMS FOR EXTRAS SHALL BE SUPPORTED BY WRITTEN AUTHORIZATION AND ITEMIZED MATERIAL AND LABOUR COST BREAKDOWNS.
13. ALL NEW AND EXISTING ELECTRICAL EQUIPMENT MOUNTED AND CONNECTED BY THIS CONTRACTOR, WHETHER SUPPLIED BY HIM OR NOT, SHALL BE IDENTIFIED BY MEANS OF PLASTIC NAMEPLATES. THESE NAMEPLATES SHALL BE FASTENED WITH SCREWS AND MUST ALSO INDICATE THE SOURCE OF SUPPLY TO THE EQUIPMENT.
14. WIRING SHALL BE CONCEALED WHERE POSSIBLE. ALL EXPOSED WIRING SHALL BE RUN IN EMT OR RIGID CONDUIT AS REQUIRED BY CODE OR IN WIREMOLD IN FINISHED AREAS. BX CABLE MAY BE USED IN HOLLOW PARTITIONS OR SUSPENDED CEILINGS. MINIMUM WIRE SIZE SHALL BE #12 AWG COPPER TO 70° - #10 TO 125° CONDUIT TO BE RUN PARALLEL TO BUILDING LINES. BRANCH WIRING UP TO AND INCLUDING #8 TO BE SOLID, LARGER THAN #8 TO BE STRANDED. ALL BRANCH WIRE TO BE APPROVED FOR 600 VOLTS.
15. EXPLOSIVE FASTENERS SHALL NOT BE USED WITHOUT PRIOR WRITTEN APPROVAL FROM THE LANDLORD.
16. FLUORESCENT AND INCANDESCENT LIGHTING FIXTURES SHALL BE SUPPORTED FROM STRUCTURAL MEMBERS. DO NOT RELY ON CEILING FOR SUPPORT.
17. LIGHT SWITCHES SHALL BE AS FOLLOWS: (SILENT ACTUATING)  
SINGLE POLE, TOGGLE TYPE - LEVITON SERIES 18221 WHITE OR EQUAL. 347 VOLT.  
SINGLE POLE, TOGGLE TYPE - LEVITON SERIES 1221 WHITE OR EQUAL. 120 VOLT.  
THREE WAY TOGGLE - LEVITON 1223  
DIMMERS TO BE 'LEVITON' SLIDING TYPE.  
MOUNT SWITCHES AT 48" AFF UNLESS OTHERWISE NOTED.
18. DUPLEX RECEPTACLES SHALL BE HUBBELL CAT.#5252 BLACK OR EQUAL, MOUNTED AT 12" AFF, UNLESS OTHERWISE NOTED.
19. COVERPLATES FOR RECEPTACLES AND SWITCHES SHALL BE STAINLESS STEEL, SMITH & STONE OR EQUAL.
20. RECEPTACLES FOR COMPUTER TERMINALS SHALL HAVE ISOLATED GROUND WITH SEPARATE INSULATED GROUND WIRE DIRECT TO GROUND IN DISTRIBUTION PANEL. PROVIDE SEPARATE NEUTRAL CONDUCTOR AS WELL. RECEPTACLES SHALL BE ORANGE.

21. DISCONNECT SWITCHES SHALL BE TYPE A, HORSEPOWER RATED. "SWITCHMATIC" BY FPE OR EQUAL BY WESTINGHOUSE OR IE. FUSES SHALL BE HRC FORM 1. FUSES PROTECTING MOTORS OR TRANSFORMERS SHALL BE "FUSETRON" OR EQUAL.
22. SUPPLY AND INSTALL EMPTY CONDUIT, C/W NYLON PULLSTRING, OUTLETS, BACKBOARDS, PULL BOXES AND WIRING FOR BELL TELEPHONE CABLES AND EQUIPMENT.
23. ALL MATERIAL SHALL BE STORED NEATLY AND OUT OF THE WAY. CLEAN UP DAILY ALL REFUSE CAUSED BY WORK. AT COMPLETION OF PROJECT CLEAN ALL FIXTURES AND EQUIPMENT.
24. PROVIDE TEMPORARY POWER AND LIGHTING FOR CONSTRUCTION WHEN REQUIRED. ONE LAMP SOCKET AND 150W LAMP PER EVERY 400 SQUARE FEET AND ONE POWER OUTLET FOR EVERY 1500 SQUARE FEET OR AREA.
25. LIGHTING PANELS  
LIGHTING PANELS SHALL BE OF THE TYPE AND SIZE INDICATED WITH THE NUMBER OF BRANCH CIRCUITS AS SHOWN ON THE DRAWINGS. PANELS MUST BE LOCKABLE.  
  
PANELS SHALL BE PANELBOARD TYPE WITH TOGGLE TYPE, BOLT-IN BREAKERS, AS MANUFACTURED BY CUTLER HAMMER, FEDERAL PIONEER "NBLP", WESTINGHOUSE OR APPROVED EQUAL.  
  
EACH LIGHTING PANEL SHALL HAVE TYPEWRITTEN DIRECTORY WITH TRANSPARENT PLASTIC COVER. REVISE DIRECTORY TO SUIT NEW AND EXISTING CIRCUITING.  
  
CIRCUIT LOADS SHALL BE BALANCED ACROSS PHASES AS CLOSELY AS POSSIBLE. PROVIDE LOCKING DEVICES ON BREAKERS CONTROLLING CIRCUITS FOR EXIT LIGHTS, TIME SWITCHES, MECHANICAL CONTROLS, ETC.  
  
SUBMIT TO ENGINEER/ARCHITECT A SET OF SHOP DRAWINGS IN PDF FOR REVIEW COVERING COVERING ALL MAJOR MANUFACTURED ITEMS.
26. CO-ORDINATE WITH LANDLORD AND ADJACENT TENANTS AS REQUIRED FOR ACCESS, POWER SHUTDOWNS, ETC.
27. WIRING FOR MECHANICAL WORK  
MECHANICAL TRADE WILL SUPPLY ALL STARTERS, CONTROL TRANSFORMERS AND CONTROLS FOR EQUIPMENT SUPPLIED BY THEM AND WILL MOUNT ALL THESE EXCEPT FOR WALL MOUNTED STARTERS AND WALL MOUNTED LINE VOLTAGE CONTROLS, WHICH SHALL BE MOUNTED BY ELECTRICAL TRADE.  
  
ELECTRICAL TRADE SHALL DO ALL POWER WIRING, WHICH IS WIRING WHICH CARRIES THE LOAD CURRENT OF THE MOTOR, HEATER, HOT WATER TANK OR OTHER EQUIPMENT SUPPLIED BY MECHANICAL TRADE. MECHANICAL TRADE WILL DO ALL OTHER RELATED WIRING.
28. FIRE ALARM DEVICES IF REQUIRED TO BE AS PER BASE BUILDING STANDARD AND TIED INTO BASE BUILDING SYSTEM. ALL WORK MUST BE DONE IN ACCORDANCE WITH LANDLORDS REQUIREMENTS. REFER TO LANDLORDS GUIDELINES.
29. CUTTING, PATCHING AND PAINTING WILL BE BY GENERAL TRADES.
30. AT COMPLETION OF WORK, PROVIDE THE TENANT WITH A SET OF AS-BUILT RECORD DRAWINGS. THE AS-BUILT DRAWINGS SHALL INDICATE ALL APPROVED CHANGE NOTICES AND SITE DEVIATIONS.
31. EMERGENCY LIGHTING UNITS. (FINISH TO BE WHITE)  
AS PER LUMINARE SCHEDULE
32. ALL CONFLICTS WITH APPLICABLE REGULATIONS SHALL BE RESOLVED BEFORE INSTALLATION BY THE CONTRACTOR AT HIS EXPENSE.
33. IF ADDITIONAL CLARIFYING DETAILS ARE REQUIRED BY THE LOCAL INSPECTION AUTHORITIES, THESE DETAILS SHALL BE PREPARED AND APPROVAL SECURED BY THE CONTRACTOR AT HIS EXPENSE.
34. THE DRAWINGS ARE ESSENTIALLY DIAGRAMMATIC, THEREFORE THE CONTRACTOR WILL MAKE USE OF ALL CONTRACT DOCUMENTATION AND SHALL FINALLY VERIFY THIS INFORMATION AGAINST SITE CONDITIONS.
35. IT SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR TO INSTALL CONDUIT WITH ALL NECESSARY OFFSETS, JUNCTION BOXES, ETC. IN SUCH A MANNER AS TO CONFORM TO THE STRUCTURE, AVOID OBSTRUCTIONS, PRESERVE HEADROOM, MAINTAIN GOOD PRACTICE, AND AS PER THE LATEST EDITION OF THE CANADIAN ELECTRICAL CODE.
36. THE ARCHITECTURAL AND STRUCTURAL DRAWINGS SHALL HAVE PRECEDENCE OVER ELECTRICAL DWG.
37. DISCREPANCIES BETWEEN DIFFERENT DRAWINGS OR SPECIFICATIONS SHALL BE PROMPTLY BROUGHT TO THE ATTENTION OF THE ARCHITECT/ENGINEER. WORK IN AFFECTED AREAS SHALL BE STOPPED.
38. IT SHALL BE THIS CONTRACTORS RESPONSIBILITY TO SUPPORT ALL LIGHTING FIXTURES ADEQUATELY. VERIFY AVAILABILITY OF FIXTURES PRIOR TO ORDERING.
39. BEFORE ANY CUTTING OR CORE DRILLING OF EXISTING WALLS AND/OR FLOOR CLEARLY MARK EXISTING BUILDING SERVICES AND STRUCTURAL MEMBERS BY RADAR SCREENING.
40. ALL PENETRATIONS THROUGH FIRE SEPARATION SHALL BE SEALED WITH FIRE RETARDANT SEALANT WITH RATING TO MATCH FIRE RATING OF WALLS/FLOORS/CEILING.

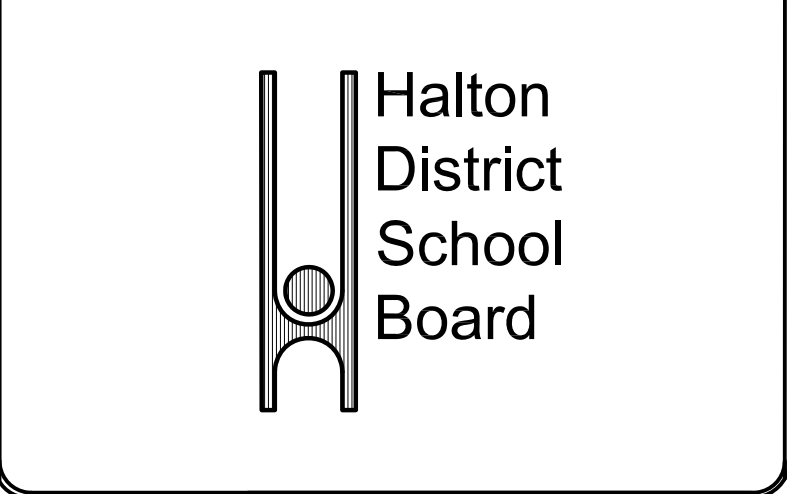
F/A SYSTEM REQUIREMENTS

1. BASE BUILDING FIRE ALARM SYSTEM IS EXISTING TO REMAIN. COMPLETE FIRE ALARM DEVICES INSTALLATION AND SYSTEM VERIFICATION REQUIRED UNDER THIS CONTRACT MUST BE HANDLED THROUGH BASE BUILDING FIRE ALARM CONTRACTOR. (ELECTRICAL CONTRACTOR SHALL CARRY A SUBCONTRACT WITH BASE BUILDING F/A CONTRACTOR).
2. PRIOR TO COMMENCING ANY NEW INSTALLATION AND REVISIONS TO THE BASE BUILDING FIRE ALARM SYSTEM DIV16 SHALL OBTAIN A WRITTEN APPROVAL BY THE BASE BUILDING ENGINEERS AND/OR PROPERTY MANAGER.
3. UNLESS OTHERWISE NOTED OR DESIGNATED ON DRAWINGS ALL EXISTING FIRE ALARM DEVICES (PULL STATIONS, BELLS, ETC.) INCLUDING DEVICES NOT SHOWN IN THE COMMON AREAS SHALL REMAIN OPERATIONAL DURING CONSTRUCTION.
4. WHERE EXISTING FIRE ALARM DEVICES TO BE REMOVED, REMAINING OF OTHER EXISTING DEVICES SHALL BE KEPT OPERATIONAL AT ALL TIME.
5. NEW FIRE ALARM SYSTEM/DEVICES TO BE INSTALLED PER CAN/ULC-S524-01 AND VERIFIED PER CAN/ULC-S537-04. A COPY OF THE FIRE ALARM VERIFICATION CERTIFICATE MUST BE SUBMITTED TO THE CONSULTANTS PRIOR TO ISSUING FINAL ACCEPTANCE LETTER TO THE CITY AS PER O.B.C. REQUIREMENTS.
6. ALLOW IN CONTRACT BID RELOCATION OF ANY EXISTING FIRE ALARM DEVICE (PULL STATION, P/A SPEAKERS, ELECTRONIC MINIHORNS) TO NEW WALL/CEILING FINISHES TO SUIT NEW TENANT LAYOUT.
7. NEW DEVICES MUST BE COMPATIBLE WITH EXISTING FIRE ALARM SYSTEM.
8. PROVIDE ALL NECESSARY SYSTEM RE--PROGRAMMING TO SUIT DEVICE AND ZONE CHANGES, IF APPLICABLE.
9. CO-ORDINATE ALL SYSTEM BY-PASSES AND SHUTDOWNS WITH BUILDING AUTHORITY. REINSTATE SYSTEM TO FULL OPERATION AT THE END OF EACH WORKING PERIOD. AT NO TIME SHALL FIRE PROTECTION EQUIPMENT BE IMPAIRED WITHOUT A QUALIFIED TECHNICIAN IN ATTENDANCE.
10. CONFIRM GRAPHICAL ZONING & REVISE F/A GRAPHIC PLAN TO SUIT ANY PROPOSED CHANGES.
11. PROVIDE "AS-BUILT" DRAWINGS SHOWING LOCATION OF ALL F/A DEVICES (PULL STATION, BELL, FIRE DETECTOR, END OF LINE DEVICES ETC.), WITH ZONE NUMBER FOR EACH DEVICE.
12. PROVIDE ON-SITE TRAINING TO OPERATIONS PERSONNEL TO DEMONSTRATE ANY SYSTEM CHANGES.

DEMOLITION SPECIFICATION

1. ARCHITECTURAL, STRUCTURAL, MECHANICAL AND ELECTRICAL ALTERATIONS AND ADDITIONS ARE BEING MADE IN THE EXISTING AREAS NOTED ON ARCHITECTURAL, STRUCTURAL, MECHANICAL AND ELECTRICAL DRAWINGS AND SPECIFICATIONS.
2. VISIT THE SITE AND EXAMINE THE EXISTING CONDITIONS AND ALL TENDERING DOCUMENTS, DRAWINGS AND SPECIFICATIONS AND MAKE NECESSARY ALLOWANCES IN TENDER PRICE FOR REMOVAL, RELOCATION, REROUTING, RECONNECTION OF EXISTING ELECTRICAL EQUIPMENT AND WIRING AS MAY BE NECESSARY FOR THE EXECUTION AND COMPLETION OF THIS PROJECT. NO ALLOWANCE WILL BE MADE LATER FOR ANY EXPENSE INCURRED BY THIS TRADE THROUGH FAILURE TO MAKE THIS EXAMINATION.
3. REMOVE AND/OR RELOCATE AND REINSTALL ALL WIRING, FIXTURES AND EQUIPMENT AS NECESSARY TO ACCOMMODATE ARCHITECTURAL AND STRUCTURAL ALTERATIONS AND ADDITIONS LIST  
BEING ALTERED OR DEMOLISHED, BUT FEEDING OUTLETS OR EQUIPMENT REQUIRED TO REMAIN IN SERVICE SHALL BE REROUTED AS REQUIRED TO MAINTAIN THE CONTINUITY OF THESE SERVICES.
4. SUPPLY, INSTALL AND MAINTAIN ALL REQUIRED TEMPORARY WIRING TO OCCUPIED AREAS AT ALL TIMES. PROVIDE ADEQUATE PROTECTION TO EXISTING WIRING AND EQUIPMENT SERVING THE EXISTING AND NEW AREAS AND PARTICULARLY WHERE WIRING AND ELECTRICAL EQUIPMENT HAVE BECOME EXPOSED TO MECHANICAL INJURY OR MOISTURE IN THE COURSE OF ALTERATIONS OR NEW CONSTRUCTION.
5. EXISTING ELECTRICAL EQUIPMENT REMOVED AND INDICATED FOR REUSE SHALL BE CLEANED BEFORE INSTALLATION. ALL UNUSED CONDUIT ENTRANCE OPENINGS SHALL BE SEALED BEFORE REINSTALLATION.
6. REUSED LIGHTING FIXTURES SHALL BE CLEANED AND RELAMPED WITH NEW LAMPS. EXISTING LIGHTING FIXTURES INDICATED FOR REUSE SHALL BE STORED SAFELY ON THE SITE UNTIL READY FOR INSTALLATION. ALL EXISTING LAMPS AND THE EXISTING FIXTURES NOT BEING REUSED SHALL BE HANDED OVER TO THE OWNERS ON COMPLETION OF THE PROJECT.
7. OBSOLETE CONDUITS AND CABLES SHALL BE DISCONNECTED FROM THEIR SOURCE OF SUPPLY, CUT BACK TO A SUITABLE POINT, MAKE SAFE, AND REMOVED TO MINIMIZE INTERFERENCE WITH NEW WORK.
8. CERTAIN ITEMS ARE IDENTIFIED ON THE DRAWINGS AS EXISTING EQUIPMENT "RELOCATED". DISCONNECT SUCH EQUIPMENT FROM ITS PRESENT SOURCE AND AFTER RELOCATION RECONNECT AND REINSTALL ALL ELECTRICAL COMPONENTS.
9. ALL EXISTING EQUIPMENT AND MATERIAL NOT REQUIRED IN THE FINAL INSTALLATION SHALL BE CAREFULLY REMOVED AT THE APPROPRIATE TIME AND SHALL BE DISPOSED OF OR HANDED OVER TO OWNER.

LEGEND	
	CEILING OR WALL MOUNTED EXIT LIGHT
	LIGHTS ON NIGHT CIRCUIT
	EMERGENCY LIGHTING BATTERY UNIT
	REMOTE EMERGENCY LIGHT MOUNTED ON WALL OR CEILING.
	SINGLE POLE TOGGLE SWITCH WITH ONE, TWO OR THREE GANG COVERPLATE
	SWITCHES AS ABOVE, NUMBER DENOTES 2, 3, OR 4 WAY.
	15A/120V DUPLEX RECEPT. OR AS NOTED
	15A, 120 V DUPLEX RECEPT WITH I.G.
	15A/120V DUPLEX RECEPT., SPLIT WIRED
	SPECIAL RECEPTACLE AS NOTED ON DWG
	120 VOLT DIRECT CONNECTION , 1PH.
	208 VOLT DIRECT CONNECTION , 1 PH.
	208 VOLT DIRECT CONNECTION, 3 PH.
	347/600 VOLT DIRECT CONNECTION 3 PH
	FLUSH OR SURFACE MTD. LIGHTING PANEL
	CIRCUIT #1 IN PANEL 'A'
	UNFUSED DISCONNECT SWITCH
	FUSED DISCONNECT SWITCH
	FIRE ALARM BELL
	FIRE ALARM STROBE AND HORN
	FIRE ALARM MANUAL PULL STATION
	CEILING MOUNTED HEAT DETECTOR
	SPEAKER
	VOICE/DATA OUTLET



2	FOR PERMIT / TENDER	MAY 6, 2021
1	FOR COORDINATION	APR 20, 2021
NO.	ISSUANCES & REVISIONS	DATE

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THESE DRAWINGS WERE PREPARED FOR BUILDING PERMIT AND AS A GENERAL CONSTRUCTION GUIDE. ANY MAJOR DISCREPANCIES WHICH ARE EXPOSED AFTER DEMOLITION SHALL BE REPORTED TO THE OWNER REPRESENTATIVE AND ENGINEERS PRIOR TO COMMENCEMENT OF ANY WORK.

THESE DRAWINGS ARE NOT TO BE SCALED.

Project Address : 1522 MOUNTAIN GROVE AVE. BURLINGTON, ONTARIO, L7R 2H2

Project Description : ROLLING MEADOWS PUBLIC SCHOOL RENOVATIONS

Drawing Description : SPECIFICATIONS, LEGEND AND DETAILS

Designed: N.P.
Checked: Y.N.
Scale: AS SHOWN
Date: JAN 2021

PNF Project No.	Dwg.No.
20041	E-16